

SPECIAL ISSUE: *The Wonderful World of Water*

THE AMERICAN GARDENER

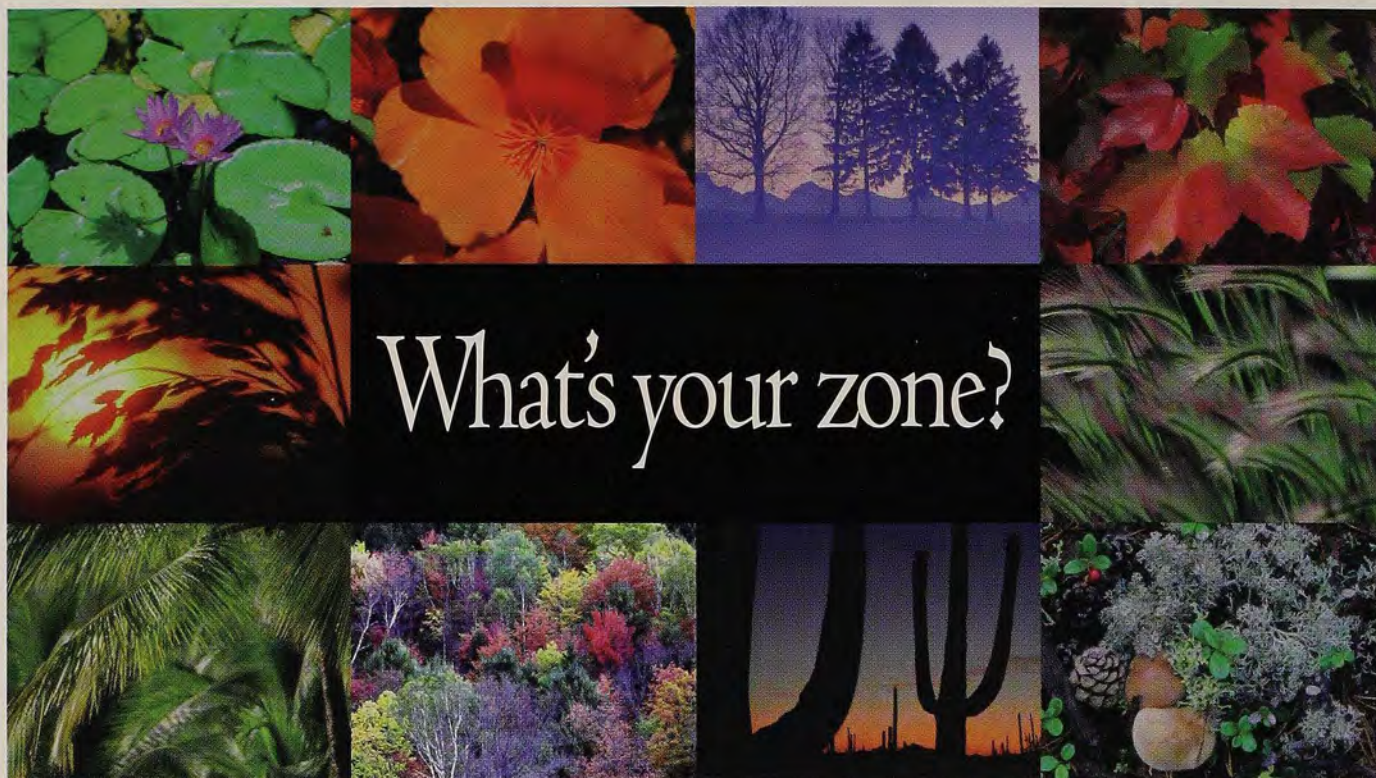
A Publication of the American Horticultural Society

March/April 1997 \$3.95



BACK-YARD SWAMPS Dry Wells and Other Tactics
CHICAGO STREAM RESTORATION From Trickle to Terrific
OREGON OASIS A Rill Dream Garden
POOLING OUR RESOURCES What Individuals Can Do





What's your zone?

Sunset knows.....The new *National Garden Book* is filled with flowers, bushes, trees, and lots of other worthwhile dirt. Spruced up with more than 45 proprietary climate zones, it covers the continental United States and Canada. Once you know your zone, you will grow into a successful gardener. Green thumbs not required.

Modeled on our best-selling *Western Garden Book*, the *National Garden Book* gives gardeners nationwide the evergreen facts Westerners have depended on for over 50 years. Featuring over 6,000 detailed plant listings and more than 2,500 color photographs, it also includes hundreds of hardy how-to tips and techniques from our garden experts. For novices and experts alike, this is the definitive reference book of American plant varieties.

The new *National Garden Book* has taken root and become a perennial favorite. From Sunset, naturally.



45 finely tuned climate zones for the entire U.S. and Canada



Sunset
BOOKS

contents

Volume 76, Number 2

March/April 1997



DEPARTMENTS

- Commentary** 4
- Members' Forum** 5
First-rate, cut-rate floral portraits.
- Offshoots** 7
Avian adversity.
- Gardeners' Information Service** 9
Cold-hardy aquatics, container street trees.
- Mail-Order Explorer** 10
Magnificent magnolias and much more.
- Conservationist's Notebook** 12
Telling the fortune of gypsy moths.
- Planting the Future** 14
AHS meetings spark A-plus gardens.
- Natural Connections** 17
Pals of wild yellow passionflower.
- Book Reviews** 51
Shrubs, ethnobotany, natives, and nature essays.
- Pronunciations** 62

FOCUS

- Kinder Killers** 47
A brief update on the search for gentler pesticides.
- Regional Happenings** 58
Early spring garden happenings.

FEATURES



- Just Add Water** 18
by Sara Stein
What can a lone gardener do to protect this irreplaceable resource?
- A River Runs Through It** 26
by Adele Kleine
In Chicago, a once sluggish stream became the heart of a vibrant wetland.
- What Noah Didn't Know** 30
by Dennis C. McGlade
Some tacks to take when the rain gods are too generous.
- All Wet** 36
by Michael McKeag
A tale of one man's obsession with his water garden.

On the cover: Michael McKeag, a Portland, Oregon, computer engineer, had dreams of living on a houseboat. When that proved impractical, he created an escapist's landscape. Plants native to the Willamette Valley surround a small pond and a stream that cuts across most of his small back yard. His story begins on page 36.

American Horticultural Society

7931 East Boulevard Drive
Alexandria, VA 22308-1300
(703) 768-5700

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

PRESIDENT

DR. H. MARC CATHEY

EXECUTIVE VICE PRESIDENT

HELEN FULCHER WALUTES

BOARD OF DIRECTORS

Officers 1996-1997

WILLIAM E. BARRICK, PH.D., **CHAIRMAN**
Pine Mountain, Georgia

KATY MOSS WARNER, **FIRST VICE CHAIRMAN**
Lake Buena Vista, Florida

NANCY S. THOMAS, **SECOND VICE CHAIRMAN**
Houston, Texas

WILLIAM A. PUSEY, **SECRETARY**
Washington, D.C.

CHARLES HENRY SMITH JR., **TREASURER**
Middleburg, Virginia

SHERMAN ADLER
Hobe Sound, Florida

KATHERINE MCKAY BELK
Charlotte, North Carolina

NANCY H. CALLAWAY
Pine Mountain, Georgia

JAMES L. CORFIELD
Downers Grove, Illinois

ARABELLA S. DANE
Boston, Massachusetts

PAUL ECKE JR.
Encinitas, California

WILLIAM R. MARKEN
Menlo Park, California

GENE M. MILLER
Silver Spring, Maryland

EGON MOLBAK
Seattle, Washington

DUDLEY MORGAN
Nashville, Tennessee

WILLIAM G. PANNILL
Martinsville, Virginia

DR. JULIA W. RAPPAPORT
Santa Ana, California

GEOFFREY L. RAUSCH
Pittsburgh, Pennsylvania

JOSEPHINE M. SHANKS
Houston, Texas

VALERIE L. THOMAS
Alexandria, Virginia

ROBERT D. VOLK
San Marino, California

commentary

You can't live without it, but you should never have to pay for it. Those were the words that guided my grandmother, Miss Nanny, in using water in her garden.

Miss Nanny's water never came from a spigot. For one thing, she showed us that if you drew a jar of city water and let it set for a day, all kinds of things would be floating in it. But mostly she could not abide to pay for anything that she could get free. Her gardening water was caught in great rain barrels.

Rainwater wouldn't burn the maidenhair ferns or turn the azaleas yellow or change the color of the hydrangea flowers from what she intended. She used it on her porch plants, recent transplants, and flower arrangements. In times of drought, choice garden plants were watered by bucket.

She reduced the need for supplemental watering through a number of practices, such as amending the soil with vast amounts of organic matter, carefully spacing plants, and weeding vigorously. Every bed had a screen of some type, such as a border of trees, to help protect it from too much sun or drying wind.

Today we are returning to this awareness of water. Gardeners are conserving water through practices such as xeriscaping and permaculture. We have learned the importance to our environment of swamps, bogs, and other wetlands, and the degree to which erosion is robbing us of topsoil. Many gardeners are adding water features to their landscapes—to attract wildlife, to provide appealing sounds and reflections, or to enjoy water plants and fish.

Several of this month's features reflect this awareness. In our fourth excerpt from Sara Stein's new book, she talks about how natural water sources are vanishing and how gardeners across the country are dealing with this concern as individuals. One of these people is Mike McKeag, who tells us in his own words about the 50-foot stream and pond he built on his small Portland, Oregon, lot.

We'll tell you about the Chicago Botanic Garden's efforts to stem erosion and improve water quality on a portion of the Skokie River that runs through its grounds, and offer suggestions from a landscape architect about how homeowners with unwanted standing water can take advantage of it—or send it on its way.

We continue to salute our 75th Anniversary with an article about how our National Youth Gardening Symposia inspired two very special school gardens in California and Ohio. These symposia exemplify the educational mission that has steered AHS for 75 years. Our fifth youth symposium will be in Chicago from July 31 through August 2. We hope you're enjoying our party!



H. Marc Cathey

H. Marc Cathey, AHS President



members' forum

FLOWERS AND FACES

I am responding to Walter Salmon's request in the November/December issue regarding suggestions for a relatively inexpensive automatic camera that will take close-up photographs of flowers.

I have been using a Konica FS-1 for more than 15 years and getting some very nice close-ups by attaching a Konica zoom Hexanon AR 80-200 mm, F4 lens.

I believe the camera was less than \$200 and the lens attachment was around \$100.

I use my camera a lot for flowers and also for close-ups of faces, especially those of my two grandchildren. *Pat Stevens
Greenwich, Ohio*

IDIOTPROOF

My camera was a gift so I don't know the cost, but I saw a similar one on sale at a

discount store here for \$99. It's a Canon Sure-Shot, Telemax, and it's idiotproof. Push the button halfway, and when the blinking stops, you're focused. No changing lenses, just one switch for close-up (four feet) or distance. I shot 17 rolls during a once-in-a-lifetime trip to India, and it took pictures of a very intricate stone carving and even of the solar eclipse.

*Page Edgerton
Victoria, Virginia*

KNOW YOUR DEALER

A camera I have successfully used is the Olympus Stylus Zoom, which sells for \$230. This little camera fits in my pocket. I get sharp photos—as long as I choose a good exposure. The photographer takes the picture, not the camera, and it will help a lot to use the correct film speed, use a



Photographs taken by members Page Edgerton, upper left, Pat Stevens, above, and Vivian Utiko, left.

THE AMERICAN GARDENER

EDITOR

KATHLEEN FISHER

MANAGING EDITOR

TERRI J. HUCK

ASSISTANT EDITOR

DAVID J. ELLIS

EDITORIAL ASSISTANT

SARA EPP

DESIGN AND ART DIRECTION

JOSEPH YACINSKI DESIGN

MEMBERSHIP DIRECTOR

DARLENE OLIVER

EDITORIAL ADVISORY BOARD

NINA L. BASSUK
Ithaca, New York

JOHN E. BRYAN
Sausalito, California

JOHN L. CREECH
Hendersonville, North Carolina

KEITH CROTZ
Chillicothe, Illinois

PANAYOTI KELAIDIS
Denver, Colorado

RICHARD W. LIGHTY
Greenville, Delaware

PETER LOEWER
Asheville, North Carolina

ELVIN McDONALD
West Des Moines, Iowa

ADVERTISING

AHS ADVERTISING OFFICE

4350 DiPaolo Center, Suite B

Glenview, IL 60025

(847) 699-1707 • FAX: (847) 699-1703

COLOR SEPARATIONS

FILM GRAPHICS

PRINTER

BANTA PUBLICATIONS GROUP

The American Gardener (ISSN 1087-9978) is published bimonthly (January/February, March/April, May/June, July/August, September/October, November/December) by the American Horticultural Society, 7931 East Boulevard Drive, Alexandria, VA 22308-1300, (703) 768-5700. Membership in the Society includes a subscription to *The American Gardener*. Annual dues are \$45; two years, \$80. International dues are \$60. \$10 of annual dues goes toward magazine subscription. Periodicals postage paid at Alexandria, Virginia, and at additional mailing offices. Postmaster: Please send Form 3579 to *The American Gardener*, 7931 East Boulevard Drive, Alexandria, VA 22308-1300.

Botanical nomenclature is based on *A Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland* and on the *Royal Horticultural Society Index of Garden Plants*. Opinions expressed in the articles are those of the authors and are not necessarily those of the Society. Manuscripts, artwork, and photographs sent for possible publication will be returned if accompanied by a self-addressed, stamped envelope. We cannot guarantee the safe return of unsolicited material. Back issues are available at \$5 per copy.

Copyright © 1997 by the American Horticultural Society. Printed in the U.S.A.

AHS PRESIDENT'S COUNCIL

MR. AND MRS. E. DUMONT ACKERMAN
ALEXANDRIA COUNCIL OF GARDEN CLUBS
MRS. ALBERTA WOOD ALLEN
MR. AND MRS. RICHARD ANGINO
MR. TOM ANJELILLO
MRS. RUSSELL ARUNDEL
MRS. SUZANNE FRUTIG BALES
WILLIAM E. BARRICK, PH. D.
MRS. JAMES L. BARTLETT JR.
MRS. WILLIAM BECKETT
MRS. KATHERINE MCKAY BELK
JEAN AND DANIEL BELL
DR. SHERRAN BLAIR
MRS. MARY KATHERINE BLOUNT
MR. KURT BLUEMEL
BORDINE NURSERY, LTD.
MRS. NANCY H. CALLAWAY
MS. SUSAN M. CARGILL
DR. AND MRS. H. MARC CATHEY
MR. AND MRS. GLEN CHARLES
MR. AND MRS. CHARLES W. COKER
MRS. LAMMOT DUPONT COPELAND
MR. AND MRS. JAMES L. CORFIELD
MARGERY HALE CRANE
MS. MAUREEN DE ST. CROIX
MRS. BEVERLEY WHITE DUNN
MR. PAUL ECKE JR.
DR. JOHN ALEX FLOYD JR.
MRS. ETHEL W. FOLEY
MRS. MARION E. GREENE
MR. GERALD T. HALPIN
MRS. RICHARD W. HAMMING
MR. AND MRS. MAX HARTL
MR. AND MRS. JOSEPH B. HARTMEYER
MRS. ENID A. HAUPT
MRS. ELSIE HILLIARD HILLMAN
MR. CLAUDE HOPE
MRS. RICHARD J. HOPP
MR. PHILIP HUEY
MS. PATRICIA JODSAAS
MRS. JANE KAMMERER
MRS. HELEN KOVACH
MR. AND MRS. ROBERT E. KULP JR.
MR. AND MRS. GERSON LEIBER
MR. DAVID M. LILLY
MRS. CAROLYN MARSH LINDSAY
LOS ANGELES FLOWER MARKET
OF THE AMERICAN FLORISTS' EXCHANGE
MRS. THOMAS MARSHALL
DR. ALFRED S. MARTIN
MRS. FRANCES B. MCALLISTER
MRS. BETTY McDONALD
MR. JOHN MCDUGALL
MRS. MARTYN L. MILLER
MR. AND MRS. EGON MOLBAK
MONROVIA NURSERY COMPANY
MRS. WALTER M. MORGAN JR.
MS. CAROL C. MORRISON
MR. WILLIAM G. PANNILL
PATRICIA L. PIERCE AND OLIVER C. SMITH
MRS. FRANCES JONES POETKER
MR. AND MRS. WILLIAM A. PUSEY
DR. JULIA W. RAPPAPORT
MRS. ALFRED RINDLER
HARRY A. RISSETTO, ESQ.
MRS. LOUISA STUDE SAROFIM
MRS. JOSEPHINE M. SHANKS
MR. AND MRS. JAMES A. SHELLENBERGER
MR. EMANUEL SHEMIN
MR. CHARLES HENRY SMITH JR.
SOUTHERN PROGRESS CORPORATION
MRS. PETER SPALDING JR.
MR. AND MRS. WILLIAM M. SPENCER III
MR. AND MRS. JOHN THOMAS
NANCY S. THOMAS
MRS. RICHARD L. TURNER
MRS. HARRY VAN DE KAMP
MR. JAMES A. VAN SWEDEN
MR. AND MRS. ROBERT D. VOLK
MS. KATY MOSS WARNER
MRS. HARVEY C. WHITE
MR. JOHN W. WHITE
MR. SAMUEL A. WIGLEY
MRS. MONROE WHITTON
MRS. MARILLYN B. WILSON
MR. AND MRS. H. EMERSON YOUNG

monopod or tripod, and deal with a reputable camera dealer who can tell you what your camera can do.

No matter what camera or photo recording system Mr. Salmon uses, there will be a better—and more expensive—one next year.

Martha Pinder
Akron, Ohio

PETAL PORTRAITS

As the enclosed photos show, one can shoot close-ups of flowers with a relatively inexpensive camera. I use my Canon Z115 on the "close-up/portrait" switch and also take sets of slides with the same camera that I use for gardening presentations. Good luck, Mr. Salmon!

Vivian Utko
Armonk, New York

BLUE PRINTS

Photographers who are also lovers of blue flowers—I read your article "Desperately Seeking Cerulean" in the July/August issue with great interest—might be interested to know that I have found the best film to capture those elusive blues as prints.

I have been shooting flower and garden photographs for years but have always been disappointed when the photos of my blue-flowered plants turned out pink, purple, or mauve. No more! Fujicolor Reala ISO 100 really does the job. I compared the results side by side with Kodak Royal Gold 100, and the difference was incredible!

I would also like to add two true blues to those mentioned in Robert Geneve's article: *Tweedia caerulea* 'Blue Cheer' and *Plumbago auriculata* (syn. *P. capensis*).

Tweedia is a tender perennial in the milkweed family. It has starry, one-inch, turquoise blue flowers all season on a viny, open plant about 18 inches high. Typical milkweed pods appear later in the season. It loves heat and sun, and can be wintered over indoors.

The plumbago has three- to four-inch umbels of heavenly powder blue flowers resembling those of phlox. The plants are

open and grow about two feet across and 15 inches high. Each floret is veined in a darker blue. This summer I had many volunteers from last year's potted plumbago pop up in beds and even in the gravel under my deck. It performs equally well in part shade, open shade, and full sun.

They both bloom nonstop for me from May until hard frost and make great companions for zinnias, salvias, and flowering tobacco.

Joe Seamone
Germantown, Maryland

NOT SO PUZZLING

I am a new member and was especially interested in the question about the monkey-puzzle tree in the November/December "Gardeners' Information Service."

The species, *Araucaria araucana*, was named for the Araucanian Indians of Chile. Its chief habitat there is the area around Puerto Montt, and it is essentially a tree of temperate climates, rather than semitropical. It thrives in Seattle.

Although rare in Victoria, British Columbia, it will grow there rather easily on level ground. In Ketchikan, Alaska, where I worked with the U.S. Forest Service, I recall a mature monkey-puzzle tree growing on a hillside. They require the drainage of a hillside there, where they receive 150 inches of rainfall a year. You are right in telling the letter writer that it would not grow for him in Calgary.

My specialty is cactus, and I'm sorry I joined AHS too late to receive the cactus article in the September/October issue. America needs a wake-up call on its cactus conservation. Crater Lake National Park in Oregon is so short-handed on personnel that poachers are stripping the landscape.

Bill Montgomery
Eagle Point, Oregon

Send letters to: Editor, *The American Gardener*, 7931 East Boulevard Drive, Alexandria, VA 22308-1300, or e-mail to editorAHS@aol.com.

J.C. Raulston Dies

J.C. Raulston, director of the North Carolina State University Arboretum, was killed December 21 in a head-on automobile accident in that state. Raulston, 56, founded the arboretum in 1975. In 1992, it was named the best arboretum in the country by the American Association of Botanical Gardens and Arboreta. In 1990, Raulston received the Communication Award from the American Horticultural Society to honor him for his generosity in sharing both his knowledge of rare plants and the thousands of cuttings that allowed new species to quickly find their way into the trade and into American gardens.



offshoots

BIRDBRAINS

by Margery Guest

At an art sale last winter, I spent \$12 on a birdhouse built by a Michigan folk artist. When spring arrived, I hung it rather carelessly on a limb of a lilac bush outside my kitchen window as an *objet d'art*. It's brightly colored, and across its roof perches a cow with a long, moplike, stringy tail. I was not thinking about birds actually using it, so I was surprised when I heard a male house wren's familiar bubbling song and later witnessed a female entering the house.

If you seek a frustrating enterprise, watch a wren build a nest. They use hundreds of tiny sticks (even thorny ones) for the bottom two-thirds of it. I watched from my upstairs home office window, struggling with my own form of frustration—writing—as the wren spent literally hours bringing sticks to the hole and trying vainly to push them through crosswise. Although some might question my scientific method, I feel confident stating a biological truth: Wrens do not learn. During the many hours over several days that I observed the wren, she never figured out that she needed to maneuver the stick into a lengthwise position in order to get it through the hole and into the house. I would rejoice when she would finally put a twig in without a struggle, thinking “Great, the next one will be easy,” but she never refined the process. She would begin again with the next twig, pushing it against the hole crosswise, dropping it, retrieving it, and pushing on it again. Every success was a combination of perseverance and dumb luck.

Then one morning, after a storm with high winds, I looked outside to see the birdhouse on the ground. Although I hung it back up, taking care to make it secure, the wrens did not return. Apparently they're at least that smart: If your house falls down on the ground, you probably shouldn't put your eggs in it.

This spring, I wondered whether or not I should remove the wrens' partial nest. But since this is an *objet d'art*, I felt I would be compromising the artist's vision by taking the claw of a hammer to it. So I left the half-nest and simply created a stronger hook using a wire hanger. Then I hung the house on the larger, more sturdy apricot tree next to the lilac bush. Maybe the wrens would come back and those frustrating hours of effort could finally be rewarded. Otherwise it could simply hang there and look interesting.

A few mornings later, my husband pointed out a very puffed-up male European house sparrow quivering and making impassioned yet monotonous chirping noises (sadly, this is his best song) while perched atop the *objet d'art*. After two or three hours (no kidding) of nonstop chirping, shaking and singing, singing and shaking, a female appeared. He quivered and sang with increased vigor. She studied the situation calmly—entering the house and peeking out from within, then peeking in from without, clinging to the edge and bobbing her head in and out as though practicing feeding babies—to see if the whole enterprise were doable.

A few minutes later she went inside and confronted the door of the house from within, holding a stick crosswise to the hole. What if she needed to remove all the sticks? I briefly wondered whether I would have to witness the same frustrating process of a year before, only in reverse. But I'm happy to report that when I used the same scientific method as before, I concluded that

compared to wrens, house sparrows should join MENSEA. The female quickly caught on to holding the stick lengthwise, and she seemed to be removing only the thorny twigs.

While she discarded unwanted nest material, the male took

on another task: tugging at the moplike tail of the cow on the birdhouse roof.

It was unclear whether he wished to use the material for the nest or simply to get it off his roof. But since it was firmly fastened to the cow, this was another exercise in frustration. As he

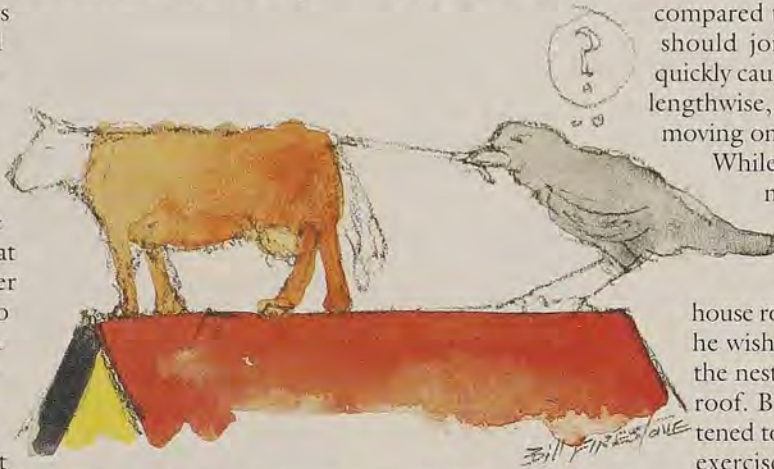
worked, I could almost hear him thinking, “What's a cow doing here anyway?” so I called out, “It's an *objet d'art*!”

Later in the day, several other females arrived and each appeared to wrestle with the first female, while the male continued his monotonous chirping from a nearby branch. Were these females competing for the right to nest in this house? If so, our male had gone rapidly from a guy who couldn't get a date to a studmeister.

As I write this, the competing females have been defeated, the male continues to sing, and lady sparrow-in-residence continues to remove thorny twigs efficiently. By season's end, we could have anywhere from eight to 35 nestlings.

This is not a heart-warming prospect. As one of my bird books says, “The filthy habits of the house sparrow are most annoying.” I've had fleeting thoughts about covering the hole with a sign reading “*Objet d'art* Only.” But I just can't bring myself to do it. Being a scientist and all.

Margery Guest is a free-lance writer in Grand Rapids, Michigan.



The American Horticultural Society

requests the pleasure of your company

at the 52nd Annual Meeting

"A Celebration of the American Garden"

recognizing the 75th Anniversary of the Society

April 24-26, The Fairmont Hotel,

San Francisco, California



Join fellow AHS members for garden tours down the peninsula and across to the East Bay, or choose an optional tour of the Sonoma Valley or a two-night optional trip to gardens around Pebble Beach.

Hear outstanding speakers Francis H. Cabot, founder and chairman of the Garden Conservancy; Jules Janick, professor of horticulture at Purdue University; and Mark Kane, executive garden editor of *Better Homes and Gardens* magazine.

Enjoy breakfast at Saks Fifth Avenue on beautiful Union Square in the heart of San Francisco. The store's windows will feature a salute to the Society and floral designs by Ralph Null, Frances Jones Poetker Award winner.

Plant a tree at Strybing Arboretum in Golden Gate Park in honor of our 75th Anniversary.

R.S.V.P.

For registration information, call Bridget Flint, meeting coordinator, at (800) 777-7931 ext. 24.



gardeners' information service

Will the frost-damaged water lettuce in my small back-yard fish pool come back in the spring? I've never had any success with aquatic plants until this year when I obtained some water lettuce. It thrived and multiplied and made a wonderful showing.

—P.E., Lafayette, Indiana

Like most floating aquatics, water lettuce (*Pistia stratiotes*) is a tender plant that will not survive a frost. If you choose to try it again, you should bring a few plants indoors before first frost and overwinter them in an indoor tank or shallow tray of water.

A free-floating aquatic with long, dangling roots, water lettuce forms upright rosettes of spongy, pale green, gently grooved leaves that can reach four to eight inches in diameter. Tiny, inconspicuous yellow flowers bloom deep within the rosettes.

Water lettuce is believed to be native to East Africa, but has naturalized around the world in tropical and subtropical regions. In Florida it has become a troublesome weed on the scale of water hyacinth (*Eichhornia crassipes*), clogging rivers and waterways. Both plants are banned in Florida and some other southern states.

Other choices you may want to consider are water poppy (*Hydrocleys nymphoides*), which features glossy, oval leaves and slightly fragrant yellow flowers centered by contrasting chocolate stamens, and American frog's-bit (*Limnobium spongia*), a floater with small heart-shaped leaves native from Ontario to the southern United States and hardy to USDA Zone 5.

I am interested in putting trees on the three blocks of our Main Street. Some of the criteria I have developed are: flowers or has attractive foliage; stays green year-round; does well in large planters; low maintenance; slow growing; compact and upright; matures under 20 feet; grows well in Zone 7; and nonfruiting. I have been considering Magnolia grandiflora 'Little Gem'. Do you have any other suggestions?

—L.G., Fordyce, Arkansas

Those are pretty demanding requirements. For Fordyce, in southern Arkansas, you need something that will survive hot summers and fairly rigorous winters.

Dorothy Callaway, author of *The World of Magnolias*, says 'Little Gem' does well in large containers at the nursery she and husband Brett operate in Coolidge, Georgia (Zone 8). "For us, 'Little Gem' is a steady grower, but not terribly fast, so I think there is little concern about it quickly outgrowing the containers."

Lanny Rawdon, owner of Arborvillage Farm Nursery in Holt, Missouri, a couple of zones north of you, suggests the Chinese evergreen oak (*Quercus myrsinifolia*). "The

good thing about oaks is that most of them will stand a little kicking around and abuse," notes Rawdon. This round-headed evergreen oak does not quite have the compact, upright form you crave, but grows to 20 or 30 feet tall and has lustrous, dark green leaves and gray, beechlike bark. Woody plant guru Michael Dirr says it is not seriously plagued by pests or diseases, is tolerant of a wide range of poor soils, and withstands summer heat. It is rated hardy to Zone 7, but may be less hardy if planted in a container.

How do I care for a 10-foot-tall papaya that I've grown from seed? I've kept it in a large flowerpot, and the leaves are very handsome, so I'd like to see it continue to flourish.

—V.J., Northford, Connecticut

Container-grown papayas are often fairly short-lived, so you have done well so far. To raise a 10-foot specimen in Connecticut, you must have been wintering it over in a greenhouse or sunny room.

Now that you've gotten the plant this far, you need to be careful about overwatering, especially in winter, because papayas can be subject to root and stem rot. Water the plant infrequently but thoroughly in winter, allowing the water to drain out of the bottom of the pot. Don't allow the pot to rest in standing water, however. Provide extra humidity by placing a flat tray filled with small stones and water under or beside the papaya.

Regular feeding is a must in summer for this nitrogen-hungry plant, but in winter you should slow down fertilization to every third or fourth watering.

Native to lowlands of South America, papayas (*Carica papaya*) are now grown widely throughout the world's tropical and subtropical regions for their fruit. They are sometimes confusingly called pawpaws or papaws, despite the fact they are unrelated to the hardy North American pawpaw (*Asimina triloba*).

These tender, treelike herbaceous plants will grow to 30 feet outdoors under ideal conditions, but need lots of light, warm temperatures, and rich, well-aerated soil. Papayas have spongy or corky, branchless trunks that can reach a foot in diameter at the base. The

trunk is usually scarred with triangular depressions where old leaf stems have separated from the tree. Giant, palmately lobed leaves radiate out from the crown of the tree on one- to three-foot stems, giving it a vaguely palmlike appearance. Papayas bear oval to pear-shaped fruits that can weigh up to 20 pounds, depending on variety. The pale yellow to orange flesh is smooth and refreshing, with a mellow, sweet flavor somewhat like a melon.

—Neil Pelletier, Director
Gardeners' Information Service

Use Your GIS



GARDENERS' INFORMATION SERVICE can help you find an elusive plant, suggest plants for special needs, or diagnose a problem and find a cure. AHS members can call GIS toll-free at (800) 777-7931 ext. 31 between 11 a.m. and 3 p.m. Eastern Time, Monday through Friday (except holidays), or e-mail us anytime at gardenahs@aol.com.



mail-order explorer

GOSSLER FARMS NURSERY: MAGNOLIAS AND MORE

by Sara Epp

It all began with ostrich feathers. Or more precisely, it all began with the demise of ostrich feathers. Roger Gossler's great-grandfather was the first importer of ostriches into Arizona in the late 1800s, when ostrich feathers were *the* fashion accessory of the day. But when the ostrich craze ended, his great-grandparents moved to Springfield, Oregon, and established a small farm. Their children were farmers, and their grandson, Jim, went into farming and ranching as well. He began with beef cattle, then went to sweet corn for canning and peppermint for Wrigley's gum.

At the same time, Jim Gossler was quietly buying and collecting magnolias, rhododendrons, and other plants. He began a small nursery in 1963 in an attempt to afford a hobby that was getting out of control. He figured that if he owned a nursery, perhaps he could buy more plants, sell most of them, and keep a few for himself. In 1968, he produced his first mail-order catalog, a one-page mimeograph of mostly magnolias. After Jim Gossler and his wife, Marj, were divorced, Marj and son Roger decided to make the nursery a full-time venture, complete with a 40-page catalog. Eric Gossler, Roger's younger brother, came to help with the business as it expanded, and several part-time employees also work for the nursery.

"I grew up with the nursery," says Roger Gossler, now 41. "I learned from living with the plants and from meeting all sorts of different people." One of the most influential was Portland resident Jane Platt, whose three-acre garden boasted wide ornamental borders and a great variety of plants. She, her husband, and her sister-in-law were among the first of the Gosslers' steady customers, and the Platt family was in turn generous with trading cuttings and plants. "She showed us that there was something beyond magnolias and rhodo-



Gossler specialties include witch hazels, such as *Hamamelis vernalis* 'Purpurea', above, and magnolias. At right, Roger Gossler arranges a handful of their 500 magnolia selections.

dendrons, that you could put things together not only as a collection, but also in a garden, in an artistic way."

Today Gossler Farms Nursery is well-known for its own three-acre display garden. Barbara Barton, author of *Gardening by Mail*, relishes the chance to visit. "They have such wonderful plants, and they have a lot of them planted out in the garden around the nursery, so it's a chance to see them as mature plants."

Those who can't visit the garden in person can take a vicarious stroll through its catalog pages. Barton says that after she got her first Gossler Farms catalog, she realized that every plant she had been looking for was in it. Offerings range from *Abelia chinensis* to *Zenobia pulverulenta*, from rare selections of witch hazel, such as *Hamamelis* 'Mexicana' and *H. vernalis* 'Purpurea', to rare hydrangeas, including *Hydrangea quercifolia* 'Snow Queen' and *H. sargentiana*. There are hard-to-find selections of junipers, maples, stewartias, kalmias, michelias, eucryphias, weigelas, and many, many more.

Despite broadening their offerings, the Gosslers have never lost their enthusiasm for magnolias—Gossler believes the climate in Springfield is perfect for them—and the nursery is home to one of the two or three biggest collections in the world. Some 500 selections grow in their garden, and there are 82 offered in the current catalog. Other specialties include witch and winter hazels, dogwoods, and viburnums.



Other specialties include witch and winter hazels, dogwoods, and viburnums.

The Gosslers grow out every plant species they offer because they understand that, for example, "it's very frustrating to wait 10 or 12 years for a magnolia to bloom and then get the wrong flower color." They take 10,000 to 12,000 cuttings each year, calling in additional help for their many magnolias and witch hazels.

Marco Polo Stufano, director of horticulture at Wave Hill in the Bronx, New York, says he orders from Gossler because they have "a

PHOTOS BY MICHAEL S. THOMPSON

fine sense of plants. They're always on the cutting edge of what is new and different. They were some of the first people in this country to carry variegated *Cornus*."

Just listen to the Gossler catalog description of this sought-after dogwood (*Cornus controversa* 'Variegata'): "Who cares about flowers? The light green foliage has a broad, creamy edge. This plant grows in wonderful horizontal layers like clouds of green and white." Another of the more unusual plants the nursery carries is *Decaisnea fargesii*, a deciduous shrub native to western China: "Weird flowers are green in June. Don't stop reading, it gets better. In late summer, the small pea pods enlarge to four inches long and turn rich metallic blue. These pods hold on until the foliage turns butter yellow."

Gossler Farms is known not only for its variety of desirable selections, but also for high quality. Barry Sugnet, a nurse from Eugene, Oregon, who has been a Gossler Farms customer since the 1970s, says he recommends the nursery to other people because that excellent quality comes at reasonable prices. "I guess that's something you ought to be able to expect from everybody, but you don't always get it, and it's marvelous when you do."

What Gossler likes best about his job is the customers. "Most of the people have bought from us year after year—we have one couple who've been buying from us since about 1970. Now if we don't hear from people, we miss them."

In turn, customers benefit from the Gosslers' enjoyment of their work. "Their enthusiasm is just infectious," says Barton. For Gossler, much of the reward comes from offering a product that's pleasurable, rather than practical. "Growing plants is nothing anybody needs. It's something to have a good time with and enjoy."

He keeps the job even more interesting by occasionally chang-

ing focus. "At one time we did some sort of bizarre things for simply botanical interest, but now our goal is to have the nicest, most interesting foliage plants, for multiple-season interest.... Fall color has become much more important—for some reason I'm being attracted to things with more fall color." Some of his favorites in this category include *Disanthus cercidifolius*, which has "wonderful dark reds and purples"; *Fothergilla gardenii* 'Jane Platt', which keeps its bright orange, red, and yellow color until very late in the

After she got her first Gossler Farms catalog, Barbara Barton realized that every plant she had been looking for was in it.

season; *Cotinus obovatus*, the native smoketree, with bright pink-purple foliage; and *Stewartia sinensis*, which Gossler describes as "glowing in the dark, an incredible red and orange combination."

The garden currently has about 5,000 plant varieties, approximately 20 percent of which are native to North America. The remainder are mostly from Japan and China. Gossler says they try to add 125 to 150 varieties of plants a year to their catalog and remove that many as well. These are usually plants bigger nurseries have begun mass-producing, making it hard for a small nursery to compete. "We're trying to keep the nursery at a size so that the three of us can run it and still have a life."

Sara Epp is editorial assistant for The American Gardener.



You're Invited!



Join Us April 10 at the Preview Reception for the
8th Annual Southern California Spring Garden Show at South Coast Plaza,
Crystal Court, in Costa Mesa, California.

Proceeds from the Preview Reception will go to the American Horticultural Society and will benefit:

The "Garden in Every School" program of the California Department of Education
Grants to participating Orange County Schools

The 5th Annual AHS National Youth Gardening Symposium

Hosted by the Chicago Botanic Garden July 31-August 2

Continuing our tradition of "Planting the Future" • Featuring speakers from around the country

Mrs. Gayle Wilson, First Lady of California, is honorary chair of the benefit committee and is scheduled to attend.

"Gardens of Enchantment,"

the Southern California Spring Garden Show, continues through April 13 with exciting displays and lectures focusing on the wonders of the Far East, Australia, and the Pacific Rim. AHS will be there! Come visit our hospitality suite!

Book and Gift Store • Book Signings • Seminars



For tickets to the Preview Reception, call Mary Ann Patterson at (800) 777-7931 ext. 21. Please RSVP by March 27.





conservationist's notebook

NEW WEAPONS IN FIGHT AGAINST GYPSY MOTH

by David J. Ellis

The onslaught of the voracious gypsy moth has been temporarily checked by a fungal foe that was introduced early this century, vanished, and then reemerged several years ago. But scientists aren't banking on the fungus as a long-term solution. The gypsy moth, generally regarded as the most serious insect pest of forest trees, may in the future be controlled by chemical compounds recently found in the foliage of green ash trees, by a wasp imported from India, or by a viral disease made more lethal by brightening agents commonly found in household cleaners.

Introduced into North America in 1869 in an ill-fated attempt to establish an American silk industry, the gypsy moth (*Lymantria dispar*) currently infests most of the Northeast from southern Canada to North Carolina, and west through parts of Tennessee and Arkansas to Michigan and Wisconsin. Isolated infestations have also been reported in California, Utah, Oregon, and Washington state.

Early efforts to control the moth included the introduction of a fungus (*Entomophaga maimaiga*) from Japan in 1910. The fungus disappeared shortly thereafter, and attempts to reintroduce it in the 1980s also appeared unsuccessful. In 1989, however, the fungus was found attacking gypsy moths in Connecticut and since then has spread rapidly through much of the moth's range. The fungus "has really had a dramatic impact on gypsy moth populations," says Richard Reardon, program manager for the U.S. Forest Service laboratory in Morgantown, West Virginia. Reardon says current projections indicate gypsy moth populations in 1997 may be the lowest since the late 1960s.

TREE BITES MOTH

In the meantime, researchers at the University of Wisconsin at

Madison have isolated several chemical compounds from green ash (*Fraxinus pennsylvanica*) that repel gypsy moth larvae or inhibit them from feeding and molting.

Dale M. Norris, an emeritus professor at the university, and Ingrid Markovic, a graduate student, investigated green ash after observing that it was among the few deciduous trees left undamaged by gypsy moth larvae. "You can walk into the forest and see defoliated oaks and other trees, while green ash is hardly nibbled on—it's quite striking," says Markovic. "Green ash was also a natural place to begin because there were so many references in the literature to the trees not being bothered by gypsy moth."

Norris says green ash leaves contain multiple chemical defenses against gypsy moths. These include several volatile chemicals—compounds that vaporize readily at low temperatures—that repel larvae before they feed, nonvolatile compounds that inhibit feeding, and another nonvolatile substance that prevents the larvae

from molting and developing into adults. The most active volatiles are linalool, one of the major constituents of lavender oil; methyl salicylate, found in wintergreen oil; and a group of compounds called farsenenes, which are minor constituents of many essential oils.

In controlled tests, Norris and Markovic were able to show that gypsy moth larvae are repelled by volatiles extracted from green ash foliage. The researchers believe the larvae may use chemical cues such as this to help determine which way to move in search of a preferred food source. Gypsy moth larvae move from tree to tree by "ballooning" on silken threads or, more laboriously, by crawling.

Norris and Markovic's discovery has been granted a patent through the Wisconsin Alumni Research Foundation. The foundation is seeking an industrial partner to develop and market products based on the compounds from green ash.

WASP MAKES COMEBACK

There's also a chance that a wasp introduced into the United States



Gypsy moths, shown above in larval stage, are one of the most serious pests of forest trees. Researchers are testing a variety of control methods, including use of compounds distilled from the foliage of green ash, left.



ROB SIMPSON (TOP), JOSEPH G. STRAUCH JR. (BOTTOM)

from India in the late 1960s as a biocontrol for gypsy moth will, like the *Entomophaga maimaiga* fungus, prove to be more resilient than was at first believed.

More than 30,000 of the wasps—a species called *Rogas in-discretus*—were released from 1968 to 1977 in the Northeast and mid-Atlantic states. But until 1994 it was feared they had vanished completely. That's when nine wasp cocoons were found near Brandywine, Maryland, by entomologists Robert F.W. Schroder and Ann M. Sidor of the U.S. Department of Agriculture's Agricultural Research Service (ARS) in Beltsville, Maryland. Brandywine is 150 miles south of the nearest area where wasps were originally released in 1971.

The wasp's ability to survive so long gives fresh impetus to its use as a biocontrol, says Roger W. Fuester, who heads the ARS Beneficial Insects Introduction Research Laboratory in Newark, Delaware. "The cocoons tell us that *Rogas* managed to survive and reproduce," he explains, "so we're going to try

Another promising biocontrol is a virus discovered more than 80 years ago to be a naturally occurring pathogen of the moth.

again to deploy it." Using fresh stock imported from India, the ARS plans to rear several thousand wasps this winter for test release next year.

Rogas wasps use caterpillars as living hosts for their offspring. In spring, female wasps lay single eggs inside the caterpillars of gypsy moths and tussock moths. After the egg hatches, the wormlike wasp larva consumes the inside of the caterpillar and spins a cocoon within its mummified body. Adult wasps emerge a few weeks later. One female wasp can lay more than 200 eggs in her lifetime.

A BRIGHT OUTLOOK FOR MOTH VIRUS

Another promising biocontrol for the gypsy moth is a virus discovered more than 80 years ago to be a naturally occurring pathogen of the moth. In 1978, U.S. Forest Service researchers registered a particularly effective isolate of the virus under the name Gypchek.

Despite continuing research, a couple of problems kept the virus from becoming a key weapon. First, the virus is sensitive to sunlight, explains Martin Shapiro, a research entomologist with the ARS in Beltsville. A second problem is that the virus works slowly, so the caterpillars are able to do most of their damage before they begin to die. "You'd like the moth to die a little faster," says Shapiro.

A few years ago, researchers found that stilbene brighteners, chemicals commonly used in many household cleaning agents, act as a kind of sunscreen for the virus. At the same time, serendipitously, it was discovered that the addition of the brightener in some way made the virus more potent, thus shortening the time it took to kill the moths. A patent was granted to the new process in 1992, and three pharmaceutical companies are working on developing insect controls based on virus-brightener combinations. Researchers hope the virus may also be effective in control of other pests, such as the armyworm and cotton bollworm.

David J. Ellis is assistant editor of The American Gardener.

EDUCATING THE HORTICULTURISTS OF THE 21ST CENTURY



Whether they're students just leaving home or older adults changing careers, generations of budding horticulturists have benefited from American Horticultural Society internships. At our public garden, they gain experience in:

- Researching questions for our Gardeners' Information Service.
- Leading activities for children through our Living Lab program.
- Sharing advice with visitors to our National Home Composting Park.
 - Guiding visitors around our historic grounds.
 - Managing our annual Seed Exchange Program for members.

Our location in the Washington, D.C., metropolitan area allows interns to visit gardens at the U.S. National Arboretum, Brookside Gardens, Longwood Gardens, Winterthur, and Monticello. They attend meetings such as the American Horticultural Society's National Youth Gardening Symposium, the native plant conference at Millersville, Pennsylvania, the perennial plant conference at Scott Arboretum, and the historic Williamsburg Garden Symposium co-sponsored by AHS. You can help us expand these opportunities even more with donations earmarked for our intern program. They are fully tax-deductible.



FOR MORE INFORMATION ON OUR INTERN PROGRAM AND HOW YOU CAN BE A SUPPORTER, CALL HELEN WALUTES AT (800) 777-7931 EXT. 12.



planting the future

AHS-INSPIRED GARDENS

by Kathleen Fisher

In both cases, it started with pumpkins. In Ventura, California, Beth McGrath was worried that the magnet school her children attended was too dependent on funds raised by the annual festival at her family's pumpkin patch. "It brings in as much as \$8,000," she says. "When you're dealing with nature, you know there's going to be a year that it's wiped out."

Since the spring of 1994, McGrath has led the school in building an 8,000-square-foot garden with an estimated \$50,000 to \$75,000 in material and labor donated by parents and businesses, or purchased through small grants. The garden features raised beds, four climatic zones—woodland, Mediterranean, arid, and tropical—and a rain forest with built-in misters.

In Bedford, Ohio, a suburb southeast of Cleveland, teacher Selene Loomis heard colleagues complaining about the high cost of pumpkins for Halloween pies and jack-o'-lanterns for preschoolers. "We could grow them here," she suggested.

That was in the fall of 1993. Today her school's fenced, 3,500-square-foot garden contains a wildlife pond, berms with alphabet and butterfly gardens, a fairy garden, and a wetland with a boardwalk. A federal Environmental Protection Agency grant will pay for an Ohio native forest habitat beyond the fence.

These exemplary gardens have more than pumpkins in common: Both were inspired by American Horticultural Society National Youth Gardening Symposia.

In the course of casting a wide net both for funding ideas and the shape the garden should take, McGrath called Sharon Lovejoy, a California-based author of children's books who had spoken at the first two AHS symposia. Lovejoy urged McGrath to attend the third one, scheduled for Pasadena in the summer of 1995.

There she got a global perspective from Bill Lucas, director of Learning Through Landscapes in London, England. "They seemed so far ahead of us" in building school gardens, she says. From Jane Taylor, curator of the 4-H Children's Garden at Michigan State University, "I got some great ideas about how to build what children like and enjoy, not what adults think they want."

Most helpful was Lyn Mathis of the Woodlake Community Children's Garden in Woodland Hills, California. "She wasn't a practiced speaker like the others, she was just a teacher. But she was gardening in the same climate, and she was able to help me find local resources."

Loomis heard about the AHS symposia when she called Johnny's Selected Seeds seeking a donation and talked to the sales and technical representative, Steve Bellavia. "He was just rapturous," she says, so she signed up for the 1994 symposium in Arlington, Virginia. "I've been a speech and language pathologist for 39 years, so I've been to a lot of meetings and workshops. But I've

never been to one where nobody wanted to miss any of the sessions. There was no going to the mall and zero sightseeing. People were so enthusiastic, wanting information and wanting to share. It was an incredible experience."

She, too, was inspired by Lucas. "He made me feel duty bound to change our grounds and blacktop into a paradise and a habitat." Her other inspiration was Maureen Heffernan, then education director for AHS and organizer of the first three symposia. "I was impressed with the gardens she had arranged to have built at River Farm and contacted several of the designers."

MADE IN THE SHADE

One of the first things McGrath did after attending the Pasadena symposium was to put together a "project package" as outlined



CLOCKWISE FROM UPPER LEFT: COURTESY OF SELENE LOOMIS; BETH MCGRATH; BETH MCGRATH, SELENE LOOMIS

by Mathis, which explains garden goals to prospective supporters. During the following school year, small grants allowed the school to buy carts—"like a mini-greenhouse on wheels"—on which children could start seedlings, wheeling them outside during the day and back into a school hall in the evening. "That gave us a head start on spring, so we could harvest everything by June."

A Master Gardener workshop on garden planning emphasized a valuable lesson: Plan all your space at once so you won't be making major alterations a few years later. The space available for the garden was a pie-shaped area between two wings of the school building, so many plants requiring full sun were ruled out. But raised beds—20 feet long, three feet wide, and two feet high—would hold flowers and vegetables started in the carts and allow wheelchair access. A "botanic walk" would lead visitors through the various climatic zones.

Even before the AHS symposium, McGrath had begun to marshal support from parents. In this magnet school—students are chosen by lottery to attend five open classrooms within the Blanche Reynolds Elementary School in Ventura—parents are required to give four hours of volunteer time per week per student, and McGrath hoped they would choose to give that time to the garden project. Once a month, from January through June 1995, she led a group of families on field trips to other school gardens. "Because they were fun family outings, they got the parents excited and the children motivated."

She surveyed parents about their hobbies and jobs, and those of extended family members, looking not only for talent,

but also for potential sources of donations or matched funding from employers.

The responses were high in both quantity and quality. One parent is a geologist and will teach children about the boulders in the garden. "Someone said he would give them to us if we would move them," says McGrath. Another, an entomologist, will be taking children to visit an insectary where beneficial insects are raised. A mother who is a mosaic artist helped the children create three large planting pots. "It took them months," McGrath relates. "The children fired their names on tiles that were placed around the top. They were thrilled."

All plants in the garden have been donated. McGrath and other volunteers particularly wanted plants that bloom in the winter—orchids (from the local orchid society), bromeliads, camellias. "The children are using catalogs and books to identify the plants and making cards about them—including things like insect pests—that can be used for a 'seek and find' by classes next year," says McGrath. She thinks much of their success in getting plants hinged on not asking any one nursery for too many items and on conveying genuine enthusiasm for the project.

"One nurseryman said he wouldn't make a donation and told me, 'I'll bet you really hate asking for this stuff.' I said, 'No, I love coming out to do this.' By the time I was through telling him about the garden, my car was stuffed full of plants and trees. I've found that 90 percent of the people I ask are willing to give something."

Misters for the rain forest were donated, as was a \$1,000 timer for them. A lumber company sold them lumber at cost. Before the garden was installed, the area was filled with 20 years' growth of ivy, some vines as thick as saplings. A construction company provided a day's work by a back hoe operator. A clothing company chipped in with items to be auctioned, and cash grants came in from a pharmaceutical company and the National Gardening Association.

Future projects will include a Roots and Shoots program, in which older adults work regularly with the children—another idea inspired by the AHS symposium that McGrath attended. "We have one neighbor who comes in regularly, but we hope to have one senior for each class," she says. "That's one reason it was important to have wheelchair access."

Students plan to use the Internet to correspond with other school-age gardeners, and a kitchen area will allow cooking projects, not only with vegetables from the raised beds, but also with herbs from the Mediterranean garden. Records of each year's successes and failures will allow other parents to take over when McGrath's



Whether you need help starting a school garden or

new ideas for an existing project, you'll find kindred spirits and lots of inspiration at an American Horticultural Society National Youth Gardening Symposium. This year's meeting will be July 31 through August 2 at the Chicago Botanic Garden. For information, call Mary Ann Patterson at (800) 777-7931 ext. 21.



Opposite, top: Getting started on the Glendale Habitat Discovery Garden.

Bottom: Topsoil produced by pond excavation was shaped into a berm traversed by a flagstone path.

Left, top: Blanche Reynolds student Keith Strmiska supervises parents Dennis Black and Scott Christy in completing a raised bed. Bottom: At this point the school's "botanic walk" was newly completed. It now winds through four climatic zones and a "rain forest."



10-year-old leaves the school in a couple of years. "There are plenty of gardeners among our parents," she says. "And the fund-raising is easy if you keep an ear open to what's out there."

DREAMING BIG

Loomis launched her project by showing slides and material to Toni Domonkos, principal at Bedford's Glendale Primary School, and immediately got 100 percent support. Next, a "garden team" of staff and parents brainstormed: What would they do if money were no object? "You shouldn't limit your vision by saying, 'We just have \$30. What can we do?'" believes Loomis.

Like the California group, this one began with a fairly detailed paper landscape. Loomis, who lives near Holden Ar-

"People were so enthusiastic, wanting information and wanting to share. It was an incredible experience."

boretum, enlisted its director of education, Bruce Cubberly, to design the garden on his computer.

The period between November '94 and March '95 was used for planning, interviewing contractors, and fundraising. A \$500 grant allowed the school to buy some supplies and to plant bulbs. Teachers attended an environmental education program offered by the state. In April there was a benefit candy sale, and Eagle Scouts built raised beds and filled them with mushroom compost.

Although neighbors predicted failure because of the large local deer population, flowers and vegetables started from seed in May survived thanks to a mesh deer fence. "But once the gourds and sunflowers got big, we had a tangled mess," says Loomis. Support from the Ohio Department of Natural Resources allowed them to replace the mesh with a deer-proof, five-foot double fence. "When you disguise it with vines," Loomis says, "it's really beautiful."

A 200-foot water line was laid to the center of the planned wildlife habitat, and in August, a 45-by-30-foot earth pond was dug. "The top 12 inches was beautiful topsoil, so we decided to build berms." The berms sport benches, bird blinds, a flagstone path, and butterfly and alphabet gardens—the latter inspired by one at River Farm. The decorated wooden letters aren't in order; children have a "scav-

enger hunt" to find them. Each class was assigned a group of letters and asked to research the plants associated with them.

Training through Project Wet, a statewide interdisciplinary curriculum intended to teach all grade levels about water and its use, raised concerns about erosion—the berms were later stabilized with trees and shrubs—and suggested solutions for a 200-foot-long soggy area between the blacktop and garden. "We were up to our ankles in mud, even through most of the summer, and the U.S. Army Corps of Engineers in Buffalo said they thought it could be developed as a wetland prairie."

An indoor "fairy garden" was such a hit—students exchanged letters with the fairies, who sometimes also left small gifts—that students created an outdoor version, guarded by a sculpture of Peter Rabbit. Loomis explains that fairy gardens reflect ancient beliefs that all living things are inhabited or protected by spirits and that certain flowers have particular uses for fairies. "Tulips are fairy cradles, moss is very special, and if you wear thyme, you can see fairies," Loomis explains to the hopelessly out of touch.

The Glendale Habitat Discovery Garden's visitors and projects have included a Native American sharing harvest traditions, experts on bats and ethnobotany, square-foot vegetable gardening in conjunction with math, and the rearing of monarch butterflies. "We have a succession of bloom from April through October for nectar plants," says Loomis, "and in addition to milkweed, we have copper fennel, willows, and other host plants."

The pond is also rich in diversity, with turtles and frogs, water lilies and water hyacinths, flags, rushes and reeds, and native grasses. Teachers were trained through a state program, Project Aquatic, to recognize the insect life in the pond as well.

Left: Glendale preschooler Greg Snodgrass tugs at a pumpkin. Below: Blanche Reynolds students Kelsey Cogdill and Josiha Latthitham perch on a boulder in the garden's "drought tolerant" section. Helle Todd, a parent who is a mosaic artist, helped the children create three pots like the one in the foreground.



The school is one of four field-testing a science curriculum developed by Holden Arboretum through a National Science Foundation grant. Kindergartners and first-graders learn "What is a plant?" and second-graders learn about plant life cycles and plants' associations with animals. Future plans include a "dipping dock" or observation deck at the shallow end of the pond, a dinosaur maze-cave, and possibly a child-sized log cabin.

Loomis marvels at what's evolved from a need for cheaper pumpkins. The children have grown cotton, made cider, dissected daffodil bulbs, made potpourri. More important, they respect what they've grown; there's been zero vandalism. They know how water gets to leaves. They're not afraid of bees.

"It's been like a little mushroom," Loomis says, "almost magical in some ways." Maybe there's something to this fairy business after all.

Kathleen Fisher is editor of The American Gardener.

COURTESY OF SELENE LOOMIS (TOP), BETH MCGRATH (BOTTOM)



natural connections

PASSIONATE COMPANIONS

by Stephen R. Johnson

Most people are familiar with the beautiful and intricate flowers of the genus *Passiflora*, popularly known as passionflowers. Native mostly to tropical South and Central America, these perennial vines use tendrils to climb surrounding vegetation. Many of the species have associations with insects that either pollinate their flowers or eat their leaves. Perhaps the most well documented is the relationship between passionflowers and the colorful *Heliconius* butterflies. More than 70 of these butterfly species rely almost exclusively on tropical passionflowers as host plants.

There are also a few temperate *Passiflora* species, each with its own associations with insects. *P. lutea*, sometimes called the wild yellow passionflower, is found sporadically in woodlands and moist soils from Pennsylvania west to Illinois and south to Florida and Texas. It is more widespread than its better known, hardier, and more invasive relative, maypop (*P. incarnata*), native to poor soils from Virginia west to Missouri and south to Florida and Texas.

The wild yellow passionflower has creamy, dime-sized flowers and simple leaves with three prominent, usually rounded lobes that vary in size and shape. Younger leaves are pale green and fuzzy, while older leaves are often covered with silvery bands.

Another way to distinguish *P. lutea* is by the presence of a flea beetle (*Disonychys discoidea*) that is adapted to toxins contained in the passionflower's leaves. This allows *D. discoidea* to eat the leaves of *Passiflora lutea* without competition. The presence of toxins—in this case cyanide derivatives called cyanogenic glycosides—probably also acts as a deterrent to prospective predators of the beetle, which advertises its chemical defenses with bright orange and black coloration.

Another insect associated with *P. lutea* is a rather small, dark gray to black native bee called *Anthemurgus passiflorae*. Like many of our native North America bees, it is a solitary forager that lives in small subterranean colonies.

Also like many other native bees, *A. passiflorae* is becoming rarer. Adapted to associate with a narrow range of plants, it is being pushed out of its native habitat by the proliferation of honeybees and the spread of exotic plant species.

John L. Neff, an Austin, Texas, bee enthusiast, carefully

studied the interaction of *A. passiflorae* and *Passiflora lutea* at a Texas site. Neff says the bee's association with the wild yellow passionflower is actually rather inglorious—it steals pollen and nectar without servicing the plant's pollination needs—but appears to be critical to the bee. "The *Anthemurgus* bee is really restricted to *Passiflora lutea*—it doesn't collect pollen from anything else. What I was particularly interested in was that these bees strip most of the pollen before other bees arrive," he says.

He determined that although *Anthemurgus passiflorae* is one of the most frequent visitors to the wild yellow passionflower, in Texas at least, it is not one of its principal pollinators. Among the few occasions on which *A. passiflorae* did manage to pollinate the passionflower was when male bees tried to mate with pollen-gathering females.

There are countless examples of integral relationships between plants and native pollinators, but undoubtedly as many others yet to be identified. In my own experiences in the Kansas tallgrass prairie, I learned that the pollen in the beautiful yellow-flowering spikes of Nuttall's death camass (*Zigadenus nuttallii*) was lethal to honeybees. Yet several native sweat bees—members of the Halictid family—and one Andrenid bee (*Andrena astragali*) can lavish attention on the death camass with no ill effects. Another Andrenid bee (*A. rudbeckii*) is the most common pollinator of prairie coneflower (*Ratibida columnifera*), one of the most widespread plants of the tallgrass prairie between Nebraska and the coastal prairie of Texas.

Not only are these tiny, solitary native bees crucial to native plant life cycles, they are also more docile than the frequently cranky honeybee. Often as I worked among the grasses, a bright metallic green sweat bee would lap salty sweat from my hands, making its presence known by a pleasant tickling sensation.

The critical role that specialized pollinators—and even nectar thieves such as *Anthemurgus passiflorae*—play in individual plant reproduction and the resulting dynamics of entire plant communities has only recently begun to receive close scrutiny. In their recent book, *The Forgotten Pollinators* (see "Book Reviews," January/February), Gary Paul Nabhan and Stephen Buchmann have done much to remedy this situation by highlighting some of these important relationships.

Dr. Stephen R. Johnson is a plant ecologist who lives in Richmond, Virginia.



Anthemurgus passiflorae female collecting pollen.

JOHN L. NEFF

b y S a r a S t e i n

Problem:
The disappearance
of our natural
wetlands.
Solution:
It's up to you.

In their wetland, the Steins found beautiful water-loving plants such as this swamp milkweed, *Asclepias incarnata*—and ugly ruts gouged by runoff from upstream development.

"How to build a bog?" wrote Mike McKeag, reminding me of the question I had asked him. "Dig a hole, line it with rubber elastomer, loop a length of Netafin subsurface irrigation line along the bottom, and fill the thing to the brim with bog fill."

The bog fill, and not the construction, Mike proclaimed, is the real challenge. He "made do," as he put it, with commercial compost, but it preys on his mind that his Oregon back-yard bog might be less than authentic in its particulate and microbial composition. He fantasizes about being in the mail-order bog soil business. His catalog would include soil mixes for as many bog types as there are Ben & Jerry's ice cream flavors, each cleverly named and illustrated with a color photograph of the community of vegetation suitable to it. Shipped dry, of course: Just add water.

Michael has a way of making things sound easy.

I myself think that everything to do with water is technical and complex. The stuff is hard to handle. It runs. It leaks. It evaporates. Does anyone out there have a truly controllable hose?

For a while I thought I'd waxed too eloquent on the subject of water in my last book. Just about everywhere I went people wanted to tell me about their plans for a frog pond, and I was afraid they'd blame me if it didn't work. It's not that I don't believe my own words, but I've never built a frog pond. I sure didn't believe that the first one I saw actually in progress was going to work.

It was in Garrison, New York, and I apologize now to its owner, Polly Townsend, for my lack of faith. Polly lives on an unpromising site, a steep hillside where the nearest pooling water where frogs might

breed must be way down there, somewhere. The pond itself was a just a hole in the hill, dug with a shovel. The liner was a weathered piece of swimming pool cover scavenged from a trash heap, and it leaked. The liner lay uncovered at its edges, held casually in place with a few stones. There was no planting. There was no plumbing. The pond was kept filled (somewhat) by hose. The water was green with algae. A plank floated in the middle. I figured the big bullfrog sitting on the plank was a freak of nature.

Then Polly replaced the swimming pool cover with a proper liner, installed a sloped stone coping around the edge, sunk pots of rushes and arrowheads in the water, planted mistflower along the bank, and provided photographic evidence of the result: Nineteen frogs were in residence.

I eat my words. It's as Mike said. Just add water.

But Michael doesn't "just add" water, either. Water to his bog is fed into the Netafin subsurface irrigation line loop and adjusted to compensate for evaporation. Water cascades across his yard from a buried 300-gallon tank, the "headwaters" of the stream that flows into his pool. A submerged pump pushes the water back uphill through two-inch plastic piping. So he doesn't "just add" water: He controls it.

Mike wonders if the Anna's hummingbird sipping nectar from his honeysuckle, the flock of pine siskins working his hedgerow, and the frog calling for a mate from the pond are fooled by the illusion of his yard—by its planted meadows and aspen grove and thimbleberry bramble—or perhaps really have found a home.

Yes, Michael, they really have found a home. But it is really not so simple as just adding water.

This article has been excerpted with permission from Planting Noah's Garden, to be published by Houghton Mifflin in March. It is the last in a series of four excerpts from that book published in The American Gardener.

Just Add Water



Coloring our World

I recall with great fondness the "invisible paint" books we used to have as children. The pages were outline drawings that, like magic, became splashed with gaudy color at the touch of a wet brush.

I was reminded of this childish activity when, some years ago, business with a publisher in San Diego took me for the first time by air across the Southwest desert. Astonishingly, there appeared below giant green polka dots against the tan ground. Someone explained that they were crops raised under the long arm of a slowly sweeping, circular irrigation system. I hadn't known you could turn dirt green by just adding water.

The same phenomenon struck me as, on wheels now, I approached the San Diego suburbs. There I was, driving along the highway through chaparral country, enchanted with the soft blurred colors, seeming almost to hear the scuttle of lizards and breathe what I imagined would be the resinous fragrance of the scrub, when the ridges on the ocean side turned green. Green and bougainvillea magenta, green and jacaranda blue. I could see the sprinklers sparkling in the arid air.

Such gaudy stripes also are appearing now around Phoenix, Arizona, where desert is being "developed" at the rate of an acre an hour. Bulldozers clear away century-old saguaros and chew up the desert's protective crust to make way for homes on lawns. Of course, what else? And what could be worse? Let me tell you: The central feature of one of these developments is a manmade lake, big enough to sail on.

I've said that if we each add our little dot to the landscape, a new painting gradually will emerge from our pointillist endeavor. But these splashes of color are not what I meant. In fact I realize that if, flying over the Tucson suburbs, one could see the dot of Ruth Shilling's desert garden from the air, it would be like an invisible painting because she has not added water. Not to the desert soil anyway.

Ruth keeps a water trough for birds, just the inner tank of an old hot water heater with a portion of one side cut out. It lies on the ground; she fills it with a hose. The water trough is more the size of dot I have in mind.

Water is to birds in the desert what nesting boxes are to bluebirds in the East: the scarce resource that limits their population. In the desert, bird populations rise or fall with the

number of drinking spots because water is the scarcest of the resources they need in order to reproduce. Here, we may have plenty of water and food, but natural cavities are rare: We will have no more breeding bluebirds than we provide with boxes.

While this concept holds true in natural habitats, its application to extensive development is dubious. Michael's frog may well have found a real home on his one-seventh-acre oasis, but it did not spontaneously generate in his bog soil. At the rate the Phoenix suburbs are spreading, there won't for long be any habitat from which anything might come. Subdivisions are spreading as quickly up the Sierras, down the western rivers, around every boom town to the eastern shore. The real desert is not the undeveloped arid lands where lizards scurry and peccaries run free. The American desert is the well-watered greensward of our endless tract developments, and it is spreading from coast to coast faster than the sands of the Sahara.

We are like impatient children spilling water over an invisible picture to make it appear all at once instead of tediously, bit by bit. The image has splotted and run; we are ruining it.

Liquid Assets

I have hanging on my attic wall two huge maps of the United States. They measure three feet by five feet and hang one atop the other. I must lift the colored one that indicates elevation to see the black-and-white one that shows in exquisite detail our country's landforms and drainage systems. On this map, based both on ground surveys and satellite images, water seems actually to run, drip down slopes, trickle into valleys, form streams, flow into rivers, spread into ponds and lakes, and sink finally into desert playas or wash out to sea.

I purchased the two maps at a time when I had become lost in Sierra Club Naturalist Guides. The guides offer an overall description of, for example, the Piedmont, the Southern Rockies, the North Woods, the Southwest Deserts.

Each volume includes the geological history and present soil formations of the area, describes the major ecosystems, and sketches in the flora and fauna that characterize them. I had hoped by reading all the guides to give myself a sort of armchair tour of the country, but even in southern New England, my own familiar portion, I soon became disoriented. It's one thing to have driven along the Connecticut River many times; it's another to picture the river valley's width and course, slopes and feeders. Why should the range of the tulip tree halt abruptly at the Connecticut-Massachusetts border as though it respected political boundaries? Or finger northward along Massachusetts' border with New York as though following the course of something not shown in the guide's simple drawings?

So when the maps arrived, I took to reading the books in their constant presence, poking into swamps and fingering mountain balds.

California, said the map, has a zillion streams! No, said the guide to the Sierra Nevada, it does not. The Central Valley has none left at all; its streambeds are empty, the water spilled to irrigate celery and lettuce. The author could not even describe the valley's riparian vegetation, since, unlike our tulip trees, it had not been studied before it was destroyed.

The tulip tree's respect for state boundaries turned out to be topographical, based on moisture gradients: Its range ends abruptly at the drier foothills of the Berkshire Mountains, but follows the Hudson north along the river's moist valley. The many lakes shown on the map in flatter portions of southern New England accorded well with guide descriptions of the grass pinks, ladies'-tresses, fringed gentians, meadow lilies, and rose pogonias typical of our wet meadow ecosystems. But here my intimacy with the area belied both book and map: What remains of such wetlands is mostly to be found on preserves; elsewhere they have been drained. The truth of the riparian woodlands so well described in nature guides is that most have been cut down and cultivated. The reality of the countless little rills that lace New England on the map is that they are ravaged by spring floods, glutted with silt, and dry in summer. The soil is no longer root-matted, spongy,

***California, said the map, has a zillion streams!
No, said the guide to the Sierra Nevada, it does not.***



Gardeners invariably rue a decision to plant steep banks with crown vetch, left, which will take over everything in its path. There are many other choices that flourish near or under water. The silky dogwood (*Cornus amomum*), above left, can be planted in thick ropes called fascines to create a mass of bank-holding shrubs, and its fall foliage may turn reddish purple. The

author's niece planted soft rush, above, to hold soil in a swale, or open ditch, behind her house. Pickerel weed, below, is an emergent aquatic that can be planted directly in a pond or stream.





deep-down damp and trickling. Rain spills off the land too fast.

The maps don't show, and the guides don't describe, what lies below the surface: the country's largest water system, the aquifers that feed our springs and wells. This is fossil water, as oil is fossil fuel. It has percolated through soil and stone for thousands or tens of thousands of years, and is a finite cache, at least on our time scale. Theoretically, aquifers are a renewable resource, recharged continually by rain. But each molecule of water raining on the land's surface takes a hundred years to reach the underground reservoir that traps it, and we are emptying the tank faster than it is refilling.

Ruth Shilling had to lower her well pump to reach the water, which had fallen 26 feet over a decade and a half. When I was a child summering in Connecticut, people got their water from shallow wells that filled with groundwater, or from natural springs. Artesian wells that tap the aquifer from which such springs arise were not common then. My family was among the first to drill this modern sort of well on the old farm where previously we had hauled water from a spring. The spring sank; it's gone, its deep source spilt and squandered.

Mitigating Circumstances

I met Katrina Thomas by chance in a bookstore and went to see her wetland garden. A brook ran lazily between steep banks—very steep. We climbed down a full flight of stone steps to reach the level of her garden where pickerel weed bloomed on a

sandbar against a flood-borne snag, and blue flag and bottle gentian grew where the channel broadened and water lay limpid at our feet. The soil was gnawed and scarred with runnels. The brook is a rip-tearing monster in the spring, and it had bitten the banks away. The water must have once run through Katrina's yard, not below it, a hundred years ago or more.

Violent spring floods and aggressive erosion date from the clearing of land for agriculture. Spongy woodland soils earlier had been natural irrigation systems, metering out the water, feeding it slowly and steadily through the season. Where the land was fairly flat, tame spring floods deposited a yearly film of fine sand and silt beyond the banks, and this is where wet meadows, with their orchids and their gentians, were once found. Katrina's brook runs for miles through residential tracts and rural countryside plowed for crops or hayed for fodder. Water runs off this shallow-rooted land as from a roof or road, and nothing will slow it except replanting the ravished valley it has carved.

Eventually I realized that Katrina had not summoned me here to admire her irises, but to consult on crown vetch.

***Theoretically, aquifers are
a renewable resource.
But we are emptying the tank
faster than it is refilling.***

My gardening encyclopedia describes the pretty, pink-and-white pea-flowered crown vetch, *Coronilla varia*, with amusing ambivalence. "Although native to Europe, this has become widely naturalized in the northeastern U.S. and can become a vicious weed in any garden.... Crown vetch increases rapidly by sending out underground stems in all directions, and also the shoots may root where they touch moist soil. It is excellent for planting on steep, rocky banks and growing at will, but should not be planted in a well-kept garden, for even though the aboveground shoots may be pulled up where they are not wanted, roots will be broken off and remain in the soil and continue to act as invading weeds for years. It is also a fine plant for preventing soil erosion on banks."

In fact—and on the advice of her county agent—Katrina had planted crown vetch to hold her bank against erosion, and just as the encyclopedia warns, it had become a vicious weed, spreading along the brook and into a bed of daylilies many yards from where it was planted. It had crept over the rim of the bank and was prowling through the lawn toward new horizons. How to get rid of it, and with what to replace it, were the questions on Katrina's mind.

In this circuitous way I entered a world as new to me as the landforms and drainage map had been—the world of mitigation. Like other bookish travelers in strange lands, I looked up the dictionary meaning. Mitigation is "to cause to become more gentle or less hostile; to



Katrina Thomas planted crown vetch to reduce erosion along this bank, far left, and soon found it romping many yards away through her daylilies. It was replaced by switch grass, left, which holds soil with spreading roots and attracts wildlife.

make less severe, violent, cruel, intense, painful.” It is in the nature of flowing water to carve and reshape the land, cutting into one bank and piling silt along another. Rivers change course; hills erode to plains; lakes shallow to marshes. These changes in the land are inevitable over time. My understanding was that wetland mitigation is to slow the hectic pace, to gentle the waters.

I had misunderstood. Wetland mitigation laws are intended to protect the water—its cleanliness and plentiful supply—not the integrity of wetland habitat. Thus property owners may be permitted to drain a marsh if, in mitigation, they create an equivalent wet area; or they may be allowed to deforest a bank if, in mitigation, they replant the newly erosional surface with something else. What that something is—and whether the rare green dragon that grew in the original marsh can grow in its replacement, or whether wood frogs will breed there or wood ducks find food to eat—is often beneath the notice of the law.

As we two foolishly bootless ladies drove south on the New Jersey Turnpike one cold November day past miles of crown vetch to Pinelands Nursery, we were, ironically, out to mitigate a previous, wrongful mitigation.

Fascinated by Fascines

We had made an appointment with Don Knezick, co-owner with his wife, Suzanne, of Pinelands Nursery in Columbus. Don does not deal in crown vetch. With one exception—a

willow introduced by the Soil and Water Conservation Service and for that reason suspect—Pinelands deals in species native to New Jersey and the surrounding area. The Knezicks grow wetland plants like tussock sedge and soft rush, and dryland ones like bear oak (*Quercus ilicifolia*), pitch pine, and lowbush blueberry. Quite a few of these species are equally at home drowned or desiccated, making them a good choice for seasonal wetlands such as sumps that puddle in the spring and dry up in the summer, or episodic ones like ditches that carry runoff during storms. Mitigation also involves salt-tolerant species to hold dunes along the shore; carpeting or thicketing ones to hold steep banks; and species that can grow in sterile dirt where all topsoil has eroded. The nursery grows all of these by sophisticated technologies in quantities then incredible to me.

I was transfixed. In some of the polyhouses, water flows through long, shallow tanks along a central aisle. In these grow emergent aquatics like pickerel weed (*Pontederia cordata*) and wool grass (*Scirpus cyperinus*). Salinity of the water is adjusted for salt marsh species: Cord grass is grown first in fresh water, then gradually accus-

tomed to its ultimate habitat by measured additions of salt. Smaller plants are grown in plug trays from which at planting time they are popped like ice cubes. One can “contract” for these or larger plants to be grown to order in quantities of 500, 5,000, or tens of thousands.

Don demonstrated the use of erosion control products I had never heard of—fiber mats, coir logs, fascines. In one polyhouse, a recent contract for an aquatic rush was growing in a two-inch-thick, coconut-fiber bog mat submerged in water. He lifted one corner. Roots spread throughout the fiber. The plants were only a few weeks old. The mat can be rolled up, plants and all, then rolled out over the bed of a watercourse.

Don suggested that Katrina’s best choice for both erosion control and wildlife habitat would be switch grass (*Panicum virgatum*), a rhizomatous species that by its spreading roots would quickly hold the soil. The bank measured 70 by 20 feet. At one plant per square foot, she would need 1,400 plants. We could contract for them. Erosion control mats would be worthless in her situation because they could not be laid smoothly over the numerous shale projections in her bank.

Something came over me. The excitement of technology? The self-importance that comes from contracting plants grown specially to order? Or simply curiosity, the chance to experiment, the gathering of new material for a book?

The upshot of our visit that November day was an order that

Wetland mitigation laws are intended to protect the water—not the integrity of wetland habitat.

would be distributed more or less equally among three of us. The following spring found me sitting on the terrace ripping holes in bog mat, pushing into the holes plugs of various aquatics. Eighty miles south, my niece Ellen was planting 1,400 plugs of wool grass and soft rush in fiber matting rolled out along her ditch. [See "Ellen's Lot," January/February.] Eighty miles north, Katrina valiantly was inserting that many plugs of switch grass among the herbicided crown vetch on her bank.

Summer came. Our bog mat plantings flourished and began to fill in the pond shore as I had hoped. Ellen's *Juncus effusus* and *Scirpus cyperinus* began to hold their own—to slow the water, to hold the soil rushing from cul-de-sac to culvert. Katrina's switch grass rooted in and grasped the crumbling bank. I wished I had tried more, tried everything: fiber biologs that looked like giant luffa sponges stuffed with marshy herbage, thick ropes called fascines made of silky dogwood or pussy willow sticks.

The fascines particularly intrigued me because they are the living material itself, fresh-cut and cord-bound wands that sprout into instant thickets. I had found among friends a potential customer for fascines of red-osier dogwood (*Cornus stolonifera*) to be planted in a ferociously steep storm channel that cuts her lot almost vertically, but I hadn't realized that they must be planted a month earlier in the season than I had thought to order them.

So why not homemade fascines?

Down by the pond, between an old boulder and the young sedge meadow, grow five dwarf red-osier dogwoods whose knee-high scarlet stems look mighty nice in winter among buffy skeletons of wool grass against the frozen pond. In the swamp below it, my husband and I found tussock sedge, flag iris, swamp milkweed, marsh fern. But the extent of erosion was shocking: What 10 years before had been a watery lacework playing over the surface was now ugly ruts gouged by spring torrents, originating in new development upstream. I imagined mitigating this wooded wetland with thickets of dwarf dogwood woven among lush green skunk cabbages under red-blossomed maples, like swamp Christmas-time in spring. Or one patch anyway, just to see.

Toward mid-spring the following year, when marsh marigolds were blooming and the dogwood buds had swelled, I snipped a batch of wands, bun-

dled them inexpertly with butcher's twine, laid them down in grooves along a trial channel, and lovingly buried them.

That, too, worked. Could it be that water is not so hard to deal with after all?

I began to feel—how shall I put it?—more *manly* about controlling water, more akin to Mike with his elastomer and Netafin. But it was not waterway construction that I was dealing with: It was the gentling plants.

The Big Picture

In March 1995, a letter from Mike McKee arrived containing a spreadsheet chart titled "Electrical Power Cost Before and After Stream Installation." His bill—and his household power consumption—had nearly doubled. "How many Columbia River salmon has it cost to create habitat for the frogs, birds, and insects that use our stream?" Mike wondered.

I'd just finished reading a book called *Our Natural History* by Daniel B. Botkin, an ecologist who has been directing a study of salmon in northern California and western Oregon. Botkin describes multiple reasons for the drastic decline in stream-spawned, oceangoing salmon and their close kin, steelhead and sea-run cutthroat trout. Overfishing. Irrigation. Dams. Reservoirs. Channelization. Clear cutting. Erosion. Botkin's point is that if there is no single reason, there also is no single solution, no rock-hard right answer, no rigid management policy that, practiced uniformly over time, would mitigate these fish's precarious existence.

Salmon need landslides in the mountains because that gravelly debris is the source of the clean-pebbled beds in which they spawn. They need fluctuating water levels that at times aid returning adults, at other times advantage their sea-bound fry. They need floods to carve new meanders and marshes where the young can seek shelter from predators. They need storms to fell forest trees, to dam streams, to form quiet pools and splashy ripples. They need fires to clear the banks, to let alders sprouting in the new, bright light replenish soil nitrogen for

the next generation of great forest conifers. They need the regrowing forest as well, for only in its shade is the population of diatoms—young salmon's primary food—sufficient to feed their growing appetites. Salmon survival depends on numerous small catastrophes: Stasis kills.

Botkin's goal in writing *Our Natural History* is to help us realize that the natural world has never existed in a static state such as we imagine the "primeval forest" or the Columbia River before human interference. He asks us to be flexible, experimental, to allow change, admit error—and avoid in the future monolithic controls such as those that have curbed the freedom of 4,600 miles of waterway in the Columbia and Snake River Basins—a third of the river that salmon traveled at the time of the Lewis and Clark Expedition.

We speak at different scales: Botkin of great ecosystems, I of small properties, Mike of miniature bogs. But I think we three are part of a new environmental harmony in which no single voice declares the right solution. Michael's solution to providing wetland habitat would be the wrong one if it were the only one, if we were all to pump 300 gallons of water uphill continually. Katrina's brook, Ellen's ditch, my pond, Ruth's trough, and Polly's hole in the hill are other solutions—soft, in harmony, and equally mitigating in our otherwise water-squandering suburban desert.

I am sometimes impatient with how slowly pictures emerge from small dots and worried by how quickly the canvas is being painted green. I'm annoyed that owners of the development upstream from me seem unaware that their mowed-back style silts my pond and runs the soil from my swamp. But mostly I'm relieved to consider the advantages of this particular suburban scale I work with and write about: small enough in Mike's case that a frog pond makes a difference; big enough on our place that natural wetlands can be restored to diversity.

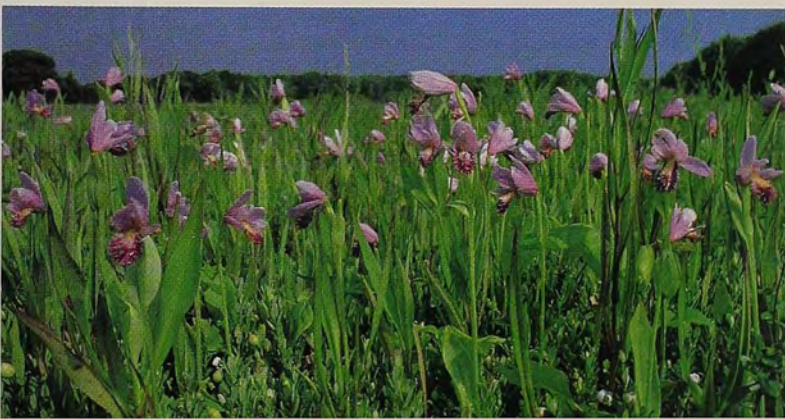
Our suburbs are in the aggregate populated with so many kinds of people in such varied circumstances that if we can break out of the monolithic uniformity of lawns, we will be free to find our ways as variously and flexibly as streams once found the sea.

**Botkin asks us to be
flexible, experimental,
to allow change,
admit error.**

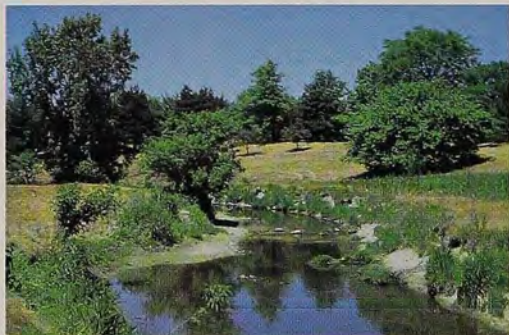
Planting Noah's Garden is available to AHS members for \$25, plus shipping and handling. To order, call (800) 777-7931 ext. 36 or see the form on page 57.



Flat portions of southern New England are full of lakes, according to landform and drainage maps, and floras of that region agree that wet-meadow flower species are to be found there, as well. But for the most part, says Stein, species such as these can be found only on nature preserves. Clockwise from upper left, fringed gentian (*Gentianopsis crinita*), meadow lily (*Lilium canadense*), rose pogonia (*Pogonia ophioglossoides*), and grass pink (*Calopogon tuberosus*).



**Three years ago this
Chicago Botanic Garden stream
didn't run, it oozed.**



b y A d e l e K l e i n e

A soft breeze stirs willow branches above the slowly meandering stream. A frog leaps from boulder to boulder, intent on some unseen insect, while butterflies dance through the black-eyed Susans that are blooming their heads off. There's bird chatter, too, from the prairie grasses on the river bank.

This bucolic scene in the Chicago Botanic Garden in Glencoe, Illinois, represents the near-completion of a two-year restoration project in which the power of plants was harnessed to heal an eroding river channel. Garden staff labored intensively in heat and mud, their goal a self-sustaining environment for this small section of the Skokie River. They have been rewarded by seeing it change from a shallow, sluggish, sediment-filled stream to one that is deeper, clearer, and clearly going somewhere. More important, it is now a corridor of biodiversity, further changing the landscape through which it passes.

The Skokie River flows south for about a mile across the botanic garden, cutting through 12 acres. The Skokie was a slow, meandering swale before the turn of the century, when it was compressed into a straight channel to serve agriculture. When the botanic garden was created 30 years ago, the river was moved and channelized

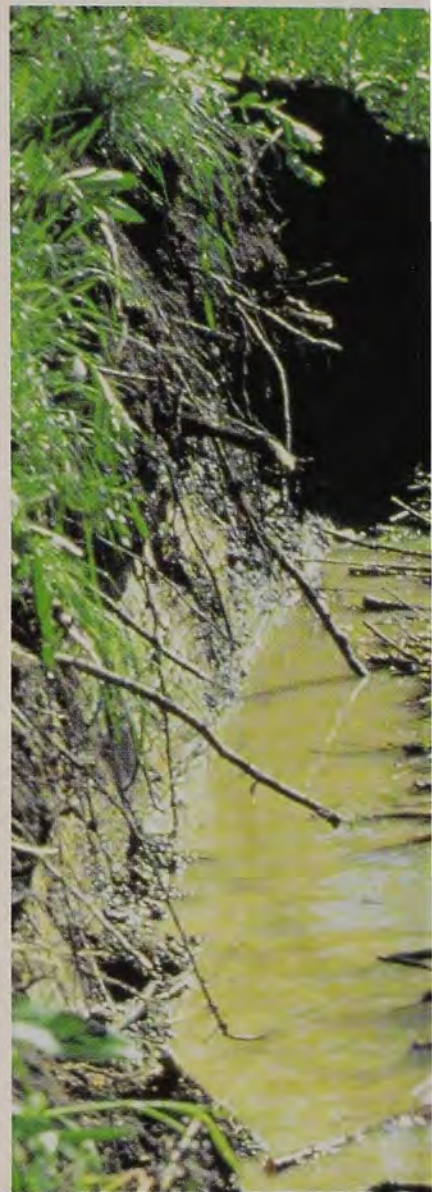
again. Its banks became severely eroded and unsightly, and utility pipes were exposed. In summer, the unshaded stream was only three inches deep in some places, clogged with algae and too hot to serve as a healthy home for fish and insects.

Adjoining the river was a maintenance headache: a strip of bluegrass and fescue lawn 30 to 60 feet wide. Mowing was expensive, but left unmowed it was merely a scruffy monoculture offering little habitat

A River Runs

for birds or other animals. These problems aren't unique to the Skokie or the botanic garden. They're typical of urban and suburban streams where runoff causes intermittent flooding, cuts and widens channels, and clogs streams with debris.

In this case, the sediment oozed its way to the Skokie Lagoons in the Cook County Forest Preserve south of the garden. Created as public fishing holes and to serve as catchments during floods, the lagoons had recently been bottom-cleaned to make them "fishable" in accordance with the federal Clean Water Act. To maintain that status, it was essential that





Before restoration began in 1994, far left, the Skokie was shallow and sluggish and its banks were crumbling. To help rebuild the banks, workers buried 40,000 dormant branches of sandbar willow, left.

the water feeding the lagoons also be clean.

Because the Chicago Botanic Garden draws some 750,000 visitors a year, members of the Northeastern Illinois Planning Commission thought its section of the Skokie would make an ideal public education project for using vegetation and ecological restoration techniques to control nonpoint source pollution—pollution that comes from any source other than direct discharge of waste—and improve water quality. Erosion is usually prevented with structural elements such as riprap, concrete, or bulkheads. “I see this as a low-cost, aesthetic alternative to traditional solutions for stream management,” says Dennis Dreher, director of natural resources for the commission. Eventually, the project was to serve as a model for similar undertakings by cities, park districts, land use planners, and private citizens.

Restoration Begins

The botanic garden provided 40 percent of the funding, while the rest came from the U.S. Environmental Protection Agency under the Clean Water Act. The project was launched in the spring of 1994 with the garden’s Cynthia Baker as project manager, staff member Joan O’Shaughnessy as Skokie River horticulturist, and Dreher as consultant.

The restoration had three main goals: to stabilize the eroding channel banks, to re-

Through It



PHOTOS COURTESY OF THE CHICAGO BOTANIC GARDEN

store the riparian buffer zones beyond each bank, and to improve water quality and habitat within the stream itself.

To help with the banks the team hired Steven Apfelbaum of Applied Ecological Services in Brodhead, Wisconsin, who specializes in creating naturalistic wetlands and floodplains to repair and prevent flood damage. Apfelbaum's crew brought in 100 truckloads of wetland soil (a developer had received permission to remove it as part of a mitigation agreement) to create marshes and three oxbows. The latter form naturally when a bend in a stream is cut off and forms a crescent-shaped lake or wetland. When the stream overflows, the

by three-foot oak stakes at one- or two-foot intervals. Others were laid along the stream bottom to create a narrow, meandering "pilot" stream. The goal here was to narrow and deepen the Skokie, thus making it cooler, "and to bring some 'sinuosity' back to the river," says O'Shaughnessy.

The logs were planted with such aquatics as sweet flag (*Acorus calamus*), southern blue flag (*Iris virginica* var. *shrevei*), and softstem or great bulrush (*Scirpus validus* var. *creber*, also known as *Schoenoplectus validus*). Wetland plants absorb nitrogen and phosphorus, which support algae and other growth that can choke the water's flow. One- to three-foot rocks were

the garden's population of reed canary grass is a European strain—but can out-compete other plants. "We're keeping an eye on them," she says, "as they tend to become monocultures in disturbed areas." Plants are handpicked if they invade the open water or stands of more benign natives. O'Shaughnessy concluded that it's better to totally replant an area, appropriate to its expected moisture, than to leave anything to chance.

The wetland soil that was trucked in, while rich, was a far cry from a gardener's ideal loam. It was rock hard in summer, when workers had to loosen it with mat-tocks. Rain turned it to mud in which they



Staff and volunteers poked more than 112,000 plugs into the garden's wetlands, above right. Posts of sandbar willow, above left, almost disappeared later in the midst of prairie flowers, opposite. Rocks in the background help aerate the water and create abodes for water dwellers.

oxbow catches and holds some of the water, reducing its eroding impact.

In 1995 the team applied a technique called brush layering. Forty thousand dormant branches of sandbar willow (*Salix exigua*, formerly *S. interior*) were buried along the banks in rows, totaling 440 feet. An alternative approach, tried along other sections of heavy erosion, involved planting 500 four-foot-tall, two-inch-diameter limbless willow "posts" every four feet. O'Shaughnessy explains that brush layering has a much more immediate effect, quickly sending out a mass of roots and shoots to form a mat, "but it's also much more expensive and labor intensive."

Another technique called for the use of coir logs—strong, flexible, and biodegradable coconut fiber rolls, each 20 feet long, a foot wide, and weighing 180 pounds. Some of the logs were placed directly against the stream banks and held in place

laid along the bottom of the bed to create riffles that keep oxygen high while offering rock-loving organisms a place to cling and pool-loving creatures a place to hide.

Bring on the Sedges

The most heavily used plants in these wetland areas were sedges. In addition to the softstem bulrush, there is dark green bulrush (*Scirpus atrovirens*), wool grass (*S. cyperinus*), red bulrush (*S. pungens*), chairmaker's-rush, (*S. americanus*), broom sedge (*Carex scoparia*), and brown fox sedge (*C. vulpinoidea*).

While some sections of the wetland were heavily replanted, others were left open to catch floodwaters. In these latter areas, particularly, cattail (*Typha latifolia*) and reed canary grass (*Phalaris arundinacea*) have been unwanted, though not unexpected, volunteers. Both are native species—although O'Shaughnessy believes

kept planting, in spite of finding it difficult to move their feet. "The work was very physical," recalls botanic garden intern Kira Hirsch, "and much of the planting involved climbing steep sections of eroded stream bank, wading along the water's edge, or standing in mud flats in all kinds of weather." Yet she began to feel that the dirty, hard work was worthwhile when the water became noticeably cleaner in just a few months.

Thirty thousand plugs of prairie cord grass (*Spartina pectinata*), which has deep, dense roots ideal for preventing erosion, were planted along some 10,000 linear feet of the channel. Other wetland and bank plantings proceeded at a heroic pace. The recordkeeping was meticulous. For example, in the summers of 1994 and 1995, using plugs grown from seed collected the previous autumns, the oxbows were planted with 20,286 plants of 50 species, the banks with 50,421 plants of 36 species, the swale marsh

PHOTOS COURTESY OF THE CHICAGO BOTANIC GARDEN

with 10,635 plants of 34 species, and the floodplain with 20,844 plants of 50 species. In only two months of 1994, staff and volunteers planted a prodigious 69,081 plants, beginning work at 9 a.m. and often staying to 5 p.m. The total of 112,668 plugs represented 79 species in all.

The Big Buffer

The created wetlands composed only one acre of the project area. In July 1994 the 11-acre riparian buffer zone was cleared of weeds and brush, but not tilled. Workers used a drill to plant seeds of eight native grasses and flowers—big bluestem (*Andropogon gerardii*), switch grass

rows, swamp sparrows, and juncos. “Mayfly, caddisfly, and dragonfly larvae seemed to be at home under the rocks in the water,” says Jim Steffens, the botanic garden’s ecologist, suggesting that water quality had improved. But, adds O’Shaughnessy, “We don’t have enough data yet to say what’s happening to the river, or if it’s connected to our work.”

The telling time for flood control is late winter and early spring, when it’s common for rivers in northeastern Illinois to overflow their banks. The first season after the project began didn’t bode well. “Several hundred feet of the Skokie banks eroded severely in the spring of ’95,” says O’Shaughnessy. “But when the river over-

versity,” O’Shaughnessy says now, “and the survival rate seems quite high.”

In keeping with its educational mission, the Chicago Botanic Garden has produced a video of the project, offers occasional workshops on stream bank stabilization, and plans to create a fully interpreted stream bank stabilization demonstration site with easy access for visitors. Groups inspired to copy the project have included municipalities and golf courses.

Project leaders hope it will be a catalyst not only for their neighbors along the troubled Skokie, but for any homeowners who confront habitual wet places or have been captivated by a waterfront site, only



(*Panicum virgatum*), Canadian wild rye (*Elymus canadensis*), Virginia wild rye (*E. virginicus*), grayhead prairie coneflower (*Ratibida pinnata*), black-eyed Susan (*Rudbeckia hirta*), cup plant (*Silphium perfoliatum*), and Joe-pye weed (*Eupatorium maculatum*), mixed with annual rye grass as a cover crop.

The success of the mitigation—both in terms of increased wildlife and lessened erosion—will be evaluated for years, but some results were immediate. By the autumn of 1994, the staff observed larger numbers of seed-eating birds, especially goldfinches, who feasted on sundrops (*Oenothera perennis*), as well as song spar-

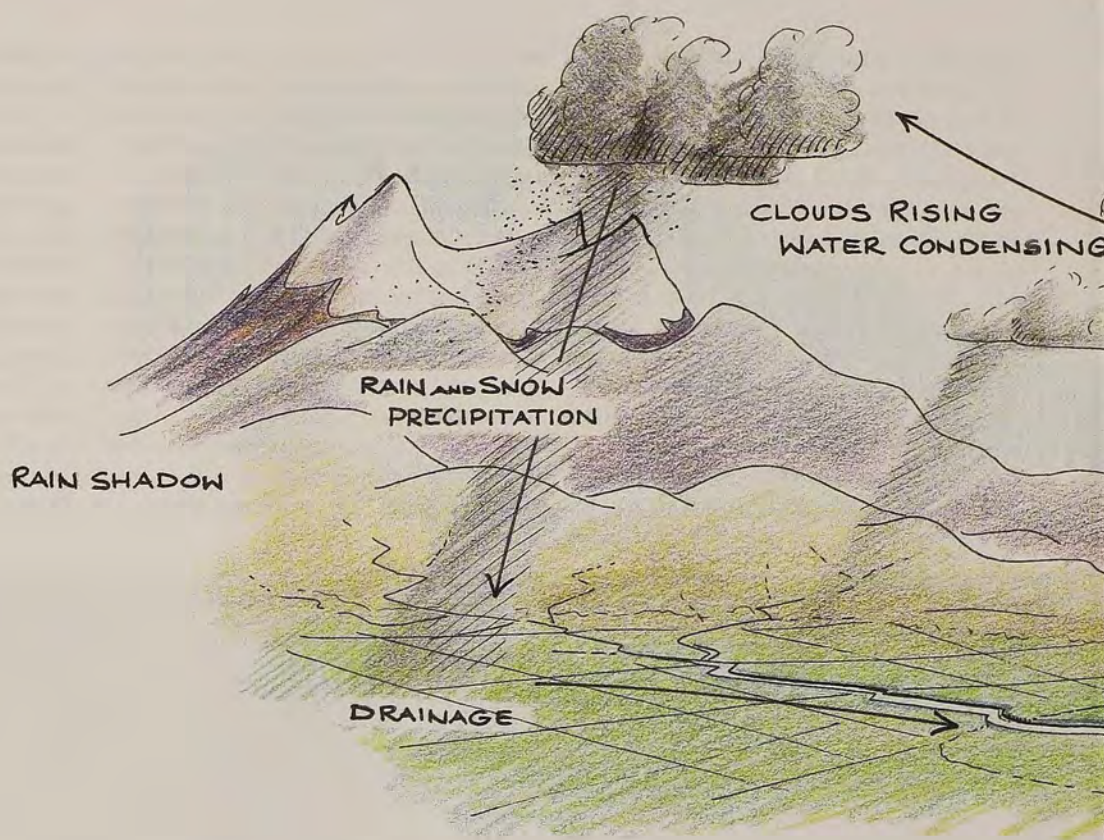
rowed its banks again in 1996, very little new bank erosion was evident. This suggests that the plants and various other erosion control techniques are doing their job.”

She was at first concerned about survival rates among some of the plantings. “The flooding may be taking a toll on the wetland and riparian buffer vegetation, burying some plants in silt,” she speculated two years ago. “Some of the mature plants survived this inundation of sediment, but recently germinated seedlings will have a hard go of it.” In 1996, however, there were more natives in the prairie buffer area than in the previous year. “Despite flooding we’re seeing some good di-

to face the reality of flooding and erosion.

In a few years, when plants are established, the river will look landscaped not by humans, but by nature. Then the Skokie will silently but eloquently make its own point: that the end result of willow bundles, coir logs, prairie cord grass, and blue flag is vastly more appealing than fill dirt or walls of rock. “We are using nature to reverse what humans have done to nature,” says garden intern Hirsch. “I didn’t know that plants were so powerful.”

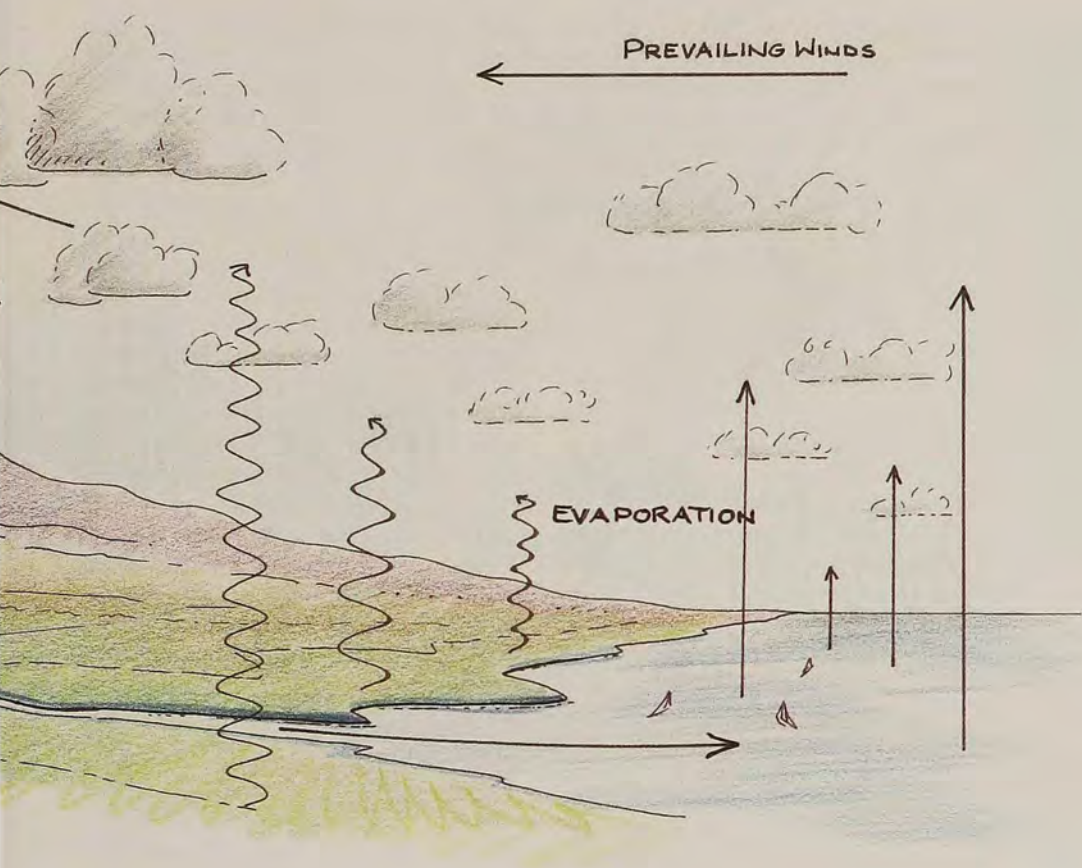
Adele Kleine is a free-lance writer living in Winnetka, Illinois, who teaches flower arranging at the Chicago Botanic Garden.



What Noah Didn't Know

A gardener can't have too much water, but it can be in the wrong place at the wrong time.

by Dennis C. McGlade
Illustrations by Alastair Bolton

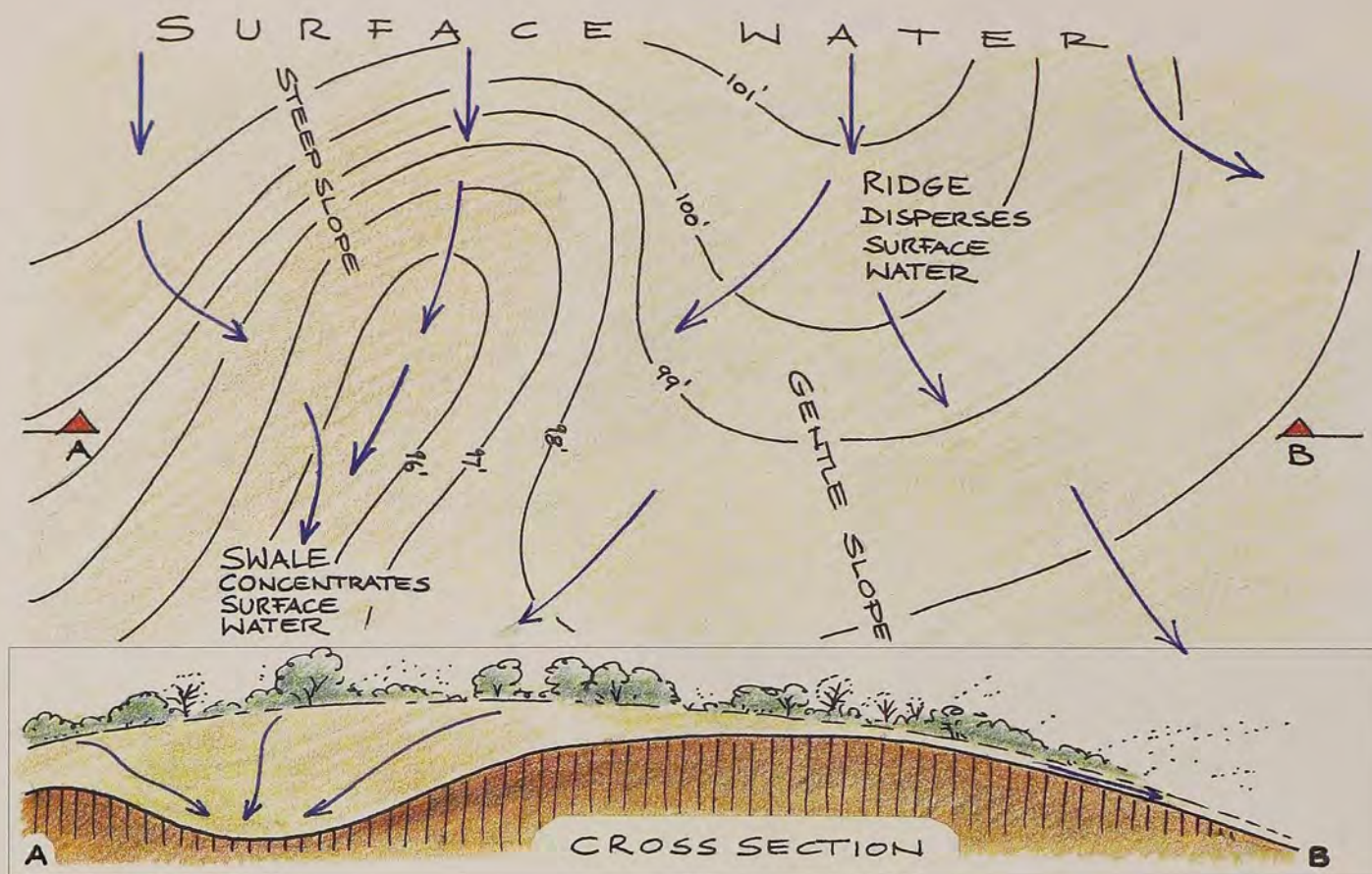


“And God said, Let the waters under heaven be gathered together unto one place, and let the dry land appear; and it was so.” Genesis, Chapter 1, Verse 9

The above words appear to be the first record of a civil engineering project to remove excess surface water from the land. Ever since, gardeners, farmers, and city dwellers have been waging the battle of runoff, generally without divine intervention.

In the Iron Age, English farmers kept their fields from becoming waterlogged with simple, open drainage ditches about a foot deep. Such a low-tech approach had little adverse impact on natural drainage systems. Not so with drainage interventions on the scale of today's. Every time we divert water from land that would ordinarily be wet in order to make room for our homes and highways, parks and parking lots, there is less land to absorb the unwanted water. There are fewer plants to purify it as it pours into neighboring streams and rivers. High water and low water in these streams are both more extreme, and intervals between floods seem to be getting shorter.

Water is never lost, but is constantly being recycled from earth to atmosphere and back again through what is known as the hydrologic cycle, above.



A topographical or "topo" map will give you a concrete picture of the contours of your area (see sidebar).

"And the waters prevailed exceedingly upon the earth; and all the high hills, that were under the whole heaven, were covered."

Genesis, Chapter 7, Verse 19

It may seem a curse to engineers, but it is one of nature's blessings that earth's water is never really lost but always in a state of recycling, known as the hydrologic cycle. Except for water locked below ground in a geological repository, such as an aquifer, all other water is constantly changing its state from precipitation to either runoff or absorption, to evaporation or transpiration of plants and animals, and then to precipitation again.

Every parcel of land is part of a watershed or drainage basin that contributes water to the nearest creek or river, with smaller watersheds flowing into larger ones. The largest in the United States is, of course, the Mississippi River watershed, which handles most of the runoff between the Rocky Mountains and the Appalachians, from Canada to the Gulf of Mexico. A single urban or suburban lot doesn't appear to contribute much runoff. It's the aggregate drainage from millions of individual properties that has created a need for

a "runoff ethic." In creating our modern population centers we've traditionally collected runoff in underground pipes, concentrating its volume and speed with disastrous results downstream.

Since the law of gravity applies to runoff, the lower your property in the watershed, the more water will flow by, over, or sometimes under it. But the overall configuration of your property and surrounding land—how steep the slopes are and whether they tend to occur in the middle or on the edges of your lot, for instance—also affects the volume of water you have to contend with and whether it creates huge headaches or interesting landscape opportunities. Is the shape of the land upslope concentrating the flow directly toward your house? Are the slopes so steep that water runs off rapidly, causing erosion rather than allowing water to sink into the soil?

Knowing how to get this information by reading topographical maps is an important skill for anyone working out a drainage strategy. These maps use curved, roughly parallel lines to indicate relative elevations and relative steepness of slopes. Water flows perpendicular to these contour lines. The closer together the contour lines are, the steeper the slope. Contour lines

that point downhill form ridges, while those pointing uphill form swales or valleys, which may be occupied by streams.

Other natural factors that should be taken into consideration are the type of soils you and your neighbors have, and their underlying geology, especially depth to bedrock. If you have soil that is sandy to loamy, slopes that are shallow to flat, and great depth to the underlying rock, then rain will be absorbed and the amount of runoff will be low. When soil is heavy clay, rock is close to the surface, or both, the ground can become saturated more easily. The soil is like a sponge that can hold no more water, and any excess will flow over the surface—in other words, a flood.

In creating our urban landscapes, with their impermeable streets, roofs, and parking lots, we have produced the equivalent of shallow or surface bedrock. Therefore, you'll face an entirely different situation if you're downstream from a city than if you're downstream from a forest or other heavy stand of vegetation.

"And the dove came in to him in the evening; and lo, in her mouth was an olive leaf pluckt off: so Noah knew that the waters were abated from off the earth."

Genesis, Chapter 8, Verse 11

Of course, the best time to address potential drainage problems is before your house is built. Developers do this either by using fill dirt to create an elevated platform to build on, or by lowering the grade adjacent to the structure so that the existing elevation becomes the site's high point. Sometimes the excess earth from the excavation is used in the earth platform.

A waterlogged low point doesn't have to be an eyesore. It can be the genesis for a pond or bog garden. But trying to incorporate runoff into these interesting ecosystems can be more difficult than creating the feature using a purely artificial water supply. While neither garden can be allowed to go dry, a bog shouldn't have standing water on top of it, and a pond shouldn't overflow. Water coming from a neighbor's yard can bring in sediment or pesticides that can fill in these features or upset their ecology.

A less aesthetic structure, such as a recharge basin or a detention basin, can be tucked away in a less prominent spot. The purpose of the former is to recharge your

groundwater by letting runoff slowly soak into your soil. A detention basin serves to hold runoff so that it doesn't leave the site too fast, exacerbating flooding farther down the watershed. These features can be screened with drifts of shrubs and trees. A shallow basin might even be planted with wetland species that tolerate a limited amount of standing water.

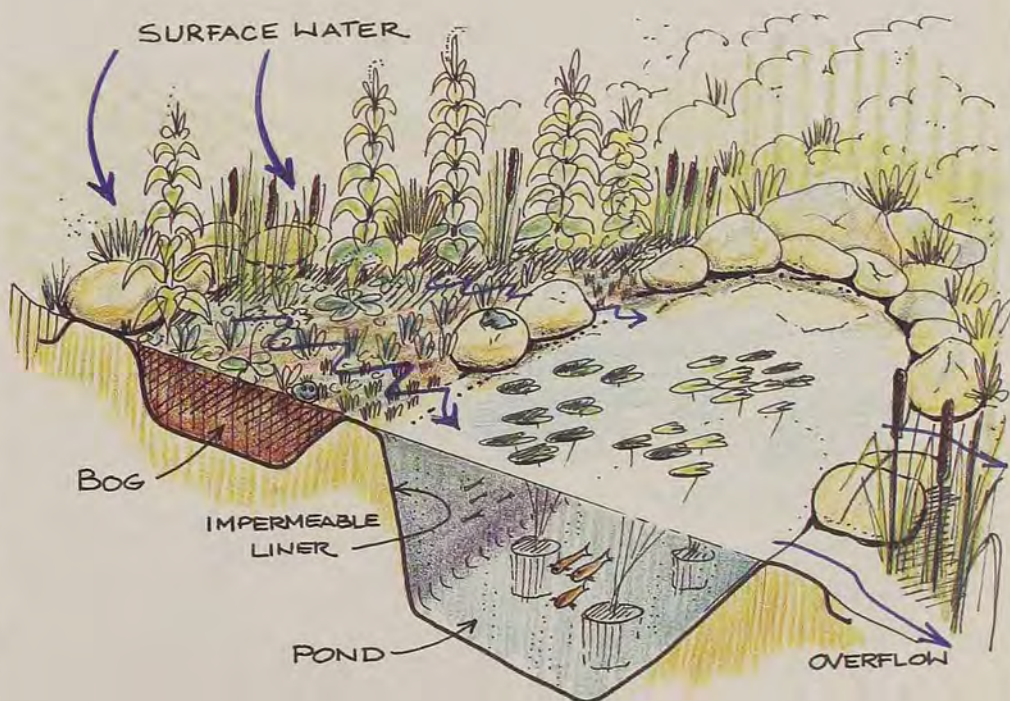
If your own land is sloping, runoff from uphill neighbors can be dealt with by creating either a berm, which is a ridge of earth, or a swale, which is essentially a shallow, open ditch. Either can intercept the runoff above your house, lawn, pool, or other feature you want to protect, diverting it to a place where it can be released to continue its way down the watershed over land, be collected for recharging, or be directed into the storm sewer system.

As you're considering these options remember that the design of drainage structures is complex and specialized, and local ordinances may have very specific requirements regarding their capacity. Do-it-yourselfers can correct relatively minor problems with runoff or standing water, but any deliberate changes that exacerbate flooding or erosion on a neighbor's property could result in a lawsuit. Before embarking on any ambitious drainage project, it's best to consult with a civil en-

Resources

Topographic maps of varying scales for all states and U.S. possessions are available from the U.S. Geological Survey, Box 25286, Denver, CO 80225. Most maps are priced at \$4, but there is a handling fee of \$3.50 per order. Indexes of maps—which include a grid designed to help you locate the specific area you are looking for—are available free by calling 1-800-USA-MAPS. Their fax-on-demand system is also accessible at this number. For more information, visit their Web site at <http://www.usgs.gov>.

A landscaped bog, pond, or combination is probably the most picturesque use for excess water, but trying to incorporate runoff into such features can be more difficult than relying on artificial water sources.



gineer or a landscape architecture firm that employs such specialists.

Both sloping and flat land can employ yard drains placed in low points to collect excess water into underground pipes. The pipes are sloped to carry the water downhill to some kind of collection point or where it can be released across the surface of the ground. The problem with this alternative is that concentrating the volume of storm water in pipes can increase the rate of flow, worsening erosion and gulying wherever the pipe empties. The water velocity can be slowed, however, if this flow can be spread over a large, gently sloping, and well-vegetated area.

If you have a single, localized low point with one side downhill of the other, you can cut a ditch through the low side, allowing excess water to leave by that route. Alternately, low points can be eliminated by filling them with soil. Which you choose to do will depend on the size of the low point, where it's located relative to your property line, the presence of significant vegetation, and other factors.

For example, if you have a very small area of standing water on your lawn, filling it is an easy, inexpensive way to go. If your problem area is in a wood, you wouldn't want to dig an elaborate ditch that could damage the roots of trees and kill them or make them unstable. And while it's possible to fill on top of tree roots without harm to the tree, it's difficult and expensive.

You don't have to hold excess water on the surface, of course. You can create an underground system—ranging from a very simple underground sump (this would probably be the best solution for a water-

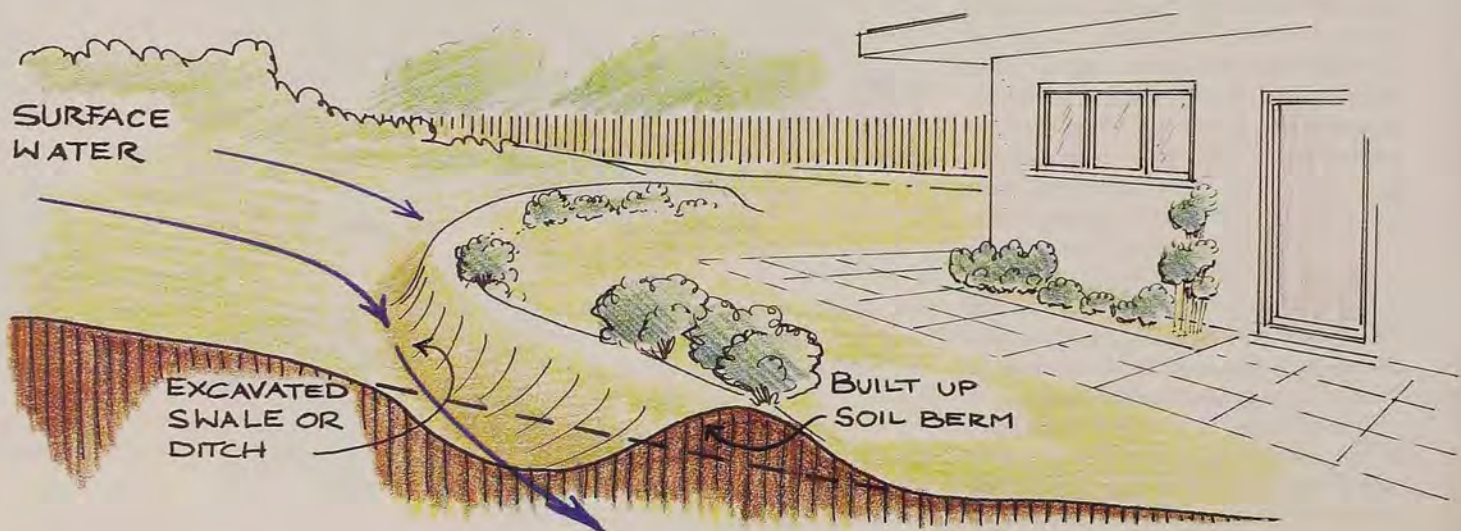
logged woodland) to a complex system of drains and sumps—to collect the water until it can soak into the surrounding subsoil. Obviously the soil must be deep enough and permeable enough for these so-called soakaways or dry wells to perform their tasks. They won't work if they fill up and the water has nowhere to go.

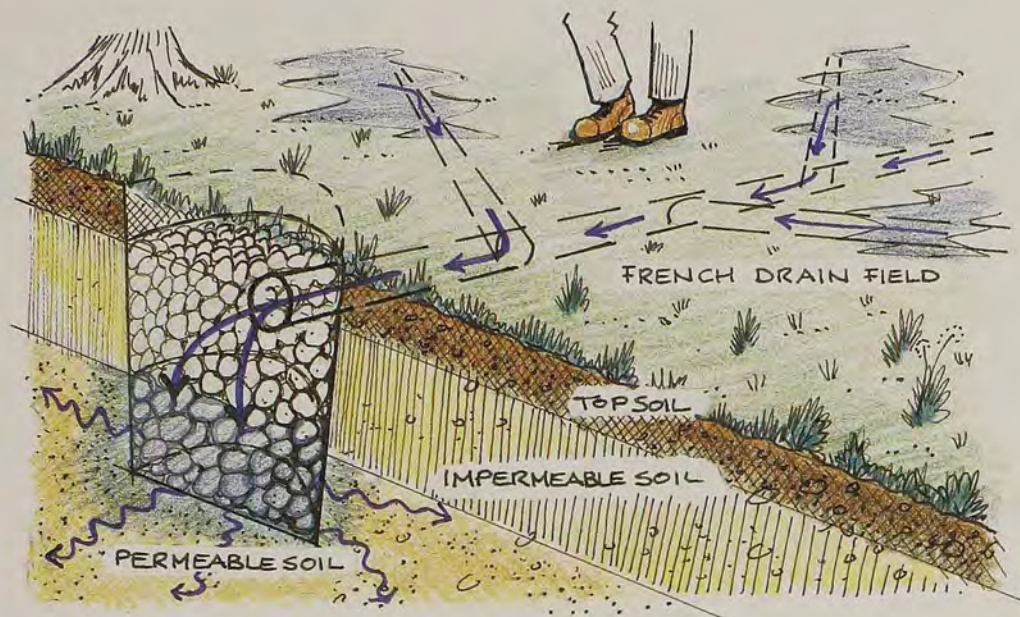
The dry well is built by digging a hole—either shallow, long, and linear, or deeper and more vertical like a well. A relatively shallow dry well of three to four feet deep, in soil that contains enough clay or silt for the sides of the hole to remain vertical, can simply be filled with two- to four-inch rocks. A deeper well, or one dug in soil that's prone to collapsing, should be lined with unmortared brick or stone. Lining the well with heavy landscape filter fabric will keep fine soil particles from filling the spaces between stones.

If topped with a perforated lid—the type used on a conventional storm water inlet—a brick- or rock-lined well could be left empty. Otherwise, fill it with rock, cover it with filter fabric and soil, and camouflage it with plants. Before the development of high-tech filter fabrics, people used a layer of salt hay or over-turned squares of sod to keep soil from falling into the well from above. Such an atavistic technology would still be quite adequate for a home gardener with a limited problem.

If the area to be drained is relatively large, you can lay a system of French drains—drain tiles or perforated pipes at least four inches in diameter leading into the dry well. If your land slopes, lay the pipes parallel to the ground. On a flat site, the pipes need to slope at the rate of one

Some fairly low-tech solutions to deflect water away from a house or other important feature of your property are to create a swale or ditch, or a raised berm. To double the protection, use the soil from the swale to build a berm on its near side.





A dry well will allow runoff to percolate down through a layer of impermeable soil. If the area to be drained is large, you can create a system of French drains leading into the dry well.

foot per 100 feet, or about an inch every eight feet. A common pattern is to have one main pipe leading into the well with several shorter pipes feeding into it in a “herringbone” pattern. The pipes are laid in a gravel-lined trench with six inches or more of gravel on top, then a layer of landscape fabric (one reference book suggests using unbacked insulation), and another six inches of topsoil. This is considerably more work than the sort of open ditches made by the Iron Age farmers, but also a lot less obvious.

Any of these solutions, no matter how well executed, can fail in a season of particularly heavy rainfall. Professionally engineered drainage structures may be built to deal with a 50-year storm—one so heavy it occurs on the average only every half-century—or a 100-year storm, and still fail if two 100-year storms occur the same week! Something along those lines is what happened to Noah.

“And it came to pass in the six hundredth and first year, in the first month, the first day of the month, the waters were dried up from off the earth: and Noah removed the covering of the ark, and looked, and, behold, the face of the ground was dry.”

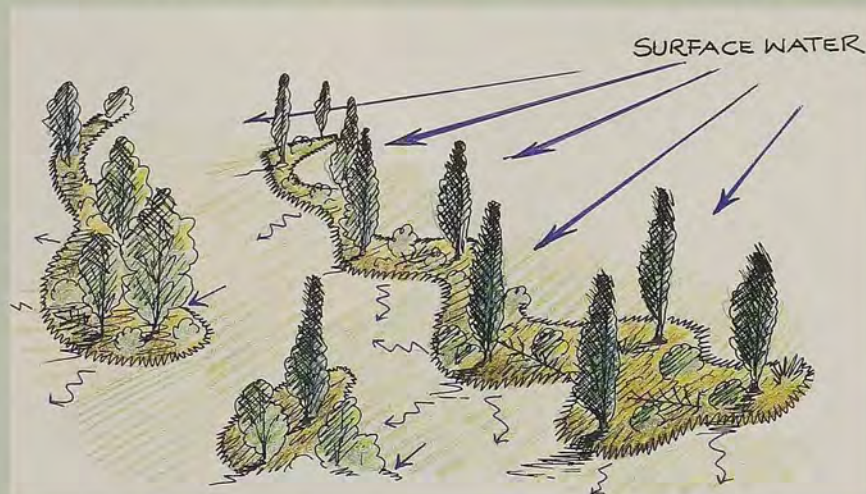
Genesis, Chapter 8, Verse 13

Dennis C. McGlade is a principal in the Olin Partnership, a Philadelphia landscape architecture firm.

Dams to Be Praised

Alastair Bolton, the Washington, D.C.-based landscape designer who illustrated this article, sometimes installs features he calls mulch barriers or dams to control excess surface water on sites that have been overmanaged. “These are places where all of the topsoil has been removed by builders, or where extremely tidy gardeners bag up all their leaves and grass clippings and have them hauled away.”

He notes that these structures aren’t dams at all, but planted berms of mulch intended to slow water the same way a naturally forested area would. The mulch is



heaped in curved, drifting shapes and anchored down with biodegradable jute netting so it won’t be dislodged by rain. Fast-flowing water that would otherwise erode the site instead seeps slowly through the dam, either being absorbed or gently trickling away. Where surface water is especially heavy, a series of the dams can be built parallel to each other. Sometimes large limbs are laid on the dams to further stem the tide and help hold down the mulch.

“Some people think they look rather messy at first, but then they see how well they work,” says Bolton. Eventually, the mulch breaks down to form an absorbent, humusy topsoil. The barrier itself can be made from downed limbs and chipped tree trimmings that arborists frequently give away.

—Kathleen Fisher, Editor





All Wet

**When he couldn't
live on the water,
he brought the
water home.**

s t o r y a n d p h o t o s
b y M i c h a e l M c K e a g

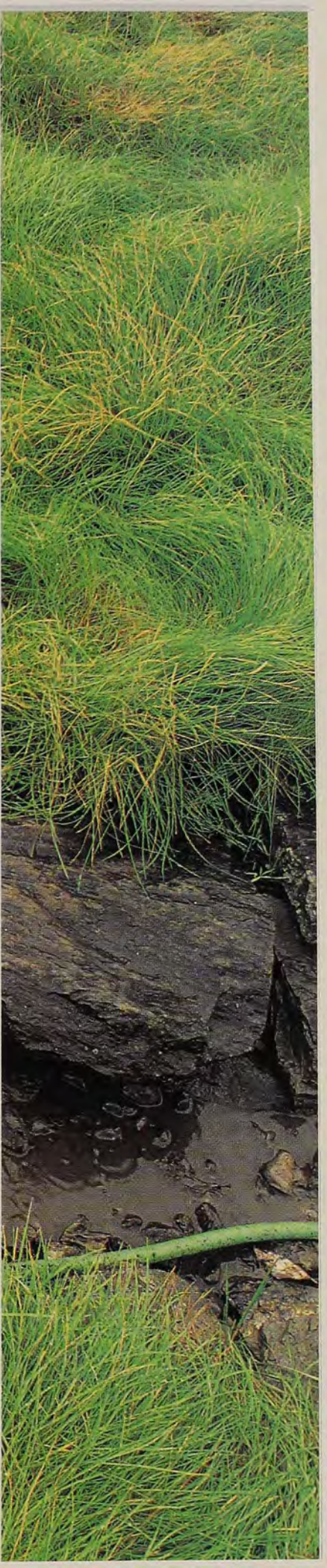
**Looking back, it shouldn't have
surprised us that we ended up living
with so much water.**

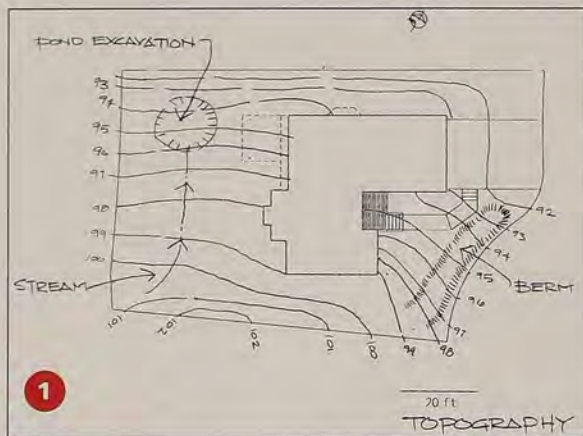
Kathleen and I had shopped for a houseboat along the Columbia River near Portland, Oregon, and found an attractive moorage on a side channel. The dock was new, the houseboats too. The view was pristine, upstream and down. I dreamed of weekend mornings over coffee, watching herons fish outside my window, of kayaking the slough for exercise, of afternoons puttering with a sailboat. While homeowners elsewhere weeded, pruned, and mowed, my responsibilities would stop at the waterline.

But practical considerations intervened: the long commute through the worst of Portland rush hour traffic to and from our jobs at computer companies in the Tualatin Valley. The high cost of houseboats. Their poor investment value.

We struck a pragmatic compromise, buying a lot on a hilly cul-de-sac only a few minutes from work. Our estate, though

Photo: Slime waits for no man. McKeag learned that with the joys of pond-keeping can come the drudgery of flushing out algae, inch by inch.





only 6,600 square feet, was at least real. The price was right, and we did have a view. We occupied ourselves with house design and construction.

Move-in day came. Spring arrived, weeds sprouted. But as luck would have it, my company grants each employee a sabbatical every seven years, and it was time for mine. After three months of heavy-duty escapism, exploring the deserts of the Southwest and walking black sand beaches in Hawaii, I returned to waist-high weeds in full bloom: bull thistle, Canada thistle, Himalayan blackberry, dog fennel, red clover, tansy ragwort, broadleaf dock. I think it was Steve McQueen who once told an interviewer, "I'd rather awake in the middle of nowhere than in any city on earth," or words to that effect. Me too, Steve. A condemned man, I plotted my next escape.

What if I turned my little patch of suburbia into a pocket wilderness? If worlds can be created from little marks on paper, or patterns of light and dark on celluloid, or illuminated pixels on a phosphorescent screen, then surely the illusion of wilderness can be created from plants and stones and sculpted earth. And what if some birds and bugs and other creatures were enticed to take part? If this little world was made self-sufficient, with responsibility pushed (in current corporate parlance) "to the lowest level," then, as chief executive officer, my job would be but to watch and listen, a job for which I feel fully qualified.

The Grand Plan

In all the years she had been practicing, Portland landscape architect Gretchen Vадnais had never before been approached by a client wanting to "landscape the whole place in nothing but natives," although she confessed to "sneaking native plants into

the design" whenever she thought she could get away with it.

We surveyed the site. "Nice view," said Gretchen, "but where's the soil?" We measured. Gretchen sketched. I held forth at length, reiterating the grand vision. Gretchen revised her drawings. We struggled with the question, "What is native?" and defined the rules: We would only use plants present in the Willamette Valley before the first Europeans arrived. We divided the yard into miniature habitats: a forest understory on the north, in the shade of the house; a brushy thicket along the back fence line, another across the top of a mounded berm, shielding us from the cul-de-sac; and bunch-grass meadows in back and front.

I no longer remember when or how the stream and pond invited themselves to the party. Perhaps one of the books I read on wildlife gardening was responsible. But once arrived, this great notion refused to go home, even when master stream builder Eamonn Hughes delivered his construction estimate. I lacked time or know-how to try it myself, and I was lucky enough to engage this tall, bearded Irishman shortly after he arrived in the States with his handsome portfolio. He's now developed quite a reputation for his ability to sculpt natural-looking streams from stone and mortar, plastic pipes and submersible pumps.

Eamonn walked the site: "Nice view, but where's the soil?" He measured, evaluated grades, delineated the stream course with a sweeping gesture, spread his arms to embrace the pond, and located waterfalls and oriented their drops to focus the sound into open windows.

The water features opened opportunities for additional specialized habitats. A riparian margin was added along the stream course. Gretchen's drawings now showed a pondside thicket of willow and alder, a bank covered with red-osier dogwood



1. A sketch shows the topography of the yard and location of the stream and pond. The bog was built under the deck, seen as a dashed line. **2.** A bulldozer carves the hollow for the pond. **3.** Workers, viewed from the deck, mortar stones in place for the waterfall. **4.** The pond is done except for trimming away excess liner. **5.** In the pond's second year, the lot has filled in with native grasses.

and Douglas spirea, and a boggy margin of rushes and sedges.

If a little bog is good, I reasoned, a bigger bog must be better, so a bigger, better bog was added to the paper plan. The bog would begin in the shade under an upper-story deck off the master bedroom, then emerge into full sun to join the pond's margin, adding two new habitats. New conscripts joined our plant roster too—skunk cabbage (*Lysichiton americanus*), redwood sorrel (*Oxalis oregana*), devil's-club (*Oplopanax horridus*), slough sedge (*Carex obnupta*), tufted hair grass (*Deschampsia caespitosa*), and spike rush (*Eleocharis palustris*). Skunk cabbage? Devil's-club? Even Gretchen was incredulous. Her client had gone over the top.

For inspiration and instruction we visited a real bog, which lay in deep shade under western red cedar in a little ravine above the Columbia River Gorge. A continuous carpet of redwood sorrel was punctuated at intervals with skunk cabbage, each rosette of huge, dark green leaves arrayed about a bright yellow floral spike sheltered by a yellow bract. I fell on my knees, both to thank God for the bog and to dig a small soil sample. The densely interwoven network of wirelike sorrel rhizomes snared the blade of my trowel and I retrieved an empty handle. Eventually, with bare fingers, I teased out a small handful of bog fill and sealed it in a Ziploc bag for future reference.

Pipe Dreams

It was five months after house completion that Jeff the Builder arrived to finish grading. His procrastination was our good fortune since by then the vision was complete. We would take advantage of Indian summer weather to rough in the stream and pond, planning to finish the next summer. If the pond entered the rainy season surrounded by bare ground it would become clogged from

the outset by silt-laden runoff. Besides, the phased approach was easier on cash flow.

With a clanking yellow Dresser TD7G, Jeff carved a hollow for the pond, shaved a flat to accept the deck, and pushed the excess earth around front to form the berm. The tangled anarchy of summer weeds gave way to human industry. There's nothing like commanding heavy equipment to give a man confidence.

Next came Dennis the Landscaper, who doodled about in his Bobcat applying finishing touches. He then rolled in with a huge red van—a mobile plumbing shop and irrigation supply warehouse. He and his helpers cut trenches that crisscrossed the yard in all directions. They glued pipe and fit valves, making our pocket wilderness-to-be look like the underpinnings for a theme park.

This hardware formed a convoluted, three-dimensional puzzle that only Eamonn could solve. We had no hope of getting equipment into the yard, now a labyrinth of irrigation trenches. Eamonn shrugged. "We intend to dig by hand. It's faster."

Eamonn had priced several options: long stream with deep pond, short stream with deep pond, long stream with shallow pond. The long stream with deep pond exceeded our budget. We opted for the long stream (spanning the entire width of the back yard) with shallow pond (deep enough for water striders and some aquatic plants, but too shallow for fish). This option resulted in a mismatch. If a pond doesn't contain at least as much water as that required to fill the return pipe and the entire streambed, the pump will run dry before the cycle is complete. The solution was to add a 300-gallon underground tank, buried in a hole next to the pond, to contain the missing volume.

Under the skilled blades of Eamonn's shovel masters, the streambed emerged out of brown clay, then the pond, and finally the deep hole for the turquoise plastic reservoir. When the reser-



1. McKeag enlists son Charles to help dig the bog. **2.** The bog is filled with commercial compost. **3.** Shade screens keep sun from the bog until trees and shrubs have time to mature. **4.** Errant thimbleberry from above the bog is being removed. Skunk cabbage and redwood sorrel cover the bog proper, while dagger-leaved rush (*Juncus ensifolius*) and slough sedge (*Carex obnupta*) grow to the right. To the left, delicate lady fern (*Athyrium filix-femina*) provides a contrast to the large leaves of devil's-club.

voir had been dropped in its hole, a two-inch plastic pipe was buried in a trench between that hole and the headwaters.

As the first winter rains began to fall, Dennis delivered dump-truck loads of sandy loam. By Bobcat bucket and wheelbarrow load, the slick brown clay disappeared. Next, he and his crew conveyed trees, shrubs, and bushes from trailer to garden under Gretchen's alert direction. Blue-lined paper dreams became twigs spreading skyward. We planted stones, too: chunks of Columbia River basalt to hold the berm. Last, we sprinkled the whole with winter barley seed to form a dense barrier against erosion and weeds. I wrote the last checks, fulfilling my part of the bargain.

The following June, Eamonn backed his flatbed truck into the drive and with his helpers unloaded a couple tons of rock, several sacks of mortar, a huge black roll of heavy-duty rubber sheeting, plus wheelbarrows, picks, shovels, buckets, and other implements of the stream builder's trade.

The stream and pond had been dug oversized to allow room for the mortared stone that would line the margins, and sharp vertical steps had been cut at intervals along the stream where waterfalls soon would splash and gurgle. Early summer sun glinted off shovels as Eamonn's crew quickly returned these excavations to pristine condition. Then they draped them unceremoniously with great black sheets of rubber pond liner and trimmed the liner loosely, well beyond the margins of stream and pond.

Our stone, like our plants, had to be native. Columbia River basalt from a farmer's field arrived covered with mosses and lichens. Mortared directly on top of the pond liner, it defined stream banks, pond margins, and waterfalls. In the bottom of the stream and pond a layer of mortar was troweled over the exposed liner, protecting it from puncture and the sun's ultraviolet rays. A layer of river cobbles on top of the mortar added to the illusion that this was one of nature's works. A large flat stone hid the spillway between the pond and reservoir. Only a green plastic maintenance hatch showed, and it was hidden behind an irregular ridge of rock rubble. Excess liner was trimmed just outside the mortared stones, then covered with soil.

Finally it was time to flip the switch. The pump whirled at the bottom of the underground tank and its water level dropped. Faintly, from the distant headwaters, we heard the sound of trickling water, rising in volume. Like a miniature flash flood descending a dry arroyo, a one-inch wall of water came into view, inundating the cobbles, cresting the mortared stone ledges, and spilling over the last falls, into the pond at our feet. The garden filled with the sound of rippling, falling water.

Hydro-Logic

Throughout construction I took notes and photographs. "This looks pretty easy," I told myself. "Maybe next time I *will* tackle it

without help.” But it’s not easy to fool Mother Nature. You can’t use too much mortar, and you must hide it in the recesses of the joints. You must lay stones with a relaxed grace that can’t be learned from handbooks. And how do you place stone to make water play music, focusing the sound through open windows on summer evenings? My experts had paid those dues and now get it right on the first try.

Stream building is engineering as well as art. The imbalance that required the underground tank is just one example. Water makes joyful noises, but it flows with gravity. After we calculated that our stream would drop six feet in its 50-foot journey, we still had to consider width, depth, gradients, and flow rate. If flow rate and stream width are not in scale, you end up with either a lonely trickle over hot stones or a flood cresting the banks.

The second law of stream physics is “what goes down doesn’t return without assistance.” In artificial, recirculating streams, that help usually comes from electric pumps. The desired flow rate downstream and the vertical rise from the pump back up to the head of the stream determine the size of both the pump and the return pipe. We settled on a four-tenths-horsepower pump, which is capable of delivering 4,800 gallons per hour through a two-inch pipe up a five-foot rise. Since our rise is somewhat greater and our return pipe is more than 50 feet long, our flow rate is slightly less, but it’s sufficient to fill our stream to an average depth of one-and-a-half inches across a width of about one-and-a-half feet.

We’re not done with physics yet. Our hydrologic microcosmos participates in the greater hydrologic cycles around it. Water evaporates, leaving our stream to join the vast flow of vapors traversing oceans and continents. Our little waterworks occupies its own watershed that captures falling rain and accumulates runoff from melting snow. Our artifice of pumps, pipes, and stones teaches us lessons about natural systems. In fact, being so small, it’s even more vulnerable to change in circumstance. It doesn’t take much excess inflow to create a flood, or drought to suck the stream dry. And if you want to experience firsthand the effects of watershed mismanagement, indulge in an excess of autumn weeding, leaving tracts of disturbed ground exposed to winter rains. Your stream will introduce you to turbidity, siltation, nutrient excess, and their consequences, with an immediacy no book or television documentary can equal.

Flood is prevented by allowing for graceful overflow into the big watershed next door. From the top of our tank a mortared gutter leads to a six-inch-diameter underground drain line that “daylights” under the back fence. In times of excess rain or melting snow, the water rises in the tank until it overflows, spilling into the gutter, then runs down the buried drain line to the fence. From there, it finds a road-side ditch that drains into the stream at the bottom of our hill.

We compensate for drought by tapping into a much larger watershed 40 miles away—the Bull Run, Portland’s municipal water supply. It’s possible to install a float valve that will automatically top off the system when it’s low, but Eamonn says they’re unreliable. So when I see from the living or dining room window that the continuous sheet of water over the first falls has broken into rivulets, I drop the hose in the pond to make up the difference.

And we’re still not done with physics. Lifting the water back up requires continuous inputs of energy. Our stream is lifted through the energy of water that’s falling elsewhere: The big wheel of the Columbia River, and the gigantic hydrologic cycle of which it is a

part, turn the turbines at Bonneville Dam, from whose megawatts our pump draws 800. We run the stream continuously, except when severe drought, extended freeze, or maintenance forces a shut-down. After the first six months of operation I compared our electric bills to the same six months the preceding year and discovered we were paying about \$26 per month for the pleasure of the

Our little waterworks occupies its own watershed that captures falling rain and accumulates runoff from melting snow.

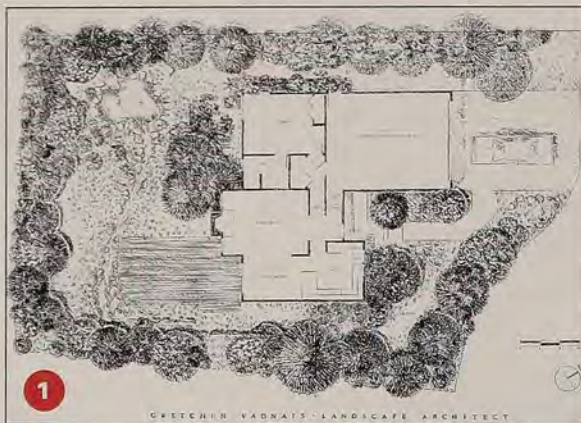
stream’s company. Measured in dollars the rewards are a bargain. I feel less comfortable with the cost in kilowatt-hours, which has doubled from an average of 500 to 1,000 kWh per month. I’ve created habitat for frogs and water striders, a bathing place and watering spot for towhees, juncos, and finches, but not without cost.

Bogging Down

The stream and pond looked pretty stark that first summer, surrounded by barley stubble and a few puny trees and shrubs. With the last stream payment, I put away my checkbook and pen and picked up a shovel. By raising summer sweat and blisters, I could have the bog area ready for fall planting. Besides, now was the time to conscript my son Charles, who was home from college.

We dug a depression, a foot or two deep, from under the deck to the pond, grading the slope to ensure drainage away from the house. Eamonn delivered another ton of the same moss-laden rock and a large sheet of pond liner. This rock we laid dry (without mortar) to support the bank above the bog, leaving gaps here and there to serve as planting sites for ferns. We draped the liner over the depression, lapping it over the one that extended from the pond margins, and trimmed it neatly along the bog edges so that once the bog was filled with soil, the liner would disappear.

Gretchen’s drawing showed a seep watering the bog. How do we fashion a seep? I recalled what I knew about mosquitoes’ breeding habits. How do we keep the bog wet without forming puddles on the surface? Someone suggested watering from the bottom up. It happened that a pipe originally installed to provide make-up water in a drought rose right where our bog met the pond, poking through a hole we’d cut in the liner. I found the next piece of the puzzle at our local irrigation supply store. They had a new subsurface irrigation product from Israel (whose residents are masters of desert farming), consisting of a half-inch-diameter tube with a series of little openings. Each opening was a tiny flow regulator that compensated for differences in pressure, ensuring consistent drip rate along the full length of the tube. After fitting the tubing to the supply pipe near the pond, I laid the tube along the surface of the bog liner, running it upslope from the pond, making a big loop in the main portion of the bog under the deck, and termi-



MICHAEL S. THOMPSON

nating the tube with a ball valve hidden in a small plastic irrigation box so I could reach the valve if I ever needed to flush the line.

Now I was ready to fill the bog. I still had my bog soil sample in its Ziploc bag, but I realized I didn't have the slightest idea how to reproduce it. Fall planting season had arrived and I needed a truckload of something. I settled for a load of steaming, black, commercial compost and filled the bog to the brim.

I did use my bagged bog sample for a pH reference. To my surprise, the real bog soil measured close to neutral (pH 6.5). My improvised bog fill, on the other hand, was decidedly acidic (pH 4.5). I dug in several sacks of lime to compensate and raked the surface smooth.

A test of the bog watering system showed that it actually worked! Half an hour, maybe more, after opening the main valve, the bog was uniformly damp across its entire surface.

Marginal Success

After all this messing with rubber membranes, pipes and stones, dirt and tubes, we were finally ready to add plants to the previous season's shrubs and trees. This year's bill of fare included wetland plants for stream side, pond shore, and bog.

The Willamette Valley supports one of the largest concentrations of commercial native plant nurseries in the nation. They're the supply side of demand created by government-mandated habitat restoration and wetland mitigation projects, and a gradual awakening of public agencies to the advantages of landscaping with native plants. While many of these nurseries are within an hour's drive of Portland, most are geared for wholesale rather than retail trade. But following the first transactions mediated by Gretchen, I've continued to buy from some independently. I call or write for

a price list, then fax my order, requesting confirmation of price and availability. In a follow-up phone call, the nursery and I agree on a date for pick up.

I try to behave as any wholesale customer would. I don't expect them to be open on weekends, and I take a day off work if necessary, often a Friday so I can plant over the weekend. I may schedule pickups at more than one nursery on the same day. For me, it's a holiday, a drive in the country punctuated by visits with nursery owners who share my enthusiasm for native plants.

That first year, Gretchen and I shopped together. We took both our trucks. From a nursery that specializes in ornamental grasses we returned with Gretchen's pickup looking like a mobile meadow, the three-foot-tall culms of tufted hair grass (*Deschampsia caespitosa*) and blue wild rye (*Elymus glaucus*) waving in the breeze. The tufted hair grass, which grows in wet meadows, would go where the bog met the pond and on the far side of the pond near the outlet. The edge habitat between the hedgerow and the head of the stream seemed a likely location for blue wild rye.

We unloaded our trucks and set out the same day for another nursery, this time returning with woody plants, including red-osier dogwood (*Cornus stolonifera*) and Douglas spirea (*Spiraea douglasii*) for the bank above the pond, blue elderberry (*Sambucus caerulea*) to shade the bog, and Oregon ash (*Fraxinus latifolia*), Pacific willow (*Salix lasiandra*), and black cottonwood (*Populus balsamifera* subsp. *trichocarpa*) to join the red alder (*Alnus rubra*) planted the year before in creating the illusion of a riparian woodland north of the pond. Five thimbleberries (*Rubus parviflorus*) were destined for the top of the bank overlooking the bog. Two red huckleberries (*Vaccinium parvifolium*), planted in a trench filled with wood chips and compost to simulate the decaying logs



1. Gretchen Vadnais's landscape design (rendered by Richard Zita). **2.** McKeag removes quaking aspen from a mail-order packing box. **3.** Kathleen McAllister cuts back a tangle of red fescue (*Festuca rubra*). **4.** Redwood sorrel. A visit to a natural bog inspired McKeag to plant it around his skunk cabbage. **5.** The area around the bog has become a lush jungle of red alder, cottonwood, blue elderberry (*Sambucus caerulea*), red huckleberry (*Vaccinium parvifolium*), vine maple (*Acer circinatum*), thimbleberry, and sword fern (*Polystichum munitum*).

they favor, would eventually guard the bog on the opposite side.

We didn't have room in either truck for the discovery of the day: western red cedar (really an arbovitae, *Thuja plicata*) stumps covered with moss and lichens and serving as nurseries to all manner of young trees and shrubs, including, besides western red cedar itself, red huckleberry, salal (*Gaultheria shallon*), and California hazel (*Corylus cornuta* var. *californica*). The stumps had been "rescued" during clear-cut logging. We returned for them a few weeks later.

The next shopping trip took us the length of the Willamette Valley to a nursery south of Eugene specializing in wetland plants. There we picked up a couple dozen lady ferns (*Athyrium filix-femina*), nine skunk cabbages (*Lysichiton americanus*), three devil's-clubs (*Oplopanax horridus*), and enough rushes and sedges to fully populate the garden's boggy regions. We also acquired enough redwood sorrel (*Oxalis oregana*) to fill the spaces in the bog between the skunk cabbage, and a couple of false Solomon's-seal (*Smilacina racemosa*) to grace the bank overlooking the bog.

UPS delivered our aspen grove—four small quaking aspens (*Populus tremuloides*) with leaves already fall gold. I adjusted their planting positions with great care so that eventually they would shade the bog from midday summer sun while filtering late afternoon light as it entered the living room, looking all the while as if this were a lucky accident.

Each planting season, new species join the original troupe, with the players sometimes rewriting my script. The redwood sorrel has multiplied, but fails to form the continuous carpet I witnessed around the skunk cabbage in that wild bog and intended for my own. The first five thimbleberry canes have multiplied to hundreds, forming an impenetrable thicket, threatening to encroach

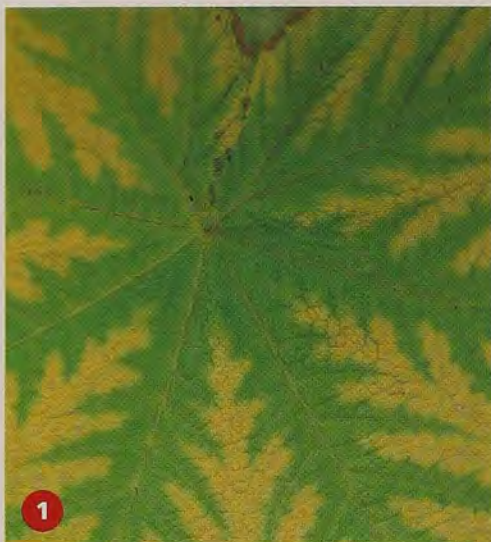
on devil's-club territory. Annual pruning of the thimbleberry leaves my forearms smarting from devil's-club spines. Are the devil's-club's huge maple-shaped leaves and bright red berries enough reward for such abuse?

The four little aspens now tower above the house, shading both bog and living room as hoped, but new aspens sprout at every opportunity. Some meet with my approval, others meet my pruning blade. The tufted hair grass exhausted itself in one glorious burst of compost-fueled growth, to be overwhelmed the next year by an advancing wall of slough sedge (*Carex obnupta*). Dagger-leaved rush (*Juncus ensifolius*) now threatens the sorrel. The blue elderberry does indeed shade the bog, but in the process bends double under the combined weight of its foliage and huge umbels of gray-blue berries, completely blocking the path I carefully constructed between the bog and the pond. If I clear the path I'll expose the shade-loving skunk cabbage and devil's-club, not to mention the robin raising her second brood of the season. I must crawl on all fours under the barrier, or risk a precarious end run, teetering on the pond's rocky margin. Some garden boss I've become!

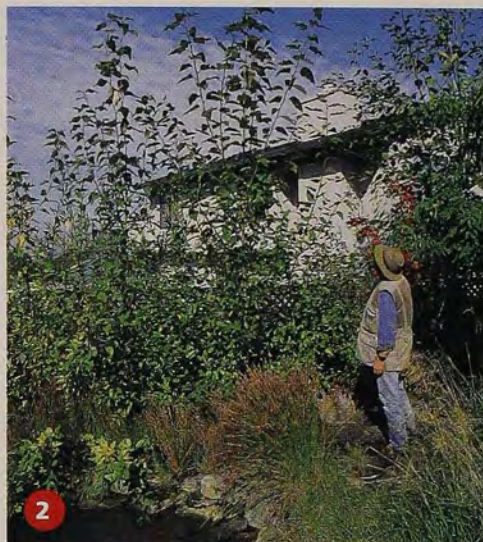
Adventures With Algae

The pond's own ecology also keeps life interesting. Eamonn was a fanatic about silt, taking pains to place the rocks where they would keep soil particles from the water. He insisted that his workers (and his client) keep soil-bearing boots and tools out. I suspected that his fanaticism stemmed from past trauma, and now I know that trauma firsthand.

In spite of careful rock placement, lots of soil washed into our stream the first winter. Heavy rains on still sparsely vegetated ground turned the stream from clear sparkle to coffee (with



1



2



3



4

JESSIE M. HARRIS

1. A devil's-club leaf in its fall finery. 2. McKeag inspects a cottonwood and alder thicket on the north side of the pond. 3. Thimbleberry in flower. The five McKeag planted have multiplied to hundreds. 4. A pond attracts wildlife of all forms. Here a yellow and black orb spider lies in wait between branches of western serviceberry (*Amelanchier alnifolia*) and the stems of blue wild rye (*Elymus glaucus*) near the head of the stream. 5. Tawny stems of blue wild rye, gone to seed, lean over the stream's headwaters.

cream). But the color summer brought was even less appealing.

As July's sun warmed the unshaded waters, filamentous algae began to hang off the lips of waterfalls, cling to cobbles, and flow in long green streamers. Rafts of the stuff drifted in the pond. Nutrients from winter runoff, combined with plenty of sunlight for photosynthesis, had turned our stream into an algae farm.

So far I've concentrated on treating the symptoms rather than the root cause. I've had three chances to perfect my procedure.

First I shut down the pump and let the water drain out of the stream, then drag a hose to its head. Methodically working my way along the streambed, I scrub algae off the stones and flush accumulated silt downstream. Algae that can be scooped up is thrown in a bucket with holes to drain off excess water. In the pond, using a small lawn rake as an algae catcher, I skim slime

off the surface, then set to cleaning pond-bottom cobbles, again enlisting the holey bucket. I rest it on a pond-side stone, tilt it at an angle, and rotate it like a cement mixer, tumbling the cobbles as I spray them with the hose. Cleaned cobbles are piled in the streambed just above the pond and the process repeated until no cobbles remain in the pond.

A small submersible pump removes most of the pond water, but it can't cope with the muck and slime. With bucket, hose, dustpan, and broom I slave away until the mortar on the pond bottom glistens. To clean the underground tank I redirect the pipe from the pump at its bottom to flow down the overflow line instead of up to the head of the stream. It takes at least one refill and repump to remove all the murky water.

Then I refill the tank, restore the plumbing, return the cobbles,



Official Tools
CYPRESS
GARDENS

Now, if it could just pick up the kids.



The Planter's Wagon by Ames®. So versatile you can fold the handle down for a comfortable seat. Stand the wagon up for a vertical workbench. Or use it to haul tools, supplies, mulch and flower flats.

Easily maneuvers in tight spaces. Fully assembled and ready to use. Visit our website at <http://www.ames.com> or call us at 1-800-725-9500 to find the retailer nearest you.

AMES®
Lawn & Garden Tools—Since 1774

We Take The Hard Work Out Of Yard Work.

©1997 Ames Lawn & Garden Tools

and rake them smooth before picking up my tools in twilight and restarting the pump.

Now that the stream is surrounded by a bunch-grass meadow and other mature plantings, runoff is not a problem. Whether algae will continue to be remains to be seen. Trees and shrubs help shade the pond, though the stream is still too exposed. It will be several years before the big-leaf maple above it casts a substantial shadow. Next spring I'll add streamside plantings of tall herbaceous perennials and emergent plants with their feet right in the water, and aquatics that not only shade the water directly with their floating leaves, but consume nutrients that might otherwise feed algae. There are chemical additives said to be safe for fish and plants, but I worry about their effect on amphibians.

Nature Calls

As I write, a great blue heron is on our neighbor's roof, stretching his neck, apparently inspecting our pond. I've caught glimpses of herons before, wheeling in a circle over the pond or rising up abruptly past the bedroom windows. But I've yet to catch one actually hunting in our pond.

We don't have fish, but we do, in season, have frogs. The first announced his arrival one wet March evening as we prepared for bed. Pacific tree frogs, though small, are loud. Our lone frog cried out for a mate all night. We lay awake listening, filled with pride and wonder that a frog had discovered our pond and found it to his liking.

The following spring, our frog population jumped to four. Easy to hear, they were hard to see. As I approached, they fell silent. When I finally tracked one to a crevice near the pond, I had to kneel on the rock that was his roof and bend my head over until I touched the water. Then I could see him crouched in the damp shadows, inflating his sac to... "Ribbit!" I almost fell in.

Their song nearly imperiled a young visitor next door as well. Perched precariously on the top of our neighbor's swing set, she stretched her neck toward the pond, not unlike the heron. Spotting me on our deck, she piped, "You have frogs!" As the proud proprietor, what more could I say? "Yup."

The pond and stream are the focus of the yard. The constant sound and movement mesmerize. It is the yard's hearth. On two occasions the pump failed, the stream drained and fell silent. The garden felt as empty as a room after the fire has gone out.

We've become dependent. So have other creatures: the water striders skimming the pond surface, the bees collecting water from the splashed rocks, the robin teaching her fledglings to bathe, the evening grosbeaks drinking noisily and emptying our feeders before leaving for summer breeding in the mountains. Violet-green swallows swoop low down the stream, tracing its course a few inches above the surface, then pull up sharply over the pond, narrowly missing a high speed crash in the cottonwoods, taking an insect or two with each pass. A family of goldfinches converges on the thistle-seed feeders, then heads to the stream for a drink. The young are inexperienced and bold. They drink their fill, splash, bathe, and preen without caution. On quiet, foggy mornings, the fox sparrow slips out of hiding for a quick sip. I slip out too, with coffee mug in hand, to sit on the bench in the mist and stare downstream, almost ready to believe that in passing through the patio door, I've traveled to the middle of nowhere.

Free-lance writer and photographer Michael McKeag is a senior engineer and electron microscopist at Intel Corporation.

focus march/april kinder killers



LITTLE CAN BE MORE CONFUSING FOR GARDENERS

TODAY THAN PESTICIDES. *Most of us know that we should use garden chemicals conservatively and carefully for our own health and our garden's. But most of us also reach breaking points when thrips go after grandma's gladiolus or fungus stalks our variegated dogwood. What's safe, what's not? What's new and hot? The two big trends are toward biopesticides—derived from natural rather than synthetic ingredients—and genetic engineering that makes the pesticide a part of the plant. But every step of the way is fraught with controversy. Many ask: Are biopesticides really safer than synthetics? And what are the unforeseen consequences of gene splicing? We don't have the answers, but here we report some of the questions.*

many little hammers

Despite billions of dollars spent regulating pesticides, overall they pose no less risk today than 25 years ago, according to a two-year study conducted by Consumers Union, the independent product-testing organization that publishes *Consumer Reports*.

PETER LIU

"We're on a 'pesticide treadmill,'" says the study's lead researcher, Charles M.

Benbrook, a former executive director of the National Academy of Sciences' Board on Agriculture. "While pesticide use has risen since the early 1970s, crop losses to pests have not declined. Not only don't chemical methods of pest control work as well as they should, they pose substantial ecological and economic risks. What's needed to get off this treadmill is a quicker

AMES® Gardener's Special Package Offer

a \$41.00 value for only \$19.99
Mail-In Special Offer Expires December 31, 1997.



You Get:

- Ames Grow America Series books, *The Weekend Gardener* and *Annual & Perennial Gardening Guide*
- Ames Deluxe Bypass Pruner with precision ground steel blades and textured cushion vinyl grips
- Ames full grain leather Deluxe Bypass Pruner holster
- Ames vinyl-coated oversized kneeling pad
- Ames Grow America Series *Basic Pruning Guide*, featuring Joe Freeman, Chief Horticulturist for Cypress Gardens

To receive your Gardener's Special Package, send your check or money order for \$19.99 payable to:
Ames Gardener's Special Package
P.O. Box 1485
Mansfield, Ohio 44901

(PLEASE PRINT) NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

AMES®
Lawn & Garden Tools - Since 1774



FRIDAY, MARCH 21- SUNDAY, MARCH 23
 Virginia Beach Pavilion Virginia Beach, Virginia
 1997 MILL ATLANTIC
HOME & GARDEN
 SHOW
 PROMOTIONAL CO-SPONSOR - THE VIRGINIAN PILOT
All AHS Members Admitted Free

©1994 EDF

Buy recycled.



It would mean the world to them.

Recycling keeps working to protect their future when you buy products made from recycled materials. For a free brochure, write *Buy Recycled*, Environmental Defense Fund, 257 Park Avenue South, New York, NY 10010, or call 1-800-CALL-EDF.

  ENVIRONMENTAL DEFENSE FUND 

shift to safer, ecologically sounder, and more cost-effective IPM methods."

The study is part of a 288-page softcover book called *Pest Management at the Crossroads*, which describes safer and more effective ways to control pests using an innovative array of preventive tactics and biological controls. This multilevel approach to pest control is known as integrated pest management (IPM), although a more evocative description—"many little hammers"—has been coined by ecologists. The book offers recommendations for a nationwide transition to biointensive IPM by the year 2020. Under this approach, based on an understanding of pest ecology, use of reduced-risk pesticides is a last resort.

Many universities, botanical gardens, and small farms have switched to IPM or organic gardening practices in the last couple of decades, but large-scale agricultural and horticultural enterprises and home gardeners have been slower to make the change. According to the study, Americans spent \$10.4 billion on pesticides in 1995, about three-quarters of which was spent on agricultural uses. The study further reports that over the last 10 years the number of weed species known to be resistant to herbicides has risen from 48 to 270 and the number of plant diseases resistant to fungicides has gone up by 50 percent.

For more information on *Pest Management at the Crossroads* or to order a copy postpaid for \$35.95, call (301) 617-7815 or write to Professional Mailing and Distribution Services, Inc., P.O. Box 2013, Annapolis Junction, MD 20701. Or visit their Web site at <http://www.pmac.net>.

laissez-faire gardening

Action taken by the U.S. Environmental Protection Agency (EPA) last summer may open the way to a wider array of relatively safe and inexpensive pesticides. The agency will no longer regulate 31 substances deemed unlikely to harm human health or the environment. The substances include corn gluten meal, cottonseed oil, dried blood, garlic and garlic oil, sesame, and a number of herbs and herbal oils.

These are considered active ingredients and can now be sold as pesticides without the extensive—and expensive—testing normally required by the federal government. The product label will still have to identify

the percent by weight of active ingredients, and list all inert ingredients. The inert ingredients too must be on an EPA-approved list. This list of about 150 inert ingredients includes such things as paper, cardboard, rubber, and sawdust, and specific foods or food ingredients, such as carrots, honey, soy flour, and whey.

"And we will cut them some breaks if the inert ingredient isn't on the list but is a substance generally considered safe for human consumption, such as beef broth," says Bob Brennis, special assistant to the division director for registration at the EPA.

The agency wanted to get the paperwork related to testing of such substances "off our plate," Brennis says. "We felt this wasn't good use of our resources or the taxpayers' money."

A number of these products were already being marketed as pesticides—for instance, garlic solution as an insecticide and corn gluten as an herbicide—and the agency was preparing to crack down on them before the regulations were relaxed, he says. "We thought this might start the ball rolling for people trying to find formulations that may be efficacious. There hadn't been much incentive to be creative, and we hadn't been able to ensure a competitive, free market. Now we will be allowing common people without huge resources to try to distribute some of these things on an experimental basis."

Producers are still prohibited from claiming that their formulas are effective against disease-causing organisms or carriers, including the ticks that carry Lyme disease. The vaguest prohibition is against false or misleading statements about the product appearing on the label. Brennis says this is intended to prevent outrageous or dangerous claims—"to use an extreme example, that cinnamon will stop moose from charging." If a product simply fails to wipe out all your aphids, he says, "we hope market forces will prevail."

fungicide follies

What gardeners could use now is a safe, non-controversial fungicide. Benlate was the most popular fungicide among commercial growers of ornamentals in 1991 when complaints about contamination problems led DuPont to withdraw it from the market. DuPont subsequently paid millions of dol-

lars in damages to growers who claimed entire crops were wiped out.

Now major producers of another widely sold product, Funginex, plan to stop making it or to forego testing that would allow greenhouse use. Stepping into the breach may be products that are not only fungicides, but also insecticides and miticides.

In the 1960s, scientists began to report the insecticidal properties of neem, a botanical oil extracted from *Azadirachta indica*, a tree native to India. Since then, they've found that as many as 200 different insects, as well as mites and nematodes, may be vulnerable to its compounds.

About seven years ago, USDA Agricultural Research Service plant pathologist Jim Locke discovered that neem oil would also control fungus diseases, and last year the first triple-action biopesticides were released to U.S. markets. The promotional material for Rose Defense, the product for home gardeners, claims that it kills all stages of whiteflies, aphids, mealybugs, and scale; controls blackspot, powdery mildew, rust, and anthracnose; and that a two-percent spray killed 87 percent of mite eggs.

Locke emphasizes that these products act much like horticultural oils, by smothering eggs and pests. Purely insecticidal neem products, notably W.R. Grace's new products Neemix and Neemazad, rely on a neem seed extract, azadirachtin, to disrupt insect life cycles.

The patenting of neem products raised a flap a year ago over questions of intellectual property rights. Critics charged that patents held by companies such as W.R. Grace could lead to shortages of a product Indian farmers have used for thousands of years, and even force them to pay royalties on neem extract.

W.R. Grace responded that it would use only two percent of the neem seeds collected in the country annually, and that its patent protects the process of extracting and stabilizing azadirachtin, and applies only in the United States.

herbicide hijinks

It's an ill wind that blows no gardener good, and it may be that the tree-of-heaven (*Ailanthus altissima*) will soon yield an effective herbicide.

The tree is known for its invasive tendencies and is a common sight along road-

Rose Pillar

Create an exquisite outdoor centerpiece with our soaring 8-foot rose pillar. Climbing roses, bougainvillea, clematis and other vines will cascade

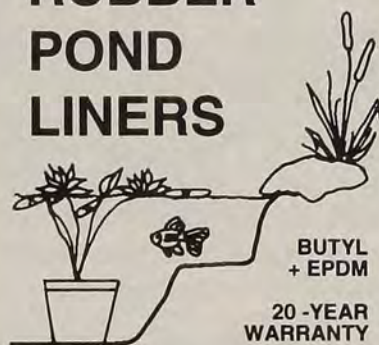


over the flared top of this commanding 22-inch diameter structure.

Single columns make striking accent points, or combine several to create screening or a dramatic allée. Planting suggestions included.

Our exclusive design, the pillar is quality constructed of 1/2" raw steel to weather beautifully and is heavy enough to provide a sturdy support. \$119 (plus s&h). A Garden of Earthly Delights, Dept. AG1, Call toll free, 888-259-4165. VISA/MC accepted

RUBBER POND LINERS



Our premium rubber pond liners are safe for all aquatic life, conform well to curves, remain flexible in the coldest weather, and withstand long-term sun exposure. We fabricate sheets of almost any size and shape from fish-grade Butyl rubber, preferred by water-gardening experts worldwide. We also offer durable fish-grade EPDM rubber at very affordable prices. Other products include heavy-duty underliner fabric, low-maintenance filter systems, and energy-saving pumps.

RESOURCE CONSERVATION TECHNOLOGY, INC.

2633 N. Calvert St. Baltimore, MD 21218
(410) 366-1146 or (800) 477-7724

WHY WAIT UNTIL SPRING!

Cold Frames

- Lexan® Thermoclear® double-wall lid panels
- Beautiful cypress w/ stainless steel hardware lasts for generations, indoors or out
- Two sizes 29" or 58" wide
- Optional heating for city gardeners or severe climates



CHESTNUT KNOB
Fine Garden Furnishings & Accessories

Box 4882 Martinsville, VA 24115 Call (800) 266-3035 for Free Catalog

Beautiful Perennials...

Our plants return to bloom season after season for years of easy pleasure - our specialty, perennials. We grow and ship over 500 varieties in the spring and fall - easy to plant and each plant guaranteed! Send for our **FREE** color catalog today!

Bluestone Perennials
7225 Middle Ridge Road
Madison, Ohio 44057

1-800-852-5243

<http://www.bluestoneperennials.com>

...at a price you will like!

**BLUESTONE
PERENNIALS**

DISCOVER THE JOY OF Water Gardening



Informative
How to

**NEW A-19
CATALOG
AND GUIDE
TO WATER
GARDENING**

\$3.00 REFUNDED
WITH FIRST
ORDER

80 shop at home pages
in full color on fountains, pools, pumps, Koi,
goldfish, Aquatic Plants, Water Lilies & Lotus.

A World Class Catalog from A World Class Company
Buy the Ortho Book *Garden Pools Fountains and
Waterfalls* and receive Our Beautiful 80 page
Catalog and Guide to Water Gardening **FREE**.

This 116 page Ortho Book is a great supplement to our catalog.
Step by step instructions, illustrated in full color, saving you
time and money. Both for just **\$10.95** ppd.

- ☐ Above offer **\$10.95** ppd.
- ☐ Best, New Book! The Pond Doctor, 160 pages on
planning and maintaining a healthy water garden.
Soft Cover by Helen Nash \$18.95 ppd. plus our
\$3.00 Catalog and Guide **FREE**.
- ☐ Catalog and Guide to Water Gardening **\$3.00** ppd.
\$3.00 refunded with 1st order

CALL (617) 447-4711 Ext. 77 HAVE YOUR CREDIT CARD READY
or TOLL FREE FAX 1-800-966-4591.

Paradise WATER GARDENS

65 May St., Dept. AM, Whitman, MA 02382

sides, in vacant lots, and other waste places. Researchers have known for some time that one reason it can outcompete other plants is because it produces a toxic compound, whose identity remained mysterious.

Now Reid Heisey, an associate professor of biology at Pennsylvania State University's Schuylkill campus, has identified a substance called ailanthone that he says can be extracted from the tree's bark and used as a broad-spectrum weed killer.

The trees begin producing the substance in their roots, branches, and trunks at between two and three years of age, he says. But marketing it isn't practical yet because of the cost of the extraction process.

Heisey compares ailanthone's action to commercial herbicides like glyphosate, which kills all plants with which it comes in contact. The best-known glyphosate product is Monsanto's Roundup, which may be American gardeners' favorite chemical. Some gardeners who would never consider using an insecticide or synthetic fertilizer say they feel comfortable using Roundup, which is said not to accumulate in soil. Even the Environmental Defense Fund and Vice President Al Gore have given it their stamps of approval.

But nothing is sacred, and this product too has its critics. Chief among them is the Northwest Coalition for Alternatives to Pesticides (NCAP) in Eugene, Oregon. Its *Journal of Pesticide Reform* cites studies indicating that glyphosate keeps leguminous plants from fixing nitrogen and harms essential mycorrhizal fungi. Glyphosate is said to be the most commonly reported cause of illness among landscape workers and to have been found in food crops planted a year after the ground was sprayed with it. A recent report from the Australian Environmental Protection Agency indicated that it was killing at least three species of frogs in that country.

Monsanto is investing heavily in genetically engineering crops to be resistant to Roundup, so that farmers can spray their fields without damaging their crops. If successful, this is expected to mean much heavier use of Roundup, so that its safety is of increasing concern.

Bt blues

The bacterium *Bacillus thuringiensis* (Bt) is the focus of a pitched battle on the genetic engineering front. Bt parasitizes larvae of such insect pests as cabbage loopers and tomato hornworms. Because it isn't toxic to humans or ani-

mals, it has been eagerly embraced by gardeners who want to reduce their use of synthetic pesticides. Vegetable gardeners can buy specific strains that will attack different insect hosts.

Recently, scientists have succeeded in splicing genetic material from Bt into a number of our most popular agricultural crops, including corn, potatoes, and cotton. Farmers don't have to be bothered with applying Bt and reapplying it after rain. The end goal seems laudable—increasing yield while allowing farmers to reduce the use of harmful pesticides.

But critics say the new products are being rushed to market without being thoroughly tested. The biggest concern is that such widespread exposure will trigger insect resistance to Bt, and gardeners and farmers will lose a powerful "natural" ally. Last summer, farmers reported that a new Bt-doctored cotton sustained heavy losses from cotton bollworms, one of its targeted pests. The cotton, it is thought, may have been engineered with a dose of Bt too weak to kill the bollworms, but giving them enough toxin exposure to hasten the build-up of resistance.

Gardeners are warned that Bt, like any other pesticide, is not without drawbacks and should not be overused. Even though strains are somewhat specific in their effects, the bacterium will kill many types of larvae, including those of butterflies.

pest control directory

If you are interested in environmentally friendly pest-control products for a wide variety of applications, you will find it worthwhile to acquire a copy of the 1997 *Directory of Least-Toxic Pest Control Products*. This comprehensive directory was published by the Bio-Integral Resource Center (BIRC), a nonprofit organization that specializes in research and education on integrated pest management (IPM).

For a copy of the directory, send \$11.50 to BIRC, P.O. Box 7414, Berkeley, CA 94707, or call (510) 524-2567 to order by credit card. California residents need to include an additional 83 cents to cover tax.

BIRC can also provide how-to articles on using biological control organisms effectively within an IPM program for specific pests. A complete list of these articles is available postpaid by sending \$1 with a request for BIRC's Publications Catalogue.



book reviews

- 🌿 *special shrubs*
- 🌿 *ethnobotany*
- 🌿 *native plants*
- 🌿 *essays on nature*

PLANTS THAT MERIT ATTENTION VOLUME II: SHRUBS

Janet Meakin Poor and Nancy Peterson Brewster, editors. Timber Press, Inc., Portland, Oregon, 1996. 363 pages. 8 3/4 x 11 1/4". Publisher's price: hardcover, \$59.95. AHS member price: \$52.50. **TIM 081**

I want this book! Every gardener I showed it to had as strong a response as I did. Although the second in a series (belatedly following *Volume I: Trees*, published in 1984), it stands on its own. It is an extremely useful and much needed book on a neglected subject. Designers, gardeners, students, and professional horticulturists will consult it time and time again.

The editors, who also worked on the first volume, again made good use of their numerous contacts across North America. The list of contributors reads like a "Who's Who" of American horticulture. Photographs used in the volume include many from the most distinguished names in the profession, including

Ed Hasselkus of the University of Wisconsin, Gary Koller of the Arnold Arboretum, Richard Lighty of the Mount Cuba Center for the Study of Piedmont Flora, and the late J.C. Raulston of North Carolina State University.

With contributors like these, it's no surprise that the book is a visual treat. For most major species there are photographs showing both detail and the plant's overall form. These are helpful, whether you are trying to convince a client to buy it or merely looking for ideas for your garden. It is easier to learn or to "sell" a plant with a photograph than with a verbal description.

Some of the photographs are particularly stunning. The fruits in Koller's photograph of *Lindera angustifolia* shine like marbles. The white stems of *Rubus cockburnianus* glisten in Raulston's photograph. Certainly a hundred more deserve similar praise. On the other hand, some should have been left out. Several, including the cover shot, are out of focus, upside down, or poorly exposed. Although understandable, considering nearly 700 photographs are included, it is nonetheless disappointing.

The book is truly national in scope, and the range of the plants is excellent. Gardeners in USDA Zones 3 and 4 will find as many shrubs to consider as gardeners in Zones 9 and 10. Individual plant descriptions have comments on landscape value that complement the photographs. Each listing includes information on public gardens where the plant can be

seen. Another good touch is that sources are given for most of the plants.

The editors dealt with two large genera in different ways. Rhododendrons are skipped, while a number of shrub rose taxa are listed. Personally, I would rather have had a review of the major species of both groups, rather than have so many rose cultivars at the expense of rhododendrons. I was

pleased to see, however, that dwarf conifers were, as they should be, included as shrubs.

In addition to the usual indices of public gardens and nurseries, there is a series of invaluable lists of shrubs sorted by nursery sources, hardiness zone, fragrance,



Milaeger's

GARDENS

1997 SPRING

Over 100 **NEW** varieties for 1997!

PERENNIAL WISHBOOK

Gardening just got better...

Our catalog tells you how to grow plants, not just how to buy them. Along with complete plant descriptions and cultural information, we give you helpful tips to make plant selection easier. Features over 1000 carefully selected varieties of perennials, ornamental grasses, prairie plants, vines and books.

Send \$1.00 for our Spring catalog sent in January.
You'll also receive our Fall catalog when it is ready in early summer.



Milaeger's
GARDENS

4838 Douglas Avenue, Dept. AG
Racine, WI 53402-2498 1-800-669-9956

84 PAGE FULL COLOR

DISCOVER THE HUMANE ALTERNATIVE TO TRAPS, GASES, AND POISONS.

P3 SONIC MOLECHASER

ONLY \$39.95 + S&H

Safe!
Humane!
Effective!

Rid your Lawn and Garden of Destructive Rodents. Forever!!!

New Sonic Molechaser targets the very sensitive hearing of destructive under-ground rodents such as moles, gophers, ground squirrels, pocket mice, etc. Constructed from a single billet of aluminum for long life and weather resistance. Covers over 1,000 sq. yds. Runs 4-6 months on 4 D batteries (not included). 16" long.

Call 1-800-590-4272

755 Humble Drive, Cookeville, TN 38501

TROY-BILTManufacturing Co. Dept. A5226
1 Garden Way, Troy, NY 12180Mail this coupon, or
for fastest service, call the
TOLL FREE number below!**YES!** Rush me facts on the
PRO Chipper including my color
Catalog, your TROY-BILT EASY
PAY PLAN, and current money-
saving offer! 3 13

Name _____

Address _____

City _____

State _____ Zip _____

Product available in Canada

**NOW
3 Models
Available!****FREE
Catalog!**

American Gardener Readers:

**CHIP YARD
DEBRIS FAST!****The TROY-BILT®
TOMAHAWK®
PRO Chipper is a
Commercial-Style
Wood Chipper...for
homeowners!**Now...chip & eliminate
woody yard debris,
brush, even tree trunks
to 4" thick! RECYCLE
brush piles into mulch
& woodchips. Super-
powerful...yet priced
for homeowners.**CALL TOLL FREE: 1-800-862-3993 Dept. 5226***You've heard about it—
Now don't miss the best!*Subscribe to THE AVANT GARDENER, "the
unique horticultural news service." Every month it
brings you the newest, most useful gardening infor-
mation—new plants, products, techniques, with
sources, feature articles, special issues. 29th year. Curious? Sample
copy \$2. Serious? \$14 a full year to new subscribers (regularly \$20).THE AVANT GARDENER
P.O. Box 489M • New York, NY 10028Snow Creek
Daylily Gardens☒ Please send your latest full-color Catalog. \$2 enclosed.

* PLEASE PRINT *

NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

Exquisite, proven varieties, developed by
leading hybridizers, and pictured in luscious
color from the people at B&D Lilies. Send
\$2 for your copy today.Photocopy, or clip & mail with payment to:
Snow Creek Nursery • 330 P Street • Dept H • Port Townsend, WA 98368conspicuous bloom, fruit, fall color, soil
moisture requirements, and ability to tol-
erate environmental stress.This is a "must have" book that will
remain valuable for many years. The price
is reasonable in view of the book's size,
scope, and number of color photographs.
One can easily skip purchasing several less
useful books to buy this one. It is worth
every penny.

—R. William Thomas

*R. William Thomas is the education divi-
sion manager at Longwood Gardens in
Kennett Square, Pennsylvania.***PLANTS, PEOPLE, AND CULTURE:
THE SCIENCE OF ETHNOBOTANY***Michael J. Balick and Paul Alan Cox. Sci-
entific American Library, New York, 1996.
228 pages. 8 3/4 x 9 1/2". Publisher's price:
hardcover, \$32.95. AHS member price:
\$29.75.*

WHF 001

Gardeners who practice their art
with almost religious fervor may
not realize that their attitude to-
ward plants is in some ways comparable to
sacred views held by indigenous peoples
around the world. Balick and Cox con-
clude that this connection is the key to
plant conservation. They argue that in-
stead of imposing our views about plant
conservation on**PLANTS, PEOPLE, AND CULTURE**
*The Science of Ethnobotany*MICHAEL J. BALICK
PAUL ALAN COXother cultures, we should
adopt some of their values and practices in
order to bring about a fundamental
change in how we protect plants. This is
not a trivial problem: Some 60,000 out of
170,000 of the world's tropical plant
species and 8,000 of the 80,000 temper-
ate species are at risk of extinction over the
course of the next 50 years. With the pop-
ularity of gardening rising, it is becoming
more and more important to instill con-

servation thought and practice into gardening. This will, hopefully, make gardeners more conservation-minded than they already are.

Most of this delightful and appealing book is given over to case stories about indigenous peoples' use of wild plants for medicine, food, shelter construction, and spiritual enlightenment. The final chapter—the most important section of the book—discusses biological conservation and ethnobotany. The bottom line is that without ethnobotany we aren't capable of plant conservation. Any gardener wishing to learn more about this fascinating and colorful field could not do better than read this book. It is handsomely produced, a pleasure to browse through, and intriguing to study. I recommend it without reservation.

—James P. Bennett

An avid gardener, James P. Bennett is a member of the Institute for Environmental Studies at the University of Wisconsin at Madison.

EASY CARE NATIVE PLANTS

Patricia A. Taylor. Henry Holt and Company, Inc., New York, 1996. 325 pages. 7 1/2 x 9 1/2". Publisher's price: hardcover, \$35. AHS member price: \$31.50. **HOL 006**

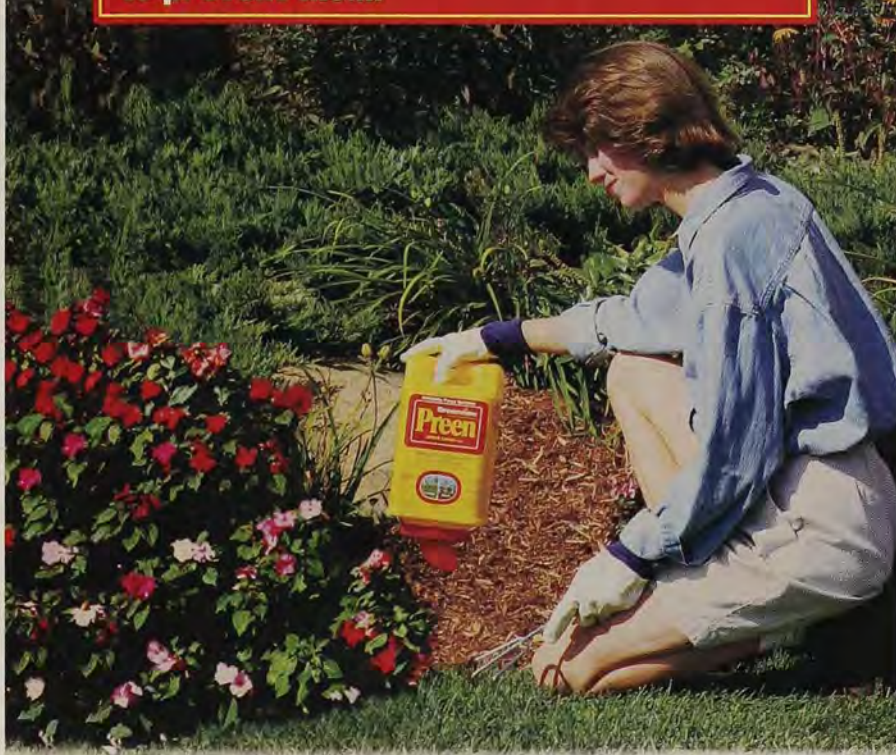
In the last several years, the concept of using native plants in gardening has begun to catch on everywhere. Tied to this is "naturescaping," which involves using plants naturally adapted to the site conditions of a garden in order to minimize preparation and maintenance. A number of good books have been published recently on these topics, although the authors sometimes have approached their subject with such zealotry as to possibly alienate those not already converted to the cause. In contrast, Taylor's book, aimed primarily at traditional gardeners, explores the use of easy-care natives in a way that will make those readers feel right at home.

Taylor begins with a history of the use of American plants in gardens. She notes that the 18th- and 19th-century botanical explorers of North America sent hundreds of species to Europe, where they attracted the interest of both botanists and gardeners. It became fashionable for gardeners in Europe to grow North American natives at a time when, ironically, most gardeners over here were using a small set of traditional European plants.

Taylor also tackles a controversial topic among plant enthusiasts, namely the proper definition of the word "native." At one

Last year, Laura Johnson spent hours and hours pulling weeds.

This year, she's spending a few minutes to prevent them.



You see, Laura's discovered the secret to weed-free gardening. It's not that she doesn't enjoy weeding, it's just that — well, okay, she just doesn't enjoy weeding.

Which is why this year, Laura's using **Preen**®, America's best-selling flower and garden weed preventer. **Preen** actually prevents weeds from growing around over 180 bulbs, flowers, roses, shrubs, trees and vegetables — **guaranteed**, or your money back. And **Preen 'n Green**® not only prevents weeds, it contains a balanced 9-17-9 fertilizer that nourishes

and enriches your existing plants.

And they couldn't be easier to use — with the refillable canister with built-in applicator, you just sprinkle the granules directly into the soil or mulch, then gently water-in. One application lasts up to three months.

So if, like Laura, hours of weeding isn't part of your dream summer, look for the bright yellow containers with the red caps in your local garden store. And let **Preen** and **Preen 'n Green** introduce you to the world of weed-free gardening.



Another Work-Saver Product From **Greenview**®



© Copyright 1997, Greenview, Lebanon, PA.



Finely crafted garden lighting to accent your garden pond or landscape. Solid copper construction in both standard and low voltage. Many available for shipping upon your request.



Toadstool with mill finish



Firefly with verde finish

Write or fax us for information on our entire line of fixtures.

Escort Lighting

201 Sweitzer Road Sinking Spring, PA 19608
FAX: 610-670-5170

extreme, purists restrict the term to local genetic stocks of the indigenous vegetation, whereas others expand the definition to plants that originated anywhere in North America, including both species and cultivars. Having explained the various points of view, Taylor chooses to use an extremely broad definition.

She offers a selection of sites from around the United States and Canada where curious gardeners can see plantings of natives. Among her more unusual examples are natives planted along highways by the Iowa Department of Transportation. She also profiles several private garden projects, using them to emphasize a low maintenance theme and noting the evolution of these gardens over time. Included are seven years' observations of her own garden.

Most of the rest of the book is a lengthy selection guide covering about 500 species grouped by category. Each entry includes a description of physical characteristics, notes on the plant's discovery, and hints on cultivation. Many of these plants are repeated in lists, scattered throughout the book, of plants recommended by various experts. Appendices include a rather brief list of retail and wholesale sources specializing in natives.

Any attempt to cover topics as complex as native plants and naturescaping in a single volume is bound to have imperfections. Taylor's broad definition of natives, which includes cultivars and several species native to Mexico, is sure to make purists cringe. Gardeners may also need to consult other references to see photographs of recommended plants because most are not illustrated. Readers are likely to find public gardens

that can provide useful information on natives closer to home than those discussed in the book.

That being said, expanding the book to cover more ground would have made it unwieldy and less easily used. Taylor has wisely compromised to produce a guide that is both informative and highly readable. It is a good introduction to landscaping with natives and provides a wealth of references and ideas for gardeners interested in new plants and new ideas.

—George Yatskievych

From his office at the Missouri Botanical Garden, botanist George Yatskievych compiles information on Missouri's native and introduced flora.

SHAKE THEM 'SIMMONS DOWN

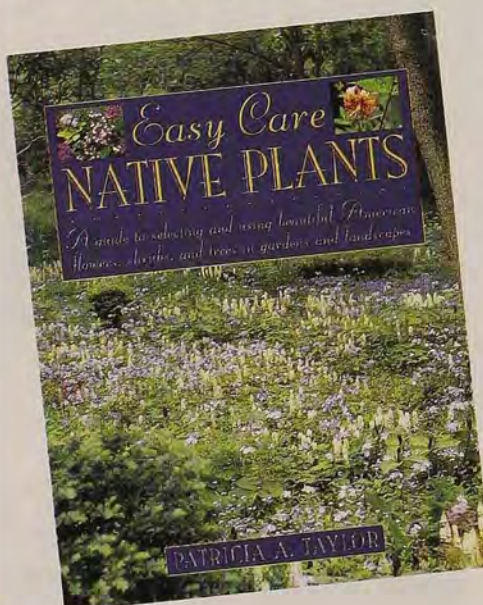
Janet Lembke. Lyons & Burford, Publishers, New York, 1996. 229 pages. 6 x 9". Publisher's price: hardcover, \$22.95. AHS member price: \$20.

LB 002

Janet Lembke's nature essays are like pleasant Saturday morning field trips—well organized but informal, user friendly, full of interesting biology and intriguing lore. It helps, too, that she is a superb writer. In this book—her fifth—she focuses on 12 trees native to the southeastern United States. The book's title is derived from a line in an old southern ditty about the persimmon tree.

"Trees usually evoke my wholehearted interest," writes Lembke, "and if the species is eccentric or grotesque, so much the better." Her interest goes much beyond facile tree-hugging, however, and she takes pains to analyze some of the complex feelings that trees evoke in us all. Trees of the New World, she states, are virtually "myth bare" in contrast to the layers of legend and superstition that, like mosses and lichens, encrust those of the Old World. Yet she plunges deep into American colonial history and Native American lore to convey a sense of the wide-eyed wonder experienced by the early plant explorers. I especially enjoyed her chapter "The Fortunes of Sassafras," which details the historical ups and downs of this familiar American woods-edge tree, and a whimsical chapter on the mutated, highly toxic upas tree, a charming digression into mythical trees that includes a sly takeoff on botanical naming and description.

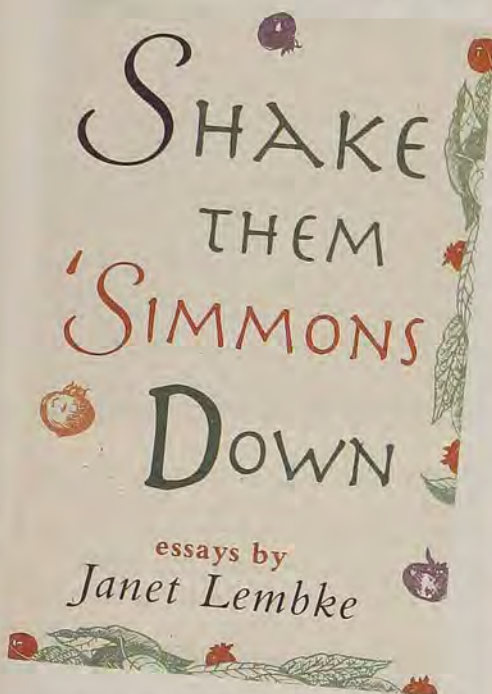
We also learn about how loblolly pine became a dominant tree of the South, the "pucker factor" of persimmons, the fungal associations of yellow poplar, the



clique of plant devotees obsessed with pawpaw; and the fierce thorn topography of Hercules' club.

Occasionally shifting her gaze to herbaceous plants, Lembke includes treatises on smoking "rabbit tobacco" and making soap from Spanish bayonet. She caps several essays with simple recipes for such things as persimmon bread and pudding, sassafras jelly, pecan pie, pawpaw zabaglione, and sumac berryade—all the celebratory ingredients for break time on the successful field trip.

Coming from an ecological perspective, my only mild criticism is that Lembke often gives short shrift to the crucial habitat factor in the lives



of trees, so that some of her accounts have a too-restricted, somewhat anachronistic focus. It isn't true, as she states, that "sumac, no matter what the species, is not fussy" as to its growth site. Poison sumac (*Rhus vernix*) definitely favors wetlands, and most of the other sumacs frequent dry open or edge sites. The only other error I noticed was her placement of magnolias "among the most primitive gymnosperms," although in a later section of the book she corrects this to read, properly, angiosperms. But these are essentially minor quibbles in an enlightening, companionable book that will delight old woods rovers, as well as people who would like to be.

—John Eastman

A resident of Kalamazoo, Michigan, naturalist John Eastman is author of several nature guides, most recently *Birds of Forest, Yard, and Thicket*.



THE PERMANENT METAL GARDEN LABEL

A - Hairpin Style Markers	100 For \$25.45
B - Plant/Shrub Labels	100 For \$ 8.90
C - Cap Style Markers	100 For \$22.60
D - Swinging Style Markers	100 For \$21.40
E - Rose Markers	100 For \$25.80
F - Tall Display Markers	100 For \$32.65
G - Tall Single Staff Markers	100 For \$26.50
H - Flag Style Markers	100 For \$20.95
J - Small Plant Labels	100 For \$ 8.30
K - Tie-On Labels	100 For \$13.95
M - Miniature Markers	100 For \$19.20

Special Quantity Prices Available
Prices Include Prepaid Postage

INTRODUCTORY OFFER:
1-Each; A,B,C,D,E,H,J and K
With Waterproof Crayon, Only \$3.75

PAW PAW EVERLAST
LABEL COMPANY
P.O. Box 93-AH
Paw Paw, Michigan 49079-0093

Growers of the Hardy Heaths and Heatherers



P. O. Box 693
Truro MA 02666-0693

Hardy New England grown
Heather plants!

Our colorful and informative 1997 catalog features complete descriptions of all 100+ varieties of hardy *Calluna vulgaris* and *Erica* we offer. Many new gorgeous photographs, thorough cultural information, design tips, hard to find books and shears. Send \$2.00 to cover cost please. Visit our new Web site and learn more about us!

Phone: 508.349.6769
Fax: 508.349.2732
<http://www.rockspray.com>

HOME IMPROVEMENT TIP:

Beautiful Gardens Begin
with a TROY-BILT® Tiller!



Learn how you can become a better, more successful gardener. Get the most out of your gardening time. Improve results in just one season. We'll show you how...send for your FREE TROY-BILT® Tiller Great Gardens Catalog today!

For Your FREE Catalog Call...

1-800-239-5353 Dept. 5191

Or Write:

TROY-BILT
Only the Best Built say TROY-BILT!

1 Garden Way, Dept. A5191, Troy, New York 12180

Product Available In Canada

©1997 Garden Way Inc.



FREE CATALOG

A complete listing of Evergreen and Hardwood Seedlings and Transplants, Landscape Ornamentals, Rhododendron, Native Plants, Ground Covers, Container-Grown Plants, plus money-saving Special Offers. Buy direct from grower.

Please send FREE CATALOG to:

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

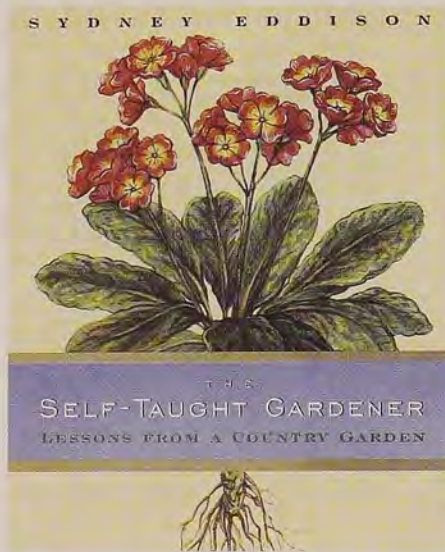
MUSSER FORESTS

Dept. 74A, P.O. Box 340, Indiana, PA 15701
(412) 465-9893 • Fax (412) 465-9893

gardeners' books

Books are chosen for the AHS Horticultural Book Service based on perceived reader interest, unusual subject matter, or substantive content. The following descriptions are not intended to be critical reviews, but are written to give an overview of the books' contents. For further information about these or other gardening books—or to order books—please call Barbara Catherwood at (800) 777-7931 ext. 36.

NEW AND NOTEWORTHY



THE SELF-TAUGHT GARDENER: LESSONS FROM A COUNTRY GARDEN

Sydney Eddison. 1997. 240 pages. Publisher's price: hardcover, \$24.95. AHS member price: \$22.45.

Drawing on her 30 years of gardening experience, one of America's favorite garden writers offers inspiration to novice gardeners on the art and craft of creating a garden. For anyone considering starting a garden from scratch, this book is a must. Illustrated with color photographs and charming line drawings.

Book code: VIK 003

PASSION FLOWERS

John Vanderplank. 1996. 224 pages. Publisher's price: hardcover, \$40. AHS member price: \$36.

This updated edition of Vanderplank's acclaimed work is the most comprehensive illustrated guide to this spectacular genus.

It is as attractive as it is informative, with descriptions of 150 species, an identification key, 120 excellent color photographs, and 100 leaf drawings.

Book code: MIT 001

A BOOK OF SALVIAS: SAGES FOR EVERY GARDEN

Betsy Clebsch. 1997. 250 pages. Publisher's price: hardcover, \$34.95. AHS member price: \$31.45. Due April 1997.

In this landmark book, the first exclusively on the genus *Salvia*, Clebsch introduces us to more than 100 beautiful, garden-worthy species and dozens of commercially significant hybrids. She encourages the wider use of salvias in our gardens for elegant, disease-free, and exquisitely aromatic plantings. Includes more than 90 color photographs and 40 line drawings.

Book code: TIM 089

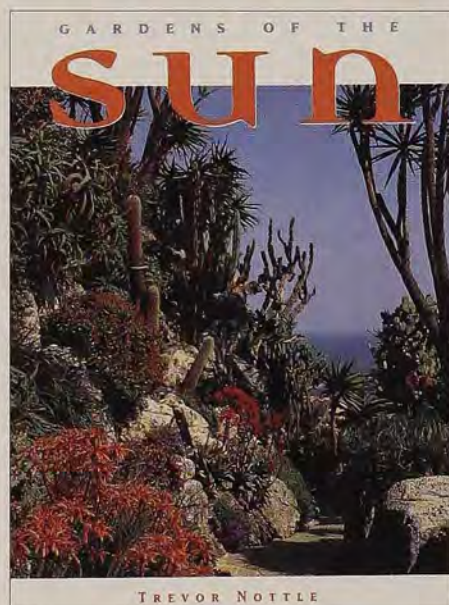
THE SUBTROPICAL GARDEN

Jacqueline Walker. 1996. 176 pages. Publisher's price: softcover, \$24.95. AHS member price: \$22.45.

Although most useful for gardeners in USDA Zone 8 and south, this book shows how adventurous gardeners in colder climates can incorporate—by using careful site selection and planting in containers—the luxuriant foliage, dramatic form, and vibrant color of subtropical gardens. Includes nearly 200 lush color photographs.

New in paperback.

Book code: TIM 093



GARDENS OF THE SUN

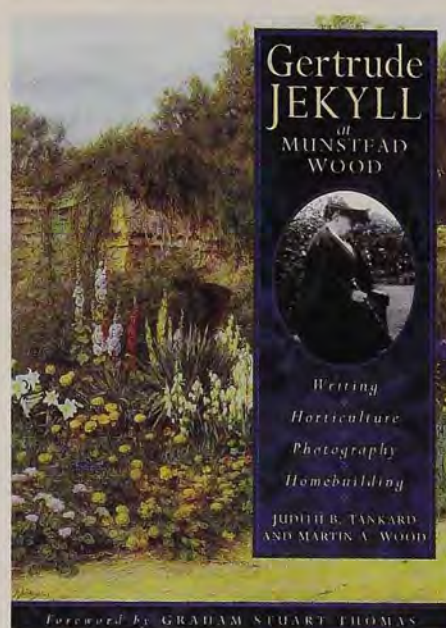
Trevor Nottle. 1996. 208 pages. Publisher's price: hardcover, \$29.95. AHS member price: \$26.95.

Nottle sets out to show that gardens thoughtfully designed to succeed in hot,

dry summers and mild, wet winters of Mediterranean climates can equal or surpass the beauty of classic European woodland and cottage gardens. He offers design tips and cultural advice, illustrated with 100 stunning color photographs.

Book code: TIM 094

CLASSIC GARDENS



GERTRUDE JEKYLL AT MUNSTEAD WOOD: WRITING, HORTICULTURE, PHOTOGRAPHY, HOMEBUILDING

Judith B. Tankard and Martin A. Wood. 1996. 224 pages. Publisher's price: hardcover, \$34.95. AHS member price: \$31.

A detailed look at the previously unexplored artistic life and business acumen of one of the most influential garden designers of this century. A must for understanding the woman, her work, and her time. Illustrated with 120 black-and-white photographs and drawings, along with color photographs.

Book code: SAG 009

THE GARDENS OF ELLEN BIDDLE SHIPMAN

Judith B. Tankard. 1996. 230 pages. Publisher's price: hardcover, \$39.95. AHS member price: \$36.50.

Tankard relates the story of this remarkable woman who contributed much to the development of landscape design in America, designing more than 650 gardens between 1914 and 1946. The book is illustrated with 200 exquisite black-and-white photographs, original garden plans, and color photographs.

Book code: SAG 006

AHS HORTICULTURAL BOOK SERVICE ORDER FORM



regional happenings

a look at what's happening around the nation

MID-ATLANTIC

MAR. 6 ■ Tidewater Garden Symposium. Norfolk Academy, Norfolk, Virginia. (703) 425-7848.

MAR. 15 & 16 ■ Flower and Garden Show. Hagerstown Junior College, Hagerstown, Maryland. (301) 790-2800 ext. 346.

MAR. 19-22 ■ Dixie African Violet Society Convention Show/Sale. Holiday Inn Koger Center, Richmond, Virginia. (540) 786-9587.

MAR. 21-23 ■ Rainbow of Orchids. Judged show. Virginia Center Commons, Richmond, Virginia. (804) 222-1834.

MAR. 21-23 ■ Richmond Home Show.

Fairgrounds on Strawberry Hill, Richmond, Virginia. (804) 288-5653.

MAR. 22 & 23 ■ Exhibition of Ohara Ikebana. River Farm, Alexandria, Virginia. (202) 363-8230.

MAR. 29 ■ 1997 Opening of Oatlands Plantation. Leesburg, Virginia. (703) 777-3174.

APR. 9 ■ Standard Daffodil Show. Zion Episcopal Parish Hall, Charles Town, West Virginia. (304) 725-2040.



APR. 13-16 ■ English Influences on American Gardening. Williamsburg

Garden Symposium, Williamsburg, Virginia. (757) 229-1000 or (800) 603-0948.

Williamsburg Garden Symposium: *When it is still winter in New York state, in Virginia it's spring—really spring with dogwood, wisteria, and dandelions in bloom. The day begins with early morning bird walks and ends with a nice, relaxing swim before dinner. In between are lectures, tours, classes, and a couple hundred other gardeners to chat with.*

—Virginia Gross, Monroe, New York

APR. 19 ■ Garden Fair and Plant Auction. U.S. National Arboretum, New York Avenue Entrance, Washington, DC. (202) 544-8733.



APR. 19-26 ■ Historic Garden Week in Virginia.

Garden Club of Virginia, Richmond, Virginia. (804) 644-7776.

Historic Garden Week in Virginia: *Started in 1929, it has raised more than \$5 million for*

restoring historic gardens and building appropriate landscapes for historic properties.

—Mrs. McCluer Gilliam, Rockbridge Baths, Virginia

APR. 19-MAY 4 ■ Gardening Days at Mount Vernon. Mount Vernon, Virginia. (703) 780-2000.

APR. 20 & 21 ■ House and Garden Tour. Leesburg, Virginia. (703) 777-2717.

APR. 25 & 26 ■ Plant Sale. American Horticultural Society, River Farm, Alexandria, Virginia. (800) 777-7931.

APR. 26 ■ Maymont's Herbs Galore. Celebration of herbs. Maymont, Richmond, Virginia. (804) 358-7166.

NORTH CENTRAL

MAR. 1-APR. 13 ■ Butterflies Are Blooming. Exhibit. Lena Meijer Conservatory, Grand Rapids, Michigan. (616) 957-1380.



MAR. 5-9 ■ FloralScape.

Flower and garden show. Cleveland Convention Center, Cleveland, Ohio. (216) 721-1695.

FloralScape: *The premier new flower show in America. We don't have to send our talent east any more.*

—Ruth Eppig, Shaker Heights, Ohio

MAR. 8-16 ■ Chicago Flower and Garden Show. Navy Pier, Chicago, Illinois. (312) 321-0077.

MAR. 12-15 ■ Arboricultural Consulting Academy. Arbor Day Farm's Lied Conference Center, Nebraska City, Nebraska. (301) 947-0483.

MAR. 15-23 ■ Indiana Flower and Patio Show. Indiana State Fairgrounds, Indianapolis, Indiana. (317) 576-9933.

MAR. 16-18 ■ Building With Trees. Conference. Arbor Day Farm's Lied Conference Center, Nebraska City, Nebraska. (402) 474-5655.

MAR. 18 ■ Garden Art and Artistry. Workshop. Olbrich Botanical Gardens, Madison, Wisconsin. (608) 246-4550.

MAR. 21-29 ■ Realtors' Home and Garden Show. Wisconsin State Fair Park, Milwaukee, Wisconsin. (414) 778-4929.

MAR. 22-SEPT. 1 ■ Butterflies Alive. Exhibit. Milwaukee Public Museum, Milwaukee, Wisconsin. (414) 278-2700.

APR. 3-6 ■ Ann Arbor Flower and Garden Show. Washtenaw Farm Council Grounds, Ann Arbor, Michigan. (313) 998-7002. *AHS members will only*

Haupt Conservatory Reopens in New York

The Enid A. Haupt Conservatory at the New York Botanical Garden will reopen on May 3. First opened to the public in 1902, the conservatory has since undergone remodeling approximately every 20 years. This time, in order to stabilize the building more permanently, the conservatory was taken entirely apart, and new climate control and utility systems added.

The conservatory will now house a collection of exhibits called "A World of Plants." Features include the Grand Palm House, a lowland rain forest, an aquatic plant house, a montane forest, African and Sonoran desert exhibits, a Mediterranean region exhibit, and a medieval garden, including plants with magical or alchemical, medicinal, or religious significance. For information, call (718) 817-8700.



The reopening of the conservatory is one of 75 events throughout the nation that the American Horticultural Society hopes members will attend to help us celebrate our 75th anniversary this year. Look for others, indicated by the symbol at left. We've featured comments from members who nominated some of them. Thanks again to all who participated!

be admitted free if they order a ticket through AHS. Call (800) 777-7931 ext. 10.

APR. 10-13 ■ Art Alive. Exhibit of floral interpretations of works of art. Columbus Museum of Art, Columbus, Ohio. (614) 221-6801.

APR. 18-20 ■ Spring Plant Sale. Missouri Botanical Garden, St. Louis, Missouri. (314) 577-9400.



APR. 19 & 20 ■

A Celebration of Gardening.

Spring open house. Madeline F. Elder Greenhouse at the Indianapolis Museum of Art, Indianapolis, Indiana. (317) 923-1331.



APR. 20 ■ Splash of Spring Walking Tour.

Spring Grove Cemetery and Arboretum, Cincinnati, Ohio. (513) 681-6680.

APR. 23-27 ■ Cincinnati Flower Show. Ault Park, Cincinnati, Ohio. (513) 579-0259.

APR. 26 ■ Planting Trees. Lecture. Olbrich Botanical Gardens, Madison, Wisconsin. (608) 246-4550.



APR. 26 ■ Spring Affair.

Demonstrations, lectures, and plant sale. Nebraska Statewide Arboretum, Lincoln, Nebraska. (402) 472-2971.



MAY 2-4 ■ Orchard in Bloom.

Gardening festival and show. Sponsored by the Orchard School. Holliday Park, Indianapolis, Indiana. (317) 290-ROSE.



MAY 3 & 4 ■ May Day Festival.

Powell Gardens, Kingsville, Missouri. (816) 566-2600.

NORTHEAST



MAR. 1 ■ Grow Together.

Workshops. Sponsored by Operation GreenThumb. Norman Thomas High School, New York, New York. (212) 788-8075.

GreenThumb Grow Together:

More than 500 individuals of various ages and backgrounds are offered 42 workshops of 75 minutes each and lunch—free since 1985.

—Frances Mastrota, New York City

MAR. 2-9 ■ Philadelphia Flower Show. Philadelphia Convention Center, Philadelphia, Pennsylvania. (800) 611-5960.

MAR. 6 ■ Artistry in Flower Gardening. Symposium. Tower Hill Botanic Garden, Boylston, Massachusetts. (508) 869-6111.

MAR. 7-9 ■ Capital District Garden and Flower Show. Knickerbocker Arena, Albany, New York. (518) 356-6410.



MAR. 8 ■ Artistry in Flower Gardening.

Symposium. Winterthur Museum, Garden, and Library, Winterthur, Delaware. (800) 395-1901.

MAR. 8-16 ■ New England Spring Flower Show. Bayside Exposition Center, Boston, Massachusetts. (617) 536-9280.

MAR. 13 ■ Learning from the Rainforest: Plants, People, and Culture. Lecture. The Rockefeller University, Caspary Hall, New York, New York. (718) 817-8747.



MAR. 13 ■ Woody Plants as Perennials.

Symposium. Coles Springs Harbour Laboratory, Old Westbury Gardens, Old Westbury, New York. (516) 333-0048.

MAR. 13-16 ■ Gardenscape: Greater Rochester's Flower and Garden Show. Dome Center, Henrietta, New York. (716) 442-7760.

MAR. 15 ■ Home Gardeners' School. Cook/Douglass Campus of Rutgers University, New Brunswick, New Jersey. (908) 932-9271.

MAR. 15 & 16 ■ Annual Flower and Garden Show. State University of New York at Alfred, Alfred, New York. (607) 587-4526.

MAR. 15 & 16 ■ Bucks Beautiful Garden Fair. Delaware Valley College, Doylestown, Pennsylvania. (215) 348-3913.

MAR. 17 ■ Bringing Ferns to the Garden: From Spores to Fiddleheads. Lecture. The New York Botanical Garden, Ross Lecture Hall, Bronx, New York. (718) 817-8747.

MAR. 21 ■ Sticks and Stones: Building a Garden with Character. Garden design symposium. Longwood Gardens Ballroom, Kennett Square, Pennsylvania. (302) 831-2517.

MAR. 22 ■ Rootin' for You. Plant workshop. Wave Hill, Bronx, New York. (718) 549-3200.

THROUGH APR. 4 ■ The Gardens of Ellen Biddle Shipman. Photography exhibit. PaineWebber Art Gallery, New York, New York. (212) 713-2885.

APR. 4-30 ■ Sherwood Collection of Botanical Art. Exhibit. National Arts Club, New York, New York. (718) 549-3200.

APR. 5 ■ Life of a Garden. Symposium. Genesee Country Museum, Mumfords, New York. (716) 538-6822.

APR. 5 ■ The New American Kitchen

Garden. Symposium. Tower Hill Botanic Garden, Boylston, Massachusetts. (508) 869-6111.



APR. 27 ■ Eighth Annual Arbor Day Celebration.

Blithewold Mansion and Gardens, Bristol, Rhode Island. (401) 253-2707.



MAY 3 ■ Wilmington Garden Day.

Tour. Greenville, Delaware. (302) 368-8626 or (302) 428-6172.

NORTHWEST



APR. 26-JUNE 7 ■ Spring Festival of Flowers.

Lakewold Gardens, Tacoma, Washington. (206) 584-4106.

SOUTH CENTRAL

MAR. 1 & 2 ■ Azalea Trail. Tour. Houston, Texas. (713) 523-2483.

MAR. 6-9 ■ Wichita Lawn, Flower, and Garden Show. Century II, Wichita, Kansas. (316) 721-8740.

APR. 5 ■ Herb Market. Plano Centre, Plano, Texas. (972) 924-3703.



APR. 5-28 ■

Azalea Festival. Honor Heights Park, Muskogee, Oklahoma. (918) 684-6302.



APR. 12 & 13 ■ Wildflower Days.

Festival. National Wildflower Research Center. Austin, Texas. (512) 832-4059.

APR. 15 & 16 ■ Florescence:

The Arts in Bloom. Flower and horticulture show. Museum of Fine Arts, Houston, Texas. (713) 639-7538.

SOUTHEAST

MAR. 4 & 5 ■ Gardens by Design.

Symposium. Davidson College, Davidson, North Carolina. (704) 892-1963.

MAR. 7 ■ Flowering Trees and Shrubs. Lecture. Dunwoody Nature Center, Dunwoody, Georgia. (770) 394-3322.

MAR. 7-9 ■ Tampa Spring Expo. Horticulture show. Florida State Fairgrounds, Tampa, Florida. (813) 960-1457.



MAR. 8-APR. 12 ■ Natchez Pilgrimage House and Garden

Tours. Natchez Pilgrimage Tours, Natchez, Mississippi. (800) 647-6742.

MAR. 14 ■ Color in the Garden. Lecture. Dunwoody Nature Center, Dunwoody, Georgia. (770) 394-3322.



MAR. 20-APR. 19 ■

Festival of Houses and

Gardens. Historic Charleston Foundation, Charleston, South Carolina. (803) 723-1623.

APR. 5 & 6 ■ Japanese Festival. Memphis Botanic Garden, Memphis, Tennessee. (901) 685-1566.



APR. 11-MAY 11 ■

Festival of Flowers.

Biltmore Estate, Asheville, North Carolina. (800) 543-2961.

APR. 12 & 13 ■ Spring Plant Festival. University of South Florida Botanical Garden, Tampa, Florida. (813) 974-2329.

APR. 12 & 13, 19 & 20 ■ Wildflower Festival and Native Plant Sale. Reflection Riding Botanical Garden and the Chattanooga Nature Center, Chattanooga, Tennessee. (423) 821-9582.

APR. 13-20 ■ Spring Plant Sale. Memphis Botanic Garden, Memphis, Tennessee. (901) 685-1566.



APR. 18-JUNE 1 ■ Epcot

International Flower and Garden Festival.

Walt Disney World, Lake Buena Vista, Florida. (407) 824-6987.



APR. 24-26 ■

Spring Wildflower Festival.

Great Smoky Mountains National Park, Gatlinburg, Tennessee. (423) 436-1255.



MAY 3 & 4 ■ Glorious

Garden Tour.

Birmingham Botanical Gardens, Birmingham, Alabama. (205) 879-1227.



MAY 3 & 4 ■ Habitat

Helpers Weekend.

TVA's Land Between the Lakes, Golden Pond, Kentucky. (800) 525-7077.

WEST COAST

MAR. 14-16 ■ Orchid Show. The Huntington, San Marino, California. (818) 405-2141.

MAR. 15 ■ Lilac Day. Tour and discussion. Descanso Gardens, La Cañada Flintridge, California. (818) 952-4401.



MAR. 16 ■ Sierra Madre Wistaria Festival and Vine-Viewing.

Downtown Sierra Madre, California. (818) 306-1150.

MAR. 20 ■ Flourishing the Spade: The Personal Art of Creating a Garden. Lecture by Sharon Lovejoy. Exeter Memorial Building, Exeter, California. (209) 592-1828.



MAR. 22 & 23 ■ California Bonsai Society Show.

The Huntington, San Marino, California. (818) 405-2141.

MAR. 22-APR. 13 ■ Spring Flower Festival. Descanso Gardens, La Cañada Flintridge, California. (818) 952-4401.

APR. 10-13 ■ Southern California Spring Garden Show. Crystal Court, South Coast Plaza, Costa Mesa, California. (714) 435-2167.

APR. 16-20 ■ San Francisco Landscape Garden Show. The Pavilions at Fort Mason Center, San Francisco, California. (415) 750-5108.

CANADA

MAR. 5-9 ■ Canada Blooms: The Toronto Flower and Garden Show. Toronto Congress Centre, Ontario. (888) 256-6677.

MAR. 18 ■ Starting Plants from Seed. Workshop. Royal Botanical Gardens Centre, Hamilton, Ontario. (905) 527-1158.

classifieds

a look at current offerings from the marketplace

CLASSIFIED AD RATES: All classified advertising must be prepaid. \$2 per word; minimum \$50 per insertion. Copy and prepayment must be received on the 20th of the month three months prior to publication date. Send orders to: AHS Advertising Office, 4350 DiPaolo Center, Suite B, Glenview, IL 60025, or call (847) 699-1707.

BONSAI

OVER 250 VARIETIES—bonsai and plants for garden. 30 types of Japanese maples, Satsuki azaleas, dwarf conifers, bamboos, tropicals, subtropicals, and more. **NEW ENGLAND BONSAI**, America's most complete bonsai nursery. FREE catalog. (508) 883-2842.

BOOKS

Hortica: Color Cyclopaedia of Garden Flora with Hardiness Zones and Indoor Plants, 8,100 color photos by Dr. A. B. Graf, \$238.

Tropica 4: 7,000 color photos of plants and trees for warm environments, \$165.

Exotic House Plants: 1,200 photos, 150 in color, with keys to care, \$8.95.

Shipping additional. Circulars gladly sent.

ROEHRS CO., Box 125, East Rutherford, NJ 07073. (201) 939-0090. FAX (201) 939-0091.

ETHNOBOTANY

Our specialization is in **MEDICAL, CULINARY, COMMON AND OBSCURE HERBS, FRUIT AND VEGETABLE SEED.** We have a large selection of rare rain forest living plant species. Catalog lists more than 1,200 items, including common bulk herbs, oils, extracts, teas, coffees, and more. For a catalog, send \$2, or visit our Internet page: www.ethnobotany.com. **LEGENDARY ETHNOBOTANICAL RESOURCES**, 16245 S.W. 304 Street, Dept. AG, Homestead, FL 33033, (305) 242-0877.

HOUSE PLANTS

ORCHIDS, GESNERIADS, BEGONIAS, CACTI AND SUCCULENTS. Visitors welcome. 1996-1997 catalog, \$2. **LAURAY OF SALISBURY**, 432 Undermountain Rd., Salisbury, CT 06068, (860) 435-2263.



Catch the Sunshine!

- Hobby to Commercial
- Affordable & Fully Warranted
- Free color brochure and "Practical Guide to Greenhouse Selection"

Gothic Arch Greenhouses

Box 1564-AG • Mobile, AL 36633 • 800/531-GROW

Northwest Resource Directory Updated

Over the years, gardeners in the Northwest have come to rely on *The Northwest Gardeners' Resource Directory*, a comprehensive guide to gardening events, botanical gardens, nurseries, lectures, tours, plant sales, and countless other resources available to gardeners throughout western Oregon, Washington state, and British Columbia.

The seventh edition of this invaluable directory, extensively revised and updated by author Stephanie Feeney, an infectious enthusiastic gardener, will be available in early April. Additions to the guide include essays by gardening luminaries such as Ann Lovejoy and Dan Hinkley, a new geographic locator section to facilitate visits to nurseries and public gardens, and an expanded chapter on tracking down sources of elusive plants and seeds.

The 352-page resource directory can be ordered postpaid for \$25.45 (from anywhere in the United States except Washington state) or \$27.44 (from Washington state or outside the United States). Send checks, payable to Cedarcroft Press, to 59 Strawberry Point, Bellingham, WA 98226.

HYDRANGEAS

EXCEPTIONAL AND BEAUTIFUL species and cultivars: 'Grayswood', 'Lilacina', 'Veitchii', 'Beni Gaku', 'Ami Pasquier', 'Madame E. Mouillère', 'Peziosa', *Schizophragma* spp., *Decumaria* spp. Many others. Catalog \$2 (refundable with order). WILKERSON MILL GARDENS, 9595 Wilkerson Mill Road, Palmetto, GA 30268.

IRRIGATION

DRIP IRRIGATION—large selection of highest quality components for landscapes, gardens, and farms. Complete systems or parts. Design assistance available. Pond liners, too. FREE catalog. DRIPWORKS, (800) 616-8321.

NURSERY STOCK

TREE-SHRUB SEEDLINGS—wholesale prices. Beautify property. Make money growing Christmas trees, ornamentals, nut trees, timber. Windbreaks, noise barriers, wildlife food/cover. Easy instructions, guaranteed. FREE color catalog. CARINO NURSERIES, P.O. Box 538J, Indiana, PA 15701.

ORGANIC GARDENING

GROW A GREAT GARDEN—Environmentally safe and friendly fertilizer products. Kelp, fish, blood, alfalfa, and bone meals. Greensand, rock phosphate, diatomaceous earth. FREE catalog. SEA-BORN/LANE, INC., (800) 457-5013.

PEONIES

BEAUTIFUL VARIETIES—Japanese and other tree peonies. Catalog \$2. SMIRNOW'S SON'S PEONIES, 168 Maple Hill Road, Huntington, NY 11743.

PERENNIALS

BEAUTIFUL PERENNIALS at pleasing prices. Send for FREE catalog—our biggest ever! BLUESTONE PERENNIALS, 7201 Middle Ridge, Madison, OH 44057.

RARE, UNUSUAL, and specially selected perennials. Free listing. Write WILLOWWOOD AG, P.O. Box 445, Parkdale, OR 97041.

HARDY MAINE PERENNIALS

We provide your garden with only the best!!
Many new and hard to find.

Descriptive catalog listing over 700 varieties \$2.00



Fieldstone Gardens, Inc.
620 AG Quaker Lane
Vassalboro, Maine 04989-9713
Phone/Fax: (207) 923-3836

Learn How To

Design, Plant & Maintain Your Perennial Gardens

with our *Perennial Handbook and Landscape Design Kit and Perennial Plant Catalogue*.

Filled with detailed instructions on site selection, amending the soil, planting, plant lists and lots of color photos.

This is a "must have" for only \$5.00.

André Viette Farm and Nursery

P. O. Box 1109, Dept. AG
Fishersville, Va. 22939

1-800-575-5538



AWARD-WINNING PERENNIAL CATALOG!

Over 1,300 cold-hardy and native perennials for your gardening pleasure. Discount coupons, 200 original drawings, planting and design tips, and more!

Send \$2.00 for 3-year subscription, deductible, or call 1-800-544-3192 to put on VI or MC

BUSSE GARDENS

5873 Oliver Ave. S.W., Cokato, MN 55321

PLANTS (UNUSUAL)

NATIVE PLANTS—nursery-propagated and grown in containers! Also hostas, water-loving plants, and unusual perennials. Catalog \$1. PINE RIDGE GARDENS, 832 AG Sycamore Road, London, AR 72847-8767.

COLOR, FORM FOR BORDERS, distinctive accents, unusual flowering shrubs, granny's spires, boxwood, honeysuckle, hollies, yaks—more! Catalog \$2, refundable. NEW GARDENS, Box 357, Greenwich, NJ 08323.

PUBLICATIONS

SAVE MONEY, HAVE FUN! Instructions on pruning, planting, dividing plants, watering, growing exotic species, bonsai and topiary training. Use for home or profit with your own business. \$19.95. LANDSCAPING, Box 18764, Reno, NV 89511.

REAL ESTATE

8.3 ACRES, 1850s COLONIAL. Gardens, pond, woods. One hour NYC. Low taxes with \$500 plant sales. 4 bedrooms, enclosed sunporch. Excellent high school. Owner: (212) 876-3190.

ROSES

PRACTICAL ROSES FOR HARD PLACES are the sole specialty of THE ROSERAIE AT BAYFIELDS. 1997 free catalog, text only, carefully describes 275 species, gallica, damask, Portland, alba, centifolia, moss, Bourbon, rugosa, Austin, modern shrub, climber, rambler, and ground cover. \$6 narrated 55-minute video slide show brings them to life. We ship bareroot in spring and fall and sell in 2-3 gallon pots at our nursery, where our "catalog in the ground" garden displays 300 varieties. Write P.O. Box R(A), Waldoboro, ME 04572. Fax (800) 933-4508. E-mail roses@midcoast.com.

MANY NEW ROSE SELECTIONS for the coming season. Over 700 varieties: new show roses and ground covers; English and old garden roses; 6 thornless HT varieties; antique and classic roses by Beales; miniatures by Rennie; hardy Ottawa explorers; Manitoba Parkland varieties; and our fabulous Pavement roses that are disease-free, low-maintenance types that are also suitable for harsh prairie winters. A superb collection. Our fields are known to be virus-free. Orders shipped with our temperature-controlled truck to UPS depots in the USA for local distribution. Catalog \$3. Books by Austin and Beales. Encyclopedic video on roses by English rose expert Peter Beales, \$35 delivered. Kindly fax or mail in retail orders or call them in on our answer line: (905) 689-9323. HORTICO INC., 723 Robson Rd., Waterdown, Ontario L0R 2H1. Tel: (905) 689-6984 or 689-3002. Fax: (905) 689-6566.

TOURS/TRAVEL

IRELAND'S GARDENS—Exclusively conducted tours of 13 private, 3 castle, and 2 botanic gardens in the beautiful south of Ireland, Sept. 3-18, 1997. Garden writer-escorted. Tour priced in Canadian dollars; U.S. clients save 38%. Call UPTOWN TRAVEL, 1-800-667-0803.

GARDENS OF NEW ZEALAND AND AUSTRALIA 1997. Camellias in September. Spring gardens in November. Private gardens. Scenic highlights. NZ Garden Tour Specialists. KIWI PAC TOURS: (415) 595-2090.

The Gardens of Europe

Visit Europe's finest gardens and a rich variety of cultural and historic sites. Tour at a civilized pace with a small group.

Holland in Springtime. Tulips at Keukenhof • Windmills, countryside and canals • The Hague, Amsterdam

Villas and Gardens of Italy. The Lakes • Renaissance villas • Medieval towns of Tuscany • Venice, Florence, Rome

Provence and Côte d'Azur. Mediterranean gardens • Roman and Medieval towns • Monaco, Cannes, Nice

Châteaux and Gardens of France. Castles of the Loire • Countryside of Normandy • Giverny • Paris

Gardens of Paris. Bagatelle • L'Häy-les-Roses • Versailles • Malmaison • Giverny

Call for a brochure (800) 505-2505

Lucas & Randall

TREES AND SHRUBS

ATTRACT BIRDS AND WILDLIFE—Plant winter-bearing trees and shrubs. Early bearing varieties available. COLD STREAM FARM, 2030Y Free Soil Road, Free Soil, MI 49411, (616) 464-5809.

CREATE AN INSTANT GARDEN!

Cold-hardy Camellias, Magnolias, Witch Hazels, Viburnums, Hundreds More Rare Trees, Shrubs & Perennials, Many in Larger Sizes for an Instant Garden!

Send \$3.00 for Colorful Catalogue.

Box 330-A • Greenwich, NJ 08323
Visa or M/C Orders (609) 451-6261



Fairweather Gardens

WATER GARDENING

AQUATIC PLANTS, LOTUSES, WATER LILIES, unordinary perennials, natives/woodlands/grasses, succulents, reblooming iris. FREE price list or color catalog on computer disk. Bed-and-breakfast opening this spring. DAY-DREAMER PERENNIAL GARDENS, Route 1, Box 438, Belpre, OH 45714. (800) 741-3867. <http://www.daydreamergardens.com>.

GRANITE MILLSTONES

A focal point for your Garden, Patio or Doorstep

MAINE MILLSTONES
Southport, Me. 04576
207-633-6091





pronunciations

a simple speaking guide to plants found in this issue

Abelia chinensis
uh-BEEL-yuh chy-NEN-siss

Acer circinatum
AY-ser sir-sih-NAY-tum

Acorus calamus
AK-or-us KAL-uh-mus

Alnus rubra
AL-nus ROO-bruh

Amelanchier alnifolia
am-eh-LANG-kyer al-nih-FO-lee-uh

Andropogon gerardii
an-dro-PO-gon jeh-RAR-dee-eye

Araucaria araucana
ah-raw-KAIR-ee-uh
ah-raw-KAN-uh

Asclepias incarnata
as-KLEE-pee-us in-kar-NAY-tuh

Athyrium filix-femina
uh-THIH-ree-um
FIL-iks-FEM-ih-nuh

Calopogon tuberosus
kal-o-PO-gon too-buh-RO-sus

Carex obnupta
KAIR-eks awb-NUP-tuh

C. scoparia
C. sko-PAR-ee-uh

C. vulpinoidea
C. vul-pin-OY-dee-uh

Cornus amomum
KOR-nus uh-MO-mum

C. controversa
C. kon-tro-VUR-suh

C. stolonifera
C. sto-lon-IF-ur-uh

Coronilla varia
kor-o-NIL-luh VAIR-ee-uh

Corylus cornuta var. *californica*
KOR-ih-lus kor-NEW-tuh
var. kal-ih-FORN-ih-kuh

Decaisnea fargesii
deh-KAY-nee-uh far-JEZ-ee-eye

Deschampsia caespitosa
deh-SHAMP-see-uh sez-pih-TOH-suh

Disanthus cercidifolius
dis-AN-thus sur-sid-ih-FO-lee-us

Eleocharis palustris
ee-lee-o-KAR-iss pah-LUS-triss

Elymus glaucus
EL-ee-mus GLAW-kus

Eupatorium maculatum
yew-puh-TOR-ee-um
mak-yew-LAY-tum

Fothergilla gardenii
fah-thur-GIL-uh gar-DEN-ee-eye

Gaultheria shallon
gawl-THEER-ee-uh SHAL-lon

Gentianopsis crinita
jen-she-ah-NOP-siss kry-NYE-tuh

Hamamelis vernalis
ham-uh-MEL-iss vur-NAL-iss

Iris virginica var. *shrevei*
EYE-ris vir-JIN-ih-kuh
var. SHREEV-ee-eye

Juncus effusus
JUNG-kus eh-FEW-sus

J. ensifolius
J. en-sih-FO-lee-us

Lysichiton americanus
ly-sih-KITE-on uh-mair-ih-KAN-us

Oplopanax horridus
o-plo-PAN-aks HOR-id-us

Oxalis oregana
auk-SAL-iss or-eh-GAN-uh

Passiflora incarnata
pass-ih-FLOR-uh in-kar-NAY-tuh

P. lutea
P. LEW-tee-uh

Phalaris arundinacea
fuh-LAIR-iss uh-run-dih-NAY-see-uh

Plumbago auriculata
plum-BAY-go aw-rik-yew-LAY-tuh

P. capensis
P. kuh-PEN-sis

Pogonia ophioglossoides
po-GO-nec-uh
o-fee-o-gloss-ee-OY-deez

Polystichum munitum
pah-LISS-tih-kum mew-NEE-tum

Pontederia cordata
pon-tuh-DEER-ee-uh kor-DAH-tuh

Quercus ilicifolia
KWER-kus il-ih-sih-FO-lee-uh

Rubus cockburnianus
ROO-bus cock-bur-nee-AN-us

R. parviflorus
R. par-vih-FLOR-us

Salix exigua
SAY-iks eks-IG-yoo-uh

S. lasiandra
S. lah-see-AN-druh

Sambucus caerulea
sam-BOO-kus see-ROO-lee-uh

Schoenoplectus validus
show-no-PLEC-tus VAL-ih-dus

Scirpus americanus
SEER-pus uh-mair-ih-KAN-us

S. atrovirens
S. at-ro-VY-renz

S. cyperinus
S. sy-PUR-in-us

S. pungens
S. PUN-genz

S. validus var. *creber*
S. VAL-ih-dus var. KREE-bur

Silphium perfoliatum
SIL-fee-um per-fo-lee-AY-tum

Smilacina racemosa
smy-luh-SEE-nuh rass-eh-MO-suh

Spartina pectinata
spar-TY-nuh pek-tih-NAY-tuh

Twedia caerulea
TWEE-dee-uh see-ROO-lee-uh

Typha latifolia
TY-fuh lat-ih-FO-lee-uh

Vaccinium parvifolium
vak-SIN-ee-um par-vih-FO-lee-um

Zenobia pulverulenta
zeh-NO-bee-uh pul-vur-yew-LEN-tuh

Zigadenus nuttallii
zih-guh-DEN-us nut-TAL-ee-eye

What's in a Name: *Oplopanax horridus*

Commonly known as devil's-club because of its spiny stems and leaves, *Oplopanax horridus* is a member of Araliaceae, the ginseng family. The generic name is derived from the Greek words hoplon (weapon) and panakes (cure-all). These allude, respectively, to the plant's ferocious spines and to its kinship with ginseng (*Panax* spp.), named in turn for its wide-ranging medicinal attributes. The specific epithet, which means bristly or prickly, is further warning about its yellow spines, which can painfully wound the unwary.

A deciduous, suckering shrub that grows three to 10 feet tall, devil's-club is native to moist woods and stream banks from western Ontario and Michigan west to the Pacific Coast from Oregon to Alaska. It has prickly leaves up to 10 inches wide, divided into seven to nine angular lobes with serrated edges. In spring, small greenish white flowers bloom in paniced inflorescences, followed in early summer by scarlet, berrylike fruits.

Great Gardens of *May 8-19, 1997*
Southern England
with optional trip to Chelsea Flower Show



BARRY HICKS

THE SPLENDORS OF ENGLAND IN THE SPRING ARE LEGENDARY. Our trip to southern England seeks the very best garden styles and content. We will have the opportunity to visit inspiring gardens designed by the likes of Harold Peto (Iford Manor and Heale House), Capability Brown (Petworth), Graham Stuart Thomas (Mottisfont Abbey rose gardens), Vita Sackville-West and Harold Nicholson (Sissinghurst), and others. For those wishing to extend their stay in England, we are offering an optional extension to London (May 19-23) to attend the Members Only Day at the Chelsea Flower Show. While in London, additional garden tours will include Hatfield House and the Royal Horticultural Society's Wisley gardens.

Also Planned For 1997

■ GREAT GARDENS SERIES OF GREAT BRITAIN:
 JUNE—GARDENS OF THE MIDLANDS
 JULY—GARDENS OF THE NORTH
 AUGUST—GARDENS OF SCOTLAND

■ JUNE 9-20, 1997
 GARDENS OF BRITTANY,
 NORMANDY, AND ISLE OF JERSEY
 ■ JULY 13-21, 1997
 GARDENS OF THE CANADIAN ROCKIES

Leonard Haertter Travel Company

7922 Bonhomme Avenue, St. Louis, MO 63105
 (800) 942-6666, (314) 721-6200 (in Missouri)

CST#2019027-50

WHY DO LEADERS CALL IT "GREATEST or BEST STUFF or PRODUCT in the WORLD?"

ONLY SO { RECOMMENDED BY NEARLY 1000 BOOKS, CONFERENCES, MAGAZINES, NEWSPAPERS, TVs, RADIOS

USED BY FIVE U.S. DEPARTMENTS TO HELP WIN WORLD WAR II THOUSANDS OF GOVERNMENTS, STATE UNIVERSITIES, LEADING ARBORETUMS, BOTANICAL GARDENS, PARKS SYSTEMS U.S., STATES and CITIES IN MULTIPLE-DRUMS LOTS

25 GROWERS ADDED SUPERthrive™ TO (Not instead of) 25 FERTILIZERS

SUPERthrive™ unique extra life:—EXTRA GROWTH: "IMPOSSIBLES" MADE EASY.
THE SMALL PLANTS IN EACH PHOTO BELOW ARE THE BEST THAT YOU OR 25 GROWERS CAN DO, WITH 25 FERTILIZER BRANDS — WITHOUT ADDING SUPERthrive™ 50 VITAMINS-HORMONES



UNCHALLENGED 1/2 CENTURY; Greatest Guarantee-Offer PROOF ever!

NOW 1/2 CENTURY \$5000. GUARANTEED to be WORLD CHAMPION

#1 ACTIVATOR #1 REVIVER #1 Trans/PLANTER #1 GROWER (ADDED to effects of fertilizers), #1 PERFECTER
"Money-where-the-mouth-is" guarantee of all time · proven on billions of plants.

BILLIONS-PROVEN EXTRA-LIFE-MAKER

WORLD'S FAIR Gold Medal **Ⓜ** **HORMS #4 TMs**

SUPERthrive **50 IN ONE**

LONG KNOWN BY EXPERTS ON EVERY CONTINENT AS WORLD'S #1 TOP PLANT SUPPLY

50 VITAMINS, HORMONES, Economically saves waiting for plants to make these bio-organic complexes of carbon, hydrogen and oxygen, **NON-FERTILIZER**. Dramatically healthier plants throughout the world, when SUPERthrive™ **ADDED to any fertilizing.**

NOT AT ALL 'LIKE' claimed-alike substitutes.

JOIN WITH DR. JOHN A. THOMSON'S VITAMIN INSTITUTE IN CELEBRATING 1/2 CENTURY OF GUARANTEED FAR-BEST

VITAMIN INSTITUTE 5409-15 Salsuma Ave., NORTH HOLLYWOOD, CA. 91603 (800) 441-8482, FAX (818) 766-8482