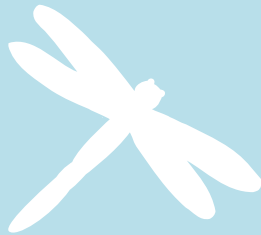


Ecoscaping Back to the Future . . .

Restoring Chesapeake Landscapes

Native Plant Rain Gardens and Xeriscapes
Examples From the Chesapeake Ecology Center
by Zora Lathan and Thistle A. Cone





Ecoscaping Back To The Future...

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The CEC is committed to building partnerships and encouraging various groups to work collaboratively on habitat restoration and protection. The tremendous assistance of countless volunteers and numerous partners has been invaluable, and has made the installation of 18 Native Plant Demonstration Gardens possible. Our program partners are: Adams Academy at Adams Park Middle School, Alliance for Sustainable Communities, Annapolis Environmental Commission, Annapolis GreenScape Program, Anne Arundel County Master Gardeners, Anne Arundel County NAACP, Anne Arundel County Public School System, Anne Arundel County Stewardship Work Group, Anne Arundel County Waste Management Services, Anne Arundel Green Party, Balanced Life Skills, Bates Middle School, Blacks of the Chesapeake Foundation, Chesapeake Bay Foundation, Chesapeake Children's Museum, Clay Street Computer Learning Center, Juvenile Drug Court Program, Maryland Department of Natural Resources, Maryland's Lower Western Shore Tributary Team, Merkle, Inc., Mills-Parole Elementary School, Severn River Association, Single Volunteers of Baltimore and Annapolis, Spa Creek Conservancy, Unitarian Universalist Church of Annapolis, University of Maryland Gemstones, US Fish and Wildlife Service, Chesapeake Bay Field Office, and US Naval Academy Midshipmen.

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Foreword

Why practice conservation landscaping? What is involved and how does it look? Where does one start? Conservation landscaping is a fairly new concept, and many individuals and groups are still learning what the term means, what it looks like when implemented, and how to apply its principles in their landscaping endeavors.

This how-to primer provides an introduction to the latest thinking and techniques on restoring, protecting, and enhancing our yards and community green spaces in the Chesapeake Bay watershed. We have gathered information from several sources, used real-life examples featuring the gardens at the Chesapeake Ecology Center (CEC) as case studies, and compiled lists of additional resources for more detailed information.

Our goal is to provide enough background information and techniques to get people started on putting these landscaping practices into action. Professionals may wish to consult more advanced references for details on the engineering, scientific basis, and philosophy of conservation landscaping.

The CEC gardens in Annapolis, Maryland provide living examples of conservation landscaping. They showcase a range of techniques and types of native plant gardens for educational purposes and for the restoration and protection of Adams Park and the adjacent College Creek.

This primer focuses on rain gardens and xeriscapes (drought tolerant gardens), the predominant types of demonstration gardens at the CEC. These types of conservation gardens and landscapes have a broad appeal because they are aesthetically pleasing, while they restore and protect our yards and community green spaces. Rain gardens are shallow, saucer-shaped ponding areas planted with moisture-loving native plants; while xeriscapes can be flat or mounded areas that tend to be drier and are planted with drought-tolerant native plants. Often, when grading is done to create one of these two types of gardens, it presents conditions for creating the other type. For example, when a shallow depression is made to create a rain garden, the excess soil can be used to create a mounded area, or xeriscape. The native plants listed in the chapters covering rain gardens and xeriscapes—Chapters V and VI—are adapted to the Coastal Plain region; and most are also adapted to the Piedmont Plateau region of the Chesapeake Bay watershed.

How to use this guide

Depending on your current knowledge of conservation landscaping, you can use the various chapters either to start from scratch or take yourself to the next level of understanding of these topics and techniques. We encourage you

to read the entire guide or skip to the parts that are most useful. If you would like to better understand the philosophical background and rationale for this type of landscaping, or if you need inspiration to get involved in this exciting new movement, then be sure to read Chapter I, “A New Garden Ethic and Aesthetic.” In Chapter II you will find information that is specific to the issues in the Chesapeake Bay watershed, and food for thought on the importance of native flora and fauna for the food crops we eat.

If you are already convinced of the need for conservation landscaping and would like to understand the basic principles, go on to Chapter III. When you are ready to get started, consult Chapter IV, “Conservation Landscaping Nuts and Bolts—General Guidelines,” where you will find all you need to start planning your own garden areas. For specific tips and examples on creating rain gardens and xeriscapes, consult Chapter V and VI. If you are working with a school or community group, you will find Chapter VII to be particularly useful. Chapter VIII includes a list and descriptions of commonly used native trees and shrubs. A glossary of conservation terms used in this primer is provided in Chapter IX.

Finally, please consult Chapter X, the Resources section, for valuable additional information and general reference lists, no matter your interest level. We hope you will find in this guide inspiration and information that will help you get started or help you refine and improve your yard or community conservation landscaping project.

Red Chokeberry (*Aronia arbutifolia*)



Overview of the Chesapeake Ecology Center

We have included specific examples, plant lists, and photos from the demonstration gardens at the Chesapeake Ecology Center to illustrate our guide to conservation landscaping. In only a few years, the CEC has become a regional resource for citizens to visit and observe ecoscaping in action.

The Chesapeake Ecology Center began in the fall of 2002 with the installation of the NAACP Freedom Grove Riparian Forest Buffer. The CEC was initially a division of Blacks of the Chesapeake Foundation and incorporated as a non-profit in 2004. The CEC has planted seeds, plugs, and seedlings, and has grown and bloomed into over 18 Native Plant Demonstration Gardens and Sites. Additional gardens are in the works on ten acres of waterfront park land, located just minutes from downtown Annapolis and the State Capital. Its location along the headwaters of College Creek makes the CEC an ideal location to showcase techniques to protect our waterways. The CEC works with groups throughout the Chesapeake Bay watershed, and has a special focus on the College Creek watershed.

Each year, the gardens at the CEC take on more definition. CEC staff, students, teachers, counselors, and countless volunteers install and maintain a range of native plant gardens to show residents of the Chesapeake Bay watershed how to landscape in an environmentally friendly manner. The gardens have many functions. They improve and protect water quality in

the adjacent College Creek. They improve air quality and increase wildlife habitat. Students, teachers, and community members learn conservation landscaping concepts and techniques through hands-on educational activities. The Native Plant Demonstration Gardens and Sites showcase conservation landscaping techniques, designs, wide varieties of native plants, and habitat types in which the public, particularly students, can participate through engaging, interactive learning and tours.

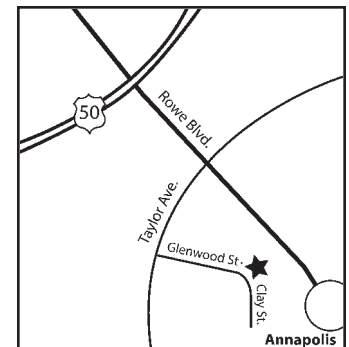
The CEC conducts garden tours and provides on-the-ground environmental education sessions, group and individual instruction, and consultation. The gardens and associated environmental education programs for students and the public promote stewardship of natural resources, bring more human diversity to the environmental arena by partnering with groups in under-served communities, and promote a “sense of place” for the Chesapeake Bay watershed through the use of plants native to the region. We are, in effect, “*ecoscaping back to the future*,” restoring native plant habitats for our present and future environmental health.

In addition to working with numerous community groups, the CEC participates in the Meaningful Bay Experience Program, sponsored by the Chesapeake Bay Trust, through which we are working with Adams Academy at Adams Park Middle School, Bates Middle School, and Mills-Parole Elementary School.

We invite you to visit the gardens in person—located on the grounds of Adams Academy at Adams Park, 245 Clay Street, Annapolis MD 21401 or take a cyberspace tour of the gardens at www.ChesapeakeEcologyCenter.org. Adams Academy is Anne Arundel County’s public middle school for behaviorally-challenged students.

CEC Native Plant Demonstration Gardens:

- NAACP Freedom Grove, a Riparian Forest Buffer (4,320 square feet)
- Watermen’s Garden (600 square feet)
- Woodland Garden (2,112 square feet)
- Butterfly Garden (2,825 square feet)
- Bayscape Garden (2,600 square feet)
- SRA Rock ‘N Rain Garden (1,800 square feet)
- Biolog Rain Garden (2,000 square feet)
- Xeriscape Garden (572 square feet)
- Sweetbay Magnolia Rain Garden (5,000 square feet)
- Nature’s Pharmacy Garden (713 square feet)
- Mothers’ Garden (1,075 square feet)
- Wildlife Habitat Demonstration Site (2,000 square feet)
- Highbush Blueberry Rain Garden (1,185 square feet)
- Compost Demonstration Site (1,045 square feet)
- Native Meadow (1,500 square feet)
- Native Grass Demonstration Garden (528 square feet)
- River Birch Rain Garden (814 square feet)
- Shade Garden—in progress



Directions from route 50 to CEC:

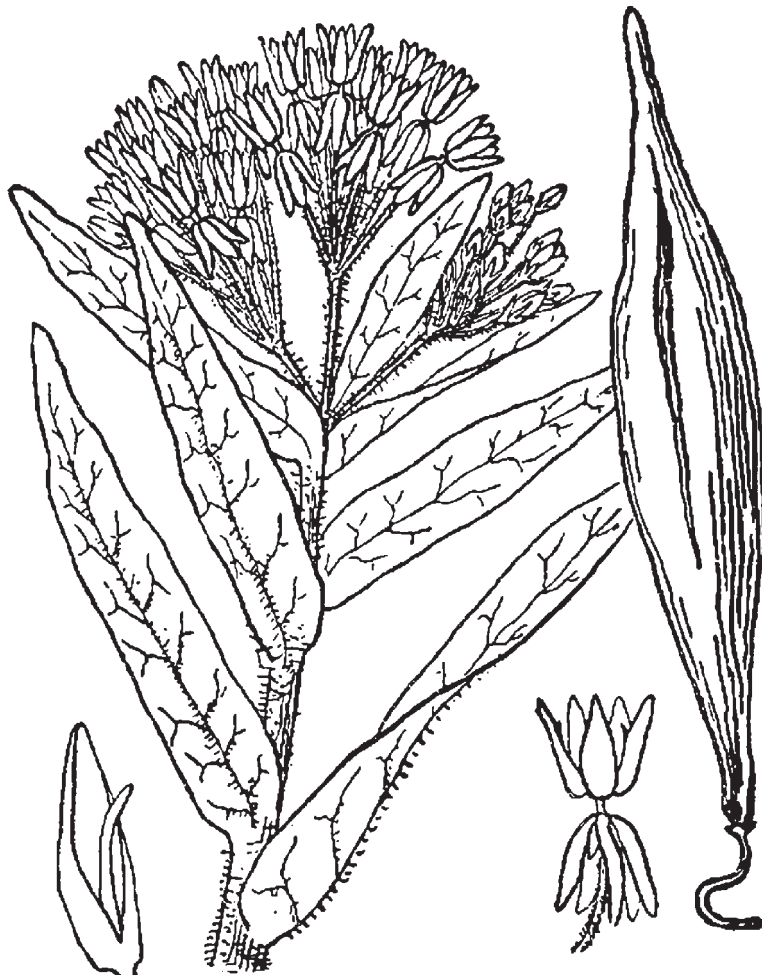
Take Exit 24 Rowe Blvd. toward Annapolis; turn right on Taylor Avenue (just past the Navy-Marine Corps Memorial Stadium); turn left onto Glenwood Street (0.42 miles); Glenwood Street becomes Clay Street; turn left into the parking lot and you’re there!

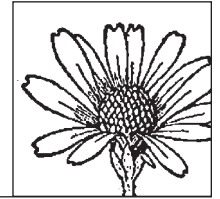
Walking the Talk

*I'd rather see a sermon, than hear one any day,
I'd rather one would walk with me than merely show the way,
The eyes are better pupils and more willing than the ears,
Fine counsel is confusing, but example is always clear,
And the best of all the preachers are men who live their creed,
For to see the good in action is what everybody needs.*

*I can soon learn how to do it if you let me see it done,
I can watch your hands in action, but your tongue too fast may run,
And the lectures you deliver may be very wise and true,
But I'd rather get my lesson by observing what you do,
For I may misunderstand you and the high advice you give,
But there's no misunderstanding in how you act and how you live.*
-Anonymous

Butterfly Milkweed (*Asclepias tuberosa*)





I. A New Garden Ethic and Aesthetic

Gardening is the Number One recreational activity in the U.S., with over 50 percent of Americans gardening in one form or another. The rewards of gardening are rich and varied. It provides an opportunity to create with nature, to grow plants for their beauty, smell, and practical benefits. The outdoor experience allows us to commune with nature, getting our hands dirty while planting, nurturing, growing, observing wildlife, and harvesting and beholding the fruits of our labor. It puts us in close contact with the on-going change, unfolding, and wonder of it all. Gardening is great exercise and gives us the opportunity to obtain essential sunlight (both of which people living in many urban environments lack in sufficient quantities). It is an activity that is accessible to just about everyone whether via your own plot of land, containers, raised beds, or community gardening. Gardening affords many wonderful hands-on lessons about nature's cycles, climatic and soil conditions, designing and working with nature, and, of course, flora and fauna. Aesthetic qualities are some of the greatest attributes of gardening and landscaping. But how often do we consider the environmental impacts and ethics of our gardening and landscaping practices?

The gardener in nature is that most artificial of creatures, a civilized human being: in control of his appetites, solicitous of nature, self-conscious and responsible, mindful of the past and the future, and at ease with the fundamental ambiguity of his predicament—which is that though he lives in nature, he is no longer strictly of nature. —Michael Pollan¹

Land Ethics

In our every deliberation, we must consider the impact of our decisions on the next seven generations.
—from the Great Law of the Iroquois Confederacy

Traditional gardening, landscaping, and landscape maintenance practices are often driven by outdated aesthetic fashion and short-sighted economic interests, with little ethical consideration. As a result, our traditional practices are often quite harmful to our health and the environment in general. A summary of today's current situation is provided by the U.S. Environmental Protection Agency:

The clearing of vast tracts of native woodlands, farmland and other habitats for urban development and the subsequent planting of extensive lawns and exotic ornamental plants that rely heavily on pesticides and mechanical equipment have been negatively impacting the environment and our health. Runoff from fertilizers and pesticides pollute our waters; mechanical lawn mowers and other garden equipment

Beebalm
(*Monarda didyma*)



contribute to air and noise pollution; yard wastes overtax our landfills; and the loss of native habitat, use of pesticides, and introduction of invasive exotic plants cause alarming decline in the numbers of many animal and plant species.²

To bring about a change in consciousness, we need to begin to consider the ethical implications of our actions which are harmful and non-sustainable. In the gardens of our minds and backyards, we can cultivate new standards which support our enlightened awareness. One garden, one yard, or one campus may seem a small area, but if many individuals and groups work toward home, community, and regional greening projects using natural systems as models, our whole country will benefit. By making conscious choices that sustain the quality of our region's landscape, we can all help steer our culture towards identifying more closely with the land and its native plants and wildlife and set an example for other regions to follow.

Our values can motivate us to restore the landscape closer to its origins and create a sustainable future, or not. If we recognize our relationship to the world around us and our responsibility to future generations, we can meet our present needs without compromising the ability of future generations to meet their own. If we embrace an ethic in our country which helps us see humanity as part of a larger community, a community of all living things and systems on the earth, we will feel more obliged to protect the many parts of the ecosystem.

One American writer of the land conservation movement, Aldo Leopold, described this ethic back in the 1940s in his book *A Sand County Almanac*. He wrote that, "The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land." Leopold believed that the most effective way to change people's behavior is to change what they care strongly about. He felt that it was necessary for people not only to use the land, but for them to have love, respect, and admiration for the land. This type of fundamental change in environmental ethics can be achieved through education and example.

One of the most successful ways to help develop love, respect, and admiration for the land is to provide hands-on experiences which nurture those feelings. Participation in planting activities, for example, is as important as experiencing the results. At the CEC we have invited students and faculty to take part in planting the native gardens, and we strive to educate participants on why these activities are so important. Other groups from the community and elsewhere have also benefited from direct experience in planting and maintaining the gardens; and increasing numbers of visitors are learning what native plants and environmentally friendly landscaping is all about from our demonstration gardens and educational materials. More than new concepts, conservation landscaping principles are an illumination of nature's ways and means and a rediscovery of what naturally took place before we degraded the landscape. But how did we get to where we are today in our understanding of best landscaping management practices?

A human being is part of the whole called by us a universe—a part limited in time and space. He experiences himself, his thoughts and his feelings, as something separate from the rest, a kind of optical delusion of his consciousness.

This delusion is a kind of prison for us; it restricts us to our personal decisions and our affections to a few persons nearest to us.

Our task must be to free ourselves from this prison by widening our circle of compassion to embrace all living creatures and the whole of nature in its beauty.
—Albert Einstein, Quoted in H. Eves *Mathematical Circles Adieu*

Preservation and Regionally-Based Restoration

A conservation landscaping ethic has evolved out of the 20th century wilderness preservation ethic, a uniquely American concept. According to Michael Pollan, a well-known author and professor, wilderness is easier to grasp in a country as large and geographically varied as ours; and national trends have tended to favor large, abstract landscape ideas—lawns, monocultures, wildernesses—which can be applied across the board. Such ideas have the power to simplify and unite. However, an ethic based on the garden would give local answers. Unlike the wilderness idea, it would propose different solutions in different places. Because it is location-specific, a garden ethic will never speak as clearly or univocally as the wilderness ethic, but local solutions are essential. The health of a place suffers when we impose practices that are better suited to another place.

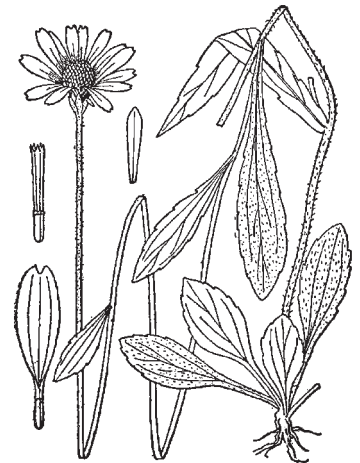
The wilderness ethic, according to Pollan, embodies an “all or nothing,” an “either/or” thinking, and, in fact, we’ve ended up with a landscape in America that conforms to that model remarkably well. In his book *Second Nature: A Gardener’s Education*, Pollan tells us:

Americans have done an admirable job of drawing lines around certain sacred areas (we did invent the wilderness area) and a terrible job of managing the rest of our land. The reason is not hard to find: the only environmental ethic we have has nothing useful to say about those areas outside the line. Once a landscape is no longer “virgin” it is typically written off as fallen, lost to nature, irredeemable. We hand it over to the jurisdiction of that other sacrosanct American ethic: laissez-faire economics. ‘You might as well put up condos.’ And so we do.

Essentially, we have divided our country in two, between the kingdom of wilderness, which rules about 8 percent of America’s land, and the kingdom of the market, which rules the rest. But what do those of us who care about nature do when we’re on the market side, which is most of the time? How do we behave? What are our goals?

We indeed have choices beyond wilderness versus development with largely impervious surfaces including chemically laden lawns. Today’s efforts range from protecting pristine places to restoring home landscapes. “Consult the genius of the place,” is Alexander Pope’s famous advice to landscape designers. Aldo Leopold believed that it is not always enough to conserve the land—that sometimes it is desirable, possible, and necessary for humans to intervene to restore nature. Leopold believed that scientists can learn to restore damaged ecosystems including polluted rivers, dead lakes, vanished prairies, and clear-cut forests. Ecological restoration—and not simply preservation—became the basis for a new land ethic. Taken a step further, regionally appropriate ecological restoration, using native plants, has significantly increased over the last decade and a half.

Orange Coneflower
(*Rudbeckia fulgida*)



A thing is right when it tends to preserve the integrity, stability and beauty of the biotic community.
—Aldo Leopold, *A Sand County Almanac*

Nature versus Culture

The human race is challenged more than ever before to demonstrate our mastery—not over nature, but of ourselves. –Rachel Carson

In *Noah's Garden*, Sara Stein advises, “Horticulture told me to cultivate the soil to control the weeds; botany told me that the more the soil is disturbed, the more weeds grow.” A host of cultural landscaping fashions, including tilling, staking trees, the use of chemical fertilizers and pesticides, and the predominance of turf, are actually the antithesis of the best environmental landscaping practices. Notably, turf continues to be popularized by builders, who love lawn because it is cheap to install (its costly maintenance is not their concern); and it is the default solution that homeowners have been conditioned to expect. Other landscaping methods, such as trees, shrubs, groundcovers, planting beds, rain gardens, xeriscapes, and meadows, may be more work up front. However, they are usually less costly and less time-consuming to maintain than turf, and they provide much greater environmental benefits and sustainability.

If the Earth does grow inhospitable toward human presence, it is primarily because we have lost our sense of courtesy toward the Earth and its inhabitants, our sense of gratitude, our willingness to recognize the sacred character of habitat, our capacity for the awesome, for the numinous quality of every earthly reality.

–Thomas Berry, *The Dream of Earth*

Lawns are the most predominant form of landscaping in America. In little more than a century, we have rolled a green carpet across the continent. It is also the most resource-consuming and polluting form of landscaping. According to the Lawn Institute, America has some 50,000 square miles of lawn under cultivation, on which we spend an estimated \$30 billion a year. Our aesthetic sensibilities are conditioned to expect bland lawns as the norm, which fits well with our monoculture of fast-food chains, big box stores, interstate highways, and television.

While gardening can be an infinitely variable process of creativity and discovery, lawns are a cookie-cutter, paint-by-number form of landscaping. Heavily managed turf grass is akin to nature purged of the natural cycle of reproduction and death—such lawns rarely flower, set seed, or die. We have a deep urge in our culture to subjugate nature, and mowing our lawns responds to that need. Lush, green, compacted lawns that we have been acculturated to believe are the norm and desirable, are almost as bad as impervious surfaces in causing rapid stormwater runoff. They are often too full of toxic chemicals, devoid of biological diversity—necessary for our survival—and require huge amounts of water and other resources and investment in upkeep.

Landscape architect Larry Weaner tells us, “In an attempt to attain the perfect lawn, Americans are using enormous quantities of water, fertilizer, herbicides, pesticides and fossil fuels to make grass grow more vigorously, then spending time and money on a weekly basis to keep it short.” No doubt mowed lawns will persist, and limited amounts of environmentally managed lawns aren't necessarily harmful. However, lawn as our standard, primary default solution is an out-dated product of our culture. We can now work to bring our landscapes into the 21st century.

The usual American alternatives seem to consist of either “paving over paradise and putting up a parking lot,”³ creating excessive impervious surfaces, including lawn (which can be up to 90 percent impervious), or sealing it away in a preserve to protect the “sacred 8 per cent.” Now more than ever, we need to learn how to use nature without damaging it, to find a middle ground that provides for our needs and desires without diminishing nature. Larry Weaner advises, “We have a responsibility to treat the land as more than our personal paint canvas. The landscape designer should be part artist and part repairman, restoring some of the aesthetic qualities and environmental functions of the native landscape that have been destroyed.” At the CEC we have tried to show that there are attractive, practical alternatives to the traditional lawn-and-lollipop-shrub landscaping with exotics which has proven to be such a detriment to the environment.

There is value in preserving wilderness, but there is equal value in restoring the suburbs and cities where most of us live to something closer to balance—for our children’s sake and the sake of all the other species around us. –William Cullina⁴

A New 21st Century Garden Aesthetic

A new garden aesthetic is on the move in this country, and it brings changes for the better. Conservation landscaping can have a different look than that which most city and suburban gardeners have been taught to accept. The differences can be subtle to dramatic, depending on your choices, but using these techniques will help heal our landscape. If you do nothing else in your garden but refuse to plant alien invasives, you will have done a great service to the land. If you remove as many invasives as possible from the landscape, all the better. (See the section in Chapter III, “Avoid the use of and remove/replace invasive plants.”) Better still, practice conservation landscaping by installing, for example, rain gardens, xeriscapes, meadows, woodland gardens, hedgerows, and forest buffers.

Conservation landscaping or environmentally-friendly landscaping is also sometimes referred to as BayScaping, Bay-wise landscaping, or ecoscaping. All of these terms refer to a set of gardening and landscaping practices which help protect and improve the Chesapeake Bay, its associated lands, and tributary waters. By practicing conservation landscaping, we can improve air and water quality and the health of humans and wildlife while reducing landscape maintenance costs and decreasing the time spent on yard chores such as mowing. At the same time, we will be emphasizing the beauty of our unique regional landscape.

Our aesthetic sensibilities are very much conditioned by the culture in which we live; and our cultural fashions can have great environmental impacts. Typically, yards in America are not places for experiencing, but for viewing. We can choose to create yards that are not only visually

One of the penalties of an ecological education is that one lives alone in a world of wounds. Much of the damage inflicted on land is quite invisible to laymen. An ecologist must either harden his shell and make believe that the consequences of science are none of his business, or he must be the doctor who sees the marks of death in a community that believes itself well and does not want to be told otherwise.
–Aldo Leopold,
Round River

For some years I've embraced the theory that an urbanly correct expanse of perfect lawn, whether chemically or organically maintained, is pretty darn boring. It is a wasted opportunity for discovery, experimentation and joy. I've been gradually making my small space into a habitat for birds, butterflies and other small critters. —Sara Stein, *Noah's Garden*

appealing but are also healthier and more interesting to use. Reducing turf grass is a simple way to make your yard more ecologically sound. People are beginning to recognize and accept that yards need not look like putting greens and that a well-landscaped yard can include a diversity of herbaceous plants, shrubs, and trees and still be very beautiful. By using a wide variety of native plants, you will have more seasonal interest and less damage from pests and diseases. Planting sites more densely in layers of differing heights, results in better water retention, greater air and water quality benefits, and increased wildlife habitat.

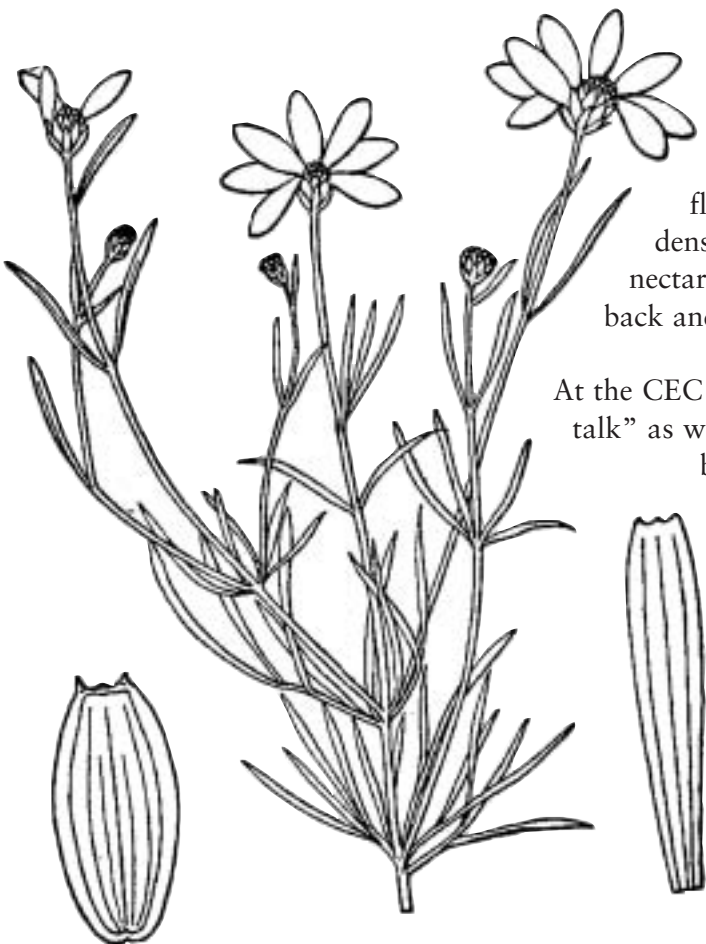
The use of native plants helps to develop a “sense of place” and a pride in what is truly local to our region. Whether they are viewing plants in a meadow speckled with foxglove beardtongue and goldenrod, or a redbud or dogwood tree in bloom, most people don't have a good idea of which plants are original to this area. Many are pleasantly surprised to find that natives are quite aesthetically pleasing. Knowledge of plants native to the locale can help members of the community nurture a “sense of place” and a feeling of belonging to a vibrant and beautiful watershed.

In addition to adding great beauty to a landscape, trees and shrubs are very efficient at absorbing excess water and nutrients from stormwater runoff, cleaning the air, and providing erosion control. They also provide energy conservation and cooling. For example, air temperature is up to 25% cooler under shade trees.

For many, the best reason to plant native plants is that they will attract wildlife to watch and enjoy. Nothing quite matches the sights and sounds of a flock of birds enjoying seeds or berries in our gardens or the view of a butterfly or hummingbird sipping nectar from native flowers. Plant native plants, then sit back and watch what will appear!

At the CEC we strive to “walk the talk” and not just “talk the talk” as we work with students and the public to demonstrate both aesthetic and ethical conservation landscaping practices. The history of a piece of land can frequently be tied to the plants growing, or not growing, on it. We like to think of environmentally-friendly landscaping as “ecoscaping back to

Whorled Tickseed (*Coreopsis verticillata*)



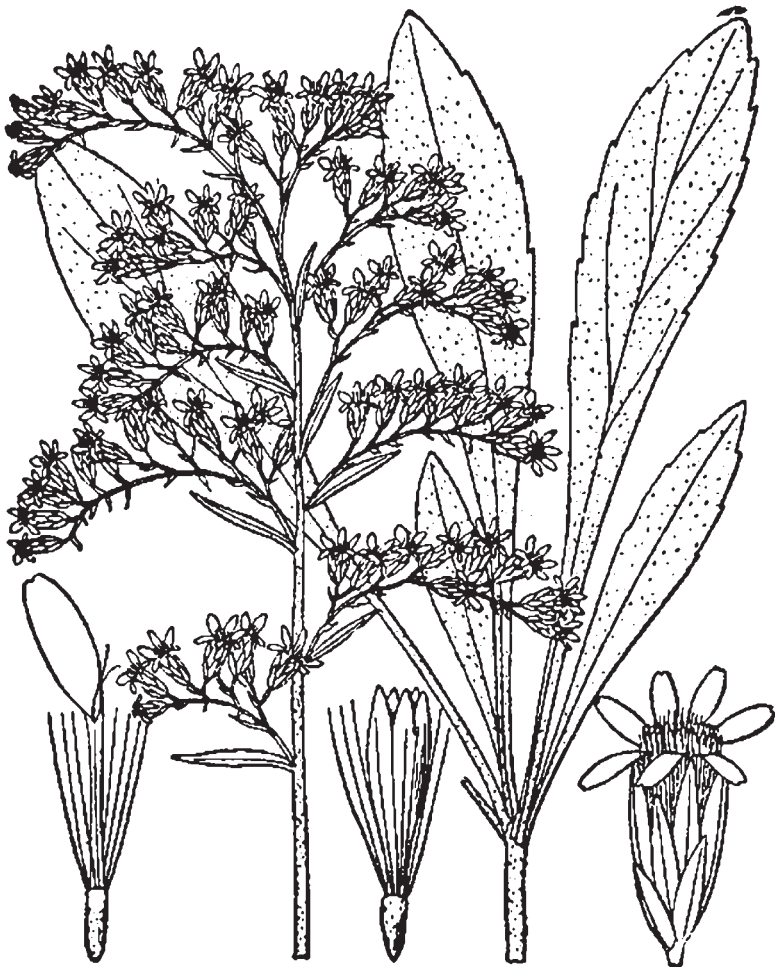
the future.” When we try to recreate historically accurate plant communities on a parcel of land, we are striving to restore an approximation of both the plant *and* the animal systems that once existed in the area. The future of our ecosystems depends on our success at being able to not only protect them, but also to restore them where possible.

With open minds and concern for the environment, we can begin to discern the genius of our own little places and how we might begin to devise styles of gardening and landscaping that will suit us, the local wildlife, and this country. Perhaps in our gardens we can discover fresh ways to bring our aesthetics and our ethics about the land into meaningful alignment.

One of the happiest things that can befall us is to love the land we live in.
–Lady Bird Johnson

The key to intelligent tinkering is to keep all the parts. –Aldo Leopold

The name for the genus containing goldenrods is *Solidago*. This comes from the Latin word *solido* meaning “to make whole or heal.” The origin is probably due to medicinal uses early peoples made of goldenrods, but it seems symbolic that we are now using the goldenrod, and other natives, to help heal the land and make it whole again.



Gray Goldenrod
(*Solidago nemoralis*)



II. Necessity of the Native Flora and Fauna of the Chesapeake Bay Watershed

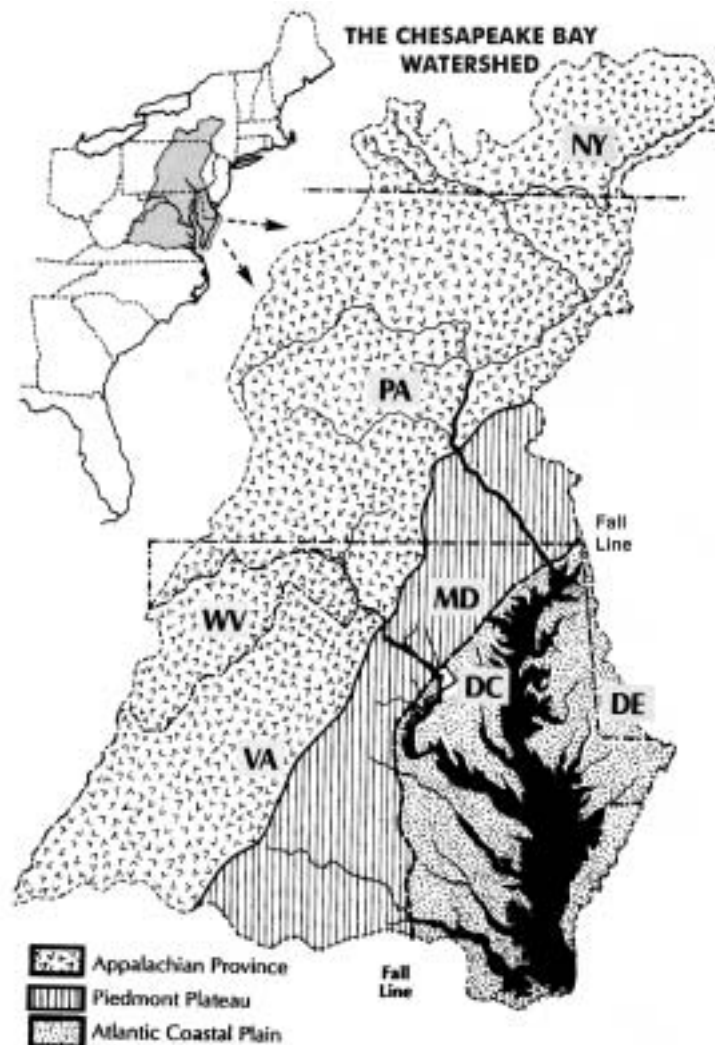
THE PROBLEM

Every eight months, nearly 11 million gallons of oil run off our streets and drive-ways into our waters—the equivalent of the Exxon Valdez oil spill. —Pew Ocean Commission, 2003, *America's Living Oceans*

With increased development, deforestation, loss of habitat, and monocultures of lawn grasses, the Chesapeake Bay watershed has lost much of the diversity and genetic heritage of its native plants. —Chesapeake Bay Foundation website

The Chesapeake Bay is the largest estuary in North America. A watershed is all the land areas that drain to a particular body of water. “The Bay is fed by fifty major tributaries that drain 64,000 square miles of land, the Bay’s watershed. This watershed includes the District of Columbia, and parts of Maryland, Virginia, Pennsylvania, New York, Delaware, and West Virginia.” —US Fish and Wildlife Service, Chesapeake Bay Field Office, *Bay•B•C's*

Chesapeake Bay watershed showing the physiographic regions created by the geologic history of the area. Source: Chesapeake Bay Program website www.chesapeakebay.net.



The population of the Chesapeake Bay watershed is expected to expand from about 16 million to an estimated 19 million or more people by 2030. This increasing population and its accompanying development results in increased impervious surfaces that produce more runoff, much of which is piped into waterways. The increased runoff arrives at a faster rate which often causes flooding and at a warmer temperature which is hard on aquatic life. It is often full of toxic chemicals and other pollutants. It also means less water trickling down to groundwater supplies.

Sediment and nutrients in runoff fill waterways and smother plant and animal life. Sediment coats and buries submerged aquatic vegetation (SAV) in the Bay, frequently killing it. SAV provides fish and wildlife with food and shelter, filters out pollutants, and absorbs nutrients that wash into the water. Waterfowl, blue crabs, and young rockfish (striped bass) use SAV beds for food and habitat. Sediment not only impacts animal life and SAV, it also creates huge public and private expense to dredge it out of waterways to allow boat passage.

With ever increasing amounts of impervious surfaces and hence stormwater runoff, more and more harmful pollutants are being washed into our waterways where they enter the food chain and bio-accumulate in seafood. As fish and wildlife populations decline, so do associated revenues. Algae blooms rob water of oxygen vital to the survival of most aquatic life, killing large numbers of fish and other aquatic life in the Bay and its tributaries. Nutrients, such as nitrogen and phosphorus, contribute to algae blooms and other problems; and these obvious signs of degraded water quality reduce the safety and appeal of boating, swimming, and other recreational opportunities and reduce their associated revenues.

THE SOLUTION

Human Health and Economic Benefits of Native Plants and Native Wildlife

Aside from all of the excellent reasons for planting native plants, such as their beauty, low maintenance, and promotion of a sense of place, native plants should be the norm in the landscape for a host of very pragmatic reasons. **A wide diversity of native plants and wildlife is absolutely essential, not only to our health, but to our survival.** One of the most vital reasons is that native plants provide valuable pollinators with food and places to reproduce. We need these pollinators to help us produce food crops.

Many examples of the close relationship of plants and animals exist in this geographic area, such as the host-plant relationship between various butterflies and the plants on which their caterpillars must feed. The monarch butterfly is famous for its dependence on milkweed; and the Maryland state insect—the Baltimore checkerspot butterfly—must lay her eggs on one of only a few select plants, including turtleheads; and the zebra swal-

No one has the right to use America's rivers and America's waterways, that belong to all the people, as a sewer. The banks of a river may belong to one man or one industry or one state, but the waters which flow between the banks should belong to all the people.
—President Lyndon B. Johnson, upon signing the Clean Water Act of 1965

Woodland Sunflower
(*Helianthus divaricatus*)



lowtail butterfly feeds almost exclusively on pawpaw trees during its larval (caterpillar) stage. Examples of native milkweed, turtlehead, and pawpaw can be seen at the Chesapeake Ecology Center. As with the classic monarch butterfly and milkweed example, native insects and other pollinators have developed complex relationships with numerous plant species, so that they depend on them for the survival of healthy populations.

The next time you bite into your lunch, think about this. According to the Johns Hopkins Bloomberg School of Public Health, experts calculate that “over 90 percent of all flowering plants and over 75 percent of food crops require fertilization by animal pollinators in order to produce fruit and seed.” The domestic honeybee population is in decline, due to several factors, including pesticide use.⁵ Therefore, we now need to depend, even more than at other times in history, on the benefits of native pollinator animals to help provide the foods we eat.

If humanity survives to look back on the 20th century, future historians will regard the mass extinction of plant and animal species, now under way, as the development with the most lasting consequences for us. –Jared M. Diamond, Professor of Physiology, University of California

The NBII (National Biological Information Infrastructure, part of the U.S. Geological Survey) reports, for example, that “More than half the world’s diet of fats and oils comes from oilseed crops. Many of these, including cotton, oil palm, canola, and sunflowers, are pollinated by animals.” Without pollination, these plants would not produce the viable seeds or plant parts on which we rely so heavily. Now add the grains, fruits, vegetables, fibers, and other products which need pollinators, and you get a picture of their essential role in our lives.

Our food supply and many products we use are dependent on animals, including the native bees, wasps, butterflies, moths, beetles, flies, birds, bats, and other pollinators. Native plants provide habitat requirements which make them essential for many of these animals.⁶

Native plants also attract a variety of wildlife species which help with the control of mosquitoes, flies, and other annoying and disease-causing insects. With the arrival of West Nile virus, and the existence of many other mosquito-borne illnesses, the public health value of natural controls for mosquitoes is significant. Many types of birds eat flying insects like mosquitoes; and wildlife such as bats, dragonflies, frogs, toads, and others help control them as well. Creating and restoring native habitat areas helps to attract these useful animals and keep them near to where we live, so that they can do the job of reducing nuisance insects around our homes. Reducing or eliminating pesticide use also helps protect and enhance populations of birds, amphibians, and other animals.

Another pragmatic argument for landscaping with native plants, especially as an alternative to lawn only, is that it can increase property values. According to the National Wildlife Federation, planting even a few trees in a yard adds to its potential value. Property owners have also found that a thoughtfully landscaped yard with low-maintenance native plants can be a big selling point.

Although many people agree that there is an intrinsic value to supporting native plants and wildlife, and many wish to enjoy the pleasure of seeing birds and butterflies and other wildlife close to where they live and work, there are documented economic reasons to support these populations as well.

In 2001, close to 22 million people took trips for the purpose of watching non-game wildlife. They spent \$8.2 billion on travel related expenses, including \$4.8 billion on food and lodging. Most of these, 18 million Americans, took trips for the express purpose of watching wild birds. The total amount spent that year on travel, equipment, and related supplies and materials to observe wildlife is estimated at \$38.4 billion. This includes participation by 31 percent of the adult population over the age of 16, or 66.1 million people.⁷

A final self-serving reason to protect and restore wildlife habitat in our landscapes is that the decline of certain species can be seen as a harbinger of the decline of an entire ecosystem. The status of wildlife as “canaries in a coal mine” indicators of trouble ahead for us should not be underestimated. If, on the other hand, we can maintain populations of local wildlife by landscaping with native plants, providing enough diverse habitats, and eliminating or greatly reducing the use of toxic chemicals, we can be fairly certain that our health will be better protected as well. Rachel Carson’s book *Silent Spring* was a startling wake up call regarding the importance to humanity of caring for our environment and deciding what we really want to put, or not put, into it. Her example of pesticide use (especially DDT which causes bird eggs to break) potentially causing a “silent” spring with no bird song, caused many people to think hard about how we want to treat our world.

WHAT YOU CAN DO

Conservation landscaping can be a positive solution to lessen the impacts of development. As an alternative to outdated, damaging cultural fashions in landscaping, try these methods to begin restoring and protecting your own backyard and our Chesapeake Bay watershed. As Dr. Maya Angelou tells us, “We did what we knew; when we knew better, we did better.” Imagine the difference it would make if we all did what we now know is the better thing to do.

Principles of Conservation Landscaping are summarized here and examined in greater detail in the following chapter.

- Avoid the use of and remove and replace invasive plants.
- Use regionally native plants.
- Place plants in appropriate growing conditions.
- Minimize the use of supplemental watering.
- Minimize the amount of lawn.
- Reduce or eliminate the use of chemical fertilizers and pesticides.

We are at a turning point. We can reshape our economic and political systems based on how nature works, or nature will do the job for us with an unprecedented and unnecessary increase in human misery and loss of life.
–G. Tyler Miller, *Living in the Environment*

- Compost to reduce yard waste and to use as a soil amendment.
- Reduce the use of power landscape equipment.
- Utilize native trees to reduce heating and cooling needs.
- Purify the air and water by planting native trees, shrubs, and perennials.
- Reduce the amount of impervious surface and install rain gardens to recharge groundwater and reduce runoff.
- Reduce runoff and soil erosion and stabilize slopes by planting native trees, shrubs, and perennial ground covers in swales and on terraces, in addition to level and raised areas.
- Provide wildlife habitat by planting native species.
- Mulch to conserve water, suppress weeds, improve soil structure, and to lessen erosion.
- Learn to appreciate nature and tolerate some imperfection in the garden.
- Protect existing natural areas and the watershed's "sense of place."
- Maintain native plant gardens and plan for the long term.

When we plant a tree, we are planting ourselves. Releasing dolphins back to the wild, we are ourselves returning home. Composting leftovers, we are being reborn as irises and apples...we can know the activity of the world as not separate from who we are but rather of what we are.

—Joan Halifax, *Faces of Compassion*

Conservation landscaping—using native plants, removing invasive plants, conserving water, eliminating or reducing chemical fertilizers and pesticides to reduce pollution and conserve resources, shaping the ground for better infiltration and to control erosion, and enhancing aesthetics and wildlife habitat—is beginning to be implemented on a regional basis nationwide.

Tips to Benefit Wildlife

Local wildlife, such as birds, insects, and mammals are critically dependent on native plant communities. The value of native plants to wildlife cannot be over-emphasized. The plants that evolved here over thousands of years are associated closely with the native animals and other simple forms of life, such as fungi and invertebrates, which evolved together with them. This means that native plants support the inner workings of the whole ecosystem, if we give them the chance.

A few simple changes in how we landscape can make a big difference to wildlife species. Consider these tips for increasing the wildlife-friendly character of your yard, campus, or public space.

- Plant native plants appropriate to the soils for your site: wet, dry, salty.
- Plant a variety of trees, shrubs, grasses and other herbaceous plants for food, shelter, nesting, and habitat.
- Provide clean water sources for as much of the year as possible. We often think of providing food for wildlife, however, water can be an even more critical need.
- Choose plants that will grow to varying heights to reproduce overstory, understory, and herbaceous layers found in nature.
- Reduce or eliminate deadheading of flowers. Although meticulous gardeners tend to remove some types of flower heads to force them to bloom again and cut back grasses, consider leaving them intact until late winter or early spring. Leaving plants uncut over the winter provides seeds, shelter, and nesting sites for wildlife.

- Leave logs and snags (standing dead trees), as long as safety allows, for habitat.
- Provide brush piles of fallen branches, rock piles, and evergreen shrubs and trees for cover.
- Consider adding nesting boxes and bird feeding stations if they can be properly maintained.
- Add plants that provide winter food.
- Plant native plants with berries and other fruits such as blueberry, blackberry, black chokeberry, winterberry, American holly, dogwoods, pawpaw, persimmon, sumacs, inkberry, cranberry.
- Plant native plants that produce nuts, such as oaks, hickories, American beech, and American hazelnut.
- Plant composites and grasses with seeds enjoyed by wildlife, such as switchgrass, broomsedge, orange coneflower, and other composite flowers.
- Plant nectar flowers for pollinators like butterflies, bees, and hummingbirds. (Hummingbirds especially like red and orange flowers such as cardinal flower, native honeysuckle, wild columbine, and trumpet vine.)
- Include host plants for caterpillars, such as turtlehead (Baltimore checkerspot butterfly), milkweed (monarch butterfly), and pawpaw (zebra swallowtail butterfly).
- Consider planting a series of early-, mid-, and late-season bloomers to provide nectar, and then fruit and seed, throughout the year.
- Consider leaving a sandy patch unplanted, in which solitary bees may nest.
- Don't plant the exotic butterfly bush (*Buddleia sp.*) which is spreading to wild areas by seeds.
- Avoid the use of pesticides, which often kill much more than the intended pests.

Looking at anything, we can see the nature of interbeing. A self is not possible without non-self elements. Looking deeply at any one thing, we see the whole cosmos. The one is made of the many.

–Thich Nhat Hanh, *The Heart of Understanding: Commentaries on the Prajnaparamita Heart Sutra*



Black Chokeberry
(*Photinia melanocarpa*)



III. Principles of Conservation Landscaping

The following principles detail some of the most important considerations for conservation landscaping. The more of these principles you can incorporate into your landscaping projects, the better off the Chesapeake Bay watershed and all of its living elements will be.

■ *Avoid the use of and remove and replace invasive plants*

Although we encourage planting as many local native plants as possible, it isn't necessary to remove all plants that are non-native. Some people choose to plant a favorite plant from elsewhere, or a cultivar that they just have to have. If the plant is known not to be invasive, this shouldn't be a problem.

Most invasive plants are "exotics." That is, they have been brought here from another ecosystem, frequently from another continent. That often means that they arrived here with few or no natural enemies to control them and hold down their numbers. Those that get completely out of control cause huge problems to wildlife and the plants they displace, agriculture, and the livelihood of many people. Sometimes people have deliberately imported these plants as an ornamental or to provide some particular presumed benefit, like kudzu, which was supposed to help control erosion. Sometimes the plants are brought in accidentally with nursery stock or with other items shipped from elsewhere. Either way, if these aliens find an environment with insufficient checks and balances, then their populations may spread like wildfire.

Some invasive species, such as bamboo have vigorous growth habits that, if unchecked, can quickly overwhelm a landscape. Beware of planting invasives such as English ivy, purple loosestrife, butterfly bush, Norway maple, or Bradford pear. These can actually still be purchased at nurseries, despite their known bad habits. (See Chapter X "Resources" for additional sources of information on invasive species.)

■ *Use regionally native plants*

Native plants are species that are indigenous to a specific region, for example, the Chesapeake Bay watershed. They are adapted to the local soil and climate. As people moved from the Old World to the Americas, they brought exotic plants, and frequently changed the landscapes to resemble those that they knew in Europe and elsewhere. The result of the tendency to try to reproduce plants and plant arrangements from other countries is that thousands of acres of turf grass and many alien invasive species have been introduced.

The problem [of invasive species] has become so severe that the federal government has finally written laws and established committees to help find ways to eradicate some of the most aggressive species. In addition, federal regulations now call for the use of native plants in landscaping projects on federal and public property.

–Windstar Institute

Native plant benefits include:

- Best adapted to local conditions, for example, no need to use chemical fertilizers.
- Water conservation, that is, once plants are established in the right place, no need for supplemental watering.
- Reduced maintenance over the long run. While native plants are not maintenance-free, if they are placed in the landscape based on their preferred conditions, they require less care than non-native species.
- Won't harm natural areas, e.g., won't become invasive.
- High habitat value provides food, shelter, and nesting areas for wildlife.
- Great variety of species for all conditions.
- Create a “sense of place.”

(A list of local native plant sources is included in Chapter X “Resources.”)

■ *Place plants in appropriate growing conditions*

It is important to select the appropriate plants for existing light, soil, and moisture conditions. Some plants prefer dry soil, others prefer moist soil, while some can handle a range of conditions from dry to moist.

There are many good references on the growing conditions preferred by specific plants. Evaluate your site and select plants that will work well for the given conditions. Successful gardeners know that the old adage, “right plant, right place” will save you time, energy, and money. Moreover, your plants will be healthier, and more resistant to diseases, pests, and other problems—without the need for added fertilizer or pesticides. If a plant is not happy, and is doing poorly in a particular location, try moving it.

■ *Minimize the use of supplemental watering*

- 30% to 60% of urban freshwater is used for watering lawns (depending on locale).⁸
- A 1,000 square foot lawn requires 10,000 gallons of water per summer to maintain a “green” look.⁹

A tremendous amount of water applied to lawns and gardens is never absorbed by the plants and put to use. The greatest waste of water is applying too much too often, resulting in runoff. In addition to over-watering plants, excess irrigation leaches nutrients from the soil. Runoff caused by excess watering can carry polluting fertilizers and pesticides to streams, rivers, and the Bay. Water is also wasted through evaporation. In general, if you have to water, it is best done early in the morning to conserve water for your plants, yet still allow the water to evaporate from leaves and avoid promoting diseases for plants prone to such problems. The beauty of using native plants is that once they are established in the landscape (which can take approximately two months for herbaceous perennials), they shouldn't need supplemental watering.

There are many invasive plants you would not consider planting in your garden that have become a particular nuisance, such as Tree of Heaven (*Ailanthus*). *Ailanthus*, Norway maple, and other invasive trees are even capable of preventing other plants from growing around them. Control of *Ailanthus*, *Phragmites* or common reed, and purple loosestrife is particularly difficult, so please consult sources such as those listed in the Resources section for assistance in eradicating these tough plants.

Water waste and excessive plant and weed growth can be reduced by providing water only when needed and only where the landscape requires moisture. Recent advances in irrigation technology allow for precise delivery of water with very little waste. Drip irrigation systems and micro-emitters are cost-effective when evaluated against rising water costs. The real benefit of these systems is that the water is used only for growing the plants desired, while helping prevent nutrient-consuming and waste-generating weed growth in other areas.

Rain water running off buildings can also be conserved and used in roof collection systems such as rain barrels and cisterns attached to drip irrigation lines, or mitigated by the use of “green” vegetated roofs.

■ *Minimize the amount of lawn*

Although lawns can prevent erosion better than bare soil, most other types of landscape plantings provide more benefits to the environment than does a lawn. Many lawns have become very compacted, too full of toxic chemicals, and a drain on our time, energy, and financial resources. They can be almost as bad as impervious surfaces in causing rapid runoff. For example, a thick, green lawn can be up to 90 percent impervious according to the US Environmental Protection Agency.

In most cities and suburbs, lawns are the most prominent type of vegetation. Lawns are also the most resource-consuming, as well as polluting form of landscaping. Americans spend over \$30 billion annually on lawn care. Lawns consume more supplemental water, fertilizer, and pesticides than any other type of landscaping. Although lawns become stressed during periods of drought, most lawns receive twice the water they require for a healthy appearance. Less frequent, deep watering of lawns is best. Reducing the size of lawns and using common sense to maintain them will reduce the quantity of water and other inputs needed.

An emerald green carpet may seem desirable, but at what cost? That emerald carpet is difficult to sustain without the application of numerous chemicals and large amounts of water. Children, pets, and the environment especially stand to gain health benefits from reduced amounts of lawn and more responsible lawn care. Determine the minimum amount of lawn you absolutely need for recreation or other purposes, and then eliminate the excess. Consider some of the many beneficial alternatives presented in this guide. These will provide you, your family, and the environment with better solutions.

■ *Reduce or eliminate the use of chemical fertilizers and pesticides*

- 80,000,000 pounds of synthetic pesticides are used on U.S. lawns each year.¹⁰
- When pesticides are regularly applied, 60-90% of earthworms are killed. Earthworms are invaluable for soil health.¹¹
- Over 100 million tons of fertilizers are applied to residential lawns and gardens annually.¹²

Grass is the cheapest plant to install and the most expensive to maintain. –Pat Howell, landscape designer

Before using fertilizer in your landscape, it is important to test the soil to see if it actually needs amending. A laboratory will give you detailed results and suggestions on amendments, and simple kits from a gardening store will give you a rough idea about certain nutrients. Don't add fertilizer if you don't need it. It will not be used by the plants and could cause significant problems as it runs off into the nearby waters. Algae blooms and fish kills are caused by too much fertilizer running off lawns and other landscapes.

Commercial fertilizer is costly and is frequently made from petroleum products. If you choose to amend your soil, after testing it, try to use organic fertilizers, slow release products, or compost. Remember that if you "grass-cycle" or leave clippings on your lawn, it will reduce the additional nitrogen requirements by 25%. Make sure no fertilizer remains on driveways or sidewalks, where it will wash into surface waters via storm-drains. If your lawn is unhealthy due to poor soil structure, compacting, slopes, poor drainage, pests, disease, improper pH, or shade, adding fertilizer will not help. If you have a lawn that you believe needs to be fertilized, we suggest you contact your local Cooperative Extension for suggestions on grass types and fertilizer requirements.

Pesticides, like fertilizers, should only be used as a last resort. If used improperly, they can be very dangerous to your health and the health of the surrounding environment. They can kill other things besides the intended species, such as worms, beneficial insects, birds, and other animals. They frequently make pest problems worse, because they tend to eliminate the beneficial insects which are trying to take care of the problem. Pest populations frequently recover faster from a pesticide application than the "good guy" insects who help keep them in check. This makes for a vicious cycle of dependence on chemicals to try to control a worsening problem.

Instead, try using integrated pest management (IPM). This technique entails simple preventative measures and using the least dangerous chemicals only if necessary, such as insecticidal soaps and oils. Using native plants that are adapted to the region and the specific site, and resistant to local diseases and pests, is the best approach. A wide diversity of native plants will attract many beneficial insects to your garden and may be all you need to keep pests in check. Using barriers, traps, and vigilant hand removal of pests can also help. The simplest aspect of IPM is accepting that a certain amount of damage will be done by pests. Having tolerance will help gardeners not to panic and apply pesticides where they are unneeded and problematic. Given overall healthy conditions, many problems are self-correcting.

Most chemical pesticides represent a very crude form of knowledge about insects.... Even though this knowledge has been produced by Homo sapiens wearing lab coats, it is not nearly as sophisticated or precise as the knowledge a ladybug, say, possesses on the subject of aphids. The ladybug is not smart, but she knows one thing exceedingly well: how to catch forty or fifty aphids every day without hurting anybody else. If you think

Little Bluestem
(*Schizachyrium
scoparium*)



Many insects are actually beneficial to your garden and landscape plants. Bees, flies, wasps, ladybugs, and lacewings are great at controlling pests and/or pollinating flowers. Planting native nectar sources enables many of these insects to maintain populations that will help you control the pests in your garden. Plants in the composite (sunflower) family, like asters, coneflowers, and Joe-Pye weed, are excellent nectar sources, as are those in the mint family, like spotted mint and goldenrod. Those in the carrot family can also help beneficial insects; but most of these we encounter are non-native, such as parsley, dill, and Queen Anne's lace.

If the only thing that moves in your backyard is a lawnmower, it's time to plant natives. —Joy Buslaff, "The Smart Lawn/Native Grasses, Reel Mowers, Sharpening," *Wild Ones newsletter*

of evolution as a three-and-a-half-billion-year-long laboratory experiment, and the gene pool as the store of information accumulated during the course of that experiment, you begin to appreciate that nature has far more extensive knowledge about her operations than we do. The trick is to put her knowledge to our purpose in the garden. —Michael Pollan

■ *Compost to reduce yard waste and to use as a soil amendment*

Composting is the natural process of decomposition and recycling of organic material. Nature's recycling system is efficient, completing the cycle-of-life process. Leaves that fall to the forest floor form a moist mulch layer that protects the roots of plants and provides a home for nature's recyclers—bacteria, insects, and worms that feed on the mulch, turning it into compost. As the mulch decomposes, nutrients essential to plant growth are released into the soil and are absorbed through plant roots.

Compost contributes to good soil structure, which allows soil to retain nutrients, moisture, and oxygen for long periods of time. When we remove yard waste from the landscape where it was produced, we deprive plants of their own natural fertilizing source. Like the natural composting process in the forest, we can create compost in our yards and gardens by placing yard waste in a suitable spot in bins or piles. (See Chapter IV for composting instructions.)

Yard waste alone accounts for approximately 18 to 20 percent of municipal solid waste, and during peak seasons, can account for 25 to 50 percent (US Environmental Protection Agency). Backyard composting saves valuable landfill space. It also saves taxpayers the additional costs to collect, haul, and manage yard waste.

■ *Reduce the use of power landscape equipment*

- Gas powered garden tools emit 5% of the nation's air pollution.¹³
- The average homeowner spends 40 hours per year, the equivalent to a one-week vacation, mowing the lawn.¹⁴

We have choices about how we spend our time and money, use our energy resources, and impact our air quality. Given the above statistics, gas-powered lawn care may not be how you choose to use your resources. Consider lawn reduction, electric tools, and hand tools as alternatives. Have you ever seen someone using a large gas-powered lawn mower on a 10 foot x 10 foot postage-stamp size lawn?

One of the most wonderful side benefits to reducing turf grass in your yard is the reduction in noise pollution. Turf grass maintenance is not only costly and time-consuming, but it often entails the use of rather noisy equipment. Anyone who has heard the many-decibel onslaught from a neighbor or lawn company mowing or leaf-blowing their way across the

lawn knows how disturbing the noise can be. The impacts in terms of stress, hearing impairment, and the disturbing of wildlife have not been adequately considered in many areas. Some communities have begun to regulate the use of such equipment, including which hours of the day they are allowed to be used and limits on decibel levels.

■ *Utilize native trees to reduce heating and cooling needs*

Another way to reduce energy use, besides reducing power equipment on the lawn, is to enhance the beauty and energy-efficiency of a home or other building by thoughtfully planting trees and shrubs in appropriate places.

- Evergreen trees on the north side will shield buildings from winter winds. By breaking the wind, such trees will reduce your heating costs in winter.
- Deciduous trees on the south and west side will provide shade in summer, reducing summer air conditioning costs. For example, air temperature is up to 25% cooler under trees; while deciduous trees allow the sun to warm buildings in the winter. Because such trees will drop their leaves in winter, they won't deprive your home of sunlight when you need it. Remember to check on the final height trees will attain before planting to anticipate the possibility of interfering with power lines, roofs, etc.
- Shrubs used as foundation plantings can reduce heating costs, creating an insulating, dead air space around the home. Plant the shrubs a few feet away from the building foundation.

■ *Purify the air and water by planting native trees, shrubs, and perennials*

Forest buffers, rain gardens, and other conservation plantings provide many water quality benefits, including reduction of stormwater runoff, water purification, water cooling, and groundwater recharge. Another great benefit of such plantings is the improvement of air quality. Air pollution is a particular concern in the Chesapeake Bay region, since some of the worst levels in the nation have been found here.

American Forests lists the following air quality benefits of trees, for example: "Air pollution in our cities, and even our suburbs, is a serious concern as we enter the twenty-first century. The burning of fossil fuels has introduced a steady flow of deadly pollutants into our atmosphere, yet very few urban areas can meet national clean air standards. Luckily, we are surrounded by efficient air cleaning machines—trees. Trees sequester many pollutants from the atmosphere, including nitrogen dioxide (NO₂), sulfur dioxide (SO₂), ozone (O₃), carbon monoxide (CO), and particulate matter of ten microns or less (PM10)."¹⁵

Trees, shrubs, and other perennials, especially when planted in layers, can provide advantages besides direct air pollution removal. Evapotranspiration—the process of drawing water up through the roots and plant and evaporating it from the leaves—cools surrounding air temperatures. Their shade can also

Serviceberry
(*Amelanchier canadensis*)



help cool local temperatures in urban areas, which can reduce ground-level ozone formation. This helps reduce smog and the “heat island effect.”¹⁶

■ ***Reduce the amount of impervious surface and install rain gardens to recharge groundwater and reduce runoff***

Impervious surfaces, such as paved areas, roofs, and other structures which do not allow water to infiltrate into the ground, cause great problems for nearby waterways. Impervious surfaces cause runoff to be rapid, carrying pollution and overheated water to our streams and rivers. Thoughtful design of buildings, roads, paths, and parking areas, and choosing alternatives to traditional paving methods can help reduce the amount and improve the quality of water that reaches our waterways.

There are various innovative paving materials now available which will allow water to pass through them instead of running off. Using pervious pavers, gravel, and other more permeable materials in parking areas and driveways can help with this process. Paths made of mulch, or with brick or stone pavers set in sand or mulch, instead of cement, may permit more water to pass through into the ground. These methods help reduce the problems of flooding, water pollution, and groundwater depletion prevalent in areas with too much impervious surface. Rain gardens, rain barrels, and green roofs are also techniques to reduce the impact of too much impervious surface. (See Chapter V for detailed information on rain gardens.)

■ ***Reduce runoff and soil erosion and stabilize slopes by planting native trees, shrubs, and perennial ground covers in swales and on terraces, in addition to level and raised areas.***

Reducing stormwater runoff, erosion, flooding, and sediment buildup is a major benefit of practicing conservation landscaping techniques in the Chesapeake Bay watershed. Turf grass tends to form a partially impervious barrier to water flow; while shrubs, trees, and other types of gardens improve the ability of water to filter down and recharge groundwater supplies. The more water that is held in land areas, that is not rushing down to swell streams and rivers, the less flooding we will have.

A simple way to help slow and purify stormwater runoff is to create swales, instead of berms or isolated “islands” in parking lots and other areas of impervious surface. A swale is simply a depression in the ground, not separated from rain water runoff by a curb or other obstruction. A swale can contain vegetation and act as a type of rain garden—a saucer-shaped depression—or bioretention area. Shaping the land in this fashion imitates nature by creating contours throughout the land. The human tendency is to level the landscape, not understanding the environmental

Virginia Wild Rye
(*Elymus virginicus*)



impact of this type of grading. Rain gardens have the added benefits of reducing flooding and increasing groundwater supplies. Many people get their water from underground aquifers. The replenishment of groundwater—which is particularly important in times of drought—depends upon the absorption of rainwater into the ground.

Stabilizing slopes is also important for reducing erosion. If you have tried to grow grass on them, you know that steep slopes are not always easy to plant and maintain in lawn. There are many native plant alternatives which will do well on slopes and require much less maintenance. Reducing or eliminating mowing on a steep slope can be a huge time savings and safety advantage as well. Try native groundcovers, trees, or shrubs instead. Terracing can also help to stabilize slopes, reduce rain water runoff, and provide more manageable planting beds.

■ *Provide wildlife habitat by planting native species*

Water, food, shelter (including nesting spots), and space to live out their lives in a fairly undisturbed way are the basic things all animals need. The more of these elements we can provide in our suburban and urban landscapes, the better off wildlife will be. If we provide a diversity of habitats which include native plants, and few if any pesticides, more of the locally-evolved species will be able to coexist with us.

We are not talking about attracting wolves and elk, which were in the area in ancient times. We are, instead, hoping to attract small creatures that you will enjoy observing occasionally, if you are lucky. The most common will likely be birds, from robins and mockingbirds, to hummingbirds and hawks. There may also be small mammals like raccoons, opossums, foxes, and field mice. If you are outside a lot, you may get to see the occasional reptile, like a small snake or turtle. Amphibians like toads, frogs, and salamanders will be around if there is water nearby where they can lay eggs. Insects and other pollinating invertebrates will be attracted if you plant wildflowers and other native plants. There is nothing like a garden full of butterflies to put a smile on a wildlife gardener's face. (See Chapter II for more information on the importance of local wildlife.)

■ *Mulch to conserve water, suppress weeds, improve soil structure, and to lessen erosion*

Mulch is an organic or inorganic layer of nonliving material covering the soil surface around plants. The benefits of organic mulch, such as shredded leaves or pine are manifold:

- Helps to hold soil in place and minimizes erosion.
- Minimizes evaporation and retains moisture for plants, allowing considerable water savings and reduced maintenance, especially during dry spells.
- Keeps soil cool in the summer and warm in the winter, maintaining a more uniform soil temperature, which can improve plant growth.

Butterflies add another dimension in the garden for they are like dream flowers—childhood dreams—which have broken loose from their stalk and escaped into the sunshine. Air and angels. This is the way I look upon their presence—not as a professional entomologist, any more than I look upon roses as a botanist might.
—Miriam Rothschild,
The Butterfly Garden

Nature understands her business better than we do.
–Michel de Montaigne, French essayist

- Provides protective cover until plants mature (be careful not to bury seedlings).
- Decomposes naturally to add nutrients and organic matter to soil.
- Helps suppress weed growth, which can significantly reduce maintenance.
- Enhances the aesthetics of a landscape design—a great top dressing that provides instant impact.

Avoid the use of too much mulch. Because mulch has so many benefits, some folks imagine “if a little is good, then a lot must be better” and create mulch volcanoes around trees. This type of excessive mulching creates unhealthy conditions. (See Chapter IV for additional information.)

■ *Learn to appreciate nature and tolerate some imperfection in the garden*

When trying to restore natural landscapes, remember that nature doesn't design in straight lines, nor in lollipop shrubbery row arrangements. Adding curves to the landscaping beds and pathways, planting in “drifts” instead of rows, and avoiding drastically-pruned shrubs will add to the “natural” look of your gardens.

As noted in the section on reducing pesticides, learning to tolerate a bit of insect damage or a few dandelions in the lawn, for example, is part of the aesthetic in conservation landscaping. A better understanding of the lawn or garden as part of a larger ecosystem, will result in little or no fertilizer and/or pesticide use. Try to discover exactly what type of organism is causing the blemish on your plant, and see if you can outwit it with gentle means. If not, show tolerance if possible.

■ *Protect existing natural areas and the watershed's “sense of place”*

Just like doctors try to “first do no harm” to their patients, conservation landscapers must try to protect intact natural areas. In other words, if there are functioning natural systems on or near your property, try to protect and enhance them; but certainly don't damage them with your efforts. If possible, add buffers around them to extend the wildlife habitat they provide.

Another pitfall to avoid, is the temptation to dig up wild plants to expand a native plant garden. Sometimes a plant is locally or regionally rare and your removal of one or a few plants could endanger or wipe out the local population. Unless you have special permission from a landowner to remove native plants on a construction site where they will be destroyed, you should rely on reputable nurseries for your plants. Be sure that they have propagated their plants from nursery stock or from plants legally rescued from the wild.

Native plants are key to establishing a “sense of place” for the region. Our pride in what is local and historically unique should include the indigenous

Because our actions are so closely linked to the health of the Chesapeake Bay, stewardship of the land and water by ordinary citizens is our most effective tool for the Bay's restoration. There is much that we can do to help the Bay regain its historical elegance. What better place to begin than your own backyard?
–Chesapeake Bay Program, *Better Backyard*

plants. Our children—and landscapers—should be taught which plants form the unique flora that was here before people arrived from around the world, bringing exotic plants with them. The more we include native plants in public and private locations, the more residents will begin to recognize and admire their intrinsic beauty.

One of the most wonderful human benefits of planting native plants, is the opportunity to discover a keen “sense of place” regarding what types of plants developed and belong here. Each region is unique in its combination of soil, climate, and other conditions which influence what can grow there successfully. Wouldn’t it be wonderful if the same enthusiasm we show for the local sports teams or for our home town could be shown for the plants that are native to that area? Native plant gardens can help provide that pride in things local and precious. The more we plant and publicize native plants, the more people will recognize their beauty, their value, and the important role they play in the local ecosystem.

■ *Maintain native plant gardens and plan for the long term*

It’s hard to imagine the American landscape without St. John’s wort, daisies, dandelions, crabgrass, timothy, clover, pigweed, lamb’s-quarters, buttercup, mullein, Queen Anne’s lace, plantain, or yarrow, but not one of these species grew here before the Puritans landed. America in fact had few indigenous weeds, for the simple reason that it had little disturbed ground. The Indians lived so lightly on the land that they created few habitats for weeds to take hold in. No plow, no bindweed. –Michael Pollan

Disturbing the soil—creating a haven for weeds—obliges us to maintain it. Develop a regular garden care and maintenance schedule for your garden. Like other types of gardens, the initial needs of native plant gardens will be watering to help plants become established, and weeding to keep down the competition. Take heart; if you maintain your landscape, the amount of weeding needed should lessen each year as more and more weeds are removed and the disturbed area stabilizes. Adding mulch once or twice a year may also be needed since organic mulch (which is the best kind) breaks down over time. Plants may need to be moved, replaced, and thinned as they grow, spread, or die. Figuring out who will complete these tasks for the long term is just as important as the planting of the garden.

Long term planning is essential before installing trees and shrubs, which should be thoughtfully located in the landscape due to their long life, possible substantial size, and the resulting effects they create in the landscape. Many variables exist that may influence your installation and maintenance plans, including time, available help, budget, and season. It may not be feasible to turn the property into a conservation landscape overnight. You may need to install your planting plan in stages and plan for long-term improvements, phased in over time. Remember, maintenance will be ongoing. Conservation landscapes are living, dynamic ecosystems that evolve and are ever changing.

The garden is a love song, a duet between a human being and Mother Nature.

–Jeff Cox, *Creating a Garden for the Senses*

Indiangrass
(*Sorghastrum nutans*)





IV. Conservation Landscaping Nuts and Bolts— General Guidelines

The supreme accomplishment is to blur the line between work and play.
—Arnold Toynbee, British Historian

Gardening is an educational process that lasts a lifetime. Its diploma consists of a green thumb, a happy heart and a permanently enlarged soul. If you're ready for an advanced degree, Mother Nature is anxious to teach. Her class is always in session. —Author Unknown

WHERE TO BEGIN?

“Plan your work, then work your plan” is a familiar saying and good advice that bears repeating, especially to gardeners. Alexander Pope wrote, “All gardening is landscape painting.” Before you begin your masterpiece, reduce it to paper. When developing your design, consider such matters as site conditions, your own tastes, your impacts on the landscape, and how to improve same. It’s been said, “Thoughtful preparation will pay more dividends than a wheelbarrow full of fertilizer.” So remember, plan your work, then work your plants.

OBTAINING AND CREATING A SITE MAP

When starting on your home landscape or community project, it is important to first obtain or create a map of the site as it currently exists so that you will know what you have to work with. This will enable you to plan appropriately and to minimize unnecessary work, expense, and other problems. You can use a copy of a tax map, a topographic map of the area, or survey of the property; or you can create your own site map by taking measurements of the area. Transfer the measurements onto a piece of graph paper to produce a scale base map. The scale of landscape maps and drawings are usually 1/4 inch equals one foot, 1/8 inch equals one foot, or 1/16 inch equals one foot.

Then add to your scale base map permanent features that exist on the site, such as buildings, accessory structures, walkways, lights, water sources, utility right-of-ways (sewer, septic, water, etc.), and existing beneficial plants. Remember to consistently use the same symbols throughout the drawing; for example, use one symbol per type of plant. Feel free to make up symbols or copy ones you have seen on plans (there are no set standards). Add a reference key to indicate what the symbols stand for.

A good way to unleash your creative energy and not worry about your drawing ability or unnecessarily redrawing your scale base map is to create an overlay map, which can be created on tracing paper placed over the

Nature to be commanded, must be obeyed.
—Francis Bacon,
philosopher
(1561-1626)

base map. Scale overlay maps are good for creative experimentation as well as indicating, for example, drainage problem areas or existing microclimates. Areas of shade, surface depressions with moist soil, wind tunnels or slopes can form a microclimate worth noting on your map.

GATHERING INPUT

With maps of your site in hand, gather input from observation and discussion with family members, school or group members, and others sharing the landscape. Take time to walk through the landscape several times to study it and recognize the possibilities for the site. Give yourself time and enjoy the creative process.

Site considerations:

- Climate
- Topography
- Soil type (moist, wet, dry, loam, clay, sand, acid, or alkaline).
- Light conditions for planting areas (full sun, or full to partial shade).
- Water sources, including access to water for newly installed plants.
- Existing vegetation and animals, including insects.
- Past land use (e.g., debris may have been landfilled in an area).
- Human-made structures (buildings, decks, patios, sidewalks, fences, utility rights-of-way, etc.).
- Traffic patterns of people in vehicles and on foot, including sports and play areas; traffic patterns of wildlife.

Some of the questions you may consider are:

What are the practical uses of the site? What about service areas, for example, garbage cans, work space, clotheslines, and storage? Is recreation space for people as well as pets needed? Will portions of the current landscape be retained? What species of wildlife do you want to attract to the landscape? Will there be a vegetable garden? How will maintenance be handled? Are there local ordinances to consider?

Now is also a good time to take a soil sample of the areas to be planted. A soil test kit can be obtained from your local county extension office (check the blue pages of your telephone directory), or from garden supply centers. Knowing the soil characteristics of the designated planting areas is important to select appropriate plants for the site.

Remember, the evaluation process will be ongoing, just as a garden is a growing, living thing and is never complete. As well, nature may decide—independent of your ideas—to edit your landscape. With these considerations in mind, sketch out your desired results. Modify your plans and ideas as needed.

In the naturalistic garden, the site is king. It determines both the form and content of the garden. Topography determines the shape and even the placement of walks and paths, the lines of massed shrubs or trees, the form of beds of herbaceous plants. —Hal Bruce, curator of plants at Winterthur

Green-and-Gold
(*Chrysogonum virginianum*)



DEVELOPING A GARDEN DESIGN

I have never had so many good ideas day after day as when I work in the garden. –John Erskine

Conservation landscape design is the arrangement of plants, water features, stone, accessory features, and the working with or creating of contours in a landscape to enhance it for our use, enjoyment, wildlife needs, and the overall health of the environment. A good design will unify the landscape as a whole.

...if the planting of site-appropriate native woodland species on the perimeters of suburban properties became commonplace, a series of continuous woodland corridors would be created, connecting existing isolated fragments of native forest badly in need of ecological interaction. The positive ecological impact of this would be quite significant, while the aesthetic advantages of suburban landscape in visual harmony with our native American forest would be easily apparent. Additional privacy would be a bonus. –Larry Weaner, landscape architect

A good starting place in developing your design is to take or collect photographs of the natural areas that inspire you. Use these for ideas to change your traditional landscape into one that is more environmentally friendly. Photos can provide helpful design ideas for your project. Also, it is very instructive to take before, intermediate, and after photos of your landscape project.

After gathering input, you are ready to begin designing your garden. There is more than one approach to landscape design; however, imitating nature's designs—arrangements, patterns, colors, and textures found in nature—can provide the best results. The following guidelines will facilitate the design process.

Basic principles of design to keep in mind:

- You may find it helpful to begin with the shape of your design. Consider a variety of curvilinear forms. For example, create a sun-shaped area for a raised xeriscape (drought tolerant) planting bed. Work with or create contours in the landscape, for example, swales for rain gardens. For a naturalistic garden effect, remember that nature tends to design in curves, rather than straight lines.
- Consider emphasizing natural features in your yard, such as existing trees, swales, and depressions, to create a rain garden or a pond, or dry areas to create a xeriscape garden.
- Place plants in appropriate growing conditions. Vegetation will grow and thrive if you plant the right plant in the right place. For example, a plant that requires dry soil and sun won't thrive in a wet, shady location, and vice versa. Know the site conditions and research the plants you wish to use.
- Research your plants to become familiar with their mature size; leaf structure; bloom color, shape, time of year, and duration; wildlife benefits; and look throughout the season, such as whether selected plants are evergreen or not.
- Plant in drifts (massing of like plants). For example, drifts of the same plant strategically located within a meadow (which is a varied mixture of native grasses and wildflowers) can create dramatic effects.
- Consider the needs of wildlife—water, food, shelter, and space—the ingredients necessary in the landscape to support and attract wildlife. A

wide variety of plants in the landscape will attract the most species by providing these necessary elements. The spatial arrangement of food, water and cover is important, both to attract wildlife and to decrease competition among species. When planning your habitat garden, connect planting beds to create wildlife corridors where possible. Corridors provide areas in which wildlife can safely travel to meet their needs.

- Consider layering your plant arrangements. For example, create a gradual transition from grasses and wildflowers to shrubs to under-story trees to canopy trees for a more natural look and greater wildlife benefits. Varied layers provide a range of light, temperature, food, nesting, and hiding areas for wildlife.
- Plan your garden with seasonal changes in mind. For example, in addition to spring-blooming plants, consider four-season gardening by adding summer- and fall-blooming plants, as well as plants that have winter interest.
- Even a small garden can benefit from adding a path. Paths help direct traffic, facilitate maintenance of the garden, and can enhance the design and use of the garden. Consider the traffic flow through the property. You can direct people where you want them to go, or not go, by your path placement; but also take notice of the paths people naturally create. It generally works better to go with the flow. Various types of mulch make a good surface for paths; and don't forget to control weeds by adding an underlying layer of weed-blocker fabric, newspaper, or cardboard.

CREATE A GARDEN PLAN

Take your site map—keeping the principles of design in mind—and sketch in the location of plants, paths, and other elements for the entire site. This will also help you phase in the project in stages if you can't accomplish it all at once. Use either tracing paper and pencil, or grease pencil and clear plastic. Place the tracing paper or plastic over the base map. Begin by designating the human elements to include from your input-gathering exercise, such as recreation areas or a vegetable garden; then begin defining shapes, placing trees, shrubs, and herbaceous perennials, stone, and special features. Sketch possible natural elements you wish to enhance, such as a swale for a rain garden. As you add plants to your sketch, remember to use consistent symbols and make a reference chart for the symbols.

SITE PREPARATION

Site preparation varies widely depending on circumstances. It can be quick and simple, especially if you have the help of heavy machinery such as a bobcat, or it can sometimes take more time and effort than planting the garden. Before you dig in any area, it is critically important that you call Miss Utility (1-800-257-7777, from 7 AM to 5 PM unless it is an emergency, in MD, DE, and DC) no less than (and preferably more than) two business days ahead to locate any underground service lines or utilities that may be located where you intend to plant. Miss Utility will make all of the arrangements with utility, cable, and phone companies to mark designated

Paths lead us to the center, converging, reestablishing the familiar. Paths lead us away, far from the familiar, into adventure, into change. A good path is irresistible.

—Mary McCoy

Foxglove Beardtongue
(*Penstemon digitalis*)



areas with different colored paint (which will last through a few rainfalls) to indicate whatever utilities may happen to be in the planting area. Their automated phone system is easy to use and explains the color coding. If you don't see any markings after making arrangements with Miss Utility, you should double check with them to be sure there are no lines in the designated planting areas. Planting where lines are located is not prohibited, but you are required to dig by hand in these areas. Use caution; you don't want to accidentally dig up your phone line, and there may be restrictions to activities in rights-of-way.

In some cases, you will need to clear the area of turf and debris. Check the soil for obstructions such as asphalt, large rocks, or problematic soil texture (e.g., heavy clay or excessive compaction). Turf grass can be removed by hand, with a sod cutter or bobcat, or it will need to be covered for a few months until it is fully dead. If your planting date is a few months away, a convenient way to eliminate turf is to smother it by covering it with either cardboard or layers of newspaper. Add a 3- to 4-inch layer of wood chips or shredded pine mulch on top of either paper product to help hold it in place and create a planting bed (be sure to completely cover all of the grass). In approximately four or more months the vegetation will have died and the cardboard or newspaper will be decomposed enough to easily plant through it.

Babylon died because
its soil died.
—*The Nashville
Tennessean*

SOIL

Soil is made up of sand, silt, clay (which are large, medium, and very small rock particles, respectively), and organic matter, in varying proportions. If there is too much clay or silt, the soil tends to become compacted, making it difficult for air, water and roots to penetrate; while too much sand compromises the soil's ability to retain water and nutrients. Good, workable garden soil consists of airy crumbs in which particles of sand, silt, and clay are held together by decayed organic matter. The organic matter is the decomposed remains of once living things that now provide nutrients for growing plants, as well as improve the structure and texture of the soil.

Soils vary in "pH" rating (the acidity or alkalinity of soil), fertility, and drainage. A pH of 7.0 is neutral. Below 7.0 is acid, and above 7.0 is alkaline. Generally, it is best to install a garden suitable to the conditions you already have. However, plant selection may be limited if your site has very sandy soil, heavy clay, compacted soil, or extreme soil pH (below 5.5 or above 6.8). In these cases, you may want to seek expert advice. Determine the kind of soil you are working with by testing the soil where you plan to install your garden. Do a physical examination of the soil texture and density. Dig down about 6 inches to where the roots will be growing, and pick up a chunk of soil and squeeze it in your hand. If it sticks together and can be squeezed into a long ribbon, it may be heavy with clay which may need to be amended with compost. Classic garden soil has a relatively even mix-

ture of sand, silt, and clay, with a bit less of the clay than the other two. Fortunately, many native plants are able to survive in a range of soil textures. Figure out what type of soil you have, and try to match it with the plants that will do well there.

Soil is often damaged through compaction and excessive use of fertilizers. A well drained soil—generally defined as soil that can absorb 1/2 inch of water or more per hour—creates a good environment for native plants to develop deep roots and take advantage of deep water and nutrients. In the long run this makes for healthy, steady growth. You can test your soil’s infiltration rate by digging a hole 1 foot wide and 1 foot deep; next, pour a bucket of water into it and see how long it takes to soak in. If 1/2 inch or more of water absorbs within an hour, drainage should be adequate. If it takes much longer than that, you may need to amend the soil to improve infiltration.

If needed, the addition of the proper soil amendment can either help soil drain faster or slower. Well composted organic material is an ideal amendment that can improve soil containing too much sand or clay. Compost improves soil texture and fertility by supplying organic matter. It provides a source of slow release nutrients for plants which encourages healthy, balanced growth, thereby reducing disease and pests as well as pruning maintenance. Composting also makes great use of excess yard waste. (See the section on Composting below and Chapter X, “Resources,” for more sources of information on composting.)

Tilling is often unnecessary and can stir up dormant weed seeds. However, if amending the soil is necessary to effectively enhance soil properties, thoroughly blend either compost, topsoil, sand, or combinations of two or three amendments into the planting bed to improve drainage and promote even growth. In the case of rain gardens, if your soil is sandy, simply mix in compost to prepare for planting. If your soil is clay, you may need to remove and replace it with a recommended mixture of 50-60% sand, 20-30% topsoil, and 20-30% compost. (Hint: Don’t worry about exact ratios. Proportions may vary based on the heaviness of the clay).

Amend the soil only if necessary. If you are landscaping with native plants, this step may not be necessary. Remember, native plants are adapted to local soil conditions (provided the local soil has not been significantly degraded or changed). Many native plants prefer not to have soil that is too rich.

Once planted, the garden should be dressed with a layer of composted mulch such as shredded or chipped pine to a 2- to 3-inch depth.

At the CEC, we have installed several large native plant gardens throughout the ten acres, and amended the soil in only one garden—the SRA Rock ‘N Rain Garden.

We have conducted several soil tests on the grounds of the Chesapeake Ecology Center, and have averaged a pH of 5 or 6. A great deal of top soil was apparently added to the grounds in the 1950s. A foot deep (or more) layer lies over the land-filled remains of a small African-American housing community that once existed on the 10-acre site. While the top layer of soil is loamy, loose and well-drained, it appears that in some areas there exists a hard clay layer, and rubble (some of which is of historical significance) below the topsoil layer.

CHOOSING AND PURCHASING PLANTS

To develop a feasible garden design it is important to select the appropriate plants for the conditions of your site. Take time to research which plants are native to your area and will be appropriate for your site conditions. You may want to check online to find nurseries that sell native plants (see Chapter X, “Resources,” for native plant suppliers near you), and then take your plan to a nursery to seek their advice. It helps to have some flexibility in your plan since certain species may not be readily available.

Select plants with consideration to: their mature size and shape; leaf appearance; whether they are evergreen or deciduous; bloom structure, color, time of year, and length; seasonal interest; wildlife value; and features such as erosion control and other restoration landscaping values (some of which are covered in the following two chapters). When installing landscapes, common mistakes include planting young trees and shrubs, which will eventually become large, too close to the house or other structures, and planting trees, shrubs, and herbaceous perennials too close together. Consider the mature height of selected plants and how their size will affect your view. Some prairie perennials can grow ten feet tall, which may or may not be a feature you want to include.

The jargon of any profession can be provoking to anyone who feels excluded by it. A botanical description is so packed with trade terms of Greek and Latin derivation that most gardeners feel repulsed. Yet the jargon is an essential shorthand to prevent it [from] becoming impossibly long-winded.

–Hugh Johnson,
*Hugh Johnson's
Gardening Companion*

A word about those pesky Latin plant names

Gardeners not trained in biology are often thrown off by the "scientific" Latin names for plants. They are, however, very useful for figuring out exactly what plant you are talking about. Think of them as a "first name" and a "last name," which correspond to the genus and species. Using them allows you to discuss a particular plant with a nursery, another gardener, or someone from another part of the world, with certainty that you are talking about the same plant.

However, names change: “Taxonomists seem to love to mess with plant names. Now that plants can be identified right down to their chromosomes, many have turned out to be something other than they [were] thought to be. Just when you get proud of yourself for remembering the name of sweet autumn clematis, *Clematis paniculata*; it gets changed to *C. maximowicziana*, and there is word that this plant may get another name change.” –Ken Druse, *The Collector's Garden*

Often the species name is descriptive of the plant in some way, and sometimes the Latin or Greek root gives you a clue in remembering the name. The species name may describe the plant's color, shape, growth habit, or even a place name like *americana* or *canadensis*. For example, *Acer rubrum*, is red maple. The maples belong to the genus *Acer*; and this species is *rubrum*, Latin for red. Sugar maple is *Acer saccharum*, with *saccharum* from the Greek word for sugar.

Here is some advice on four areas of plant buying:

1) HOW MANY PLANTS TO BUY:

Most perennials are planted 1- to 3-feet on center. Determine the number of plants needed by first measuring the areas where each type of plant will be installed. Use the following formula for guidelines on how many plants to buy. Consider adding 10% to account for some attrition, or start by spacing plants slightly closer together for appearance. You can thin most perennials later, however, large shrubs and trees are not as easy to move.

Use this simple formula to calculate the number of plants needed for your design:

A = Area to be planted (total square feet)

D = Distance plants are spaced apart in feet

N = Number of plants needed

Distance plants are to be spaced apart guidelines:

- For perennials, use D = 2 feet (use 1.5 feet for slow spreaders, 3 feet for faster spreaders)
- For shrubs, use D = 5- to 7-feet (based on mature size)
- For a mixture of trees and shrubs, use D = 10 feet for a naturalistic planting
- For ornamental trees, use D = crown spread

Formula: $A \div D^2 = N$

For example: If you decide to plant an entire 100 square foot area with perennials that are spaced 2 feet apart, then you will need 25 plants, or $100 \text{ feet} \div 4 \text{ (2 feet squared)} = 25$.

2) WHAT COMMON CATALOG SYMBOLS MEAN:

Not all nurseries use the same symbols for plant needs. Be sure to check the catalog. Many use symbols like those below quoted from *Native Plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*, by Britt E. Slattery, Kathryn Reshetiloff, and Susan M. Zwicker, published by the US Fish and Wildlife Service, Chesapeake Bay Field Office.

LIGHT: The amount of sunlight a plant requires is defined as: 1) Full sun (Su), the site is in direct sunlight for at least six hours a day during the growing season; 2) Partial shade (PS), the site receives approximately three to six hours of direct sunlight; and 3) Shade (Sh), the site receives less than three hours of direct sunlight or filtered light.

MOISTURE: The amount of soil moisture a plant requires is defined as: (1) Wet (W), areas where the soil is saturated for much of the growing season, except in droughts. Many of the plants designated for wet areas tolerate specific ranges of water depths. Consult a wetland plant specialist or

How fair is a garden
amid the toils and
passions of existence.
–Sir Benjamin Disraeli,
British Prime Minister,
novelist

American Holly
(*Ilex opaca*)



reference book; (2) Moist (M), areas where the soil is damp, and may be occasionally saturated (“average soil” has been included in this category); and (3) Dry (D), areas where water does not remain after a rain. The latter areas may be in full sun or in a windy location, on a steep slope, or have sandy soil. Plants in this category are drought tolerant and appropriate for a xeriscape garden (see Chapter VI).

3) *WHAT SIZE PLANTS TO BUY:*

The following information is contributed by Dr. Sara Tangren, Chesapeake Natives:

Short of Aphrodite, there is nothing lovelier on this planet than a flower, nor more essential than a plant. The true matrix of human life is the greensward covering mother earth. Without green plants we would neither breathe nor eat. On the undersurface of every leaf a million movable lips are engaged in devouring carbon dioxide and expelling oxygen. All together, 25 million square miles of leaf surface are daily engaged in this miracle of photosynthesis, producing oxygen and food for man and beast.

—Peter Tompkins and Christopher Bird, *The Secret Life Of Plants*

“Herbaceous plants are sold in gallon pots (the most expensive), quart pots, as bare root pieces, as seedling plugs, or as seeds (the least expensive). Gallon pots don’t really contain a gallon of soil. They are about 7.5 inches in diameter. Similarly, quart pots contain a bit less than a quart of soil and are about 4 inches wide and are square. Potted plants are ideal for projects where instant visual impact is required. Bare root plants are simply divisions of dormant mature plants. They are called “bare” because they have been removed from the soil. Bare root plants are available from many wholesale nurseries. Depending on which nursery you buy them from, they may come packed in plastic bags, packed in peat moss (a non-renewable resource made by mining living peat bogs), or packed in flats and covered with soil.

“Although bare root plants are affordable, plants packed in plastic bags must be kept out of the sun at all times, and preferably refrigerated until planting. If they are kept too long they will mold and die. “Flats” are 11 inch by 20 inch black plastic rectangles shaped much like a large sheet cake pan. Bare root plants packed in soil inside of flats can be treated much like potted plants, and if kept in the shade and kept moist they will last for weeks or even a few months. Bare root plants should only be used for projects being planted during the dormant season, roughly Thanksgiving to tax day.

“Seedling plugs usually come in sets planted into a molded black plastic tray that looks something like an 11 inch x 20 inch ice cube tray. The number in a tray will depend on the type of tray but typically vary from as few as 48 to as many as 288. Seedling plugs can also be treated like potted plants, but because the “pots” are so tiny (from less than 1/4 inch diameter to 2 inch diameter) they dry out quickly. Most species of seedling will die if allowed to dry out. Seedling plugs may need to be watered daily. Seedling plugs are an especially good buy for species that grow quickly and flower in the first year. They are ideal for colonizing large areas where potted plants would make a project too expensive, or for stabilizing soils where seed would take too long. Ideally seedlings are not planted in the heat of summer unless irrigation is available.

“Seed is the most economical way to plant large areas like wildflower meadows and stormwater management pond banks. Native seed does best if planted in the fall. It is imperative that the ground be well prepared and free of weed seed, or the native seedlings will be difficult to find and care for. Typically, preparation for sowing involves a year of spraying with Round Up or Plateau prior to the planting date. Native seed is sold in packets, ounces, and pounds.”

To plant a garden is to believe in tomorrow.
—Anonymous

While planting from seed is the most economical way to establish a garden, a low-cost way to obtain plant stock is to buy seedling plugs, which can be purchased from various sources for \$1 each. Bare root herbaceous perennials can be obtained from a number of sources for about \$2.50 each. Quart size potted plants are also economical, costing about \$5 each. (Prices vary; these are average prices as of 2005.) You will pay significantly more for large, mature potted plants, although you will have greater instant impact. (See Chapter X for a list of nurseries.)

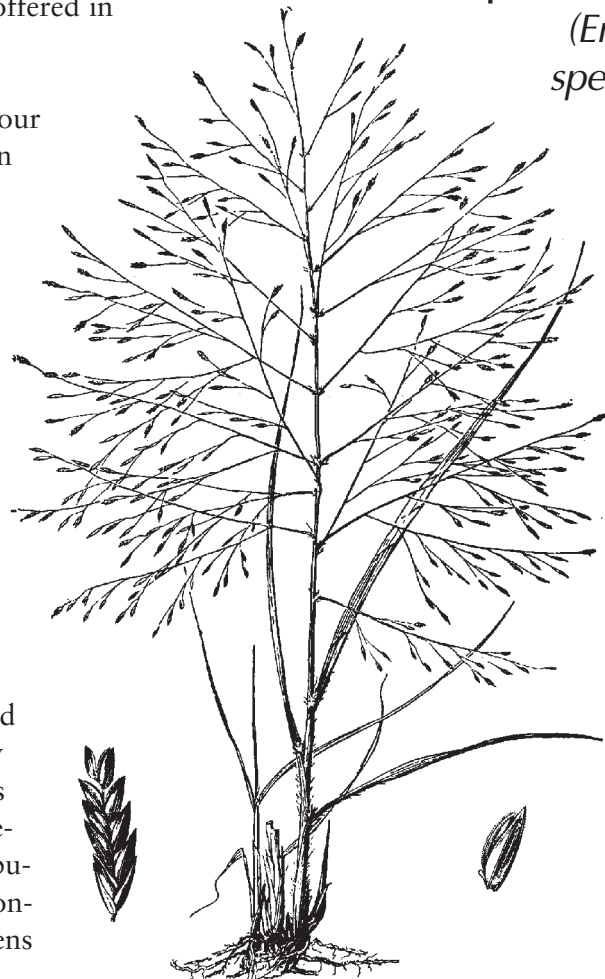
4) GENERAL CONSIDERATIONS ON PLANT BUYING:

Although some nurseries are beginning to carry a wider variety of native plants, many species are not available from traditional plant nurseries. However, as the demand grows, so does the number of native plant nurseries, as well as native plants species offered in traditional nurseries.

Timing can be a factor in obtaining plants for your garden. It is not possible for suppliers to keep an extensive inventory of native plants and seeds on hand. It is not economically practical for them to grow plants for which they do not have a ready market (however, demand and availability is steadily growing). Be sure to plan ahead, and pre-order plants, especially if you have a large project or require certain species. Remember, if you are good at planning, and your schedule allows, you can grow plants from seed.

Although nurseries may offer “native” plants, many times they are actually cultivars of native plants. Cultivars are varieties which arise in cultivation, not in nature, and they are cultivated to reproduce a particular set of traits. They may not bloom, set seed, or grow in the same way as the true native plants; so they may not be as useful to wildlife. Furthermore, if they are very popular, they may displace the naturally-occurring non-cultivated species by being over-planted in gardens and might spread to the wild. This reduces the

Purple Lovegrass
(*Eragrostis spectabilis*)



genetic diversity in a region. Less genetic diversity also makes a population more at risk for being wiped out by diseases. Ask for true native “species” plants, not cultivars, at your local nurseries. If they notice a demand, they will be more likely to stock them.

Tip: Adding small flags next to seedlings or small bare root plants can help with four things: indicate that a garden is in progress to reduce damaging foot traffic in the garden bed; help to identify weeds from seedlings when weeds begin to appear in the garden; help to quickly identify seedlings for the purpose of watering them; and you can also write on the flags with a waterproof marker to identify plants. Two and a half inch by three inch plastic flags, attached to a thin metal stakes are made in a variety of colors and can be purchased at hardware and farm supply stores.

Additionally, when planting your garden, a color can be assigned to each type of plant. Then color coded flags can be placed in the planting bed to indicate where plants are to be placed.

If possible, purchase plants propagated from native plants which originated near where you plan to plant them to preserve local genes from those plants and improve your chances of success with a genetic type adapted to your local climate and soils.

PLANTING HERBACEOUS PERENNIALS

No occupation is so delightful to me as the culture of the earth, no culture comparable to that of the garden...But though an old man, I am but a young gardener. –Thomas Jefferson

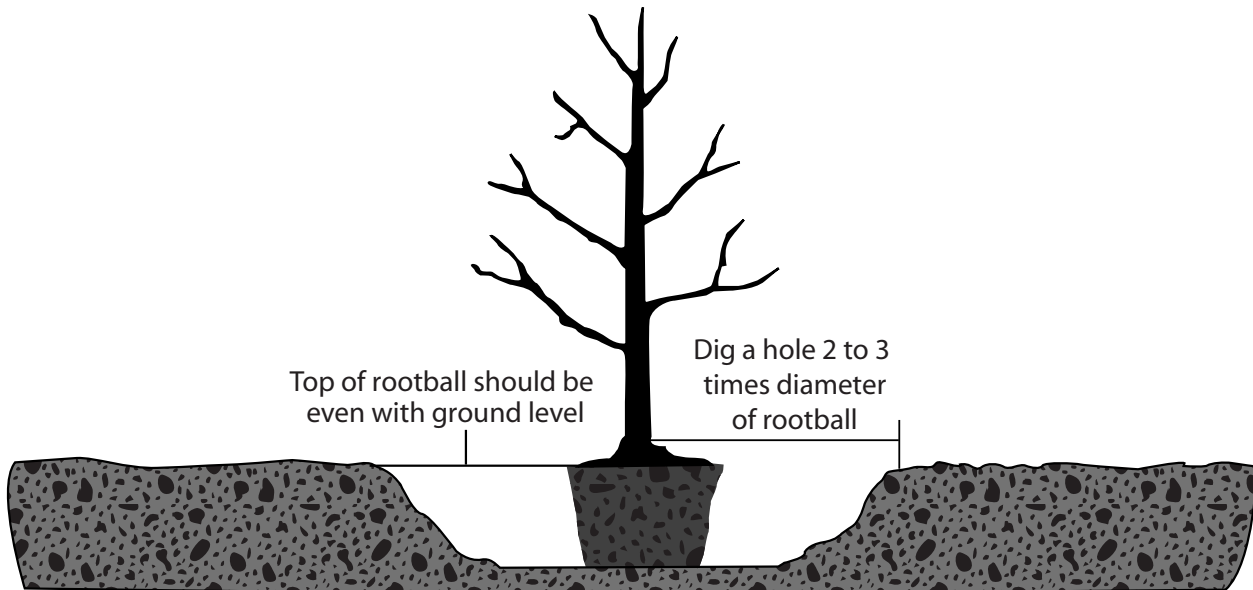
Enjoy the process, and work in phases if this makes your project more manageable. Develop a planting plan that works best for you.

It is also good to remember that the best planting times are usually fall and spring. If you plant in early spring or late fall, some potted plants may be dormant. Do not mistakenly throw these dormant plants away. They are still alive in their pots, and will green up in the spring. You can plant any-time spring through fall. However, if you plant in the summer, you will need to do more watering.

When removing a plant from a pot, don't pull it out by its stem or you may damage it. Loosen the root ball, then slide the plant out of the pot. If you find the pot “root bound” or tightly wrapped inside with many roots, it is actually helpful to cut through the base of matted roots with a trowel to separate them before planting. Loosen the root ball with your hand or a trowel, and place the plant in the soil at the same level it was growing in the pot. Firmly press or tamp the ground around the plant with your hands or feet to remove air pockets. Once the plants are installed, add a top dressing of mulch. (See Mulch section below), and give them a good watering to get them growing in their new home.

Plant seedlings 1- to 2-feet on center. Small seedlings, will not look like much for several months, but if you plant in the spring, you will start to see more definition by the fall (and vice versa), and a year later, they will be noticeably more mature. In fact, one foot on center might be too close, but some may not survive, and you can always transplant plants from crowded areas as they mature.

A technique for achieving curvaceous edges is to use a garden hose or heavy rope to help lay out your garden areas. Marking paint and stone can also be used. Before you plant your garden, you may want to use Roundup two or three times to kill weeds, with a couple of weeks in between each application to allow for growth of new weeds.



PLANTING CONTAINER AND “BALLED AND BURLAPPED” (B&B) TREES

(Reprinted with permission from the Department of Natural Resources’ Tree-mendous Maryland Program)

- If a tree is planted correctly, it will grow twice as fast and live at least twice as long as one that is incorrectly planted. Tree roots need moisture, air, nutrients, and a lot of space to grow. The roots of most trees spread through the top 12 inches of soil, (where the moisture, air, and nutrients are) but over a wide area around the trunk.
- Select a site with enough room for roots and branches to reach full size. Avoid overhead and underground utilities.
- Dig a hole as deep as the rootball and 2 to 3 times its diameter. The rootball should be even with the ground level and no deeper.
- Always handle your tree by the ball, not by the trunk or branches.
- Help prevent root girdling by vertically cutting any roots that show tendencies to circle the root ball.
- Backfill the hole, tamping the soil firmly as you go, to remove air pockets. Be sure tree is planted straight.
- Stake the tree only if it is unable to stand up to high wind, or in danger of vandalism or heavy traffic.
- Spread a 2- to 3-inch layer of mulch on entire area, but not within 3 inches of tree trunk.
- Water - Water - Water.

The best time to plant a tree was twenty years ago. The second best time is now.

–Anonymous

ADDING MULCH

Why mulch? Adding organic matter, such as shredded leaf mulch, improves soil structure; it also conserves moisture, blocks light that many weed seeds need to germinate, lessens erosion, and is an attractive top-dressing for your planting bed. As a rule-of-thumb, apply mulch to a depth

of 2- to 3-inches in planting beds. The depth of mulch to apply will depend upon the type of material used. Be sure to not to bury seedlings or dormant plants, and keep it a few inches from the trunks of trees and shrubs. Commonly used organic mulches include: chipped or shredded wood mulch, such as pine or cypress; pine needles; and shredded leaves. Inorganic mulches include: gravel and other types of stone, and a new product on the market called Treadspread which is made from recycled tires. (Treadspread may be useful in certain instances, like paths; but there is some concern about the leaching of zinc in acid conditions, which can harm plants.) Note: Do not use regular sheet plastic underneath mulch to reduce weed growth. It prevents water from soaking into the soil and prevents the soil from breathing. Use paper, cardboard, or a permeable plastic such as weed-blocker.

American Cranberry
(*Vaccinium macrocarpon*)



Often, wood chips and finer shredded mulch can be obtained at no cost from municipal and county facilities. But there are two issues to consider before using chipped or shredded wood. First, avoid the use of freshly chipped wood, unless it is for a pathway where you don't want plants to grow. Fresh wood chips will remove the nitrogen plants need from the soil as they decompose. Wood chips should be composted for six or more months before being used in planting beds. Second, hardwood is rich in the mineral manganese. Some experts believe that years of mulching with hardwood mulch will cause toxic accumulation of manganese in the soil, which can sicken and ultimately kill your plants, and that pine mulch or shredded leaves, for example, should be used instead.

Avoid using dyed mulch, which has been shown to have several problems. In natural settings, dyed mulch is out of character and there are other problems as well. Unlike composted chipped or shredded mulches, dyed mulch tends to be made from ground up waste wood, like pallets and shipping crates. It has the same problems for plants as using newly chipped wood. As it decomposes, it will draw nitrogen from the soil. Furthermore, some dyed mulch is made from construction debris, containing chemicals such as asbestos or lead paint.¹⁷

Remember to keep mulch 3 or more inches away from the base of shrubs and trees and avoid the use of too much mulch. A 2- to 3-inch depth is enough. Excessive mulching too close to the trunks of trees creates unhealthy conditions where soil microbes, insects, and even larger creatures like mice or voles can access the tree bark and damage it. It can also cause girdling roots to form around the base of the tree that could strangle it.

To determine the amount of mulch needed:

- 1 cubic yard = 27 cubic feet (9 bags of 3-cubic feet each or 13.5 bags of 2-cubic feet each).
- A cubic yard of mulch will cover approximately 100 square feet 3 inches deep. A 10 x 20 (200 square feet) garden will require 2 cubic yards of mulch.

COMPOST...IT'S HABITAT FORMING!

Composting is nature's way of recycling organic material. It is a great way to recycle nutrients from our garden clippings, autumn leaves, and other organic materials and to re-use them by making a valuable soil amendment. Compost is often referred to by gardeners as "black gold." By shredding and mixing grass clippings, plant stalks, leaves, twigs, and (where appropriate) kitchen scraps, the rate of decomposition can be increased. Materials that attract pests (such as meat and fat), promote disease (such as pet waste), promote weeds (weed seeds and roots), cause odors, or create other nuisances should not be composted.

Adding yard waste to a compost pile is more convenient than bagging and dragging leaves and grass to the roadside curb. Why throw away, then go and buy a resource you have right in your own backyard? Usually the most accessible items to add to a compost pile or bin are leaves, shredded cardboard or newspaper (black and white only), sawdust, straw, twigs and other woody materials, which are examples of carbon-rich or "brown" material; while fresh grass and garden clippings, fruit and vegetable scraps, and coffee grounds and filters are nitrogen-rich "green" material. An easy formula to remember is: **"One part green, two parts brown*, makes the yard waste turn to ground. Add some water and some soil, turning is the only toil."** (*Proportions may vary.)

If you are trying to be very scientific about composting, and make usable compost in the quickest, most efficient manner, then you can try to mix the optimum amounts of carbon and nitrogen in your compost. About 30 to 1 respectively, by weight, works best. The 30:1 ratio of C:N is an ideal rule of thumb, but should not cause excessive concern. You can look up the exact C to N ratio of different substances you add to compost, as well as suggested recipes for compost piles on the Internet; or just add what you have, and it will probably work pretty well! Just make sure you have some green and some brown; and try adding a bit of compost or soil to introduce those hard-working microbes; and add water as needed.

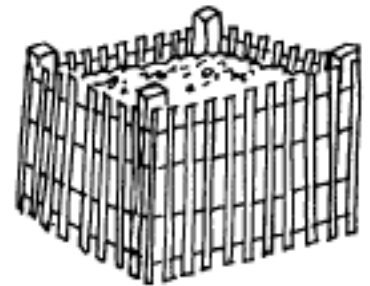
Factors to keep in mind:

- **Locate** your compost bin or pile in an appropriate area, as close to where it will be used as possible, without being in the way.
- **Shredding** yard waste hastens decay.
- **Nitrogen**, e.g., fresh grass clippings, accelerates decomposition, although too much nitrogen can cause odors.
- **Air:** The pile or bin should be well ventilated. Turning the pile speeds up the decomposition process.
- **Water:** The compost pile should be kept as moist as a squeezed sponge.

The bin or pile should be at least 3 feet square to ensure enough heat build up. Temperatures of 160 degrees and above will kill most weeds seeds. However, if your pile is very large, it may become difficult to turn.

Compost Bin

(Courtesy of the Wisconsin Department of Natural Resources)



Anaerobic (without oxygen) composting can work too, if you don't turn or aerate your compost; but it works more slowly and can also generate odors.

There are varieties of bins from which to choose. Some bins can be ordered or purchased from local garden supply retailers, or homeowners can construct their own from cedar, other wood, or recycled wooden pallets. There are also special in-ground bins which are animal resistant and are good for food waste. Another option is a simple compost pile. Even if you don't mix organic material in certain ratios, and don't turn or add water to the pile, it will eventually break down into a rich soil amendment.

GARDEN MAINTENANCE

Sweet flowers are slow and weeds make haste. –William Shakespeare

Weeds stand at the forefront of evolution; no doubt they are evolving in my garden at this very moment, their billions of offspring self-selecting for new tactics to outwit my efforts and capitalize on any opening in my garden. Weeds are nature's ambulance chasers, carpetbaggers, and confidence men. Virtually every crop in general cultivation has its weed impostor, a kind of botanical Doppelganger that has evolved to mimic the appearance as well as the growth rate of the cultivated crop and so ensure its survival. –Michael Pollan

If you (like so many of us) are concerned about staying in shape, consider doing a little bending and stooping. After all, you can burn a lot of calories and stretch practically every muscle in your body by getting down and dirty in the garden and eliminating weeds by hand.

For though we may be the earth's gardeners, we are also its weeds. And we won't get anywhere until we come to terms with this crucial ambiguity about our role—that we are at once the problem and the only possible solution to the problem. –Michael Pollan

The definition of "weed" is usually just "a plant out of place." If you have to contend with a population of weeds or invasive plants, there are several options. The best weeding method for the health of the environment is to remove or pull weeds by hand. Many weeds will bounce back if you don't remove the entire root, so bring along a trowel. Weeding is easier in moist soil after it rains. Other natural techniques are spraying full strength vinegar on young leaves (works well on a hot day), and pouring boiling water over weeds. Mulch and weed-blocker can help reduce this task on pathways and between plants.

If hand removal of weeds is not possible, one may resort to the least-damaging herbicide possible. In some cases it is necessary to use an herbicide containing the active ingredient glyphosate, such as the brand Roundup. This still has minor effects in the soil, but it has been shown to break down fairly quickly in warm weather. It will kill many types of organisms in an aquatic ecosystem and should not be used near surface or groundwater. (An alternative to Roundup for areas near water is the brand called Rodeo. Check with an expert before applying herbicides near water.) Read the directions and carefully mix glyphosate just before use. It should be applied on a dry, calm day to avoid spreading to plants you want to

keep. If you accidentally spray a good plant, keep a watering can handy and immediately rinse off the spray. When using Roundup, the weeds won't brown and look dead until 1 to 2 weeks after applying it; and you may still want to remove the weeds (but they will be easier to remove, and you will not have to worry about getting all of the roots).

According to the manufacturer, "Roundup enters plants through foliage and moves systemically to the roots, killing weeds by stopping the production of a substance found only in plants. Any product not absorbed by plants breaks down into natural materials without moving in or on the soil to untreated plants. Weeds usually begin to wilt within hours with complete kill in 1 to 2 weeks. One application kills most weeds."

TRIAL AND ERROR GARDENING

Part of the joy of gardening is working in harmony with nature and fine-tuning over time. As Roger B. Swain tells us, "Nature writes, gardeners edit." Among other things, a garden is a form of self-expression that can give body to our wishes. Trial and error gardening will answer many garden questions. In the garden, the voice of experience—distilled, collective, and well worn—speaks volumes. An open, flexible approach to gardening makes it a much more enjoyable experience—one that can also help keep you physically flexible and in shape.

The experienced gardener welcomes in her garden not only the laws of nature, but the play of contingency, too. She is open to happy accidents. Confronted with a problem, she tries this or that, sees what happens, then tries something else. The experienced gardener accepts that a garden is never truly finished; that though she may tame nature for a time, her mastery is temporary at best.

While weeding may be an on-going chore, take consolation in the knowledge that over time, year-by-year, as you reduce the weed population and the native plants fill-in the landscape, the weeding will lessen; and that the time spent weeding will generally be significantly less than the maintenance required for a lawn.

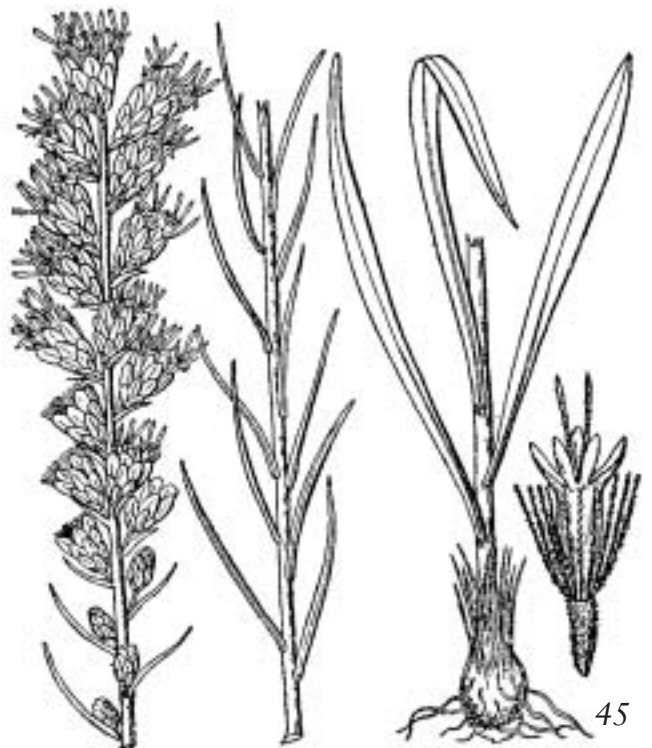
Study and imitate nature's ways and means. Enjoy your newly created conservation landscape, minus the droning noise of a gas-powered lawn mower, and filled with the sights and sounds of a wide variety of wildlife attracted to your native plants.

A garden should be in a constant state of fluid change, expansion, experiment, adventure; above all it should be an inquisitive, loving, but self-critical journey on the part of its owner.

—H. E. Bates, English novelist and short-story writer

How much the making of a garden, no matter how small, adds to the joy of living, only those who practice the arts and the science can know. —E. H. Wilson, Arnold Arboretum

Blazingstar
(*Liatris spicata*)





V. Rain Gardens—A Better Way to Manage Stormwater

Complementary Garden Arrangements

Rain gardens and xeriscapes often complement one another. If you create them together, you can even think of them as “yin and yang” gardening. Rain gardens are generally designed as shallow, saucer-shaped ponding areas planted with moisture-loving native plants; while xeriscapes (which are covered in the next chapter) can be ground level or mounded areas that tend to be drier and are planted with drought-tolerant native plants. Often, when grading is done to create one of these types of gardens, it presents conditions for creating the other type. For example, when a shallow depression is made to create a rain garden, the excess soil can be used to create a mounded xeriscape, which is a drier type of landscape arrangement. Leaving or creating depressions in the landscape promotes stormwater infiltration and reduces stormwater runoff.

Virginia Sweetspire
(*Itea virginica*)



What is a Rain Garden?

Rain gardens are low-lying saucer-shaped garden areas that have absorbent soils which temporarily collect stormwater runoff, usually from a roof, pavement, or other impervious surface, and allow it to slowly percolate into the soil. This provides flood control, groundwater recharge, and water-cooling benefits, while the plants, soils, and associated microorganisms remove many types of pollutants—such as pesticides, oils, metals, and other contaminants—from stormwater runoff. A rain garden is one type of “bioretention” landscaping feature that is a depression into which water will flow.

Properly designed and maintained, rain gardens are attractive landscaping features that function like a natural moist garden, moist meadow, or light forest ecosystem. They can look as naturalistic or as formal as you like.

Benefits of a Rain Garden

Our man-made system of curbs, gutters, and stormdrains quickly carries stormwater runoff directly to local streams, rivers, and the Chesapeake Bay without any natural filtering process. “We tend to think that large industrial polluters cause most water pollution, but this is not the case. We are the real culprits. Studies by the US Environmental Protection Agency have determined that up to 70% of the pollution in our surface waters is carried there by stormwater runoff. Some studies show that about 50% of such pollution comes from individuals and homeowners, due to yard care, yard waste, and chemical pollution from household activities.”¹⁸

Rain gardens serve several important functions in conservation landscaping. Stormwater pouring off hot roofs, pavement, and other impervious surfaces is temporarily captured, cooled, and allowed to percolate into the ground. This provides flood control, groundwater recharge, and water-cooling benefits. Stormwater is able to reach a more healthy temperature for fish and other wildlife by the time it slowly makes its way to the Bay. In addition, this living filter system removes many types of pollutants from stormwater runoff. Nutrients such as nitrogen and phosphorus, which would otherwise contribute to algae blooms and other problems, are taken up by the plants in the garden. Sediment that carries pollution and buries plants and animals in the Bay is trapped before it can reach a waterway. Rain gardens also tend to become wildlife oases with colors, fragrances, and the sights and sounds of songbirds and butterflies regularly visiting your garden.

By creating a rain garden and keeping most of the rain that falls on your site contained on site—the way nature intended—you can help improve water quality in local streams, rivers, and ultimately the Chesapeake Bay. Rain gardens save water, reduce pollution, and help wildlife—all at the same time.

Planning

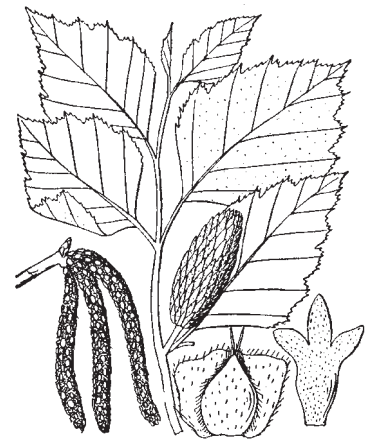
There is usually an existing drainage pattern for most landscaped sites (even if it is not very noticeable), and it may be best to go with the flow. Determine the direction of runoff and low spots where water collects, either by observing the flow of water during rainfall or by running hose water on the ground. If the low areas are away and downhill from your building foundation, they would be good places to locate rain gardens. If you have many low spots, you can choose those that are closest to the downspouts from your roof (but at least 10' away from a building) or nearest to a paved driveway.

Many rain gardens are designed to contain runoff from a roof downspout. You can even bury an extension to the downspout and have it discharge right into the rain garden. For single-family homes, rain gardens are typically between 150 to 400 square feet. Any size rain garden is better than no rain garden, and the bigger the better. Ideally, all of the rainwater that falls on a piece of land would stay on-site and be captured by rain gardens and rain barrels.

To determine the optimal size for a rain garden for a single-family home:

- Estimate the amount of impervious surface by multiplying your rooftop width times length, to get square feet; then add the square feet of paved areas.
- Different parts of your roof drain to different downspouts. Determine which part of the roof, and the square footage, will drain to each down-

River Birch
(*Betula nigra*)



spout, that will then drain to the area sited for your rain garden. Ideally, all downspouts and impervious surface runoff from driveways, etc., would be channeled to one or more appropriately sized rain gardens.

(The following formulas are borrowed from www.raingarden.org.)

- For sandy soil, your rain garden should be 20-30% of the drain area. For example, if your roof and driveway measure 1200 square feet and all the rain from them will be used, your rain garden should be 20 to 30% of that, or 240-360 square feet (e.g. 10' X 24').
- For clay soil, your rain garden should be about 60% of the drain area. (Clay absorbs water very poorly; the varieties of rain garden plants that do well in clay take at least three years to get established. Soil replacement may be the best choice in clay soils.)
- If you improve your soil drainage and replace your soil with rain garden mix (50-60% sand, 20-30% topsoil, 20-30% compost), your rain garden should generally be about 20-30% of the square footage of your drain area.

To determine the amount of soil or amendment needed:

- 1 cubic yard = 27 cubic feet (9 bags of 3-cubic feet each or 13.5 bags of 2-cubic feet each).
- A rain garden that is 6 inches deep x 5 feet wide x 10 feet long will need 25 cubic feet of replacement soil, or almost 1 cubic yard (0.925 cubic yards).

Areas where standing water collects and doesn't soak into the ground within a day or two have poor infiltration. This is likely due to either heavy clay soil or the compaction of soil, for example, during construction. Compaction of building site soils makes the need for your rain garden even more critical.

Soil

As with most gardens, an important first step for rain gardens is to test the soil where you plan to install your garden. (See Chapter X "Resources" for information on soil testing.) Extreme pH, presence of a clay layer, or other surprises may need to be corrected. (See Chapter IV for additional information.) Amend the soil, only if necessary, based on conditions. If you are landscaping with native plants, this step may not be necessary. Remember, native plants are adapted to local soil conditions, provided the local soil has not been significantly degraded or changed.

It is a good idea to check the percolation of the soil in the area you have chosen for your rain garden. Dig a one-foot deep test hole and fill it with water. If water remains in it for more than 24 hours, you may need to amend the soil or choose another location. If standing water remains in a rain garden for more than a few days, it could become a breeding place for mosquitoes. The fastest breeding mosquitoes take at least four days to reproduce; therefore, this should be the outside range for water to remain standing.

Simple rain gardens are 3- to 6-inch deep, saucer-shaped depressions. While rain garden dimensions vary, remember, *any size rain garden is better than no rain garden.*

Site Preparation

Examine the slopes on your site, and be sure that any overflow water will be channeled away from structures or other sensitive features. Install rain gardens at least 10 feet from a building foundation to keep basements from getting wet. If you have a septic system, stay away from the drain-field. It doesn't need any added water. Be sure that you consider where excess water will flow out of the garden in a heavy storm. Try not to direct too much water to the roots of trees that don't like to live in wet soil; and don't excavate too close to large trees, or you may damage their root system.

Before you dig in any area, be sure to call Miss Utility (1-800-257-7777, from 7 AM to 5 PM, unless it is an emergency, in MD, DE, and DC) no less than two business days ahead to locate any underground service lines or utilities that may be located where you intend to plant. (See Chapter IV for additional information.)

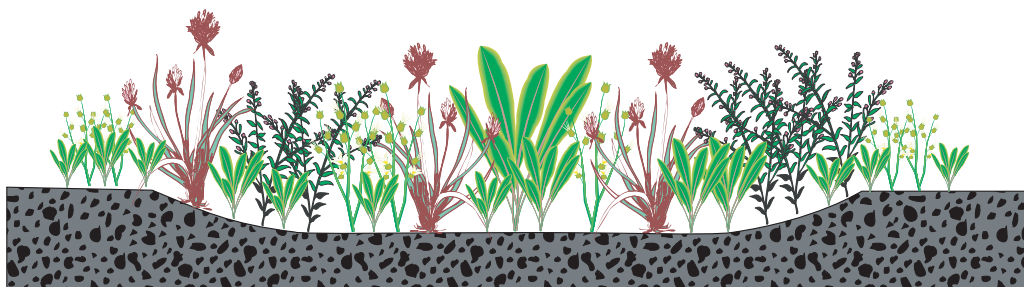
Site preparation may be a simple process or it can take more effort than planting the garden. First, define the borders and shape of your garden at the location you have selected using non-toxic spray paint or a garden hose. (See Chapter IV.)

Turf grass usually needs to be removed by hand, or with a sod cutter or bobcat, or it will need to be covered for several months until it is fully dead. Removing turf grass is a convenient way to start a rain garden, since it will help create a **3- to 6-inch deep depression** needed to collect the runoff. Check the soil for obstructions such as asphalt, large rocks, or unusual soil texture (e.g. clay, sand, excessive compaction). A rock bar can be helpful in probing the soil. In some cases obstructions need to be removed or curbs need to be cut to allow water to flow into the garden.

Heavily compacted soil will need to be dug up and loosened to a depth of two feet, or amended for better drainage (see the formula above). Extra soil left over from creating the depression for the rain garden and amending the soil (if necessary) can be used in another part of your yard to create a mounded xeriscape garden.

Grade the surface of your prepared rain garden bed by creating a saucer-shaped depression. This will improve the effectiveness of the garden to hold and treat the runoff as it sheets across the surface of the garden.

Rain gardens are essentially vegetated swales. Shaping the land in this fashion imitates nature by creating contours throughout the landscape which allows for infiltration, while vegetation and soils provide filtration and cleansing.

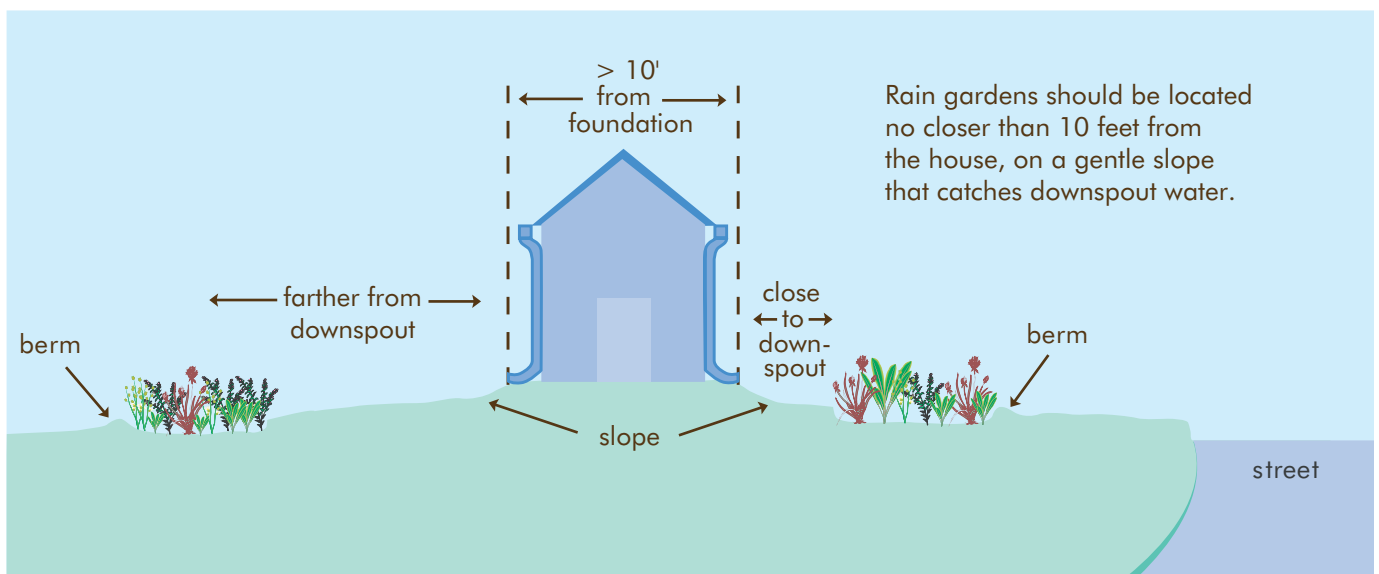


When preparing large gardens you may want to consider hiring a contractor with a bobcat to remove turf grass and shape the planting beds to create depressions and knolls or other pleasing contours to your property. Remember, driving any kind of heavy equipment on your land will compact the soil, and reduce its ability to absorb water. Be aware that extensive grading will require a permit.

If your land is sloped and all the water drains away (the condition for some of the rain gardens at the CEC), create terraces in the slope. Install berms on the down-slope side of each terrace to slow the water down and allow it to weep into the next cell. In larger rain gardens, berms such as biologs, made of coconut fiber, work well. Biologs will slowly decompose over several years and eventually become earthen berms. You may want to enlist the help of an engineer to help determine the number and spacing of the berms needed to control the water flow.

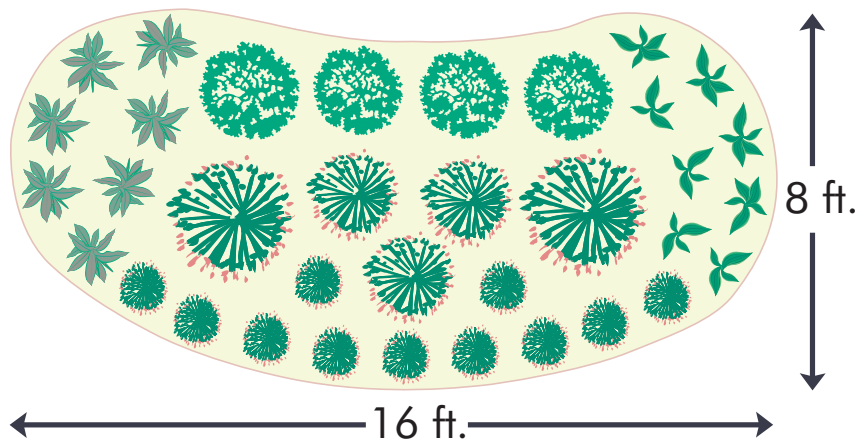
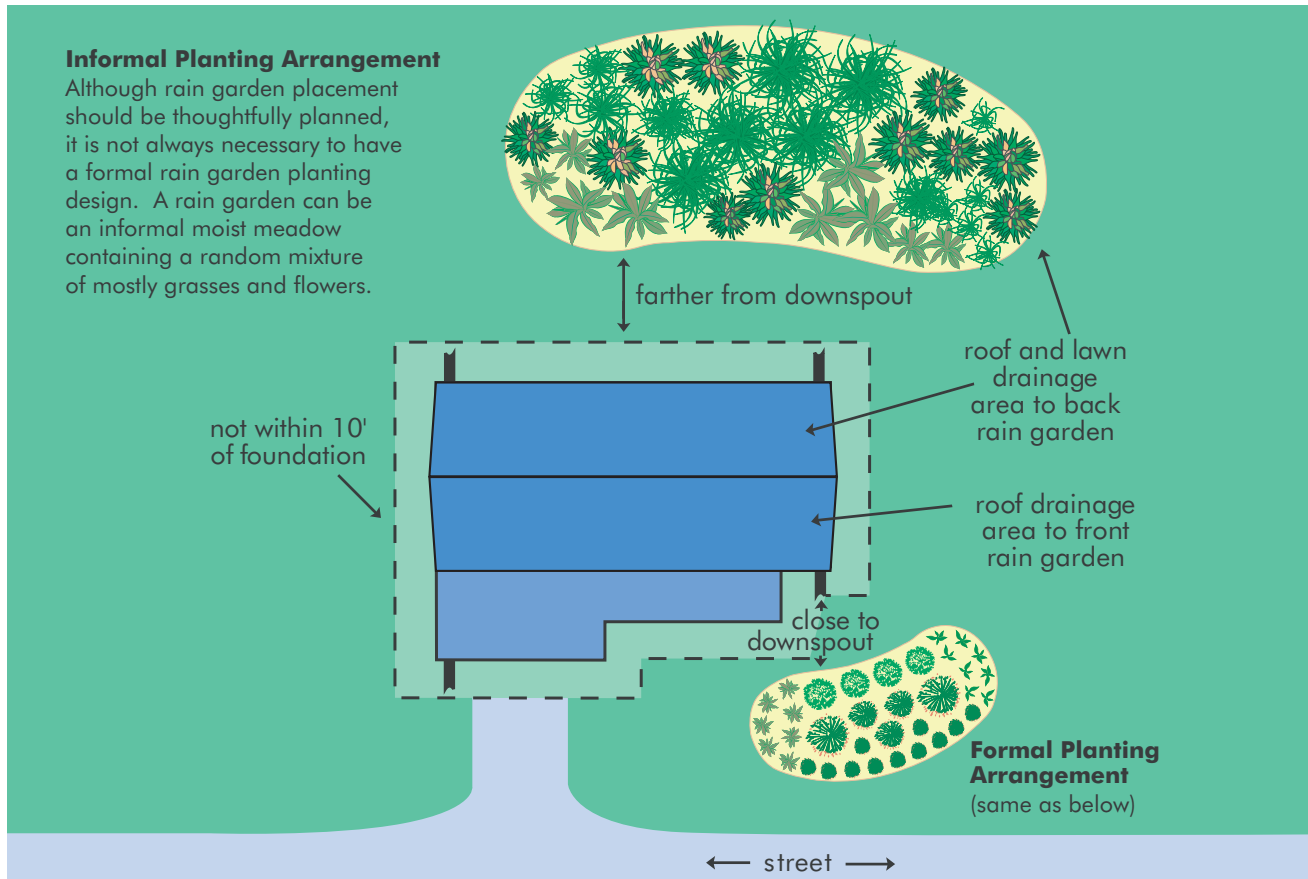
Site considerations: If you are mitigating a large area of impervious surface runoff with a rain garden, it is useful to have the water travel across a grassy swale and/or gravel bed area before it reaches the plants. The swale can help remove silt from the stormwater, and the gravel bed can help slow the water so that it doesn't wash away the first plants as it reaches the garden. Install a permeable layer such as weed-blocker cloth under the gravel so that it doesn't sink into the underlying soil.

A **drain system** may be necessary if a lot of water needs to be infiltrated or the soil contains clay. An under-drain system of gravel and perforated pipe ("French drain") may be helpful. Rain gardens are sometimes constructed to absorb and filter a certain amount of rain, and the filtered water is then piped to another location through the underdrain system.








Home Rain Gardens—Overhead View

Rain gardens can be installed in the front, back, or side yard. Design with the end in mind, and consider how the rain garden can be integrated into existing and future landscaping. Locate your rain garden to capture water from your rooftop channeled by downspouts, from other impervious surfaces such as driveways and sidewalks, or to capture runoff from lawn areas. Consider views from different vantage points, including inside the house or, for example, from a patio where you can take advantage of the sights and sounds of a wide variety of wildlife attracted to your native plants.



Total Area: 128 sq. ft.
1/4 inch = 1 foot

This is an example of a formal rain garden planting arrangement including:

-  Tussock Sedge (*Carex stricta*)
-  Foxglove Beardtongue (*Penstemon digitalis*)
-  Swamp Milkweed (*Asclepias incarnate*)
-  Switchgrass (*Panicum virgatum*)
-  Blue-Eyed Grass (*Sisyrinchium angustifolium*)

Plant Installation

Once your planting bed is ready, it is time to plant. You can prepare a rain garden bed, then cover it with mulch, and as time permits, plant through the mulch; or, you can install the plants, then mulch. The choice is yours. Water plants as soon as you install them.

Choosing the appropriate native plants will help insure the success of your rain garden. Estimate how often the plants in each part of the rain garden will be inundated, and choose plants accordingly. Some plants are able to withstand moist and dry conditions, and they would do well along the drier edges of a rain garden. Be sure that the plants that receive the most water are well-adapted to those conditions. Consider the amount of light the plants will receive as well. Choose sturdy plants to be closest to the strongest flows of water.

There are many good references on which native plants will do well in a rain garden. Perennial native plants are recommended because they will be easy to care for, good for local wildlife, and provide lasting beauty year after year. (See the lists of suggested plants on the following pages and in Chapter VIII.)

Silky Dogwood
(*Cornus amomum*)



Spring and fall are good planting times for your rain garden. As you design the garden, determine the height of plants you would like, and consider adding some trees and shrubs to the design. The look of several different plant layers is more natural, and larger plants absorb lots of water.

After the garden is installed, top-dress it with 2- to 3-inches of organic mulch, such as leaf mulch or composted wood chips. Mulch is especially useful in rain gardens since it helps to retain moisture, suppresses weed growth, absorbs some of the pollutants in the stormwater runoff, and provides an attractive top dressing. Be sure not to bury perennials or the trunks of trees or shrubs with mulch. Weed regularly. A nicely prepared rain garden is a great place for invasive plants to start growing in the newly loosened soil.

Maintenance

Water your newly planted rain garden regularly until it becomes established, unless Mother Nature does the job for you. Aside from watering, the primary maintenance needed for a native plant rain garden will be weeding and the addition of mulch to the surface about once a year. Remember, the lower maintenance requirements of native plants does not mean NO maintenance.

Over time, adjustments may need to be made to optimize the effectiveness of your rain garden. Plants may need to be relocated and/or water flow adjusted, for example, by adding, modifying, or moving earthen, biolog or gravel berms.

Case study: SRA Rock ‘N Rain Garden at the CEC (1,800 square feet)

The SRA Rock ‘N Rain Garden infiltrates stormwater from the upper parking lot at Adams Academy at Adams Park Middle School. This rain garden was adopted by the Severn River Association (SRA), who assisted with the installation; and they help maintain the garden. Rock ‘N Rain refers to the rock berms placed at intervals to break the water flow draining from the adjoining parking lot. (Two other CEC rain gardens use biolog berms to break the water flow.)

In the 1950s—when Adams Academy at Adams Park (formerly Adams Elementary and The Learning Center) was built—the Anne Arundel County School System cut a 120-foot long swale and lined it with asphalt to drain the water as quickly as possible off the parking lot to nearby College Creek. Today’s best management practice is to do the opposite, that is, to break the water flow, allow it to cool and soak into the ground to recharge groundwater, and allow the water to flow through native vegetation to remove pollutants. After the difficult process of removing asphalt—by hand and with a bobcat—from the 1,800-square-foot area, we amended the hard clay soil with 1/3 sand, and 1/3 top soil. John Flood rototilled the planting bed. (Other than this garden, we’ve purposely avoided amending the soil. For other gardens, we’ve used what is in place and installed plants appropriate for conditions.)

Carol Jelich designed the garden. Members of the Severn River Association, Adams Academy students, and other volunteers planted the garden. The garden has flourished since its installation in the spring of 2003, and includes the following plants:

- Tussock Sedge (*Carex stricta*)
- Switchgrass (*Panicum virgatum*)
- Foxglove Beardtongue (*Penstemon digitalis*)
- Narrow Leaf Mountain Mint (*Pycnanthemum tenuifolium*)
- Swamp Milkweed (*Asclepias incarnata*)
- Swamp Sunflower (*Helianthus angustifolius*)
- Joe-Pye Weed (*Eupatorium fistulosum*)
- Virginia Wild Rye (*Elymus virginicus*)
- Turtlehead (*Chelone glabra*)
- Inkberry (*Ilex glabra*)
- Sweet Pepperbush or Summersweet (*Clethra alnifolia*)
- Silky Dogwood (*Cornus amomum*)
- River Birch (*Betula nigra*)
- Red Chokeberry (*Photinia pyrifolia*) or (*Aronia arbutifolia*)





Case study: Biolog Rain Garden (2,000 square feet)

At the lowest point of the front parking lot, near the entrance to Adams Academy at Adams Park Middle School grounds, the Anne Arundel County School System cut a 100-foot long swale and lined the area with asphalt in the 1950's. The asphalt swale sloped toward College Creek in order to shoot water from the parking lot as quickly as possible to the creek.



Today, we recognize that the opposite process is preferable for protecting the Bay and its tributaries. Instead of an asphalt chute, we designed this rain garden to break the water flow, allow it to cool and soak into the ground to recharge groundwater, and allow the water to flow through native vegetation to remove pollutants. Like the Rock 'N Rain Garden, the Biolog Rain Garden saves water, reduces pollution, and helps wildlife—all at the same time. The rain garden infiltrates stormwater runoff from the front, lower parking lot. Named for the devices used here to slow the flow of water, this garden uses biologs made from rolled, biodegradable, coconut fiber.



Rob Schnabel, restoration specialist with the Chesapeake Bay Foundation, designed the garden. The asphalt was removed with the help of a bobcat, the assistance of the Anne Arundel County Stewardship Workgroup, and many others. John Flood rototilled the garden; and Vince Leggett, Bill Sanders, and Zora Lathan planted the garden.



- Biolog
- Switchgrass (*Panicum virgatum*)
- Broomsedge (*Andropogon virginicus*)
- Foxglove beardtongue (*Penstemon digitalis*)
- Winterberry (*Ilex verticillata*)
- Silky Dogwood (*Cornus amomum*)
- Red Chokeberry (*Photinia pyrifolia*) or (*Aronia arbutifolia*)
- Black Chokeberry (*Photinia melanocarpa*) or (*Aronia melanocarpa*)
- Arrowwood Viburnum (*Viburnum dentatum*)
- Spicebush (*Lindera benzoin*)
- New York Ironweed (*Vernonia noveboracensis*)
- Cinnamon Fern (*Osmunda cinnamomea*)
- Blue Lobelia (*Lobelia siphilitica*)
- Buttonbush (*Cephalanthus occidentalis*)
- Cattail (*Typha latifolia*)(native, but very aggressive)

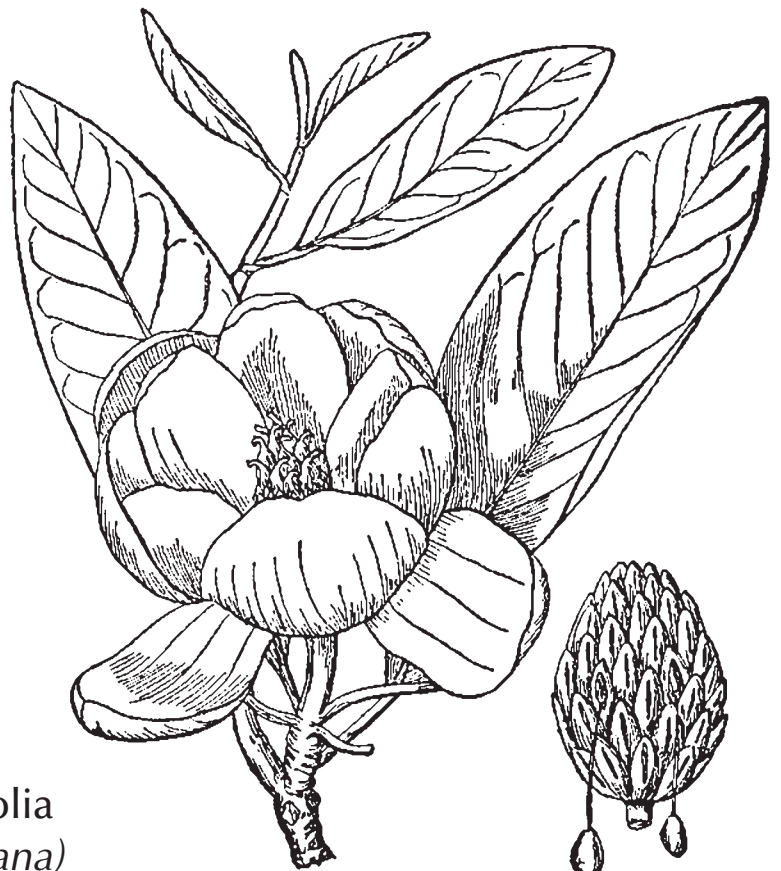
Case study: Sweetbay Magnolia Rain Garden (5,000 square feet)

This rather large rain garden is an attractive addition to our collection of gardens. Unlike the other four rain gardens at the CEC, the Sweetbay Magnolia Rain Garden has a wide frontage on the front parking lot and several curb cuts to allow runoff to enter its bioretention area. It also features a low berm on the back side and ironstone boulders (for visual interest) at the downhill side.

Like our other rain gardens, this garden provides not only wildlife benefits with its attractive flowers and inviting fruits, it also contributes water quality advantages through its filtering action. Stormwater is purified by the plants and soil in the garden, and it is allowed to soak into the ground and recharge groundwater. The addition of this rain garden significantly lessens the impact on the Biolog Rain Garden, which is occasionally inundated with water since it is at the lowest point on the grounds in the front of the school.

Darnell Hall, Marvin Redding, Bill Sanders, Vince Leggett, members of the Anne Arundel County Stewardship Workgroup, and others, assisted Zora Lathan and Thistle Cone in preparing the site. Adams Academy students, Naval Academy Midshipmen, Anne Arundel Green Party members, and other volunteers planted the garden. Zora Lathan designed the garden, which includes:

- Sweetbay Magnolia (*Magnolia virginiana*)
- River Birch (*Betula nigra*)
- Silky Dogwood (*Cornus amomum*)
- Inkberry (*Ilex glabra*)
- Highbush Blueberry (*Vaccinium corymbosum*)
- Blue Flag Iris (*Iris versicolor*)
- Hyssop Thoroughwort (*Eupatorium byssopifolium*)
- Foxglove Beardtongue (*Penstemon digitalis*)
- Switchgrass (*Panicum virgatum*)
- Little Blue Stem (on berm) (*Schizachyrium scoparium*)
- Lowbush Blueberry (on berm) (*Vaccinium angustifolium*)



Sweetbay Magnolia
(*Magnolia virginiana*)



Case study: Highbush Blueberry Rain Garden (1,185 square feet)

The Highbush Blueberry Rain Garden provides not only delicious blueberries for wildlife and humans, but includes other moisture-loving plants with aesthetic and habitat benefits. The garden was tricky to install due to the asphalt swale that was there previously. A large-sized area of asphalt was removed with the help of a group of Midshipmen from the Naval Academy. However, since this was too much for volunteers to do entirely by hand, a bobcat was used to remove the bulk of the material. Students from Adams Academy, as well as other volunteers, planted this garden.

Three biologs (rolled, biodegradable, coconut fiber) were added to the Highbush Blueberry Rain Garden to help slow the flow of water down the slope. These provided separate sections for plantings as noted in the plant list below. The garden is the sole filtration device for the entire back parking lot for Adams Academy at Adams Park Middle School.

This site was designed by Adams Academy students with assistance from Zora Lathan and Thistle Cone.

(1st section)

- Foxglove Beardtongue (*Penstemon digitalis*)
- Switchgrass (*Panicum virgatum*)
- Highbush Blueberry (*Vaccinium corymbosum*)

(2nd section)

- Highbush Blueberry (*Vaccinium corymbosum*)
- Black Chokeberry (*Photinia melanocarpa*) or (*Aronia melanocarpa*)
- Button Bush (*Cephalanthus occidentalis*)
- Winterberry (*Ilex verticillata*)
- Pawpaw (*Asimina triloba*)

(3rd section)

- Highbush Blueberry (*Vaccinium corymbosum*)
- Silky Dogwood (*Cornus amomum*)
- Inkberry (*Ilex glabra*)
- Northern Bayberry (*Morella pensylvanica*) or (*Myrica pensylvanica*)
- Cinnamon Fern (*Osmunda cinnamomea*)

(4th section)

- Highbush Blueberry (*Vaccinium corymbosum*)
- American Cranberry (*Vaccinium macrocarpon*)





VI. Xeriscapes—Drought Tolerant Landscapes

What is Xeriscaping?

The word *xeriscaping* comes from a combination of *xeri* derived from the Greek word *xeros* for dry, and *scape*, meaning a kind of scene or view. While xeriscape (pronounced zir-i-scape) translates to mean “dry scene,” in practice xeriscaping simply means landscaping with drought-tolerant plants to conserve water and protect environmental health. If native plants are selected and planted according to their preferred growing conditions, your garden will thrive without added fertilizer, pesticides, and water, under normal conditions—that includes a xeriscape garden or any other type of native plant garden.

The word *xeriscape* was originally a trademark of the Denver Colorado Water Department. It is now the generally accepted term for landscaping to conserve water in dry conditions. Xeriscaping techniques have been adopted by several states. However, it is a more commonly used term and technique in the arid southwest and west. Whether called xeriscaping, water-wise or water-smart landscaping, its benefits are numerous.

Smooth Blue Aster
(*Symphyotrichum*
leaves)



Benefits of Xeriscaping

The Chesapeake Bay watershed has varying resource conditions, available water, soil type, temperature ranges, and sun exposure. By designing a well-planned, water-conserving landscape which uses drought-tolerant native plants, a balance can be achieved that is both aesthetically pleasing, and works in harmony with the resources of the region.

Nationwide, water can no longer be considered a limitless resource, as communities are faced with increased demands on existing water supplies. Consequently, there is a greater focus on water conservation, not just in times of drought, but in anticipation of future population growth. “At present consumption rates, water is predicted to be the limiting factor to further growth globally within the next 200 years.”¹⁹

In addition to conserving water resources, a significant bonus of water-conserving landscaping is the reduced maintenance required. Xeriscape designs reduce the areas planted with water-guzzling grass by substituting drought-tolerant herbaceous perennials, ground cover, shrubs, trees, and mulch. Grass (if used at all) may be treated as the accent in the landscape rather than the predominant feature. By using appropriate native plants, you will not only save precious water resources, but you will also save yourself a lot of work watering your landscape (once the plants are established, which will take approximately two months for herbaceous perennials, and several months to a year for shrubs and trees). Xeriscaping

can result in immediate cost savings through lower water bills, as well as reduce the amount of plant trimmings which must be disposed of or otherwise managed, and thereby help homeowners and communities save both water resources and landfill space.

Like rain gardens and other types of conservation landscapes, native plant xeriscapes generally don't require fertilizer or pest control measures. Because pesticides and fertilizers can inadvertently harm beneficial organisms, as well as impact air and water quality, eliminating or greatly reducing their use protects environmental health.

Xeriscape Benefits:

- Conserve water, thrive without supplemental water.
- Provide lots of attractive native plant options.
- Present minimal pest and disease problems.
- Thrive without the use of pesticides or fertilizer.
- Require less maintenance over the long run, which saves time and money.
- Provide wildlife habitat.
- Restore and protect the environment.

Planning and Design

Xeriscapes should be located in average to dry site conditions. Design plans should be compatible with available resources, including water, native plants, soil types, sunlight, and temperature ranges. A xeriscape can look as formal or as naturalized as you like. You might choose to create a rock garden using prickly-pear cactus (*Opuntia humifusa*), the only cactus native to the Chesapeake Bay region, and other native plants; or you could create a drought-tolerant butterfly garden or dry meadow, complete with an ever-changing medley of wildflowers.

Creating a beautiful, water-efficient landscape begins with a well-thought-out landscape design. Begin by sketching your yard or community site to indicate the location of existing structures, trees, shrubs, and grass areas. Then consider the landscape budget, function, appearance, and maintenance plan (see Chapter IV). If design assistance is needed, seek help from resource guides, the internet, environmental organizations, landscape designers and architects, nursery professionals, or county Cooperative Extension agents. A well-planned design enables you to convert to xeriscaping in one season or to install your water-wise landscape in phases. Whether you create your own design or call upon a landscape design professional, a well-designed environmentally-friendly xeriscape can be beautiful and help meet your life-style needs by saving time, money, and resources.

Site Preparation

As with rain gardens or any type of landscaping, before you dig in any area, be sure to call Miss Utility (1-800-257-7777, from 7 AM to 5 PM, unless it is an emergency, in MD, DE, and DC) no less than two business days ahead

Switchgrass
(*Panicum virgatum*)



to locate any underground service lines or utilities that may be located where you intend to plant. (See Chapter IV for additional information.)

If the xeriscape is to be located on level ground that is currently planted with turf grass, it will need to be removed by hand, or with a sod cutter or bobcat, or it will need to be fully covered for several months until it is completely dead. The surface of the garden should be either level or mounded up using excess soil, such as soil that has been cut out for a rain garden. Water will drain more quickly from a mound or berm, thereby creating drier conditions than level or depressed areas. When creating a mounded planting bed, an option for killing turf grass is to cover it with several layers of newspaper or a layer of cardboard, on top of which the soil is mounded.

Soil

Don't forget to test the soil where you plan to install your garden. (See Chapter X "Resources.") Amend the soil only if necessary. If you are landscaping with native plants, this step may not be needed. Remember, native plants are adapted to local soil conditions (provided the local soil has not been significantly degraded or changed.) Some well-adapted xeric plants prefer not to have soil that is too rich. (See Chapter IV for additional information on soils.)

Plant Selection and Installation

The Chesapeake Bay watershed is blessed with an abundance of beautiful native plants that are naturally adapted to a variety of conditions in the region. Choosing the appropriate drought-tolerant native plants will help ensure the success of your xeriscape. Some plants native to the region are able to withstand moist and dry conditions, while others thrive in dry conditions. Consider the amount of light the plants will receive as well. There are many good references on which native plants will do well in a xeriscape. Perennial native plants are recommended because they are easy to care for, good for local wildlife, and provide lasting beauty. Check the resources section for local nurseries, or check with your county Cooperative Extension agent for recommendations on appropriate native plants for your area and garden type, and to obtain descriptions of their physical attributes. For starters, see the list of suggested plants below and in Chapter VIII.

Although you can plant anytime the ground is not frozen, spring and fall are easier on the plants and the gardener. As you design the garden, decide on the plant characteristics you would like, and consider adding some trees and shrubs to the design. The look of several different plant layers is more natural.

Finish off your garden with 2- to 3-inches of organic mulch, such as shredded leaf mulch or composted wood chips. This helps keep the soil in place, holds moisture in, suppresses weed growth, and provides an attractive top dressing. Be sure not to bury the trunks of trees with mulch. Aside from

At the CEC, we've used excess grass (which was covered with paper) and soil to create berms and mounds for xeriscape gardens. (The terms *mound* and *berm* are often used interchangeably; however, *mound* generally refers to a more rounded configuration.)

watering while the plants are becoming established, the primary maintenance needed for a native plant xeriscape will be weeding and the addition of mulch to the surface about once a year. By applying xeriscape principles to your landscape, you will not only save resources, time, and money; but you will also enjoy the beauty and diversity of native, drought-tolerant plants.

Case study: Xeriscape (572 square feet)

Located at the entrance to Adams Academy at Adams Park Middle School grounds, the raised area or mound was created with excess soil that was dug out to create a swale for the Biolog Rain Garden. (Xeriscapes and rain gardens complement each other well in this respect). The garden was designed by Zora Lathan, and planted by volunteers and Adams Academy students. It includes:

- Switchgrass (*Panicum virgatum*)
- Narrow Leaf Mountain Mint (*Pycnanthemum tenuifolium*)
- Gray Goldenrod (*Solidago nemoralis*)
- Foxglove Beardtongue (*Penstemon digitalis*)
- Orange Coneflower (*Rudbeckia fulgida*)
- Blazingstar (*Liatris spicata*)
- Butterfly Milkweed (*Asclepias tuberosa*)
- Smooth Aster (*Symphyotrichum laeve var. laeve*)
- Hyssop Thoroughwort (*Eupatorium hyssopifolium*)
- Sweetfern (*Comptonia peregrina*)



Case study: Nature's Pharmacy Garden (615 square feet)

The Nature's Pharmacy Garden adds a unique focus to our collection of gardens. It replaces turf grass with native plants of medicinal value. Native Americans and early settlers in the area were able to utilize these plants for healing purposes. This selection of plants also happens to be drought-tolerant.

The medicinal plants are arranged in a circular mound near the entrance to the school. Excess soil from the adjoining rain garden was used to create the planting bed. The Anne Arundel County Stewardship Workgroup and others helped prepare the site. Adams Academy students, Naval Academy Midshipmen, and other volunteers planted the garden. Zora Lathan designed the garden, which includes:

- Gray Goldenrod (*Solidago nemoralis*)
- Purple Coneflower (*Echinacea purpurea*)
(native to the Prairie states)
- Hyssop Skullcap (*Scutellaria integrifolia*)
- Spotted Mint (*Monarda punctata*)
- Switchgrass (*Panicum virgatum*)



Case study: Butterfly Garden (2,825 square feet)

Wildlife habitat is rapidly declining due to development, therefore it is important that we practice conservation landscaping for the benefit of native species including native pollinators such as butterflies, moths, and bees. While feeding on nectar, adult butterflies and other insects inadvertently pollinate many plants. This enables the plants to produce seeds. Eggs, caterpillars, and adult butterflies are important food sources for other organisms in the food web, such as birds. In the grand scheme of things, butterflies are indispensable.

Borrowing from nature, Zora Lathan—in consultation with Dr. Sara Tangren—worked with Adams Academy students to design the garden in the shape of a Butterfly, which can be seen especially well from the second floor of Adams Academy Middle School. The circular flag pole area originally contained only weedy turf grass. The turf grass was removed with a bobcat and the area was rototilled. After the area was raked and leveled, numerous volunteers and Adams Academy students planted native, flowering perennials that attract and feed butterflies, including monarchs; moths; and bees; and which feed and shelter songbirds. This garden also exhibits xeriscape characteristics, with its use of drought-tolerant plants.

The drought-tolerant plants in this garden design include antennae planted with blue sedge (*Carex glaucoidea*), five 2-foot wide paths, and five 3-foot wide stripes. The plants in the stripes, in order, from the top of the forewings are:

- Orange Coneflower (*Rudbeckia fulgida*)
- Foxglove Beardtongue (*Penstemon digitalis*)
- Whorled Coreopsis (*Coreopsis verticillata*)
- Hyssop Skullcap (*Scutellaria integrifolia*)
- Blazingstar (*Liatris pilosa*) and (*Liatris spicata*)
- In the hindwings, we have a circular area planted with New England Aster (*Symphiotrichum novae-angliae*). The remainder of each hindwing is planted with Orange Coneflower (*Rudbeckia fulgida*).
- Virginia Sweetspire (*Itea virginica*) is planted as an accent near the antennae.





VII. Special Considerations for School and Community Projects

Benefits of school and community projects

Many schools have started to realize the multiple benefits of conservation landscaping projects on their campuses. Projects like those described in this primer can make the campus an even more exciting place to be. They can help students learn about their immediate environment and how to care for it, take greater pride in their school by improving its appearance, and according to some teachers, might actually improve attendance.

At schools and other locations where students and community members collaborate to create and maintain native plant gardens, the learning process is manifold. The participants benefit from the planning process, the hands-on experience of planting and maintaining the garden, and the ongoing relationship between the cooperating groups.

The students gain from the on-the-ground education and the opportunity to be part of a tangible project to make positive change in the community. Many students better retain the knowledge gained in hands-on experiences, as opposed to memorization. The whole school community appreciates the beauty of their enhanced surroundings, and the faculty members enjoy the chance to use the garden in many areas of the curriculum. Outdoor visits lead to opportunities to reinforce classroom topics. Gardens can become outdoor classrooms with live plant and animal materials for use in science curricula and other subjects as well.

Grantors and leaders in the conservation landscaping community particularly like to see conservation gardens at public locations, such as schools and community centers, because they know that the educational value will extend to the surrounding community. As more people learn about native plants and begin to recognize them, they will be more likely to use them in their own landscapes. With a small amount of signage and a bit of publicity, your garden can become a showplace for what can be done with native plants and why they are so important.

Here are some practical considerations for creating a successful conservation landscaping project in a school setting. Other community groups will find a similar process useful. While your approach may vary, here are some helpful guidelines.

Form a team

Get a good working group together, that is, a dedicated team of students, teachers, parents, community members and natural resource experts to

Some of the most important, lasting results of good Environmental Education are the heart-felt connections young people make with nature. They value the natural world because they have experienced first hand the beauty and magic of living ecological systems. To really feel this in a personal way, the kids have to go outside and experience it. –Chris Laliberte, "Creating the Need to Pay Attention," *Clearing Magazine*

facilitate the project. When possible, include all those who give approvals. It is strongly recommended that you invite your grounds maintenance supervisor to join the team. Bring all of these folks into the process as early as possible. Technical assistance with grant applications, garden plans, site preparation, plant selection, procurement, and installation, may be available through non-profit organizations and government agencies.

Approvals and sign-offs

Early in the process, cultivate a good relationship with the school participants. Publicize your project with the interested parties at the school, and encourage them to join in and invite other school members. Make sure you get the proper sign-offs from the school principal, as well as the School System's Grounds and Maintenance Departments. It is also very important that you check with Miss Utility before you begin digging. At your request, they will mark the location of underground utilities (at no charge). This is a very important step to take to avoid accidentally damaging phone, cable, water, gas, and electric utilities.

Set overall goals

For example, the team may decide to develop a habitat restoration project for some of the following reasons: add wildlife value; conserve water resources by planting a xeriscape garden; utilize water resources, for example, by planting a rain garden; prevent erosion and runoff; prevent pollution; remove invasive plants; or provide desirable views and create a "sense of place." The type of garden you choose should be based on site conditions. If you anticipate asking for grant money for the project, consider the grantor's interests and requirements for the type of garden you wish to create. Using native plants with wildlife value is always a good bet. Sometimes existing habitat will make it logical to locate your site so that it connects to these areas, creating wildlife corridors.

Assess your site

How is the site presently used? Are there areas that are not used? How was the site used in the past (if it is possible to obtain the information)? For example, was rubble landfilled at the site in the past? Test the soil and assess variables such as dry, medium, and wet areas, and light conditions.

Draw a concept plan

Find a plat or topographical map, or create a site plan, and request ideas from the group about the ultimate goals for the entire site. If possible, link natural features to create contiguous wildlife corridors. Try to anticipate future plans for the site, such as additions to the building, placement of portable classrooms, or expansion of playing fields. Discussions with principals and other administrators could help prevent your garden from being demolished after only a few seasons.

White Turtlehead
(*Chelone glabra*)



If students learn about ecological principles in the schoolyard, perhaps children will grow up to apply these principles in their communities and in their own backyards.
—Gary Heath,
Maryland State Board
of Education,
*Conserving and
Enhancing the Natural
Environment*

Develop a planting plan

After you have decided on the type of garden or wildlife habitat area you want to install and its location, develop a planting plan. Measure how much space you have; research and select plants which are appropriate for the conditions of the site; then begin sketching your garden design (see Chapter IV). It is a good idea to start with a manageable project size, and then expand over time as you show success. If needed, technical advisors can help with garden plans and help identify plant vendors. You will soon be ready to get your hands dirty with site preparation and planting, that is, playing in the dirt!

Funding

If funds are needed for plants and associated material, write and submit a grant application to, for example, the Chesapeake Bay Trust, the National Fish and Wildlife Foundation, other foundations, or corporations. Seek in-kind donations from the community as well.

Communication and signs

Communicate with everyone whose help you will need: administrators, educational staff, maintenance, grounds keepers, and all those who give approval. Bring them into the process as early as possible. Students can communicate with their local community by developing a flyer, doing a presentation, or inviting others to participate. Also, temporary and permanent signage is important to both inform and educate. Keep everyone informed of the progress; communication is key.

Implementation

Once your planting plan is in hand, you will need to decide on the best method to prepare and plant the garden or wildlife habitat area (see Chapter IV). Work in phases to complete your goals. Pick a manageable project to start with; learn from the first project, then tackle the next.

Student role

In order for students to take ownership of the project, they need to be involved, make decisions, and use their critical thinking skills throughout the process. Special student projects could include: mapping and making observational drawings, writing grant proposals, developing garden designs, making plant labels, developing signage, keeping a journal, and photographing the various stages of the project. Most students will be able to assist with the site preparation, planting, and adding mulch. With a bit of guidance, older students may be able to assist with weeding. Students love to teach others what they have learned. Consider training students to give garden tours. Plan activities to enhance the school's curriculum during and after the garden is planted. (See Chapter X "Resources for Teachers and Outdoor Educators.")

How do you best create a new site, or develop an existing site, into an educationally and environmentally rich place? The answer varies from school site to school site. However, a consistent part of the answer is to involve the students, as fully as possible, in the development of the projects. –Gary Heath, Maryland State Board of Education, *Conserving and Enhancing the Natural Environment*

Student teams

Most teachers divide students into small groups to complete various tasks. In certain parts of the project, some tasks must be done in order. In other parts, several tasks can be done concurrently. For most projects, a class, grade level, or after-school group is responsible for completing the steps that lead up to planting the garden. Additional classes or even the entire school can help with planting day.²⁰

Volunteer assistance

Recruit volunteer assistance to help with site preparation, planting, and other activities. You may want to recruit, for example: parent and teacher organizations, local environmental groups, college students, local businesses, senior citizens, scout groups, civic groups, and neighborhood residents.

Documentation and publicity

Take lots of pictures and keep a journal of activities, both of which could be great student projects. Publicize your good work. Share the ideas and help others get started. Make a list of important media contacts. Notify local media when you have events via a press release. Make sure the school newsletter contains coverage of your activities. Keep a folder or file drawer for journal activities, photos, and other documents to share with the media and potential funders if needed.

Maintenance

First, if you are a school group, you should coordinate with the maintenance personnel to keep them in the loop regarding your plans. The other very important aspect of maintenance is the upkeep of your garden. An area can look like a weed patch in a matter of months if you don't maintain it. The amount of weeding that will be required can be quite variable. (See Chapter IV for tips on maintenance.)

Make sure that long-term maintenance of the site is covered! Will there be a way to involve students and faculty every year for the foreseeable future? Will there be parent and community groups helping to fine-tune, add mulch, weed, and possibly expand the plantings over time? Be sure that you think beyond the first planting season to sustain the garden over time. Remember that new plants will need extra water until they become established. If you plant in mid- to late spring, your plants will need to be watered during the summer. Also, be sure to clearly delineate your planting beds so that maintenance contractors don't accidentally mow them down. Sometimes this requires roping off the planting area, at least temporarily, until it is established and more visible.

Although students will be capable of much of the work on the project, they will need guidance to help them distinguish weeds from desirable plants, especially while the plants are still small.

Tip: While weeding may be an on-going chore, take consolation in the knowledge that over time, year-by-year, as you reduce the weed population and the native plants fill-in the landscape, the weeding will lessen; and that the time spent weeding will generally be significantly less than the maintenance required for a lawn.

Nature inspires. It stirs us, pushes us to question and find answers, teaches us to fly, draws us into its waters, invites us to climb. In nature we discover ourselves.

In nature we gain our mental, spiritual and physical health. Nature enhances life. We teach nature to our children, we restore nature for their children.

We preserve nature for its intrinsic value.
–Ventana Wilderness Society homepage

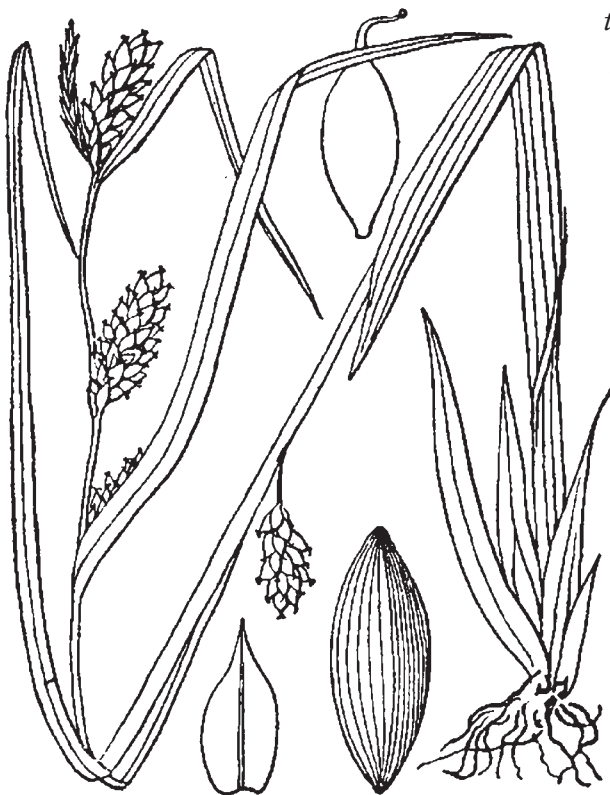
Keep the community involved and the momentum going

Cultivate and sustain interest by staging grand openings, ribbon cuttings, or other events. Invite groups and others to tour your garden(s). Send out press releases whenever events are scheduled.

Consider having one group or grade pass on information about the gardens to a younger group. This provides the older group with a good leadership experience and it allows them to show, by good example, how important the gardens are to the school.

Reluctant Enthusiast

One final paragraph of advice: Do not burn yourselves out. Be as I am—a reluctant enthusiast...a part-time crusader, a half-hearted fanatic. Save the other half of yourselves and your lives for pleasure and adventure. It is not enough to fight for the West; it is even more important to enjoy it; while you can, while it's still here. So get out there and hunt and fish and mess around with your friends, ramble out yonder and explore the forests, encounter the Grizz, climb the mountains, bag the peaks, run the rivers, breathe deep of that yet sweet and lucid air, sit quietly for awhile and contemplate the precious stillness, that lovely, mysterious and awesome space. Enjoy yourselves, keep your brain in your head, and your head firmly attached to the body, the body active and alive, and I promise you this much: I promise you this one sweet victory over our enemies, over those deskbound men with their hearts in a safe deposit box and theirs eyes hypnotized by desk calculators, I promise you this: You will outlive the bastards. –Edward Abbey



Blue Sedge
(*Carex glaucoidea*)

VIII. Alien Invaders and Commonly Used Native Shrubs and Trees



Alien Invaders: America's Most Un-wanted

Here is a sampling of a “most un-wanted” list of various plants you might encounter in creating conservation landscapes. There are many references and authorities on agricultural weeds, but fewer on the types of plants to avoid if you are gardening and landscaping. Here is a selection of those to particularly avoid or eradicate if possible. Your state agricultural extension service can advise you further on the latest invasive species to look out for.

Weeds to take special care to eradicate if possible (very invasive)

Tree of Heaven (*Ailanthus altissima*)
Mile-A-Minute Weed (*Polygonum perfoliatum*)
Multiflora Rose (*Rosa multiflora*)
Kudzu (*Pueraria montana v. lobata*)
Garlic Mustard (*Alliaria petiolata*)
Common Reed (*Phragmites australis*)

Plants not to plant because they are “alien invaders”

English Ivy (*Hedera helix*)
Periwinkle (*Vinca major and minor*)
Bamboos (*Bambusa, Phyllostachys and Pseudosassa species*)
Common Daylily (*Hemerocallis fulva*)
Autumn Olive (*Elaeagnus umbellata*)
Privets (*Lingustrum obtusifolium, L. sinense, L. Vulgare, L. japonicum*)
Winged Burning Bush (*Euonymus alata*)
Butterfly Bush (*Buddleja-several species*)
Purple Loosestrife (*Lythrum salicaria*)

Trees not to plant since they are “alien invaders”

Bradford Pear (*Pyrus calleryana “Bradford”*)
Norway Maple (*Acer platanoides*)
Princess Tree (*Paulownia tomentosa*)

*Commonly Used Native Shrubs and Trees*²¹

There are many excellent sources for detailed information on native plants, many of which are listed in Chapter X “Resources.” Several commonly used herbaceous native plant species are listed in Chapters V and VI. Although the plants listed in these chapters are for rain gardens and xeriscapes, respectively, most will also work well in average conditions. As well, there are many versatile plants that can tolerate dry to moist and sun to shade conditions. The herbaceous plants listed in the preceding chapters

are only a sampling of possible species from which you can choose, as is the following list of shrubs and trees.

When planning your garden or landscape, try to include shrubs and trees in the design. They are the backbone of many landscape designs, and they provide many attributes such as erosion control, air and water purification, water absorption, and wildlife habitat. They are also pleasing to the eye and form the basis of multi-tiered plantings. We have included detailed information on the characteristics and wildlife benefits of several commonly used native shrubs, small trees, and large trees. They are arranged alphabetically by Latin name, within each of the size categories. Several entries in these lists are from the website of the Maryland Department of Natural Resources Tree-mendous Maryland program.

Shrubs

Sweetpepperbush (*Clethra alnifolia*)



Shadbush or Serviceberry (*Amelanchier canadensis*)

Height: 6'-20', Spread: 10'. Erect stems, often clumped. Blends well on the edge of woodland or shrub border with evergreen background. Important berry producer during the early summer months. Fruit eaten by bluebirds, cardinals, and tanagers. Foliage is used by browsers.

Buttonbush (*Cephalanthus occidentalis*)

Height: 6' to 12', Spread: same. Adaptable to many soil types except dry. Full sun to shade. Needs sun to flower. Tolerates flooding to 36 inches. Tolerates drought. Found in marshes, swamps, and forested wetlands; stream, lake, and pond edges.²² Seeds eaten by small birds and ducks.²³

Sweet Pepperbush or Summersweet (*Clethra alnifolia*)

Height: 3'-8', Spread: 4'-6'. Oval, round topped, erect, dense leafy shrub. Transplant into moist, organic soils. Full sun or shade. Excellent for summer flower, shrub border. Good plant for wet areas and heavy shade. Limited wildlife value.

Sweetfern (*Comptonia peregrina*)

Height: 3'. Erect plant with fern-like leaves. Found on hillsides, cliffs, woods openings, sand flats and barrens, fields, dunes. Fragrant, fixes nitrogen, and leaves may persist into winter. Thrives in most dry soils. Sun to partial shade. Has value to songbirds and small mammals.²⁴

Silky Dogwood (*Cornus amomum*)

Height: 6'-10', Spread: 8'. Rounded multi-stemmed shrub. Wet or dry soil. Prefers sun but tolerates partial shade. Reddish purple young growth, and brownish-purple older growth. Fast-growing shrub, flat-topped heads of white flowers, blue fruit ripening to black. Purple to red fall foliage. Plants can spread by layering or cuttings. Will grow on sloped banks and provide effective erosion control in 3 to 5 years. Provides food and cover for a variety of birds and mammals. Nesting sites for gray catbirds and American goldfinches.²⁵

Inkberry (*Ilex glabra*)

Height: 6'-8', Spread: 8'-10'. Upright multibranched, rounded shrub. Prefers moist, acid soils. Excellent for foundations, hedges, mass plantings and as accent plant. Berries used by a wide variety of wildlife.

Inkberry
(Ilex glabra)

Winterberry (*Ilex verticillata*)

Height: 6'-10', Spread: same. Oval, rounded, deciduous shrub holly. Tends to form multistemmed clumps. Does well in light and heavy soils. Prefers moist, organic soils. Excellent for mass plantings and shrub borders. Red fruit is beautiful in winter. A male plant is necessary for fertilization. Used extensively by many songbirds, particularly thrushes, mockingbirds, robins, bluebirds, and thrashers.



Virginia Sweetspire (*Itea virginica*)

Height: 3'-5', Spread: 6'-8'. Erect shrub with clustered branches. Prefers moist, fertile soils. Full sun or shade. Suited for wet areas. Excellent fall color. Fruit capsules are used by some songbirds.

Spicebush (*Lindera benzoin*)

Height: 6'-12', Spread: same. Rounded shrub with pleasant fragrance. Prefers moist soil and found in river bottomlands, northern slopes, and woodland stream banks. Full sun or part shade. Interesting yellow flower in early spring. Brilliant yellow fall foliage and scarlet berries in winter. Dioecious and spreads by suckers. Berries are food for many birds.

Bayberry (*Morella pensylvanica*) or (*Myrica pensylvanica*)

Height: 5'-10', Spread: same. Fragrant leaves. Suckers to form small colonies. Full sun to part shade. Fresh and brackish marshes, swamps, sand flats, and dunes. Tolerates salinity to 20 ppt. Females produce waxy berries which persist into winter. High wildlife value.²⁶

Wax Myrtle (*Morella cerifera*)

Height: 5'-12', Spread: same. Evergreen, upright, rounded, dense shrub. Adaptable to many soil conditions, including poor and wet soils. Full sun to 1/2 shade. Excellent for mass borders. Combines well with broadleaf evergreens. Berry wax is used for candles. Fruit is eaten by a variety of birds in small quantities including tree swallows and myrtle warblers.

Red Chokeberry (*Photinia pyrifolia*) or (*Aronia arbutifolia*)

Height: 6'-10', Spread: 3'-5'. Upright, multistemmed shrub, somewhat open and rounded. Adaptable to many soil types. Full sun to half shade. Used in border and mass plantings. Fruit eaten by grouse, chickadees and other songbirds.

Black Chokeberry (*Photinia melanocarpa*) or (*Aronia melanocarpa*)

Height: 3'-5', Spread: same.²⁷ Tolerates some shade. Prefers moist sites but will grow on drier sites as well. Fruit readily eaten by birds and other wildlife.²⁸

Northern Spicebush
(Lindera benzoin)



Swamp Azalea (*Rhododendron viscosum*)

Height: 6.5'-10'. Attractive, spreading, loose-branched habit. Prefers wet conditions. Sun or partial shade and is found in wet woods and stream-banks. Soil pH of 4-6. Susceptible to disease and insects. Some wildlife value to waterfowl and small mammals.³⁰

Pasture Rose (*Rosa carolina*)

Height: 0.5'-3', Spread: same. Small, bush-like shrub with thorns and pale pink flowers. Dry fields, open woods, rocky banks, shale barrens. Full sun or part shade. Edible fruit is a berry-like rose hip. High wildlife value.³¹

Lowbush Blueberry (*Vaccinium angustifolium*)

Height: 1'-2', Spread: same. Small, bush-like shrub with edible berries. Makes a nice ground layer. Likes dry soil in dry woods, barrens, rock out-croppings. Prefers soil pH of 4-6. Full sun to partial shade. High wildlife value.³²

Highbush Blueberry (*Vaccinium corymbosum*)

Height: 6'-12', Spread: 8'-12'. Upright, multistemmed shrub with spreading branches. Requires moist, well-drained soils. Prefers soil pH 4-6.5.³³ Full sun or light shade. Blends well into shrub borders. Used heavily by grouse, scarlet tanager, bluebirds, thrushes and other songbirds.

American Cranberry (*Vaccinium macrocarpon*)

Height: 0.5 to 1', Spread: forms mats. Low-growing mat which can spread indefinitely. Edible cranberries. Found in sphagnum bogs and cool, swampy areas. Likes soil pH of 4-6. Sun to partial shade. Wildlife eat berries.

Arrowwood Viburnum (*Viburnum dentatum*)

Height: 6'-8', Spread: 6'-15'. Multistemmed, dense, rounded shrub. Adaptable to most soil conditions, but prefers well drained. Suckers freely. Good in hedges and mass plantings. Used by grouse, brown thrasher, cedar waxwing, squirrels and deer.

Nannyberry (*Viburnum lentago*)

Height: 15'-18', Spread: 6'-10'. Shrub or small tree with open habit. Adapts to a wide range of soil conditions. Sun or partial shade. Use as naturalized plant in shrub borders, as background or screen plant. See Arrowwood Viburnum for wildlife value.

Blackhaw Viburnum (*Viburnum prunifolium*)

Height: 12'-15, Spread: 8'-12'. Round-headed tree or multistemmed shrub. Adaptable to many soil types. Sun or shade. Interesting as small specimen tree, or massing, shrub border or groupings. See Arrowwood Viburnum for wildlife value.

Small Trees

Pawpaw (*Asimina triloba*)

Height: 20'-35', Spread: same. Pyramidal shaped small tree, which can

**Early Lowbush
Blueberry
(*Vaccinium pallidum*)**



sucker into a patch of trees. Prefers moist soils in river valleys, bottomlands, understory of woods in the coastal plain. Full sun preferred. Songbirds and small mammals eat the yellow fruit which appears in August to September.³⁴

Eastern Redbud (*Cercis canadensis*)

Height: 20'-30', Spread: 25'-30'. Small tree with rounded crown, pink to purplish flowers in April. Likes moist, well drained soils. Full sun to light shade. Good as specimen tree or in shrub border. Limited wildlife value.

White Fringetree (*Chionanthus virginicus*)

Height: 12'-20', Spread: same. Open habit, often wider than high. Prefers moist, fertile soils and full sun. Excellent specimen tree or in groups, borders or near large buildings. Limited wildlife value.

Flowering Dogwood (*Cornus florida*)

Height: 20', Spread: 15'-20'. Small tree with flat topped crown. Place in well drained soil. Full sun to partial shade. Has character in all four seasons. Excellent as specimen tree or used on the corner of a house or in a woodland group setting. Fruit is an important food source for songbirds including evening grosbeaks, cardinals, robins and cedar waxwings.

Common Witchhazel (*Hamamelis virginiana*)

Height: 20-30', Spread: 20'-25'. Small tree or multistemmed shrub with yellow flowers in winter. Prefers moist soils in full sun or partial shade. Excellent for foundations, hedges, mass plantings and as an accent plant. Limited wildlife value.

American Holly (*Ilex opaca*)

Height: 15'-30', Spread: 18'-25'. Dense, pyramidal in youth, opening up with age. Plant in moist, well drained soil. Full sun or partial shade. Use one male for every three females. Use as specimen plant or in groupings. Many cultivars. Used extensively by many songbirds including thrushes, mockingbirds, catbirds, bluebirds and thrashers. Foliage provides cover for songbirds and mammals.

Sweetbay Magnolia (*Magnolia virginiana*)

Height: 12'-30', Spread: same. Multistemmed, small, semi-evergreen tree with fragrant, whitish flowers May-July. Likes wet, acid soils (pH 5-6.5) in forested wetlands, seeps, stream and pond edges, sandy woods. Tolerates sun or shade, occasional flooding and some salt.³⁵ Used as specimen tree. Wildlife value is low. Seeds are eaten by some mammals and birds. Foliage is used by several birds for nest building.

Sassafras (*Sassafras albidum*)

Height: 35'-50', Spread: same. Variable leafed tree with famous "mitten-shaped" and other leaves. Historically used for tea and medicinal purposes, though the tea now thought to be carcinogenic. Likes moist, open woods. Full sun to partial shade. High wildlife value.³⁶

**PawPaw
(*Asimina triloba*)**



**White Fringetree
(*Chionanthus virginicus*)**



Red Maple
(*Acer rubrum*)



Large Trees

Red Maple (*Acer rubrum*)

Height: 40'-60', Spread: same. Habit is pyramidal in youth and rounded with age. Tolerant of most soils, but prefers slightly acid, moist conditions. Naturally occurs in wet areas. Excellent tree as specimen for lawn and park settings. Excellent fall color. Buds, flowers and leaves provide food for many birds and mammals. Chipmunks and squirrels eat seeds and some songbirds use stalks for nest building.

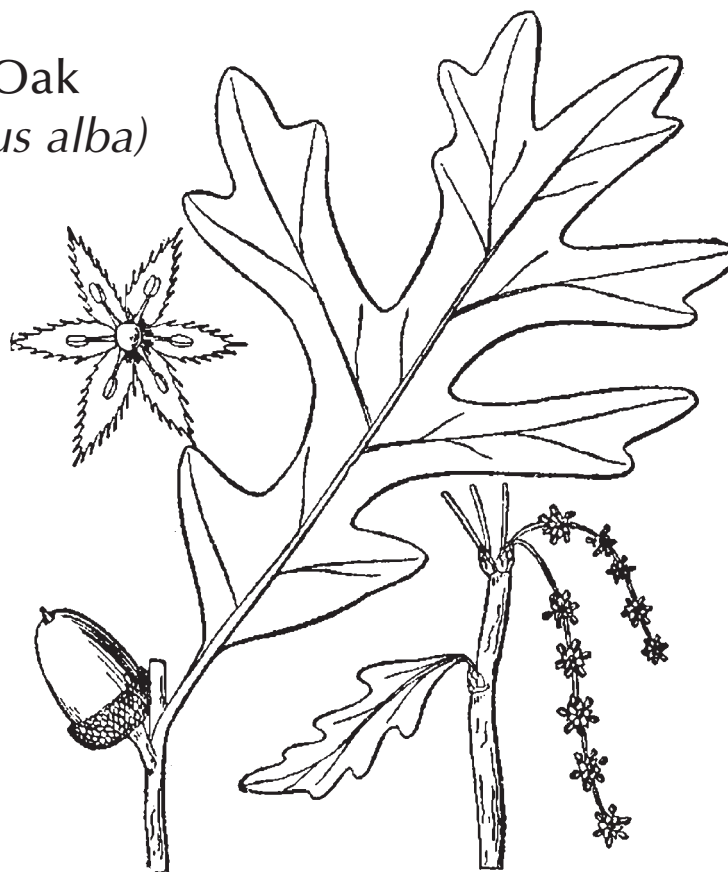
Silver Maple (*Acer saccharinum*)

Height: 50'-70', Spread: 40'-50'. Native to Mountain and Piedmont regions, not Coastal Plain.³⁷ Has strong spreading branches which form a rounded crown. Tolerant of many soil types. One of the best trees for poor soils and wet conditions. Use of this tree should be limited to areas free of buildings and heavy human use as it is prone to internal decay and subsequent loss of branches. Provides fast shade. See Red Maple for wildlife users.

River Birch (*Betula nigra*)

Height: 40'-70', Spread: 40'-60'. Pyramidal in youth and rounded with age. Often grown multistemmed. Best adapted to moist soils. Used in areas that are alternately wet and dry. Handsome tree used as specimen in parks and estates. Catkins are used by redpolls and pine siskins. Foliage is used by browsers.

White Oak
(*Quercus alba*)



Shagbark Hickory (*Carya ovata*)

Height: 60'-80'+, Spread: 40'-60'. Straight trunk with an oblong crown. Bark breaks up in thin plates. Difficult to transplant, start as seedling. Should not be used in landscaped areas because its exfoliating bark and nuts make it a "dirty" tree. Best reserved for woodland border. Leaves are used by browsers. Nuts are also consumed by deer, turkey, foxes, wood ducks, and squirrels.

Common Hackberry (*Celtis occidentalis*)

Height: 40'-60', Spread same. In youth weakly pyramidal; in old age the crown is a broad top of ascending, arching branches. Medium to fast growth. Prefers rich, moist soils, but grows in dry, heavy or sandy, rocky soils; withstands acid or alkaline conditions; moderately wet or very dry areas; tolerates wind; full sun; withstands dirt and grime of cities. Fruit is fleshy, orange to dark purple, ripening in September to October. Leaves are yellow to yellow-green in fall. Good tree for park or large area use. Useful tree for adverse growing conditions. Fruit is popular with winter birds, especially the cedar waxwing, mockingbird, and robin.

Atlantic White Cedar (*Chamaecyparis thyoides*)

Height: 20'-35', Spread: 20'-40'. Rare evergreen tree, but being reestablished locally. Native to DE, MD, and VA coastal regions. Found in wet soil in freshwater swamps, bogs, and woods. Partial to full shade. Soil pH of 4.5-5.5.³⁸ Some wildlife value, provides food and cover for birds, butterflies, and other small animals.

American Beech (*Fagus grandifolia*)

Height: 50'-70'+, Spread: same. Often has short trunk with wide spreading crown. Likes moist, well drained soils. Does best in full sun, but tolerates shade. Should be restricted to large area use for parks and estates. Beechnuts are eaten by birds and mammals and are important food for chipmunks and squirrels.

White Ash (*Fraxinus americana*)

Height: 50'-80', Spread: same. Pyramidal in youth and later developing an open rounded crown. Grows best on deep, well drained soils and full sun. Used often as a lawn tree in parks and golf courses. Moderate importance to wildlife. Seeds eaten by wood duck, finches, and cardinals.

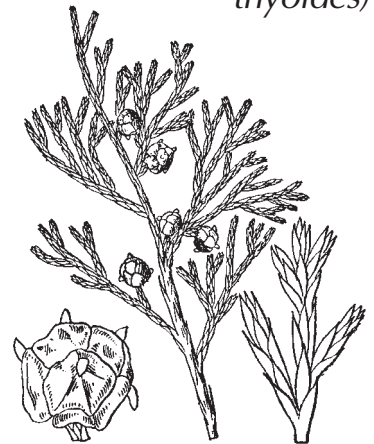
Green Ash (*Fraxinus pennsylvanica*)

Height: 50'-60', Spread: 25'-30'. Pyramidal in youth, developing upright, spreading habit at maturity. Grows quickly in full sun and in a wide range of soil conditions. Naturally found on moist bottomlands. See White Ash for wildlife users.

Black Walnut (*Juglans nigra*)

Height: 50'-75', Spread: same. Well formed trunk with oval crown. Prefers rich, moist soils. Often found on bottomlands. Difficult to transplant. Should be started as seedling. Produces toxins which are poisonous to many plants

Atlantic White Cedar
(*Chamaecyparis thyoides*)



giving it an advantage in open field situations but creating problems for gardeners. Nuts are eaten by woodpeckers, foxes, and squirrels.

Eastern Red Cedar (*Juniperus virginiana*)

Height: 40'-50', Spread: 8'-20'. Densely pyramidal when young and slightly pendulous in old age. Medium rate of growth. Tolerant of adverse conditions. Prefers deep, moist soils. Will tolerate shade only in youth. Handsome reddish brown bark. Produces small cones. Useful for windbreaks, shelter belts, hedges and topiary work. Twigs and foliage are eaten by browsers. Seeds are eaten most extensively by cedar waxwings. Evergreen foliage provides nesting and roosting cover for sparrows, robins, mockingbirds, juncos, and warblers.

American Sweetgum (*Liquidambar styraciflua*)

Height: 60'-75'+, Spread: 2/3 height. Pyramidal in youth, rounded crown at maturity. Likes deep, moist, acid soils. Occurs naturally on bottomlands. Excellent for lawn or park area. Gumballs can be a problem in lawn settings. Goldfinches and purple finches eat winged seeds.

Tulip Poplar (*Liriodendron tulipifera*)

Height: 70'-90', Spread: 30'-50'. Long, straight trunk with a narrow canopy. Fast grower. Plant in full sun and a well drained loam. Use in large areas. Wood somewhat weak. Moderate wildlife importance. The purple finch and cardinal are principal users.

Black Gum (*Nyssa sylvatica*)

Height: 30'-50', Spread: 20'-30'. Pyramidal in youth and irregularly crowned at maturity. Prefers moist, well drained, acid soils. Full sun or semi-shade. Deep taproot. Beautiful tree when used as a specimen. Fruit is relished by many songbirds. Users include wood ducks, robins, woodpeckers, thrashers, flickers, and mockingbirds.

Eastern White Pine (*Pinus strobus*)

Height: 50'-80'+, Spread: 20'-40'. Pyramidal in youth, crown at maturity has several horizontal and ascending branches. Fast grower. Grows best on fertile, well-drained soils, but is very adaptable. A very handsome and ornamental specimen, valuable for lawns, parks, and estates. Provides valuable cover and nesting sites for songbirds and mammals. Needles are used as nesting material. Seeds are eaten by quail, chickadees, grosbeaks, nuthatches and woodpeckers.

White Oak (*Quercus alba*)

Height: 100', Spread: 50'-80'. Pyramidal in youth, becoming broad and rounded with wide spreading branches. Transplant as small tree. Prefers moist, well drained soils. Difficult to obtain from nurseries. Sometimes available as seedling. Worthwhile tree for large areas. Oaks, in general, are of major importance to wildlife. Acorns are at the top of the food preference list for wood ducks, pheasants, grackles, jays, nuthatches, thrushes, woodpeckers, rabbits, foxes, squirrels and deer.

**Black Walnut
(*Juglans nigra*)**



Pin Oak (*Quercus palustris*)

Height: 60'-70', Spread: 25'-40'. Strongly pyramidal with ascending branches. One of the faster growing oaks. Full sun. Tolerates wet soils but is adaptable to many soils types. Most widely used oak for landscaping. Used on lawns, parks, golf courses and around commercial buildings. See white oak for wildlife uses.

Red Oak (*Quercus rubra*)

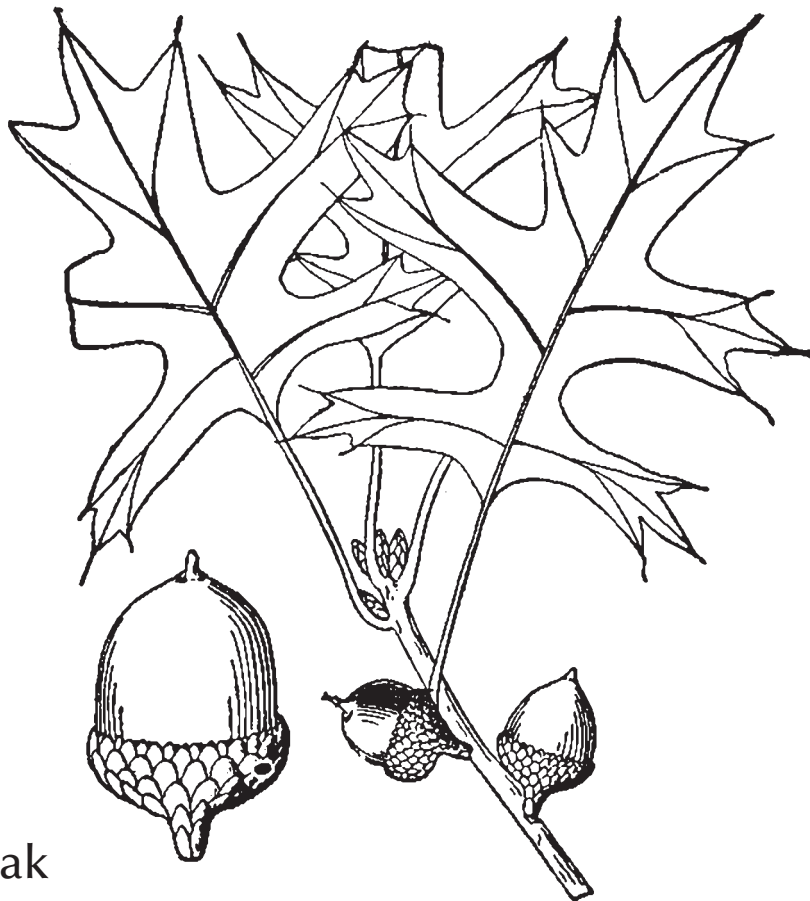
Height: 60'-75', Spread: 40'-50'. Often larger in the wild. Habit is round-topped and symmetrical. Full sun. Prefers loamy, well drained soils. Fast growing tree for lawns, parks and estates. See white oak for wildlife uses.

Willow Oak (*Quercus phellos*)

Height: 50'-100', Spread: 30'-70'. Fast growing oak with willow-like foliage. Good shade tree. Full sun or semi-shade. Easily grown in wet soils. See white oak for wildlife uses.

Bald Cypress (*Taxodium distichum*)

Height: 50'-100', Spread: 20'-35'. Deciduous conifer adapted to wet soil near rivers, lakes, and pond margins, also coastal marshes and river bottoms. Sun or partial shade. Tolerates acid soils pH 4.5-6. Some value for waterfowl.³⁹



Pin Oak
(Quercus palustris)



IX. Glossary of Conservation Landscaping Terms

Willow Oak
(*Quercus phellos*)



Annual: A plant that completes its life cycle in one growing season.

Backyard composting: Diversion of organic food waste and yard trimmings from the municipal waste stream by composting them in one's yard through controlled decomposition of organic matter by bacteria and fungi into a humus-like product.

Berm: A mound of soil created to provide ornamental or functional benefits.

Best management practices (BMPs): Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.

Biodiversity: A large number and wide range of species of animals, plants, fungi, and microorganisms. Ecologically, wide biodiversity is conducive to the development of all species.

Buffer: A naturally vegetated area established or maintained to cushion and protect aquatic, wetland, shoreline, and terrestrial environments from man made disturbances.

Composites: Plants in the family compositae, which typically produce daisy-like flower heads containing lots seeds.

Conifer: A plant that bears either needlelike or scale-like foliage. Cones are the most common reproductive structure.

Cultivar (cv.): A patented plant that can be produced only by asexual means (cuttings, grafting, etc.). In order to maintain the biodiversity of native plants, it is important to try to plant "species" plants rather than cultivars.

Deadheading: The removal of some types of flower heads to force them to bloom again.

Deciduous: Describes a plant which sheds or loses its foliage at the end of the growing season.

Ecology: The science of the relationships between organisms and their environment.

Ecoscaping: A term for conservation landscaping. Garden and landscape techniques which improve air, land, and water quality and protect or increase wildlife habitat. Other benefits include reduced maintenance time and costs, as well as enhanced beauty and "sense of place."

Ecosystem: A more or less self-contained biological community together with the physical environment in which the community's organisms occur.

Estuary: A partially restricted body of water where the flow of freshwater mixes with saltier water transported, by tide, from the ocean. Estuaries are the most productive water bodies in the world.

Evergreen: A plant that holds its foliage through the dormant season. The foliage may be needlelike (pines, spruces), scale-like (arborvitae, junipers), or broadleaf (azaleas, rhododendrons).

Excess stormwater runoff: Any increase in stormwater resulting from: an increase in the imperviousness of a site, including all additions to buildings, roads, and parking lots; changes in permeability caused by compaction during construction or modifications in contours, including the filling or drainage of small depression areas; the alteration of drainageways, or regrading of slopes; the destruction of forest; or the installation of collection systems to intercept street flows or to replace swales or other drainageways.

Fauna: The total animal population that inhabits an area.

Flora: The total vegetation assemblage that inhabits an area.

Forest: A biological community dominated by trees and other woody plants.

Habit: The shape and form of a plant.

Habitat: The place where a population (e.g. human, animal, plant, microorganism) lives and its surroundings, both living and non-living.

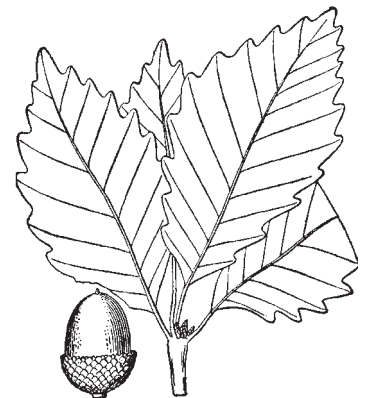
Hedgerow: A group or row of shrubs and trees separating two grassy or lower growing areas. It can act as a windbreak and provide habitat for small wildlife.

Herbaceous: Refers to plants that flourish during the growing season but die back to the ground and over-winter in some underground structure such as bulbs or roots.

Impervious surface: An area covered with solid material or that is compacted to the point where water cannot infiltrate underlying soils (e.g. parking lots, roads, houses, patios, swimming pools, tennis courts, etc.). Stormwater runoff velocity and volume can increase in areas covered by impervious surfaces.

Invasive plant: A plant which tends to escape containment and rapidly spread in an area. These plants frequently have few natural controls in the area in which they have become invasive. Native plants are capable of escaping containment and spreading rapidly, so the word *invasive* is usually reserved for alien species, meaning from another part of the country or the world.

Chestnut Oak
(*Quercus prinus*)



Mulch: Organic by-products, such as wood chips, bark or leaves, or even grass clippings that are spread upon beds or gardens to reduce weeds and conserve moisture. Their breakdown can improve the organic component of the soil.

Native plant: A plant historically present in a particular region. Native is usually defined as having been found indigenous to the local area before colonists began to arrive with plant materials from elsewhere. In our case, native plants would ideally be from the Chesapeake Bay watershed and from the coastal, piedmont, or mountain region as fits your site location.

Non-point sources: Diffuse pollution sources (i.e. without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non-point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

Nutrient: Any substance assimilated by living things that promotes growth. The term is generally applied to nitrogen and phosphorus in wastewater, but is also applied to other essential and trace elements.

Nutrient pollution: Contamination of water resources by excessive inputs of nutrients. In surface waters, excess algal production is a major concern.

Perennial: A plant that lives three or more years.

Permeable surfaces: Areas characterized by materials that allow stormwater to infiltrate the underlying soils (e.g., soil covered or vegetated areas).

Pesticides: Chemical agents used to destroy pests.

Pine: A conifer that bears its needles in clusters of two, three, or five. The term pine is often misused to describe any large conifer.

Pollutant: A waste material that contaminates air, soil, or water. Sediment, nutrients, and toxic chemicals are considered the major groups of pollutants contributing to the deterioration of the Chesapeake Bay ecosystem.

Rain garden: Low-lying saucer-shaped garden area that has absorbent soils which temporarily collect stormwater runoff, usually from a roof, pavement, or other impervious surface, and allow it to slowly percolate into the soil. This provides flood control, groundwater recharge, and water-cooling benefits, while the plants, soils, and associated microorganisms remove many types of pollutants—such as pesticides, oils, metals, and other contaminants—from stormwater runoff.

Restoration of habitat: The process of returning habitat to a close approximation of its historic, natural condition. This can include using native plants in conditions that might be found in nature, in order to provide

Chinquapin Oak
(*Quercus muehlenbergii*)



wildlife with their essential needs.

Riparian: Related to the banks of a river or stream.

Shrub: A plant that grows less than 20 feet high and may have one or many trunks or stems protruding from the ground.

Species: The basic scientific name for plants and animals. A species has two names, the genus, whose first letter is capitalized; and the species name, which describes some physical feature or geographic location or honors some prominent plant scientist. Red Maple has the scientific name *Acer rubrum*.

Specimen or feature plant: A plant that possesses some asset (form, foliage effects, bark interest, or flower display) that makes it stand out from the rest in the landscape. The most successful specimen plant will have something to offer all four seasons of the year.

Stewardship: The concept of land as a resource, our responsibility to wisely manage that resource, and our responsibility to future generations for the condition of that resource when we leave it.

Tributary: A river or stream that connects to a larger body of water.

Understory: Shade-tolerant plants that can grow beneath the arching, branched canopy of woodland shade trees.

Variety: A term often used where the term cultivar should be employed. Botanically a variety is a population within a species that has some consistent heritable feature that distinguishes it from the general species population. If this feature is considered to be desirable and the plant can be successfully propagated asexually, a member of a variety may become the source of a cultivar.

Watershed: The land area which drains into a body of water. Any rain or snow which falls on the watershed eventually makes it into that body of water. A synonym is drainage basin. The watershed of the Chesapeake Bay encompasses some 16 million acres.

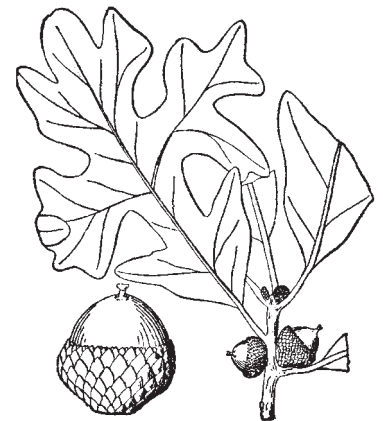
Weed: A plant considered undesirable, unattractive, or troublesome, especially one growing where it is not wanted, as in a garden.

Wildlife corridors: Contiguous vegetated areas containing trees and shrubs which provide corridors in which wildlife can safely travel to meet their needs.

Wildlife habitat: Those plant communities and physiographic features that provide food, water, and cover, nesting and foraging or feeding conditions necessary to maintain populations of animals.

Xeriscaping: Landscaping with drought-tolerant plants to conserve water in dry conditions.

Post Oak
(*Quercus stellata*)





X. Resources

Chesapeake Ecology Center (CEC)

Chesapeake Ecology Center, 410-212-4506, at Adams Academy at Adams Park, 245 Clay Street, Annapolis, MD 21401. Ongoing restoration and demonstration projects, featuring 18 Native Plant Demonstration Gardens, including rain gardens and xeriscapes, on 10 acres in the heart of Annapolis. Self-guided tours; guided tours are also available. Check the CEC's website for conservation landscaping information, photos of native plant gardens, upcoming events, and more.
www.ChesapeakeEcologyCenter.org

There are several helpful websites with extensive information on topics related to conservation landscaping. We have consulted the websites of —Alliance for the Chesapeake Bay; Chesapeake Bay Foundation; and US Fish and Wildlife Service, Chesapeake Bay Field Office—and included some of their listings. We appreciate the good work these organizations have done, and encourage you to visit their sites for more information.

Bay-Friendly Landscaping (BayScaping)

Alliance for the Chesapeake Bay, BayScapes program, DC 202-466-4633, VA 804-775-0951, PA 717-737-8622, MD 410-377-6270, extensive information available. www.acb-online.org/project.cfm?vid=85

Chesapeake Bay Foundation Headquarters, 410-268-8816, Merrill Center, 6 Herndon Avenue, Annapolis, MD 21403. Ongoing restoration and demonstration projects on 33 acres. Arboretum, formal native landscape gardens, no-mow meadows, non-tidal wetlands, upland reforestation, bio-retention stormwater management, rain gardens, rain barrels. Open to the public weekdays, 9-5. Please check in with the receptionist before touring the grounds. www.cbf.org/landscaping

Chesapeake Bay Program, *Better Backyard: A Citizen's Resource Guide to Beneficial Landscaping and Habitat Restoration in the Chesapeake Bay Watershed*, PDF file to download. www.chesapeakebay.net/pubs/781.pdf, or call 800-YOURBAY

University of Maryland Cooperative Extension, Home and Garden Information Center, 800-342-2507 (in Maryland), outside Maryland 410-531-1757. www.hgic.umd.edu

USDA Natural Resources Conservation Service, 888-LANDCARE, for free booklet on Backyard Conservation. Tips on tree planting, wildlife habitat,

backyard wetlands, etc. can be downloaded from the website.
www.nrcs.usda.gov/feature/backyard

US Fish and Wildlife Service, Chesapeake Bay Field Office, extensive information available. www.fws.gov/chesapeakebay

Bio-Engineering (Biologs) for Rain Gardens and Shoreline Protection

Biohabitats, Inc., 410-337-3659, President - Keith Bowers, 15 W. Aylesbury Road, Timonium, MD 21093. www.biohabitats.com

IKEX Inc., 800-835-1516, 2601 Emory Road, Finksburg, MD 21048

Pinelands Nursery, Inc., 800-667-2729, 323 Island Road, Columbus, NJ, 08022, bioengineering materials, wetland trees, shrubs, herbaceous plants. www.pinelandsnursery.com

Ragen Associates, 800-752-1010, 20 Larsen Road, Iselin, NJ 08830. www.ragen.com

SI Geosolutions, 800-621-0444, 6025 Lee Highway, Suite 435, Chattanooga, TN 37421. www.fixsoil.com

Compost Websites

Cornell University has a website which also has suggestions for composting at schools. http://compost.css.cornell.edu/Composting_homepage.html

Maryland Department of the Environment website on composting. www.mde.state.md.us/assets/document/factsheets/composting.pdf

Florida has an outstanding compost web site. www.compostinfo.com

Pennsylvania home composting. www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/compost/home1.htm

Lawn Resources

EPA Mid-Atlantic Region 3 has excellent resources, including a power point presentation on conservation landscaping created by Dan Welker. www.epa.gov/reg3esd1/garden

In Maryland, to order free and online publications and downloads on lawns such as “Lawns and the Chesapeake Bay,” contact University of Maryland Cooperative Extension, Home and Garden Information Center, 800-342-2507. www.hgic.umd.edu

Blue Mistflower
(*Conoclinium coelestinum*)



Environmentally Sound Way, Public Information Center PM-2113, EPA, 401 M Street, S.W., Washington, DC 20460, published in 1992

The Lawn, A History of an American Obsession, by Virginia Scott Jenkins, Smithsonian (Institution Press, 1994)

The Natural Lawn and Alternatives, Brooklyn Botanic Garden (1993, 1995)

Redesigning the American Lawn, by F. Herbert Bormann, Diana Balmori, Gordon Geballe, (Yale University Press, 1993)

Native Plant Information

Delaware Native Plant Society, 302-674-5187.
www.delawarenativeplants.org

Ladybird Johnson Wildflower Center. www.wildflower.org

Maryland Department of Natural Resources, Tree-mendous Maryland. Trees and shrubs may be ordered by various Maryland community or government groups through this program, at www.dnr.maryland.gov/forests/treemendous, or from the State Forest Tree Nursery at 1-800-TREESMD, or www.dnr.state.md.us/forests/nursery

Maryland Native Plant Society, PO Box 4877, Silver Spring, MD 20914.
www.mdflora.org

National Arboretum, 202-245-2726, 3501 New York Avenue, NE, Washington, DC 20002. www.usna.usda.gov/Gardens/faqs/nativeaq1.html

Pennsylvania Native Plant Society, PO Box 281, State College, PA 16804-0281. www.pawildflower.org

Smithsonian National Museum of Natural History, Department of Botany. *Annotated Checklist of the Vascular Plants of the Washington – Baltimore Area, Part I and Part II*, by Stanwyn G. Shetler and Sylvia Stone Orli, an excellent scientific compilation indicating which plants are native and which are not, can be downloaded from <http://www.nmnh.si.edu/botany/>

USDA Natural Resources Conservation Service.
<http://plant-materials.nrcs.usda.gov>

USDA PLANTS Database. The US Department of Agriculture's Natural Resource Conservation Service has put together a great resource for practical plant information. <http://plants.usda.gov>

US Fish and Wildlife Service (USFWS), Maryland native plant lists to download. www.nps.gov/plants/pubs/nativesMD

Wild Oats
(*Chasmanthium latifolium*)



USFWS, Chesapeake Bay Field Office. *Native Plants for Wildlife Habitat and Conservation Landscaping*, an excellent book with color photos, by Britt Slattery, Kathryn Reshetiloff, and Susan M. Zwicker, published in 2003. It can be downloaded in pdf format. www.nps.gov/plants/pubs/chesapeake

Virginia Native Plant Society, 540-837-1600. www.vnps.org

Wild Ones, Native Plants, Natural Landscapes. www.for-wild.org

Native Plant Suppliers

(Check also with your local native plant society)

Adkins Arboretum, 410-634-2878, 12610 Eveland Road, PO Box 100, Ridgely, MD 21660. Adkins has biannual native plant sales. Check their website and those of native plant societies for listings of other local native plant sales in the watershed. www.adkinsarboretum.org

Anne Arundel County Planning and Zoning, Annapolis, MD, 410-222-7441. Will provide free marsh grasses (*Spartina alterniflora*) to Anne Arundel County residents after application and site visit is completed.

Chesapeake Natives, 301-270-4534, 326 Boyd Avenue#2, Takoma Park, MD 20912. Native plants propagated from indigenous seed sources, mail order, nursery location in Riva, MD. Non-profit founded by Dr. Sara Tangren. www.chesapeakenatives.org

Clear Ridge Nursery, 888-226-9226, 217 Clear Ridge Road, Union Bridge, MD 21791, native trees and shrubs for conservation.

Environmental Concern, 410-745-9620, PO Box P, St. Michaels, MD 21663. Non-profit wholesale and retail nursery for riparian and wetland plants, education and research facility. www.wetland.org

Ernst Conservation Seeds, 800-873-3321, 9006 Mercer Pike, Meadville, PA 16335. Seeds and plants (mostly) native to the US; live stakes for streambank restoration. www.ernstseed.com

Lower Marlboro Nursery, 301-812-0808, PO Box 1013, Dunkirk, MD 20754. Shade plants including many native perennials, wildflowers, shrubs. Open by appointment; the owner is Mary Stuart Sierra who has a wealth of information on plant care and cultivation. www.lowermarlboronursery.com

Octoraro Native Plant Nursery, 717-529-4099, in Pennsylvania, native trees, and shrubs for reforestation and streambank restoration.

Hyssop-leaved
Thoroughwort
(*Eupatorium
hyssopifolium*)



www.octoraro.com. Associated with New Moon Nursery which grows herbaceous perennials, aquatics, grasses, and ferns.
www.newmoonnursery.com

Sylva Native Nursery and Seed Company, 717-227-0486, in Pennsylvania, native trees and shrubs. www.sylvanative.com

Non-Native Invasive Plants

Federal-level website with information from across the nation on invasive plant and animal species, www.invasivespecies.gov

Maryland Native Plant Society, PO Box 4877, Silver Spring, MD 20914. Information on controlling non-natives, with lists of native plant alternatives. www.mdflora.org/publications/invasives.htm.

Mid-Atlantic Exotic Pest Plant Council at www.ma-eppc.org

Plant Conservation Alliance, Alien Plant Working Group at www.nps.gov/plants/alien

Plant Invaders of Mid-Atlantic Natural Areas, National Park Service and USFWS, Chesapeake Bay Field Office. Very helpful handbook which includes photos, descriptions, control methods, and native alternatives. This publication is also online at www.nps.gov/plants/alien/pubs/midatlantic/

USDA Agricultural Research Service. Many alien invaders have become agricultural pests. To access a database on agricultural weeds to avoid and remove if possible, search the database by state.
http://invaders.dbs.umt.edu/Noxious_Weeds

Weeds of the Northeast, by Richard H. Uva, Joseph C. Neal, and Joseph M. DiTomaso. (Cornell University, 1977). Excellent photos and descriptions of a variety of weeds, including some native plants as well as alien invasives.

Purple Loosestrife and Phragmites (Common Reed) Both Tough Invasive Plants of Wet Areas

Maryland Department of Natural Resources, 410-827-8612, Wildlife and Heritage Service. www.dnr.state.md.us/wildlife/phrag.asp

The Nature Conservancy, information on control methods for phragmites and purple loosestrife. <http://tncweeds.ucdavis.edu/moredocs/lytsa01.html>

Rain Barrels

Arlington Echo Outdoor Education Center, 410-222-1688 or 410-222-3822, 975 Indian Landing Road, Millersville, MD 21108. Download instructions on how to obtain and construct a rain barrel. www.arlingtonecho.org/r_barrels.htm

Chesapeake Bay Foundation, rain barrel publication to download, search for “Build Your Own Rain Barrel” (PDF, 1.4MB). www.cbf.org

Gardeners Supply, Burlington, Vermont, source for purchasing rain barrels at 888-833-1412. www.gardeners.com

Maryland Department of Natural Resources Rain Barrel instruction page. www.dnr.state.md.us/smartgrowth/greenbuilding/rainbarrel.html

Rain Gardens

Chesapeake Bay Foundation, on website click on “Bay Resources” to download the publication “Build Your Own Rain Garden” (PDF, 3.0 MB). www.cbf.org

Maplewood, Minnesota Department of Public Works, Engineering Division, 2003. Remember to use species local to our area, but check out ideas by searching for “rainwater gardens.” www.ci.maplewood.mn.us

Prince George’s County (Maryland), 301-883-5832, Programs and Planning Division, 9400 Peppercorn Place, Suite 610, Largo, MD 20774. *Prince George’s County Bioretention Manual*, by L. S. Coffman and D. A. Winogradoff, 2001, 2002, a very helpful reference. You will also find an outstanding rain garden plant list and instructions. www.goprincegeorgescounty.com/government/agencyindex/der/esd/bioretention/bioretention.asp

Rain gardens of Western Michigan’s website contains excellent background and how-to information at www.raingarden.org

University of Wisconsin-Extension’s website has an excellent rain garden manual which can be downloaded. <http://clean-water.uwex.edu/pubs/raingarden/rgmanual.pdf>

Weems Creek Conservancy, 410-263-2102, PO Box 6018, Annapolis, MD 21401-6018. Rain garden instructions and plant lists. <http://weemscreek.org/proj-mine-raingarden.html>

Resources for Teachers and Outdoor Educators

Chesapeake Bay Foundation has a wealth of information, particularly on working with students on various water-related projects, such as raising

Swamp Sunflower
(*Helianthus angustifolius*)



SAV grasses, teacher training courses, and opportunities for student trips and programs on the Bay. www.cbf.org

Maryland Association for Environmental and Outdoor Education website has information on conferences, events, information on the Maryland Green School Program. www.maeoe.org

Project WET (Water Education for Teachers) has a website which tells how to find local teacher training and other materials. www.projectwet.org

Sharing Nature with Children, by Joseph Cornell, (DAWN Publications, 1998) is a basic guidebook to consult, with activities and philosophy on introducing children to nature study. Particularly helpful if you haven't worked in outdoor education before.

Great Blue Lobelia (*Lobelia siphilitica*)



USFWS, Chesapeake Bay Field Office's website has extensive information for teachers at www.fws.gov/chesapeakebay/schoolyd.htm.

Your state's Department of Natural Resources, such as Maryland DNR or the Virginia Naturally program may have lesson plans, grants and information that will be useful to you and your students. www.dnr.state.md.us/education/ or www.vanaturally.com

Your county or school system may have an outdoor education program with training and programs available, such as Arlington Echo Outdoor Education Center, in Anne Arundel County Maryland. www.arlingtonecho.org

Soil Test Kits (Essential When Thinking of Amending Soil)

University of Maryland Cooperative Extension, Home and Garden Information Center, 800-342-2507, has a list of regional (VA, PA, DE, OH, GA) laboratories who will do soil tests at cost. www.agnr.umd.edu/SoilTesting

Pennsylvania Cooperative Extension Service, contact your local county extension office or search the directory. www.extension.psu.edu/extmap.html

Virginia Cooperative Extension Service, contact your local county extension office or search the directory. www.ext.vt.edu/offices

Stormwater Information

Center for Watershed Protection, 410-461-8323, 8391 Main Street, Ellicott City, MD 21043-4605. A non-profit corporation that provides local governments, activists, and watershed organizations with the technical tools needed for protecting water quality. Information is available on watershed planning, watershed restoration, stormwater management,

watershed research, better site design, education and outreach, and watershed training. www.cwp.org

The Low Impact Development Center, 301-982-5559, nc., 5010 Sunnyside Avenue, Suite 200, Beltsville, MD 20705, focuses on the design and planning of a development site to reduce environmental and water quality impacts, through runoff retention, grading, planting and stormwater management. www.lowimpactdevelopment.org

Wetlands

Environmental Concern, 410-745-9620, PO Box P, St. Michaels, MD 21663. Non-profit wholesale and retail nursery for riparian and wetland plants, education and research facility. www.wetland.org

USDA Natural Resources Conservation Service, 888-LANDCARE, for free booklet on Backyard Conservation. Tips on backyard wetlands and ponds can be downloaded from the website. <http://www.nrcs.usda.gov/feature/backyard>

Wildlife Habitat

National Wildlife Federation, Backyard Habitat Certification Program. www.nwf.org/backyardwildlifehabitat/habitatmeter.cfm

USFWS, Chesapeake Bay Field Office, Annapolis, MD. <http://chesapeakebay.fws.gov/>

Wild Acres Program, Maryland Department of Natural Resources. www.dnr.state.md.us/wildlife/wildacres.asp

WindStar Wildlife Institute, Backyard Habitat Restoration, has a Certification and Internet Course with an emphasis on creating habitat for wildlife using native plants. www.windstar.org

Xeriscaping

University of Maryland Cooperative Extension, pamphlet on xeriscaping online. (Plant list doesn't distinguish between native and non-native drought-tolerant species.) <http://www.agnr.umd.edu/users/hgic/pubs/online/hg25.pdf>

Virginia Cooperative Extension, website with information on how to create a "Water-Wise Landscape." <http://www.ext.vt.edu/pubs/envirohort/426-713/426-713.html>

General Reference Books and Field Guides

The American Woodland Garden, by Rick Darke (Timber Press, 2003)

Cardinal Flower
(*Lobelia cardinalis*)



Chesapeake Bay: A Field Guide, by Christopher P. White (Tidewater Publishers, 1989)

Common Plants of the Mid-Atlantic Coast, by Gene M. Silberhorn (Johns Hopkins University Press, 1982)

Eastern Trees, by George A. Petrides and Janet Weir (Peterson Field Guides, 1998)

The Garden Primer, by B. Damrosch (Workman Publishing Company, 1988)

Grasses: An Identification Guide, by Lauren Brown (Houghton Mifflin, 1979)

Growing and Propagating Showy Native Woody Plants, by Richard E. Birr (University of North Carolina Press, 1992)

Landscaping with Native Trees, by Guy Steinberg and Jim Wilson (Chapters, 1995, out of print)

Landscaping with Wildflowers: An Environmental Approach to Gardening, by Jim Wilson (Houghton Mifflin, 1992)

Life in the Chesapeake Bay, by Alice Jane and Robert L. Lippson (Johns Hopkins University Press, 2000)

The Native Habitat Garden, by Ken Druse (Clarkson Potter, 1994)

The New England Wildflower Society Guide to Growing and Propagating Wildflowers of the United States and Canada, by William Cullina (Houghton Mifflin Company, Boston, 2000)

Noah's Garden, by Sara Stein (Houghton Mifflin Company, NY, 1993)

Planting Noah's Garden: Further Adventures in Backyard Ecology, by Sara Stein (Houghton Mifflin Company, NY, 1997)

A Sand County Almanac, and Sketches Here and There, by Aldo Leopold, 1948 original publication, (Oxford University Press, New York, 1987)

Second Nature: A Gardener's Education, by Michael Pollan (Grove Press, 1991)

Weeds of the Northeast, by Richard Uva, Joseph C. Neal, and Joseph M. DiTomaso (Cornell University Press, 1997)

Wetlands, by William A. Nearing (The Audubon Society Nature Guides, Alfred A. Knopf, 1989)



Endnotes

- 1 This and all of the following quotes attributed to Michael Pollan are from *Second Nature: A Gardener's Education*, by Michael Pollan (Grove Press, 1991)
- 2 US Environmental Protection Agency, Region III, Public Environmental Education Center
- 3 "Big Yellow Taxi," text and music by Joni Mitchell, (Siquomb Publishing Company BMI, 1970)
- 4 *The New England Wildflower Society Guide to Growing and Propagating Wildflowers of the United States and Canada*, by William Cullina (Houghton Mifflin Company, Boston, 2000)
- 5 See www.jhsph.edu/Environment/About_CLF/Canary/pollinators.html
- 6 For more information on pollinators see the North American Pollinator Project Campaign at www.nappc.org, and educators may find this website useful for lesson planning ideas on pollinators <http://www.kidsregen.org/educators/educators2.php?section=eduNga&ID=8>
- 7 Data are from USDI, Fish and Wildlife Service and USDC, US Census Bureau survey, 2002
- 8 *Redesigning the American Lawn*, by F. Herbert Bormann, Diana Balmori, Gordon Geballe, (Yale University Press, 1993)
- 9 *US. News and World Report*, 10/28/96
- 10 Pennsylvania Department of Agriculture
- 11 *Ibid.*
- 12 National Audubon Society
- 13 Bormann, *et al.*
- 14 *Ibid.*
- 15 American Forests website: www.americanforests.org
- 16 See EPA website at http://www.epa.gov/heatiland/strategies/level3_vegairquality.html
- 17 See article on HGTV website by Lindsay Bond Totten, Howard Scripps News Service, www.hgtv.com/hgtv/gl_soil_water_mulch/article/0,1785,HGTV_3634_1386486,00.html
- 18 From www.raingarden.org
- 19 S. L. Postel, G. C. Daily, and P. R. Erlich. 1996. Human appropriation of renewable fresh water. *Science* 271:785-88

- 20 *Schoolyard Habitat Project Guide*, US Fish and Wildlife Service
- 21 Except where noted, Tree and Shrub list adapted from DNR's Tree-mendous Maryland program
- 22 Slattery, Britt E., Kathryn Reshetiloff, and Susan M. Zwicker. 2003. *Native plants for Wildlife Habitat and Conservation Landscaping: Chesapeake Bay Watershed*. US Fish and Wildlife Service, Chesapeake Bay Field Office, Annapolis, MD
- 23 Maryland DNR Forest Service website descriptions of their nursery plants at www.dnr.state.md.us/forests/nursery/deciduous.html
- 24 Slattery, *et al.*
- 25 From Cornell Cooperative Extension website <http://www.cce.cornell.edu/onondaga/fingerlakeslan/a.htm#Silky%20Dogwood>
- 26 Slattery, *et al.*
- 27 List of plants native to Anne Arundel County, Maryland www.aacounty.org/LandUse/OECR/Resources/AANativePlants.pdf
- 28 Maryland DNR Forest Service website descriptions of their nursery plants at www.dnr.state.md.us/forests/nursery/deciduous.html
- 29 Slattery, *et al.*
- 30 *Ibid.*
- 31 *Ibid.*
- 32 *Ibid.*
- 33 *Ibid.*
- 34 *Ibid.*
- 35 *Ibid.*
- 36 *Ibid.*
- 37 *Ibid.*
- 38 *Ibid.*
- 39 *Ibid.*



Buttonbush
(*Cephalanthus occidentalis*)

