

## **ABOUT CCLC**

The Chesapeake Conservation Landscaping Council (CCLC) educates and supports professionals to implement sustainable landscape and green infrastructure practices for a healthy and resilient Chesapeake Bay watershed.

## **ABOUT THIS PUBLICATION**

In late 2003, CCLC Board members began working on a set of materials to help define and guide conservation landscaping practices. The intended audience ranges from professionals in the landscaping field to novice home gardeners; from property and facilities managers to local and state decision-makers. These written materials were first published in 2013 as *The Eight Essential Elements of Conservation Landscaping*. This 2023 edition, marking CCLC's 20th anniversary; was reviewed and revised by members of the Chesapeake Bay Landscape Professional (CBLP) certification Steering Committee, all professionals with diverse backgrounds in horticulture, landscape design, and education. CCLC welcomes feedback, recommendations, and new members willing and able to contribute their skills, knowledge, and talents to future endeavors. Send comments to [hello@chesapeakelandscape.org](mailto:hello@chesapeakelandscape.org)

This book is a key reference used in the CBLP certification program. For more information about CBLP, please visit [www.cblpro.org](http://www.cblpro.org)

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## INTRODUCTION

### **The Chesapeake Bay Region**

With a growing population in the Chesapeake Bay watershed, nonpoint source pollution—that is, runoff from streets, farms, construction sites, and our own yards—has become an increasing problem. Contaminants from every home and community—sediments, sewage, manure, fertilizers, pesticides, herbicides, and motor oil—can be carried into the Bay from local streams and waterways.

Rising sea levels and subsidence in parts of the coastal plain threaten developed lands as well as natural areas in low-lying areas across the region. We are now witnessing the impacts of climate change, including warmer winter temperatures, increased storm severity, and more frequent flooding. These changes should affect our plant choices as gardeners and how we design, build, and manage our landscapes.

The Chesapeake Bay is part of a vast interconnected ecosystem, and everything we do on the land affects both local waters and the Bay. The Bay watershed drains approximately 64,000 square miles across six states and the District of Columbia. Because our actions are so closely linked to the health of the Chesapeake Bay, careful stewardship of the land and water in developed landscapes is our most effective tool for the Bay's restoration. How each of us manages property and the choices that landscape professionals, homeowners, and others make impact us all.

The rewards of a well-maintained conservation landscape are many. It reflects positively on its owner and the professionals who were involved in the design, installation, and maintenance. It beautifies the home and neighborhood—or the workplace, school, business, or park. It affords a comfortable place to entertain, relax, play, work, and learn. Most importantly the practices described herein can make an important difference in helping preserve the region's plants, habitats, and animals, all critical elements in the complex web of life that characterizes the Chesapeake Bay and its surrounding watershed.

## **What is Conservation Landscaping?**

Conservation landscaping is a guiding principle that works with nature to reduce pollution, incorporates environmentally sensitive design, low impact development, native plants, and integrated pest management to create diverse landscapes that help protect clean air and water, support wildlife, and provide a healthier and more beautiful environment.

*Conservation landscaping supports clean air and water by:*

- Incorporating native plants that provide ecological benefits, are adapted to local conditions, and may require fewer chemical inputs.
- Collecting stormwater on site and employing stormwater best management practices (BMPs) to promote infiltration, slow and cool runoff, and reduce pollutants and erosion in local waterways as well as the Bay.
- Reducing the amount of turfgrass that requires mowing, thereby reducing the number of mower-produced pollutants released into the air and the amount of atmospheric deposition of nutrients into water.

*Conservation landscaping supports wildlife by:*

- Providing diverse plant communities that attract and provide wildlife habitat.
- Creating migratory corridors of conjoined healthy ecological communities.

*Conservation landscaping supports a healthier and more beautiful human environment by:*

- Reducing the amount of pollution entering the environment.
- Providing beautiful, functional, sustainable spaces for people to enjoy.



# THE EIGHT ESSENTIAL ELEMENTS

## of Conservation Landscaping

The following elements represent the practice of conservation landscaping. Implementing these practices can contribute to the restoration of the Chesapeake Bay watershed\* helping states to meet their water quality and habitat goals and help improve the region's water and air quality.

A conservation landscape:

1. Is designed to benefit the environment and function efficiently and aesthetically for human use and well-being;
2. Uses locally native plants that are appropriate for site conditions;
3. Includes a management plan for the removal of existing invasive plants and the prevention of future invasives;
4. Provides habitat for wildlife;
5. Promotes healthy air quality and minimizes air pollution;
6. Conserves and cleans water;
7. Promotes healthy soils;
8. Is managed to conserve energy, reduce waste, and eliminate or minimize the use of pesticides and fertilizers

\*Chesapeake Bay watershed—see a map at [pubs.usgs.gov/fs/fs12497/fig1.html](https://pubs.usgs.gov/fs/fs12497/fig1.html)



## 1- DESIGN TO BENEFIT THE ENVIRONMENT

*A conservation landscape is designed to benefit the environment and function efficiently and aesthetically for human use and well-being.*

Conservation landscaping is the practice of modifying the features of an area of land in a way that incorporates environmentally sensitive design, low impact development native plants, integrated pest management and sustainable stormwater management. In the Bay region, the term, conservation landscaping, is also used to describe a specific practice which is approved by the Chesapeake Bay Program, Urban Stormwater Workgroup\* as a creditable stormwater BMP. EcoScaping, RainScaping, BayScaping, GreenScaping, ecological, sustainable or resilient landscaping are also terms that may be used interchangeably with conservation landscaping.

The practice of conservation landscaping is a holistic approach that mimics nature, with a goal of creating a diverse landscape that is sustainable and resilient, that helps protect clean air and water, that supports wildlife, that conserves energy, and that provides a beautiful, healthier human environment. Landscape design is the initial investment that allows you to make the most of the site you have without expending resources to drastically alter the site.

Native plants are a vital element in a conservation landscape — they've adapted to the local climate and may be more drought-tolerant and pest-resistant than introduced varieties. Many provide food and shelter sources for birds and beneficial insects, as well as other animals. More information on native plants is provided in the next chapter.

## How?

### **Perform a detailed site analysis.**

Consider the character of the site (or regional attributes), historic uses of the land, soil type and condition, geology, topography, sun and shade exposure, existing water features, existing and any planned structures. Also consider stormwater path(s) in the landscape, existing plants and their condition, natural plant communities appropriate for the area, location of property lines, easements, septic systems and utilities underground and overhead, wildlife, and any features on adjacent properties you want to see or screen.

### **Perform a user analysis.**

Consider users, including both human and pets, user goals, access to and around the site for both pedestrians & vehicles, user activities types and frequency, site use changes over time, and any specific issues that need to be addressed.

### **Combine the site and user analysis information to prioritize the goals for the landscape.**

Consider any specific needs that are related to those goals. Then design a landscape that considers these Eight Essential Elements while achieving your goals. Examples include: add a water element or understory plants to support wildlife habitat, reduce impervious surfaces/add permeable surfaces to improve water quality, promote healthy soil by designing a compost facility or scheduling periodic aeration.

### **Include long-term maintenance in the design process.**

Examples include: designing bed edges for easy mowing, selecting low maintenance plants, designing plant communities that mimic nearby natural areas and will be sustainable and require little or no irrigation, fertilizer and pest management.

### **Consider phasing the work.**

Dividing implementation into phases keeps it from being overwhelming and may help with budgeting. Certain activities should be done in a logical order. Examples include: marking or installing utility lines before planting plants, mapping the stormwater pathway before installing BMPs and planting large trees before other smaller plants. Whether your landscape design is simple, complex or somewhere in between, paying attention to the separate phases of the project and their sequencing will make the process faster and smoother.

### **Preserve existing environmental features.**

Healthy soils, mature trees, water features, views and diverse plant communities are features that should be supported, highlighted, and protected.

### **Restore degraded environments and create new environmentally appropriate features.**

Mirror patterns found in nature. For example, layering of trees, shrubs, and herbaceous plants provides structure that is both important to wildlife and stormwater management and attractive to people. Other examples include: controlling invasive species, reducing turf areas, increasing diverse plant communities, installing living shorelines, restoring wetlands, creating habitats such as a small pond and installing pollinator supporting plants, creating transitions into existing natural areas and creating links between existing isolated natural areas.

### **Design for the minimum amount of lawn needed.**

Lawns are monocultures of non-native plants that have high maintenance requirements for water, fertilizer and herbicides. Select the most appropriate turfgrass for the site. Use soil test results to guide fertilizer applications. Follow state Cooperative Extension lawn maintenance guidelines to grow healthy dense lawns with minimal chemical and water use.

Lastly, think of landscape design as an ongoing process. Climate change, weather events, and life changes impact your landscape. Use an adaptive management approach to update the design and maintenance plan according to the conditions of the landscape and the needs of the people using it.

## ***Learn more about it***

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Consider what you will need in order to achieve your goals and what problems you might need to address on the site. Listed below are a few common landscape goals followed by one or two solutions.

### **Screening an unsightly view.**

To screen an unsightly view, use a fence with an evergreen vine or a row of evergreen shrubs or trees that meet certain height and width requirements.

### **Creating pollinator habitat.**

Choose appropriate locally grown (if possible) native plants, including host and nectar plants, and provide a water source and shelter.

### **Creating an attractive and functional corporate landscape.**

Address stormwater runoff from buildings and parking areas and provide a landscape that is attractive and interesting in all four seasons. Reduce runoff with swales, rain gardens, and permeable paving. For four season interest combine low maintenance native perennials, trees and shrubs in layered plantings. Reduce or eliminate turf, and use plants with multi-season interest at the property entrances. Add walking trails and outdoor seating/dining spaces.

### **Striving for low maintenance.**

Design plant communities (instead of individual plants surrounded by sterile mulch), plant for canopy layers, select pest resistant plants, install plants correctly, include the maintenance staff in the design conversation, reduce or eliminate turfgrass, practice integrated pest management.

### **Providing a safe environment for children.**

Design with plants that don't require the use of chemicals like fertilizers, herbicides, fungicides and insecticides. Avoid plants that have thorns, sharp points, or poisonous parts.

### **Adding more color and interest in a schoolyard setting.**

Consider a landscape design to provide spring and fall interest when school is in session. Also consider landscape elements that provide educational benefits, such as rain gardens, native plants, wildlife habitat, and pollinator gardens. Would interpretive signage enhance the engagement and experience? Can activities in the landscape be used to support school curricula?

### **Reducing runoff from the impervious surfaces and from adjacent properties.**

To use conservation landscaping to capture and treat runoff from the impervious parts of the site and/or from adjacent properties, mark the water pathway during or just after a rain event. Then decide where along the water pathway you want to incorporate BMPs to slow down, spread out, and soak in the runoff.

### ***SIMPLE TO COMPLEX LANDSCAPE DESIGNS***

Whether your landscape design is simple, complex or somewhere in between, phases and sequencing of activities are critical for successful implementation, and should be considered throughout the design process. Once an overall plan is completed, dividing implementation into phases creates smaller more manageable pieces that can be implemented in a sequenced order. Carefully planned phasing and sequencing help manage project timelines, budgets and resources, and ensures that activities are done in the proper order.

Examples include:

- Have all utilities marked before digging.
- You may need to apply for a permit before doing any work like removing trees, or building a dock in the Chesapeake Bay Preservation area (CBPA). Consult local and state regulations before work begins.
- With a limited plant budget, focus on planting everything in only one part of the design or purchase and install the trees and shrubs first and plant the rest of the plants when the budget allows.
- Septic systems, utility lines and French drains or dry wells should be installed before any landscaping.
- Planting a living shoreline is scheduled after the grading and stabilization practices are installed. Planting also needs to be scheduled at low tide.
- If you are constructing stormwater BMPs, do that immediately before plant installation.
- If you want to use native plants to attract a particular bird or butterfly, you may need to research sources and order in advance to ensure plants are available when installation is scheduled.

## ***ENVIRONMENTAL LANDSCAPE FEATURES: EXISTING AND NEW***

Preserve and protect existing features, including forests and natural areas, native plant communities, individual trees that are healthy, mature/large or especially ecologically or aesthetically valuable. Also preserve healthy soils, waterways and wetlands, meadows, animal communities, rock formations, views, and microclimates.

Conservation strategies include: planting trees, creating canopy layers, planting native plant communities, converting a lawn to a plant bed or meadow, restoring a wetland, installing a living shoreline or a buffer, creating transition zones/edge habitats, creating green corridors to connect isolated landscapes or parts of landscapes, using native plants to support wildlife and pollinators, improving soil health and creating unique microclimates or niches.

## ***References and Resources***

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## 2- NATIVE PLANTS

*A conservation landscape uses locally native plants that are appropriate for site conditions.*

Native plants are those that occur within a given natural range, and in particular habitats, where over the course of evolutionary time, they have adapted to physical conditions and co-evolved with the other species that live in that area. Since records of native plants were not written until the seventeenth and eighteenth centuries, native plant lists often refer back to this time period. Alien or introduced plants are those that have been brought to the region as a consequence of human action. In conservation landscapes, cultivars (cultivated varieties) of native plants do not always deliver the same benefits as the straight species of locally native plants.

Balanced communities of native plants which are adapted to local conditions contribute to the biodiversity of the landscape. Once established, they require little extra water, fertilizer, or pesticides. Native plants express the character of our natural landscape in a way that non-native plants cannot.

Climate change has resulted in a shift in cold hardiness zones, making it important to learn about the natural ranges of plants. If a plant in your area is growing at the southern limit of its range, it will be harder to continue to grow that plant in future. It is important to preserve the genetic variability of native plants to ensure that some can adapt to climate change. Selecting locally native plants over cultivars can help expand local populations and give them a better chance of surviving and reproducing.

## *How?*

### **Choose the right plant for the right place.**

Select plants suited to existing soil, moisture, sunlight, and other site conditions.

### **Consider climate change.**

When selecting a long-lived plant, consider how that plant is likely to grow as the climate shifts to warmer winters and more extreme periods of drought and flooding.

### **Locate reputable plant nurseries.**

Other than wild seed collection, native plants should not be obtained from the wild. It is illegal in most places to remove native plants from the wild. This disturbs the natural ecosystem, and plants often do not survive being transplanted into a landscape. To find commercial sources of native plants, see resources listed below. Always ask nurseries about the source of the native species sold. You should ask, are plants grown locally from local seed sources?

### **Design for the whole calendar year.**

Include a diversity of native plants to provide a wide variety of benefits, including species that bloom at varying times throughout the year, are different heights, colors, and textures, are woody and herbaceous and species that are evergreen and deciduous. Consider the habitat or food you are providing not just the aesthetics of the flowering plants.

### **Think like an ecologist.**

Choose native plants that complement nearby natural areas by using similar species composition. For example, when planting adjacent to an oak-hickory forest, consider selecting plant species from the herbaceous layer to the understory that occur within a natural community of an oak-hickory forest.

## ***WHICH PLANTS ARE NATIVE TO MY SITE?***

Plants labeled as “native” or “wildflower” are not necessarily native to the Chesapeake Bay region. It is important to refer to an independent reference for the region in which the plants will be planted. Check with your state’s Natural Heritage website, consult regional flora sources such as parks and wildlife refuges, or find resources through a local native plant society.

Even though a plant seems to occur naturally or “grow wild” in your yard or in the wild, this does not mean that the plant is native. Many non-native plants seem to “grow wild”. These are called “naturalized” or, in extreme cases, invasive. This means that these plants have the ability to spread and thrive outside of their cultivated location, potentially threatening the integrity and stability of nearby natural areas.

# ***References and Resources***

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## **ONLINE RESOURCES FOR SELECTING NATIVE PLANTS**

Audubon Native Plants Database: <https://www.audubon.org/native-plants>

Chesapeake Bay Native Plant Center: <https://www.allianceforthebay.org/native-plant-center/>

Ecoregional Revegetation Application: (from Roadside Revegetation Manual) [https://www.nativevegetation.org/resource\\_materials/](https://www.nativevegetation.org/resource_materials/)

Izel Plants: <https://www.izelplants.com/>

Lady Bird Johnson Wildflower Center Find Plants: <https://www.wildflower.org/plants/>

Missouri Botanical Garden Plant Finder: <http://www.missouribotanicalgarden.org/planetfinder/planetfindersearch.aspx>

National Wildlife Federation's Garden for Wildlife Native Plant Finder Tool: <https://www.nwf.org/NativePlantFinder/>

Plant Virginia Natives: <https://www.plantvirginianatives.org/>

## **NATIVE PLANT NURSERIES**

Native plant nurseries in Maryland: [www.mdflora.org/publications/nurseries.html](http://www.mdflora.org/publications/nurseries.html)

Native plant nurseries in Virginia: <https://vnps.org/native-plant-nursery-list/>

Plant Native: <http://plantnative.org/>

## *Learn more about it*

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### **CULTIVARS**

Cultivated varieties (cultivars) are available for many native plants. These plants have been selected, asexually propagated and nursery grown as “improved” selections to provide plants with certain physical characteristics such as a different flower color, a particular foliage shape, early or late bloom time, disease resistance or compact size. All the plants belonging to a particular cultivar are genetically identical. Certain cultivars of native plants are useful because they tolerate tough urban conditions. Other cultivars with compact size are useful in landscape situations where space is limited.

Although gardening with cultivars may be suitable to meet space or aesthetic goals, those planning habitat projects to provide food and cover for wildlife should use as straight species, not cultivars, as possible. Research\* about how cultivars, will affect the wildlife that depend on local native plant species for food is ongoing. Plants bred to have red/purple leaves or double blooms have decreased value to pollinators and other wildlife. If a local native plant’s bloom period, color, fragrance, or flower shape is changed, it could have serious detrimental effects on the hummingbirds, bees, butterflies, and other wildlife that may use that plant. True native plant species are suited for use by native wildlife, and planting them will increase your chances of attracting and supporting these creatures.

In addition, research has shown that some cultivars breed with local native plants and can decrease a native population’s fitness or ability to survive in an area. If the planting site is near designated natural areas, it is best to avoid using cultivars so that these genetically homogenous plants don’t end up cross-breeding with native species and “contaminating” or changing the natural gene pool. Since cultivars often lack the genetic diversity necessary to adapt to local environmental conditions, they may not thrive, and cross-breeding could lead to eventual extinction of existing native populations. Since we can’t know the full extent of how this would affect local native plant populations and all life that is interdependent with them, we must work to protect natural biodiversity. Even cultivars of locally rare species that may be available in the nursery trade should not be used for landscaping—check state and Federal lists of rare, threatened, and endangered species at <https://www.fws.gov/library/collections/endangered-species>

### **CO-EVOLUTION AND INTERDEPENDENCE**

Charles Darwin’s work contributes much to our understanding of evolution. There are specific relationships: an insect that specializes in feeding on nectar from deep flowers is dependent upon a deep-flowered plant. The plant, in turn, is specialized for being pollinated by insects with long mouthparts. Countless examples of these interdependent relationships exist and they are critical to sustaining life as we know it. Organisms both cooperate and compete in ecosystems. The interrelationships and interdependencies of these organisms are related to the long-term stability of populations and ecosystems. This is what allows Earth to be self-sustaining.

In order to reproduce, many plants depend upon insects or other creatures for pollination and seed dispersal. Some of these animals have evolved to use specific plants as sources of food (nectar or pollen and foliage) or shelter. The exchange of genetic material through pollination (sexual reproduction) allows subsequent generations of plants to adapt to environmental conditions and survive through natural selection. The great diversity of organisms is the result of more than 3.5 billion years of evolution that has filled the world with many different life forms.

There are 100,000 kinds of insects and 1,200 birds and mammals that are involved in pollinating both wild plants and cultivated crops worldwide. Wild pollinators are responsible for about one third of the food that humans eat. Habitat, fragmentation, and use of chemical pesticides are major causes of reduced pollinator populations.

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Flora of Virginia: [www.floraofvirginia.org](http://www.floraofvirginia.org)

Flora of Virginia online: [www.vaplantatlas.org](http://www.vaplantatlas.org)

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<https://dnr.maryland.gov/boating/Documents/Appendix3.pdf>

<https://www.fws.gov/office/chesapeake-bay-ecological-services>

Integrated Taxonomic Information System (authority on current Latin names for plants and animals): [www.itis.gov/](http://www.itis.gov/)

Lady Bird Johnson Wildflower Center's Native Plant Bibliography: [www.wildflower.org/bibliography/](http://www.wildflower.org/bibliography/)

Landscaping with Native Plants in Pennsylvania: [www.dcnr.state.pa.us/forestry/wildplant/native.aspx](http://www.dcnr.state.pa.us/forestry/wildplant/native.aspx)

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National Audubon Society: [www.audubonathome.org](http://www.audubonathome.org)

National Wildlife Federation's Backyard Habitat Program: [www.nwf.org/backyard](http://www.nwf.org/backyard)

Native Plants for Conservation, Restoration & Landscaping (including grassland plants; set of brochures): [www.dcr.virginia.gov/natural\\_heritage/nativeplants.shtml](http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml)

Native Plants Network (propagation information): <https://nnp.rngr.net/>

New York Flora Association: <https://nyflora.org/>

New York Flora Atlas: <https://newyork.plantatlas.usf.edu/browse/county>

Pennsylvania Native Plant Society: [www.pawildflower.org](http://www.pawildflower.org)

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Virginia Native Plant Society (VNPS): [www.vnps.org](http://www.vnps.org)

Virginia Tech's Dendrology website for identifying woody plants: <https://dendro.cnre.vt.edu/dendrology/factsheets.cfm>

West Virginia Native Plant Society: [www.wvnps.org](http://www.wvnps.org)



### 3- INVASIVE PLANT MANAGEMENT

*A conservation landscape includes a management plan for the removal of existing invasive plants and the prevention of future invasives.*

Non-native or alien plants are those that occur artificially in locations beyond their known historical natural ranges; most often brought to new regions by humans through horticultural or accidental introductions. Invasive plants are those non-native plants that display aggressive rapid growth and spread, allowing them to establish quickly over large areas. Climate change is increasing the number of species and the spread of invasive plants. Outside of their natural native range, these plants encounter fewer of the conditions, competitors, or pests that keep them in check back "at home." Their rapid spread and growth allow them to overwhelm and displace existing vegetation and form dense one-species stands or monocultures. Wind, water flow, movement of birds and other wildlife, erosion or movement of soil, and movement of people, vehicles and recreational equipment can spread invasive plants to natural areas, causing significant upset, unbalancing, and harm to ecosystems.

Invasive plants can alter fire frequencies, soil chemistry, water tables, and erosion rates. They can degrade or change wildlife habitat, food quality and availability. They can displace native plants or interfere with their reproduction, establishment and growth through competition for water, nutrients, light and space. They can also alter native plant population genetics through hybridization. The federal government and all states have a list of invasive plant species. Native plants may also be aggressive under certain conditions, but are not technically considered invasive. A weed is any plant, native or non-native, that is out of place and growing where it is not wanted in the landscape. Noxious weeds are the plants that federal and state governments are required to control. While some desirable plants have the word weed in their names (butterfly weed, milkweed, and Joe-pye weed), that does not mean that they are a weed or are invasive.

## How?

### **Customize with adaptive management.**

Each landscape is unique; invasive species should be assessed on a case by case basis and a customized management plan developed for each situation. An adaptive management plan should include both short-term and long-term actions and should be updated based on observations and experience as the site and practices evolve over time.

1. Before adding a new plant to your landscape, check to ensure that it is native, or if non-native, then check to ensure that it is not invasive, *see resources in Element 2, Native Plants and Resources below*.
2. Next, positively identify any plant you think may be invasive. Many resources are available, *see below*. Each state has invasive plant and noxious weed lists. Local botanic gardens, native plant societies, parks and garden centers may also be helpful. Numerous smart phone apps may be helpful in identifying plants, both native and invasive.
3. Then, learn about the plant's life cycle. Is there a weak point that you can utilize in your management plan? Consider whether you can remove something the plant needs to grow, interrupt its lifecycle, or use its system against it. Examples include:
  - Preventing plants from producing seed to reduce the plant population,
  - Reducing physical or mechanical disturbance to prevent plants from spreading by vegetative propagation,
  - Using perennial plants' downward translocation in the fall to carry absorbed herbicides to the plant roots,
  - Reducing or turning off irrigation where seeds need a lot of moisture to germinate,
  - Using mulch or ground covers to shade the soil so seeds don't get light to germinate

Managing invasive plants requires planning and persistence. There are many options available. Factors to consider when choosing a strategy include: the specific plant, the stage in the life cycle, location (this is especially important if it is in an environmentally sensitive area near water or in a park or preserve), size of the infestation, accessibility, any property restrictions, ability to remove debris and budget for the work.

### **Remember management is an ongoing process.**

The following tasks must recur on a regular basis:

- Identify invasive plants.
- Prioritize invasive plant locations.
- Implement a removal plan according to prioritization.
- Add new plants where needed to fill in and outcompete the invasive plants.
- Scout regularly for missed invasive plants, regrowth and new infestations.
- Stay informed on invasive species and management practices.

## **PREVENTION**

- Don't plant plants that are invasive.
- Prevent the inadvertent spread of invasive plants. Don't use equipment or tools (lawn mowers, shovels, etc.) in infested areas and then in uninfested areas. Clean boating, fishing and other water equipment after each use to prevent spreading aquatic invasive plants.
- Prevent seeds from germinating. Mulch or use groundcovers to exclude light. Solarize the soil to kill seeds already in the soil.
- Prevent seeds from forming or maturing by mowing or cutting off the seed heads

## **MECHANICAL OR PHYSICAL METHODS**

- Plants can be pulled by hand or raked out. They can also be tilled into the soil. Be aware that these methods disturb the soil and can promote seed germination or spread invasive plants that propagate vegetatively. These methods can also disturb sensitive sites, create bare ground and cause unwanted erosion. Plant desirable plants close together so the canopy will fill in quickly. This creates competition for light, space, water and nutrients so invasive plants are less likely to establish.
- Repeatedly mow or cut invasive species. Some invasives (especially annuals and taller plants) don't tolerate being cut frequently. With perennial plants, frequent cutting forces constant regrowth that can exhaust root reserves and eventually kill the plant.
- For aquatic plants in ponds, lakes and reservoirs, dyes or aerators can be put into the water to prevent light penetration and photosynthesis and to add oxygen for microbes to break down nutrients so the weedy plants starve. Pond water levels can also be lowered to expose plants to drying out and/or cold temperatures.

## **BIOLOGICAL MANAGEMENT**

- Goats and sheep can be used to eat/ graze the plants. Re-growth may need to be addressed.
- Host-specific insects and diseases can be released to attack invasive plants. This is usually regulated at the state or federal level.
- Sterile grass carp can be released to eat certain aquatic invasive plants.

## **CHEMICAL MANAGEMENT**

- A pre-emergent herbicide can be applied to the soil to prevent weed seed from germinating.
- Contact herbicides are good to use on annual plants when they are young.
- Translocated herbicides are good to use on perennial plants, especially in the fall when plants are translocating downward for dormancy.
- If dealing with aquatic invasive plants, or when working in stormwater BMPs, an aquatic labeled herbicide is required.
- Use herbicides that are labeled for use on the specific plant or site.
- It may be necessary to have a pesticide applicator's license or hire someone who does.
- Apply herbicides carefully so surrounding desirable plants aren't injured or killed. When spraying, use a shield to prevent drift. Herbicides can also be applied through dipping and clipping and painting or wiping the herbicide on the plants.

After invasive plant removal, replant the area quickly and densely and/or encourage existing vegetation to fill in to reduce the opportunity for invasive plants to reestablish.

A space without a wanted plant is a place for an unwanted plant—a place for a weed. Consider using native groundcovers to fill the spaces and avoid using commonly used non-native and invasive groundcovers (like English ivy, Japanese pachysandra, or lilly turf).

## NATIVE GROUNDCOVERS

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### HERBACEOUS, FLOWERING

*Achillea millefolium*, yarrow  
*Aquilegia canadensis*, columbine  
*Asarum canadense*, wild ginger  
*Chelone glabra*, white turtlehead  
*Chrysogonum virginianum*, green-and-gold  
*Chrysopsis mariana*, Maryland golden aster  
*Coreopsis verticillata*, threadleaf coreopsis  
*Erigeron pulchellus*, Robin's plantain  
*Fragaria virginiana*, wild strawberry  
*Geranium maculatum*, wild geranium  
*Heuchera americana*, alumroot  
*Heuchera villosa*, hairy heuchera  
*Mitchella repens*, partridgeberry  
*Pachysandra procumbens*, Allegheny spurge  
*Packera aurea*, golden groundsel  
*Phlox carolina*, garden phlox  
*Phlox divaricata*, wild blue phlox  
*Phlox maculata*, meadow phlox  
*Phlox paniculata*, garden phlox  
*Phlox stolonifera*, creeping phlox  
*Phlox subulata*, moss phlox  
*Rudbeckia triloba*, brown-eyed Susan  
*Salvia lyrata*, lyre-leaf sage  
\**Solidago* spp., goldenrods  
*Tiarella cordifolia*, foamflower

\* can be aggressive

### FERNS

*Athyrium asplenoides*, southern lady fern  
*Dennstaedtia punctilobula*, hay-scented fern  
*Dryopteris cristata*, crested woodfern  
*Dryopteris intermedia*, evergreen woodfern  
*Dryopteris marginalis*, marginal shield fern  
*Osmunda cinnamomea*, cinnamon fern  
*Polystichum acrostichoides*, Christmas fern

### GRASS AND GRASS-LIKE

*Carex albicans*, white-tinged sedge  
*Carex amphibola*, eastern narrowleaf sedge  
*Carex appalachica*, Appalachian sedge  
*Carex cherokeensis*, Cherokee sedge  
*Carex flaccosperma*, blue wood sedge  
*Carex laxiculmis*, creeping sedge  
*Carex glaucodea*, blue wood sedge  
*Carex pensylvanica*, Pennsylvania sedge  
*Carex plantaginea*, seersucker sedge  
*Carex woodii*, wood's sedge  
\**Chasmanthium latifolium*, northern sea oats  
*Danthonia spicata*, poverty oatgrass  
*Sisyrinchium angustifolium*, blue-eyed grass  
*Iris versicolor*, blue flag iris

### SHRUBS

*Arctostaphylos uva-ursi*, bearberry  
*Gaultheria procumbens*, wintergreen  
*Vaccinium angustifolium*, lowbush blueberry  
*Xanthorhiza simplicissima*, yellowroot

## COMMON INVASIVE PLANTS

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The following list includes some of the many non-native species that are commonly found in the landscape. These species spread throughout the landscape and threaten valuable natural areas. Many of these plants are still sold extensively and planted, others have been removed from the nursery trade and are no longer planted, but are still proliferating within the landscape .

**Avoid planting invasives and urge property owners to remove invasives when possible!**

### HERBACEOUS PLANTS

*Arundo donax*, giant reed  
*Bambusa* ssp. *bamboo*  
*Phyllostachys* spp., bamboo  
*Pseudosasa japonica* arrow bamboo  
*Bromus sterilis*, poverty brome grass  
*Coronilla varia*, crown vetch  
*Hemerocallis fulva*, common daylily  
*Hemerocallis lilioasphodelus*, yellow daylily  
*Hesperis matronalis*, dame's rocket  
*Iris pseudacorus*, yellow flag iris  
*Lespedeza cuneata*, Chinese lespedeza  
*Leucanthemum vulgare*, ox-eye daisy  
*Liriope muscari*, big blue lilyturf  
*Liriope spicatum*, creeping lilyturf  
*Lythrum salicaria* (all cultivars), purple loosestrife  
*Microstegium vimineum*, Japanese stiltgrass  
*Miscanthus sinensis*, maiden grass  
*Pachysandra terminalis*, Japanese pachysandra  
*Pennisetum alopecuroides*, Chinese fountain grass  
*Perilla frutescens*, beefsteak plant  
*Phragmites australis*, common reed  
*Polygonum cuspidatum*, Japanese knotweed  
*Ranunculus ficaria*, lesser celandine

### AQUATIC PLANTS

*Eichhornia crassipes*, water hyacinth  
*Hydrilla verticillata*, hydrilla  
*Myriophyllum aquaticum*, parrot feather  
*Myriophyllum spicatum*, Eurasian watermilfoil  
*Salvinia molesta*, giant salvinia  
*Trapa natans*, water chestnut

### VINES

*Akebia quinata*, five-leaved akebia  
*Ampelopsis brevipedunculata*, porcelainberry  
*Celastrus orbiculatus*, oriental bittersweet  
*Cynanchum louiseae*, Louis' swallowwort  
*Euonymus fortunei*, winter creeper  
*Hedera helix*, English ivy  
*Lonicera japonica*, Japanese honeysuckle  
*Polygonum perfoliatum*, mile-a-minute  
*Pueraria montana* v. *lobata*, kudzu  
*Vinca minor*, periwinkle  
*Wisteria* ssp. (all non-native) wisteria

## COMMON INVASIVE PLANTS

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### SHRUBS

*Berberis thunbergii*, Japanese barberry  
*Buddleja* spp. (all cultivars) butterfly bush  
*Elaeagnus umbellata*, autumn olive  
*Euonymus alatus*, winged burning bush  
*Ligustrum* spp. privet  
*Lonicera tatarica*, *L. maackii*, *L. morrowii*, \*bush honeysuckles  
*Nandina domestica*, heavenly bamboo  
*Rhamnus cathartica*, buckthorn  
*Rhodotypos scandens*, jetbead  
*Rosa multiflora*, multiflora rose  
*Rubus phoenicolasius*, wineberry  
*Spiraea japonica*, Japanese spiraea  
Many non-native *Viburnum* spp.:  
    *V. dilatatum*, linden arrowwood  
    *V. lantana*, wayfaring tree  
    *V. opulus* var. *opulus*, European cranberry bush  
    *V. plicatum*, Japanese snowbell  
    *V. rhytidophylulum*, leatherleaf arrowwood  
    *V. sieboldii*, Siebold's arrowwood

### TREES

*Acer ginnala*, amur maple  
*Acer platanoides*, Norway maple  
*Ailanthus altissima*, tree of heaven  
*Albizia julibrissin*, mimosa tree  
*Broussonetia papyrifera*, paper mulberry  
*Morus alba*, white mulberry  
*Lagerstroemia indica*, crapemyrtle  
*Paulownia tomentosa*, princess tree  
*Pyrus calleryana*, Bradford or Callery pear  
*Quercus acutissima*, sawtooth oak  
*Ulmus parvifolia*, Lacebark elm  
*Zelkova serrata*, Japanese selkova

\* spp. refers to several species

\*\*Note bush honeysuckle should not be confused with the native shrub, *Diervilla lonicera* with the common name of northern bush honeysuckle or bush honeysuckle. *Diervilla lonicera* is a fantastic tough, low growing mid-Atlantic native shrub.

## ***References and Resources***

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Center for Invasive Species and Ecosystem Health: [www.invasive.org](http://www.invasive.org)

Kaufman, Sylvan R. and Wallace Kaufman. Invasive Plants: Guide to Identification and the Impacts and Control of Common North American Species. Stackpole Books, 2013.

Maryland Department of Natural Resources: information, species list, etc. at [www.dnr.state.md.us/invasives/](http://www.dnr.state.md.us/invasives/)

Maryland Invasive Plant Prevention and Control (Maryland Department of the Agriculture): [www.maipc.org](http://www.maipc.org)

Maryland Invasive Species Council: [www.mdinvasives.org](http://www.mdinvasives.org)

National Invasive Species Council: [www.invasivespecies.gov](http://www.invasivespecies.gov)

Nonnative Invasive Plants of Southern Forests, USDA Forest Service: [www.invasive.org/eastern/srs](http://www.invasive.org/eastern/srs)

Pennsylvania Department of Conservation and Natural Resources, fact sheets: <https://www.dcnr.pa.gov/Conservation/WildPlants/InvasivePlants/InvasivePlantFactSheets/Pages/default.aspx>

Plant Invaders of Mid-Atlantic Natural Areas (U.S. Fish and Wildlife Service and National Park Service guide to ID and control of 48 invasives; also includes native plant alternatives to some common invasive landscaping plants): [www.invasive.org/alien/pubs/midatlantic/midatlantic.pdf](http://www.invasive.org/alien/pubs/midatlantic/midatlantic.pdf)

Southeast Exotic Pest Plant Council Invasive Plant Manual: [www.invasive.org/eastern/eppc](http://www.invasive.org/eastern/eppc)

U.S. Fish and Wildlife Service: [www.fws.gov/invasives/](http://www.fws.gov/invasives/)

Virginia Department of Conservation and Recreation: <https://www.dcr.virginia.gov/natural-heritage/invspdflist>



## 4- WILDLIFE HABITAT

*A conservation landscape provides habitat for wildlife.*

One of the most important and rewarding aspects of conservation landscaping is providing for native wildlife species such as birds, butterflies, bees, spiders, fish, frogs, salamanders, snakes, small mammals, and other animals. An animal's habitat is the particular type of area where it finds food, water, shelter, and breeding or nesting space. Biodiversity—a wide variety of native plant and animal life—is critical to maintaining a healthy ecosystem. For many reasons, including urbanization and climate change, the amount and quality of habitat for wildlife is declining.

Larger-scale habitat protection and restoration is critical to conserving wildlife populations. Adding native plants and practicing conservation landscaping contributes to overall restoration of the local environment. Creating conservation landscapes in residential yards, neighborhoods, parks, and on business, school, and municipal properties, will help to increase available habitat for wildlife.

In order to have the greatest ecological value for wildlife, conservation landscapes should mimic natural plant communities and incorporate features that provide as many habitat elements as possible. Whenever possible, designed landscapes should complement and connect to existing natural areas. Providing a diversity of food sources and places for shelter or nesting, as well as sources of water, will help support a variety of enjoyable, beneficial wildlife.

## How?

### **Connect nature.**

Mend fragmented habitat, by creating transition zones for wildlife in a landscapes otherwise fragmented by housing and shopping areas, roads, office buildings, and other development. For example extend one forested area to meet another or remove an area of lawn adjacent to a forested area and replace the lawn with a shrub border.

### **Provide food sources year-round.**

The leaves, stems, twigs, bark, flowers (nectar), seeds, and fruits (e.g., nuts, berries) of native plants are the basis of many animals' diets. The food web is very complex. Some animals eat plants, others eat insects or other animals, and some eat both. Providing the appropriate plants helps attract and provide various components of the food web, thus supporting a diversity of species. See Element 2, Native Plants.

### **Include a water source.**

Water is important to all living creatures, including insects, and is needed year-round for survival. To add water, include: bird baths, small lined ponds or water gardens, a pond with a wetland edge and buffer, and shallow saucers of water on the ground for lizards, frogs and dragonflies.

### **Provide structure.**

Use layers of plants of varying types, heights, and arrangements that mirror nature and are similar to what nature provides in wetlands, meadows, and forests. This layering provides needed shelter from the elements and nesting space important to many types of wildlife. See Element 2, Native Plants. If possible, leave standing or fallen dead tree trunks for nesting spaces.

### **Supply cover.**

Brush piles, rock outcrops or walls, and hedgerows are features to consider including if the site is appropriate. These provide protection and escape routes from predators and other threats.

### **Use alternatives to pesticides and synthetic fertilizers.**

Pesticides include insecticides, fungicides, herbicides and rodenticides. All life, including humans and pets, is susceptible to harm from pesticide use. Using an insecticide to rid the yard of one insect pest can also kill bees and butterflies and their larvae, Birds eating treated insects can become ill, and the effects are magnified up the food chain. Instead, choose organic, least toxic or biological options. See Manage Garden Pests with Integrated Pest Management (IPM) in Element 8, Management.

## *Learn more about it*

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### **HABITAT**

Habitat types include various kinds of wetlands, forests, meadows, and aquatic areas such as streams, rivers, ponds, and estuaries. Climate change, environmental degradation from pollution and direct destruction are all factors leading to wildlife habitat decline and loss. Development replaces natural areas and creates an abundance of lawn and impervious surfaces that shed more rainwater and contribute to water pollution. Development fragments habitats, making it more difficult for species to increase populations, migrate seasonally or to move in response to climate change.

### **NATIVE ANIMAL SPECIES**

The importance of native wildlife to a healthy ecosystem cannot be overstated. The history of the Chesapeake Bay region is inextricably linked to the value of its natural resources. The abundance of wildlife supported by the habitats and landscapes within its vast watershed enriches our way of life and our economy in many ways—from the seafood industry, to tourism, to recreation. The Bay region supports 3,600 species of plant and animal life, including more than 300 fish species and 2,700 plant types. Bird watching, wildlife viewing, and nature photography are currently the fastest-growing nature-related recreation activities. Regardless of whether nature is the primary focus of people’s activities, in periodic opinion surveys, respondents place high importance and intrinsic value on the presence of a diversity of plants and animals. Pollinators such as bees, moths, butterflies, bats, and hummingbirds are critical to the continued survival of both native plant populations and our cultivated food crops. [See Cultivars in Element 2, Native Plants.] Protecting, conserving, and restoring our natural habitats is critical to maintaining quality of life, now and for future generations.

Plants are one of the most important features of an animal’s habitat because they often provide most, if not all, of the animal’s habitat needs. Particular groupings of plant species (specific plant communities) comprise the basis of different habitat types. In turn, animals help plants to reproduce through dispersal of pollen, fruits, or seeds. Consequently, plants and animals are interdependent, and certain plants and animals are often found together.

Some animals are migratory and are only present during certain times of year. Many animals’ food needs change throughout the seasons or depending on their stage of growth. Climate changes threaten to uncouple many plant-animal relationships. For example, warmer winter temperatures may cause flowers to bloom before migratory pollinators arrive in spring. Including a wide variety of native nectar and food plants in the designed landscape will provide for the changing needs of many animals.

In a balanced landscape, native wildlife should not pose a nuisance or hazard to humans, and humans should be able to live in harmony with the wildlife. Some animals, however, can be overabundant and may need to be discouraged in the landscape (e.g., deer, groundhogs, rabbits). A number of factors can cause animals to become nuisances including: development that alters or replaces habitat, reduced food sources and reduction or removal of predators that normally keep populations in check. When there are no foxes or coyotes the squirrel, rabbit, groundhog, racoon, and opossum populations explode. People also create problems by feeding wildlife or by not securing trash receptacles which attract animals and cause nuisance situations.

Overpopulation, unhealthy populations, and wildlife/human conflicts happen when there is insufficient habitat to support wildlife. One of the biggest wildlife/human conflicts is when diseases are transmitted by ticks from wildlife to people and pets. Ticks can transmit Lyme disease, Rocky Mountain Spotted Fever, and 14 other diseases to humans. Mosquitoes can also transmit diseases. A diverse, healthy, and balanced wildlife habitat will reduce conflicts. For more information on ticks and mosquitoes, go to the Centers for Disease Control and Prevention (CDC) website at <https://www.cdc.gov>

### ***INVASIVE ANIMAL SPECIES***

An invasive animal species is a species introduced outside of its native range that spreads rapidly (e.g. nutria, house sparrows, Asian tiger mosquitoes, Emerald Ash Borers, Norway rats, Spotted Lanternfly). Some invasive animals threaten native wildlife and plant populations and/or cause destruction of habitat areas, while others pose human health risks. Identifying invasive animal species quickly may help successfully control invasive species. See *Element 3, Invasive Plants*, for links to invasive species lists.

Steps for dealing with invasive animal species include:

1. Identify the species
2. Understand the impact on the habitat (plants and animals)
3. Take actions to reduce the impact  
For example, house sparrows will nest in bluebird boxes and kill nesting bluebirds. Houses can be designed to exclude house sparrows, or boxes can be monitored to evict nesting house sparrows.
4. Monitor new plantings for unknown insects and diseases.
5. Don't move firewood. <https://www.dontmovefirewood.org/>  
Firewood can harbor insects such as Emerald Ash Borer. Keep updated on species moving into your area.
6. Keep updated on species moving into your area.  
Center for Invasive Species and Ecosystem: <https://www.invasive.org/>

## **ECOSYSTEM**

An ecosystem is a natural, interactive unit consisting of all plants, animals, and microorganisms in an area functioning together, combined with all non-living physical factors of the environment. Living organisms are continually engaged in relationships with every other element constituting the environment in which they exist. The interdependence of organisms in an ecosystem heightens the importance of protecting all natural components, so that the thread that connects the web of life is not unraveled. See *Element 2, Native Plants*.

## **WATER SOURCE**

Water sources are critical to a healthy habitat. They may be as large as a pond or as small as a dish of water on a balcony. Keep water sources clean and free of algae and mosquito larvae.

- National Wildlife Federation (NWF): <https://www.nwf.org/Garden-for-Wildlife/Water/Backyard-Ponds>
- U.S. Dept. of Agriculture, Natural Resources Conservation Service, Backyard Conservation program, backyard pond: [https://www.nrcs.usda.gov/sites/default/files/2022-09/Texas\\_Conservation\\_in\\_Your\\_Backyard\\_Backyard\\_Pond\\_Accessible.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Texas_Conservation_in_Your_Backyard_Backyard_Pond_Accessible.pdf)
- Virginia Department of Wildlife Resources: <https://dwr.virginia.gov/wp-content/uploads/providing-water-in-your-habitat-at-home-1.pdf>

## **STRUCTURE**

Instead of isolated plantings, such as a single tree in the middle of a lawn, group trees, shrubs and perennials to create layers of vegetation. A forest has, for example, a canopy layer (tallest trees), understory layers (various heights of trees and shrubs beneath the canopy) and a ground cover layer (perennials) or forest floor (leaves and other plant debris). These layers provide the structure and variety needed for food, shelter/protection and breeding or nesting space for healthy and diverse wildlife.

- Habitat at Home, Virginia Department of Wildlife Resources: <https://dwr.virginia.gov/wp-content/uploads/media/Habitat-at-Home.pdf>
- Habitat Gardening, Virginia Department of Wildlife Resources: <https://dwr.virginia.gov/wp-content/uploads/habitat-gardening.pdf>

## **POLLINATORS**

A diversity of insects act as pollinators in the Chesapeake Bay region. Honey bees are introduced pollinators, but native pollinators include solitary bees, wasps, flies, moths and butterflies. Different pollinators have different habitat requirements. The resources below provide information on pollinator habitat.

- North American Pollinator Protection Campaign <http://www.nappc.org>
- United States Geological Survey, Role of Native Bees in the United States: [https://www.usgs.gov/faqs/what-role-native-bees-united-states?qt-news\\_science\\_products=0#qt-news\\_science\\_products](https://www.usgs.gov/faqs/what-role-native-bees-united-states?qt-news_science_products=0#qt-news_science_products)
- Xerces Society, conservation of butterflies and other invertebrates, 100 Plants to Feed the Bees, 100 Plants to Feed the Monarchs: <http://www.xerces.org>

## References and Resources

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Audubon Bird Friendly Communities: <https://www.audubon.org/bird-friendly-communities>

Audubon Mid Atlantic (MD, DC & PA): <https://md.audubon.org/> and <https://pa.audubon.org/>

Chesapeake Bay Program, Better Backyard A Citizens' Resource Guide to Beneficial Landscaping and Habitat Restoration in the Chesapeake Bay Watershed: [https://www.chesapeakebay.net/content/publications/cbp\\_12259.pdf](https://www.chesapeakebay.net/content/publications/cbp_12259.pdf)

Delaware

District of Columbia Department of the Environment: <https://doee.dc.gov//service/fishes-and-wildlife>

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Maryland Wild Acres program Invite Wildlife to Your Backyard...Some Tips for Creating a Wild Backyard: <https://dnr.maryland.gov/wildlife/Pages/habitat/wildacres.aspx>

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Virginia Natural Heritage Program: <https://www.dcr.virginia.gov/natural-heritage/>

West Virginia Wild Yards Program: [www.wvdnr.gov/wildlife/wildyards.shtm](http://www.wvdnr.gov/wildlife/wildyards.shtm)



## 5- HEALTHY AIR QUALITY

*A conservation landscape promotes healthy air quality and minimizes air pollution.*

An environmentally sound conservation landscape minimizes activities that directly create air pollution, includes the use of trees and other plants that filter air pollutants, and eliminates or reduces the use of commercial products that are harmful or create polluting by-products. Petroleum-fueled landscape tools produce pollutants responsible for poor air quality and create risks to human health and the environment. Through fuel combustion and evaporation processes, pollutants such as nitrogen oxides, sulfur dioxide, carbon dioxide, volatile organic compounds (VOCs), hydrocarbons, toxic chemicals, and particulate matter are released into the air. These pollutants contribute to the formation of ground-level ozone (also known as summertime smog) and regional haze, and to the deposition of nitrogen, acidic compounds, and mercury into sensitive ecosystems. Air pollutants, including nitrogen that settle on land can then be carried by storm-water into local streams and rivers and affect water quality. The production and burning of fossil fuels also contributes to greenhouse gases that warm the atmosphere, adding to climate change. The overuse or misapplication of commercial fertilizers and chemicals can directly and indirectly contribute to air pollution. For example, ammonia-based commercial fertilizers can release ammonia into the air. Ammonia can combine with other pollutants in the air and form fine particulate matter, which can impact human health and cause regional haze. Another example is the misapplication of pesticides, which can contaminate downwind areas and affect landscapes, people and pets. Aerial spraying should be avoided on windy days (wind speeds above 5 mph).

Operating a typical 4-horsepower gasoline powered lawn mower for 1 hour produces as much smog-forming hydrocarbons as driving an average car almost 200 miles under average conditions. Gasoline-powered string trimmers and blowers are actually more polluting than lawn mowers. See <https://www.epa.gov/sites/default/files/2015-09/documents/banks.pdf>

## How?

### **Use native plants.**

If you use non-native plants be sure to check if they are invasive, and if so do not plant them. Site-appropriate plants require less water, fertilizer, and chemicals, thereby reducing overall yard maintenance. This will reduce the need for gasoline-powered equipment such as lawn mowers, string trimmers, and leaf blowers and the use of pesticides and fertilizers. See *Element 2, Native Plants*.

### **Focus on energy conservation.**

Plant additional native trees and shrubs near buildings for heating, cooling, and wind-protection benefits [See Conserve Energy in Element 8, Management]. This will reduce energy demands and will result in less air pollution. Further, the cooler air under shade trees reduces the rate of chemical reactions that produce precursors to smog.

### **Landscape to improve air filtration.**

Plants clean outdoor air by filtering out particles or absorbing gases through their stomata and cuticles. Plants can store pollutants or break them down into other compounds. The degradation of carbon dioxide produces oxygen, which we need to breathe. Select native tree and plant species that are efficient at removing pollutants from the air, including species with leaf sizes and shapes that will capture gases, dust, and fine particles. Larger, broader leaves and those with fine hairs have more surface area to collect particles. The ability of a plant leaf to absorb gaseous atmospheric pollutants is determined by conductance of the stomata and is linked to the plant's genetics. There are varying degrees of resistance and susceptibility to pollution among plants. A good resource that provides information on tolerance of native species to urban conditions is *Native Trees, Shrubs, and Vines for Urban and Rural America: A Planting Design Manual for Environmental Designers* by Gary L. Hightshoe (1987, John Wiley & Sons).

### **Plant trees.**

Trees are highly efficient at cleaning the air. This is especially true for carbon dioxide (CO<sub>2</sub>) emissions, as trees absorb CO<sub>2</sub> from the air, sequester (store) the carbon, and release oxygen into the air. One mature tree can remove 26 pounds of carbon dioxide from the atmosphere annually, the equivalent of 11,000 miles of car emissions. See [www.ext.vt.edu/pubs/envirohort/426-721/426-721.html](http://www.ext.vt.edu/pubs/envirohort/426-721/426-721.html). Many cities are employing "carbon offsets"—to counter the CO<sub>2</sub> produced as a result of human activities with the amount that tree plantings and forests can absorb. Using plants to clean the air and reduce the human-caused effects of air pollution is referred to as phytoremediation.

An urban heat island results when heat generated by the sun is trapped and amplified by buildings and impervious surfaces. This may negatively impact air quality and increase energy use and water temperatures in streams and rivers. Adding tree canopy and green roofs mitigates this urban solar heating. Reducing the use of impervious surfaces or installing light-colored materials (such as pervious/permeable pavers) will reflect heat and help keep cities cooler.

**Decrease lawn area.**

Reducing lawn area will reduce mowing time. Create diverse habitats in your landscape by using native plants and trees to create beds and minimizing large expanses of lawn. This will reduce or eliminate the need to mow and spray. Small engines are big polluters. Less lawn means less time running a lawn mower. Plant and maintain your lawn according to the Cooperative Extension recommendations for your area. Use low-maintenance turf types that grow slowly and turf types that are adapted to your climate and the growing conditions in your yard.

**Use environmentally friendly equipment.**

Replace old, polluting yard equipment with newer, low or zero emission equipment. Recycle old equipment to prevent its continued use by others. Take it to a recycling center where it can be converted into raw material for use in cleaner equipment and other products. Research the new, cleaner gasoline equipment and battery powered equipment.

**Maintain your equipment.**

Change oil and clean or replace air filters regularly. Use the proper fuel/oil mixture in two stroke equipment. Tune up the engine, maintain sharp blades, and keep the underside of the mowing deck clean. Take time to winterize the equipment each fall. Equipment that runs efficiently causes less pollution.

**Consider cleaner options.**

Electric equipment is cleaner than equipment powered by gasoline engines. Electric-powered lawn and garden tools produce essentially no pollution from exhaust emissions or through fuel evaporation. However, even electric power tools use energy that was, in many cases, produced by the burning of fossil fuels.

**Use manual tools.**

Tools that don't require electric or gasoline engines can be just as handy for small jobs.

- For smaller lawn areas, consider a reel mower, which produces no pollution and provides a good source of aerobic exercise.
- Using rakes and brooms to reduce the use of blowers and the amount of airborne dust and noise you generate. Reducing the need for yard maintenance equipment helps reduce sources of noise pollution. Trees and shrubs in the landscape also help to filter out noise pollution.

**Minimize the use of toxic pesticides.**

Use integrated pest management (IPM) techniques to prevent and control infestations. Use homemade controls (such as soapy water sprays for aphids) or commercially available organic controls to control insect and disease outbreaks. *See Manage Garden Pests with Integrated Pest Management (IPM) in Element 8, Management.* If spraying, keep the pressure low (so droplets are bigger), your speed slow, and the spray nozzle close to the ground to prevent pesticides from drifting in the air.

**Do it right.**

Use and store pesticides and fertilizers appropriately to prevent evaporation or vaporization. Recycle or dispose of household and yard waste in an approved landfill rather than burning. Keep common allergen-producing plants such as ragweed off your property. Keep soil covered with mulch and/or plants to reduce dust and erosion. Consider planting tree species with low VOC emissions.

Avoid spilling gasoline. Even small gasoline spills evaporate and pollute the air. Use a gasoline container size you can handle easily. Use a funnel and pour slowly and smoothly. If there is an ozone or unhealthy air advisory, do not fill or use gas-powered equipment. Keep the cap and vent hole on gasoline containers closed tightly. Transport and store gasoline-powered equipment out of direct sunlight and in a cool place. Replace old gas cans with newer cans that have automatic shut-off, automatic closure, flow rate based on container capacity, and an anti-permeable lining that will control VOC emissions.

## ***Learn more about it***

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### **VOC EMISSIONS**

Plants may release gases such as hydrogen sulfide that are considered to be air pollutants. If you live in an area where the air quality doesn't (or occasionally doesn't) meet established safety standards—often an issue in major metropolitan areas such as the Baltimore-Washington region—avoid planting trees that produce high amounts of “biogenic” (i.e., naturally produced) volatile organic compounds (VOCs). The ozone-forming potential of different tree species varies considerably—as much as 10,000 times. However, understand that the combined environmental benefits of trees far outweigh any adverse air quality impact from biogenic compounds, and thus planting trees is considered an important component of all urban environmental protection strategies. To aid in assessing the environmental impact of landscaped outdoor spaces, see the calculator at EcoSmart Landscapes, [www.ecosmartlandscapes.org/](http://www.ecosmartlandscapes.org/).



## 6- CLEAN WATER

*A conservation landscape conserves and cleans water.*

Water is a precious and finite natural resource, an essential component in our lives and landscapes. Without it, nothing on Earth would survive. Less than 1 percent of all the water in the world is available as fresh clean water. Rainwater is constantly recycled through the ground and in the air, eventually becoming groundwater or surface water. Compacting soils and paving surfaces have decreased rainwater infiltration and increased runoff, interrupting the natural water cycle (Figure 1).

A conservation landscape preserves the natural water cycle and helps keep waterways clean in local watersheds. A watershed is all the land that drains after a rainfall to a particular body of water—a stream, river, pond, lake, or estuary such as Chesapeake Bay. Each watershed may be part of a larger watershed, as streams and rivers ultimately flow into larger water bodies such as the Bay. Rainwater running off the land carries with it chemicals, soil, plant debris, and other pollutants.

Rainwater percolating into the land can also carry chemicals such as fertilizers, pesticides, and other toxins. Healthy soils and landscapes allow rainwater to penetrate the ground and help to filter out pollutants. Every piece of land has the ability to affect a waterway, whether it is above or below the ground. By using conservation landscaping techniques—and thus helping to reduce pollutants in the landscape, reduce wastewater amounts, increase groundwater recharge, and reduce overall water use—a landowner can help keep waterways clean and enjoy lower monthly water bills.

The amount of water used to maintain a lawn or garden can be reduced by as much as two-thirds during summer months by employing conservation landscaping practices that focus on these key elements: water and plant zoning, plant selection, irrigation timing and amount, proper and efficient equipment, mulching, and rainwater harvesting.

## How?

### **Reduce the lawn area.**

Another method of conserving water through plant selection is to minimize the amount of lawn in the landscape. Lawns require more water, fertilizer, and overall maintenance than a planting of native plants. The many benefits of lawn reduction include: conserving water (lawns and annuals require the most water in landscapes), reducing pesticides and fertilizers (less cost and pollution), reduced runoff (layered plantings are more effective at reducing runoff than turf), reduced time and money spent on maintenance, and reduced solid waste going into a landfill. Grass clippings make up a significant percent of municipal solid waste collected and hauled to landfills. Lawns also have less than 10% of the water absorbing capacity of natural woodlands, which contributes to suburban flooding. Overall, native plants are better environmental choices for people and wildlife.

### **Create water zones.**

Arrange landscape, lawn, and garden areas in zones according to water needs. Group plants with similar water needs together. (In arid parts of the country, this is called xeriscaping.) High water-use plants are grouped close to the water source (such as the hose connection); medium water-use plants and lawn areas can be farther from the water source; and low water-use plants, such as natives, can be sited on the perimeter of the property, or farthest from the water source. Designing the landscape and selecting plants to suit specific site conditions automatically reduces or eliminates the need to use this zoning plan, as all plants eventually require little or no watering. Keep in mind, however, that every plant needs some watering during the establishment period or long drought periods; so plan for access to a water source.

### **Select plants judiciously**

Choosing plants wisely is fundamental to reducing water use. When selecting plants for your landscape, choose those that are drought tolerant and adapted to your local weather conditions. Drought-tolerant species and those plants suited to existing soil moisture conditions will thrive once established with little or no supplemental watering. If the plant seems to require frequent watering, it's probably the wrong selection for that location. This is described fully in Element 2, Native Plants.

### **Water correctly.**

Water thoroughly and deeply, but not too often. Thorough watering promotes stronger root systems, enabling plants to stay healthy during drought or hot weather. Watering too lightly or too often harms plants by encouraging shallow root systems, which make landscape plants more vulnerable to temperature extremes, drought and compacted soil. Sufficient water should be applied to reach the depth of the plants' roots (6 to 12 inches). The time it takes to deliver the proper amount of water to the soil depends on the watering method, equipment, soil type and existing soil moisture, and weather conditions. One inch of water per week is the general recommendation for healthy plants. The key is to water in such a way that it soaks into the ground and doesn't run off. Soils with high clay content may need cyclic irrigation. This is when you water for a short time then wait for it to soak in then water and wait again; sometimes 3 to 4 times. Soils with high organic matter or sand content can usually be watered in one longer application because the water soaks in faster. Drip or trickle watering systems are the most efficient, applying water at the base of the plant. Overhead watering is less efficient because water droplets are sprayed into the air where they can evaporate. Overhead watering also frequently wets plant foliage which can lead to disease.

**Time watering.**

Water plants and lawns only when they need it. Well-established plants that were planted in appropriate conditions may occasionally wilt during the hottest part of the day. This is a natural defense to conserve water, and they should perk up as the sun shifts and the heat is reduced. If they remain wilted, then it's time to water them. Whether watering plants or lawn, apply water during the coolest part of the day to avoid unnecessary evaporation and waste. Early morning is generally best, but early evening is acceptable on less humid days. Late evening watering can cause plants to stay wet over night, which encourages disease development. Watch the weather—there is no need to water if rainfall can do the job for you.

**Give it a break.**

During summer, cool-season lawn grasses such as fescues, bluegrass, and perennial rye naturally slow their growth as temperatures increase and rain decreases. Allow these grasses to go through their normal dormancy during hot summer months. Dormant lawn grass may turn brown. While this requires a change in aesthetic expectations, it will save significant water and normally will not harm the grass. The lawn will green up once autumn brings cooler weather and more rain. Warm-season grasses such as bermuda, zoysia and St. Augustine, do not require much water. In fact, you can stress or even kill these grasses by over watering.

**Use proper watering equipment.**

Use equipment that delivers water efficiently to where it is specifically needed. Artificial irrigation systems are generally not usually necessary for native plantings, which are better adapted to the local rainfall environment and better able to survive temporary droughts. For lawns and some landscape areas, sprinkler (overhead) systems will water deeply and appropriately if timing guidelines are followed and the spray heads are spaced and aimed correctly for full coverage. Automatic systems should include a rain sensor to detect moisture and turn off the system when there is enough natural rainfall.

**Mulch properly.**

Organic mulch retains soil moisture by reducing competition with weeds, shading the soil, and improving soil structure. This soil moisture can reduce the need for frequent watering of landscape plants. The depth of mulch needed is variable, depending on the type of soil and plants growing there. In general, mulch should not exceed a depth of 1 to 3 inches. Never place mulch in direct contact with the trunk or stem of trees and shrubs. Mulch should not be piled up around plants so water runs off instead of penetrating the soil. See *Ongoing Soil Maintenance in the Conservation Landscape in Element 7, Soils*, for more on mulch as it relates to soils.

**Use green mulch.**

Consider planting a dense layer of native groundcovers to act as "green mulch." Green mulching involves planting native groundcovers to create a dense mat that helps to cover the ground in lieu of mulch. Green mulch suppresses weeds, provides pest resistance, is low maintenance, and adds aesthetic appeal compared to brown mulch.

### **Practice stormwater management.**

Water conservation can be achieved through stormwater management practices. Reducing runoff from a site prevents a surge of polluted stormwater from entering local waterways. The following measures are some of the many ways that stormwater can be managed:

- Reduce impervious surfaces, including parking areas, driveways, and sidewalks by using alternative pervious pavers and materials that allow water to infiltrate.
- Encourage infiltration and avoid concentrating stormwater flows.
- Replace portions of lawn area with conservation landscapes or other BMPs.
- Refrain from clearing trees and underbrush, especially on slopes, as the vegetation helps to slow runoff, and allows time for better absorption into the soil; plant native vegetation to stabilize bare slopes or to replace invasive vegetation on slopes.
- Create curved or meandering pathways on slopes instead of straight paths, as the latter makes a “raceway” for water and contributes to slope erosion. Lengthen stormwater flow paths, providing long vegetated swales to help slow and filter rainwater runoff from a site.
- If creating dry stream swales avoid the use of impervious geotextile that prevent runoff from infiltrating. Use strategically placed boulders to slow the flow and create check dams along the swale.
- Spread it out! Redirect runoff to multiple collection points onsite and distribute the water strategically into the landscape.
- Provide a place to treat runoff onsite—install a rain garden (bioretentions)—and slowly release and infiltrate cleaner water. Rain gardens absorb pollutants, trap sediment and excess nutrients.
- Where rain gardens are not suitable, install structural solutions: dry wells and infiltration trenches. These underground structural solutions allow for the collection and gradual infiltration of runoff underground into areas filled with gravel or sand.
- Direct downspouts, sump-pump discharge, and runoff from paved driveways, sidewalks, and patios into landscaped areas, conservation landscapes, rain gardens, and structural solutions. Do not direct runoff or any wastewater drainage offsite into a neighbor’s property or public right of way.
- Harvest stormwater from downspouts into a rain barrel or cistern to use later for watering plants. Be sure to have a plan for the runoff water once collected— a full rain barrel does not provide any runoff collection value.
- Plant a green roof to help absorb and use rainwater. Green roofs are partially or completely covered with plants specifically suited to a specified soil depth and roof conditions. They benefit the environment by reducing stormwater runoff, removing nitrogen pollution in rain, neutralizing acid rain effect and providing songbird and insect habitat. They also reduce city “heat island” effect, absorb carbon dioxide; and by insulating the roof reduce noise as well as heating and cooling costs.

## ***Learn more about it***

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### **GROUNDWATER AND SURFACE WATER**

Groundwater is water that percolates into the ground and exists beneath the earth's surface. It fills the pores between sand, clay, and rock and ultimately supplies wells and springs. Groundwater is a major source of water for agricultural and industrial purposes and is an important source of drinking water for about half of all Americans. Groundwater recharge is the replenishment of water that circulates in underground aquifers. Without recharge, we would not be able to draw water from wells or springs. Permeable surfaces are required to achieve groundwater recharge. Infiltration is the process of water penetrating the soil and percolating down through its structure. (Figure 1)

Surface water is water located on the earth's surface in streams, ponds, wetlands, lakes, rivers, the Chesapeake Bay, and the ocean. See [http://www.physicalgeography.net/fundamentals/study-guide\\_ch8.html](http://www.physicalgeography.net/fundamentals/study-guide_ch8.html) for more information.

### **WATERSHED**

A watershed is all the land that drains after a rainfall to a particular body of water.

- Chesapeake Bay Foundation watershed information and action: [www.cbf.org](http://www.cbf.org)
- Chesapeake Bay Program, information, guidance, agreements, maps, etc.: <https://www.chesapeakebay.net/>
- EPA Surf your Watershed: <https://www.epa.gov/waterdata/surf-your-watershed>

Extension specialists from Maryland, Pennsylvania, and Virginia wrote a detailed guide to understanding watershed restoration in the Bay region for the Chesapeake Bay Landscape Professional certification program. See <https://cblpro.org/downloads/BasicPrinciplesWatershedRestoration.pdf>

### **LAWN CARE/ WATERING**

- Lawn Reform Coalition: <https://www.lawnreform.net/>
- Lawns and the Chesapeake Bay: <https://www.cbf.org/join-us/more-things-you-can-do/in-your-yard/lawn-care.html>
- University of Maryland Bay-Wise practices: <https://extension.umd.edu/programs/environment-natural-resources/program-areas/bay-wise-program>

### **COOL-SEASON LAWN GRASSES**

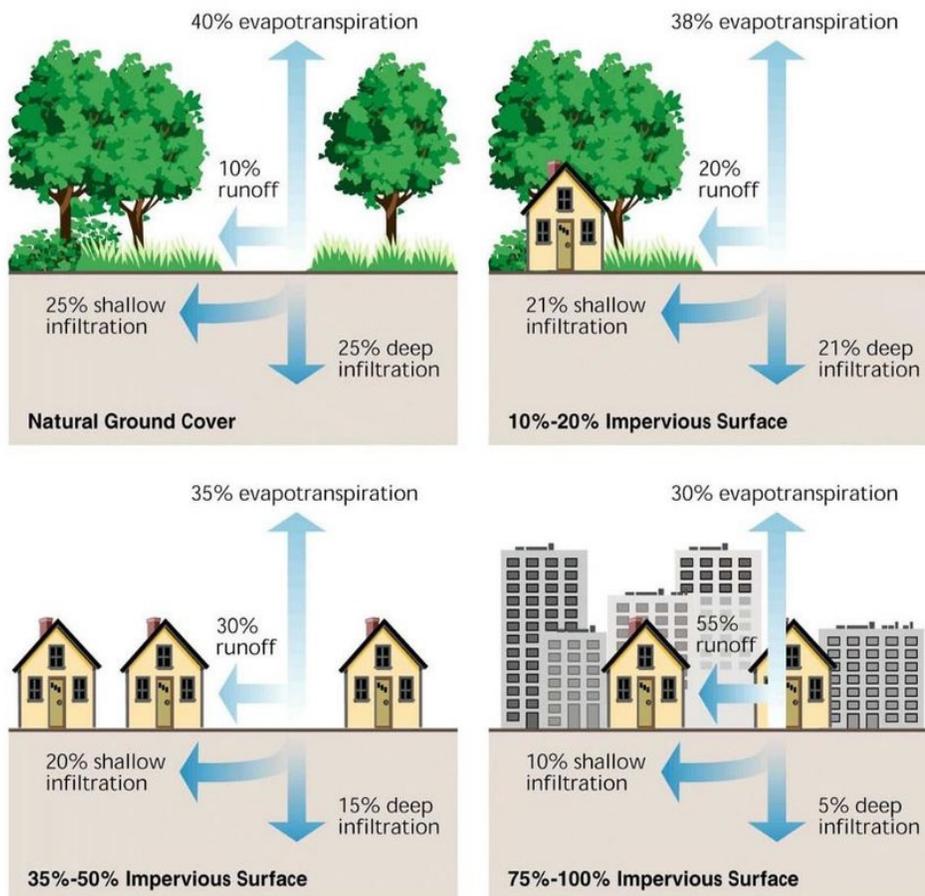
Cool-season lawn grasses include Kentucky bluegrass, turf-type tall fescues, K-31 tall fescue, perennial rye grass, and fine fescues. Warm-season lawn grasses include Bermuda grass and buffalo grass. Cool-season grasses grow during cool weather beginning in fall whereas warm-season grasses green up in late-spring.

## IMPERVIOUS SURFACES

Impervious surfaces are those surfaces in the landscape where rainfall cannot percolate into the ground, such as rooftops, pavement, sidewalks, driveways, parking lots, and compacted earth. Pervious or permeable surfaces are those areas with healthy, uncompacted soils, such as the forest floor, a meadow, a landscape bed, or a lawn that is not compacted. Permeable pavements in the form of interlocking concrete pavers, concrete, asphalt, or other materials are another BMP which is highly effective in reducing stormwater runoff.

Natural groundcover allows for greater infiltration and evapotranspiration, significantly reducing the amount of runoff leaving the site (as compared to sites with increased impervious surface) and contributing to groundwater recharge (Figure 1). As little as 10% impervious cover in a watershed may result in stream degradation.

Fig 1. *Evapotranspiration rates decrease and runoff increases as impervious surface increases.* (U.S. EPA)

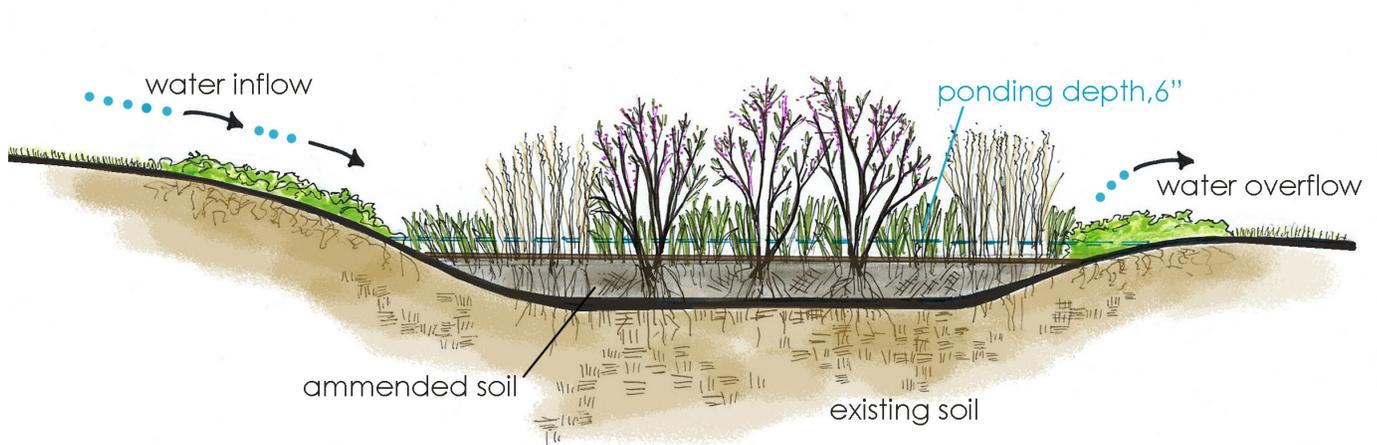


## ***RAIN GARDENS AND OTHER BMPs***

Rain gardens are planted depressions in the land where runoff flows from impervious surfaces and is absorbed by the plants in the garden. These BMPs collect water, remove pollutants, and allow it to infiltrate slowly.

Numerous localities in the Chesapeake Bay region are encouraging private property owners to install small scale stormwater BMPs such as conservation landscapes, rain gardens, permeable pavement, rainwater harvesting, living shorelines, and green roofs with rebates and other incentive programs. Some jurisdictions require the use of these BMPs to manage stormwater and reduce runoff in new development projects.

Fig 2. *Cross-section illustration of a typical rain garden. Illustration by Joyce Kelley.*



## References and Resources

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Anne Arundel County- Bureau of Watershed Protection and Restoration: Rain Gardens: <https://www.aacounty.org/public-works/bwpr>

Arlington Stormwater Management: <https://www.arlingtonva.us/Government/Programs/Sustainability-and-Environment/Stormwater>

Chesapeake Ecology Center's Rain Gardens and Rainscaping initiative: <https://www.chesapeakeecologycenter.org/wp-content/uploads/2016/05/Rain-Gardens-Across-Maryland.pdf>

DC RiverSmart incentive program: <https://doee.dc.gov/service/get-riversmart#:~:text=RiverSmart%20programs%20provide%20financial%20incentives,%2C%20shade%20trees%2C%20and%20more>.

Delaware Conservation Assistance Program (DeCAP): <https://dnrec.delaware.gov/watershed-stewardship/nps/decap/#:~:text=The%20Delaware%20Community%20Conservation%20Assistance,in%20Delaware's%20Chesapeake%20Bay%20Watershed>.

Fairfax County Rain Gardens: <https://www.fairfaxcounty.gov/soil-water-conservation/rain-garden-green-roof-industry>: [www.greenroofs.com/](http://www.greenroofs.com/)

Green Roofs for Healthy Cities: [www.greenroofs.org/](http://www.greenroofs.org/)

Montgomery County RainScapes: <https://www.montgomerycountymd.gov/water/rainscapes/>

Pennsylvania DCNR lawn conversion: <https://www.dcnr.pa.gov/Conservation/Water/LawnConversion/Pages/default.aspx>

Pennsylvania State University Green Roof Center: <https://plantscience.psu.edu/research/centers/green-roof>

Prince George's County RainCheck Rebate Program: <https://www.princegeorgescountymd.gov/departments-offices/environment/stormwater-management/rain-check-rebate-program#:~:text=The%20purpose%20of%20the%20Rain,reduce%20stormwater%20pollution%20in%20its>

Rain barrels are used to capture runoff from roofs: [www.rainbarrelguide.com](http://www.rainbarrelguide.com)

Virginia Conservation Assistance Program (VCAP): <https://vaswcd.org/vcap/>



## 7- HEALTHY SOIL

*A conservation landscape promotes healthy soils.*

Healthy landscapes begin with healthy soil. Soil contains a complex balance of minerals, water, air, and organic material, as well as living organisms such as mycorrhizal fungi. Soil supports plant roots and supplies nutrients, oxygen, and water. The structure and texture of the soil—the size and proportion of soil particles and the amount of organic material—affects how well the soil does these jobs. Large particles, such as sand, help soil drain quickly but do not store water or nutrients for plants. Small particles, such as clay and silt, hold nutrients and water well but drain poorly, and clay is hard to dig. Organic materials in the soil hold water, improve soil structure, nourish plants, and support the living organisms that keep the soil loose and fertile, and thus help plants fight pests and disease. Loamy soils that contain a balance of sand, silt, and clay and include organic matter are generally loose, well drained, and are able to store moisture and nutrients for plants. A loamy soil structure provides channels through which water and air can filter to greater depths. Air and water are, of course, essential; ideally, they comprise about half of the volume of soil.

Soil composition varies considerably within a region and supports different plant and animal communities. Some soils are particularly unique and support unusual or rare plant and animal communities [See Rare Soils, below]. Native soils require thousands of years to evolve and can be destroyed in a moment. Disturbances can result in a breakdown of soil structure and create an imbalance of plant and animal communities. These disturbances may include compaction by heavy equipment or foot traffic, changes in nutrient cycling and pH from runoff and air deposition, removal of topsoil, erosion, and plowing. Thus, a cornerstone of conservation landscaping is the proper protection and ongoing care of the soil.

“Soil food web” is term used to describe the rich and diverse community of organisms, such as bacteria, algae, fungi, and protozoa, as well as nematodes and micro-arthropods, earthworms, insects, small vertebrates, and plants found in healthy soils. This community of organisms is an integral part of the landscape. Functions range from decomposing organic compounds, sequestering nitrogen and other nutrients that might otherwise enter groundwater, fixing nitrogen from the atmosphere and making it available to plants. Atmospheric carbon dioxide, which is a primary driver of climate change, is absorbed by plants, and converted to carbohydrates which feed soil organisms. By increasing soil porosity, these same organisms increase infiltration and reduce runoff.

## **How?**

### **PRACTICE SOIL CONSERVATION BEFORE AND DURING CONSTRUCTION.**

Perhaps the greatest opportunities to protect native soils occur prior to and during construction, which can damage soil in a myriad of ways. Natural soils are directly impacted as they are bulldozed, re-graded, and paved over and topsoil can erode or become compacted or even be stripped from the site and sold.

#### **Minimize grading.**

Although it is not often recognized as such, soil is a valuable resource, yet it is often damaged by equipment, storage of materials, and earthwork before and during construction. Design for minimum building and hardscape footprints and reduce grading whenever possible. Make an explicit written agreement with site contractors that any soil removed is to remain onsite and be reused, and be disturbed as little as possible. Existing soils elsewhere on the site must be protected by sturdy fencing to prevent damage during construction.

#### **Store and reuse topsoil during construction.**

Setting aside topsoil to be reapplied after construction is an option. Identify areas that will ultimately be paved as a place to store topsoil during construction. Store topsoil in piles no larger than six feet high to avoid suffocating the important soil organisms and to protect the piles from erosion. Topsoil stored during construction should be mixed with compost—one cubic yard of compost into 3–5 cubic yards of topsoil— before respreading.

#### **Prevent compaction.**

Air spaces in soil are important for plant health, soil organisms, water infiltration, and activities that compress the air spaces out of soil must be avoided. Compaction causes damage that can take years or decades to recover, and it can be fatal to older trees at a construction site. Prevent soil compaction by limiting the amount or area of activities that cause soil compaction. These activities include: grading, excavation, heavy equipment use, heavy foot traffic, vehicle access, parking, and materials delivery access and storage. Before construction begins, designate and delineate with clear signage and fencing specific areas. Go over this information with all employees, contractors, subcontractors, and suppliers and make clear the penalties for noncompliance. Where possible, use plywood or a six-inch layer of coarse wood chips as a soil cushion (remove after work is completed). Avoid working with wet soil or during rain events.

#### **Protect existing trees and root zones.**

During construction install highly visible, strong temporary fencing to keep construction activity from compacting the soil surrounding natural areas, planting areas and trees. At minimum, protect tree critical root zones, the area inside the dripline from the trunk to the outermost edge of a tree's canopy. This is especially important as people like to store materials and park under trees. If spreading soil during construction, do not bury roots of existing trees and shrubs under more than 2 inches of added soil. Contact a certified arborist or tree specialist for onsite assistance.

**Prevent erosion.**

Soil washed from a site by erosion is a wasted resource. As it enters local water bodies, it carries pollutants, clouds the water, and can be damaging to aquatic resources and ecosystems. During construction, and to the fullest extent possible, cover bare ground with organic mulch, quick growing plants or biodegradable geotextile fabric. Bare ground on steep slopes, near waterways, and soils that are easily eroded are of special concern. Replant these areas as soon as possible to help stabilize and reduce erosion of soil. A number of stabilization methods can be used while larger trees and shrubs become established. Quick establishing perennials or temporary plants such as annual ryegrass or annual wildflowers can be used to fill in areas. Applications of mulch may continue to be necessary to cover the soil until plants are well established.

***PRACTICE SOIL CARE AFTER CONSTRUCTION OR IN AN ESTABLISHED YARD***

Ultimately, a soil management program must respond to existing site conditions. Conservation landscaping stresses working with existing conditions rather than trying to bend the site to suit desired plants. If you are fortunate, the topsoil wasn't stripped from your site or severely compacted during building construction. But some sites with extreme soil conditions may require altering in order to reestablish a healthy soil. Such conditions include compaction, low organic matter content, pH of less than 4.5 (highly acidic) or greater than 8.0 (very basic), sites where topsoil has been removed, sites where flooding is frequent, etc. A basic soil test will provide critical information on soil composition, pH, and natural fertility. Amend soil only when existing conditions are severely limiting.

**Improve compacted soil.**

As a basic test, poke a screwdriver into the soil. If you cannot achieve this without some effort, then the soil is compacted and requires aeration. The easiest way to improve the soil is to add compost (leaf mold, mushroom, manure) annually as a top dressing, and allow the natural processes of soil organisms to aerate the soil. Core aeration, rototilling, plowing, turning with shovels, or breaking the soil with a digging fork will reintroduce spaces for movement of water, oxygen, roots, and soil organisms. Choose the least intrusive measure for aerating first and if it doesn't work, then move to the next method. Aeration followed by top dressing with compost will greatly and quickly improve the soil structure (see below). If tilling, plowing, turning or digging is needed, it should be done only in the year the planting area is to be established. These types of aeration do not need to be done annually, and, in fact, tilling may be detrimental to the soil, as it disturbs and damages critical microorganisms which are essential for soil health. If improving the compacted condition is not possible, raised planting beds may be an alternative.

**Add organic matter where it is lacking.**

Organic matter (sometimes called soil conditioner) is generally composted leaf mold, organic debris (wood chips, lawn clippings, etc.), mushrooms or animal manures (horse, cow, chicken, rabbit). For soils that are extremely sandy, the organic matter will help improve moisture and nutrient retention, improve soil microbial habitat, and hold soil particles together better. For extremely clayey soils, it will help break up the clay and allow roots, water and nutrients to move through the soil. The quantity and type of organic matter to use depends on the existing soil and plans for landscaping. Consult with a local Extension Service for recommendations.

### **Import soil as a last resort.**

If there is little or no topsoil in which to plant, consider bringing in soil from elsewhere. Keep in mind that you may be bringing in a source of undesirable weeds or invasive plants. Imported soil must be carefully selected to ensure good quality—this cannot be overstressed. Choose a reliable, knowledgeable source (for large site construction, the provider must certify that the soil is weed free). Inspect the soil before purchasing or accepting it. It should have good structure, friable (loose, crumbly) texture, an earthy smell, a brown (not gray or black) color, and it should be free of debris (large rocks, roots, leaves, etc.). Have the soil tested as you would test soil onsite, for its type or content (clay, loam, sand), pH, nutrients, organic matter, etc., and choose soil that best matches the subsoil at the site. The new soil should be lightly worked into the surface of the existing soil.

## ***PRACTICE ONGOING SOIL MAINTENANCE***

“Traditional” landscaping practices may base soil preparation on soil test results that describe how to change or amend the soil to make it appropriate for crop production (including ornamental plants). Conservation landscaping, by contrast, focuses on working with the existing soil conditions and choosing plants that will thrive in the site conditions with little or no intervention. Amendments are necessary where soil disturbances or extreme conditions severely limit native plant selection.

### **Choose native plants suited for existing soil conditions.**

Native plants have co-evolved with native soils and are adapted to grow in these soils without amendment. The best way to conserve a native soil is to keep it covered with native vegetation. A wide selection of native plants will thrive in sites with conditions that traditional gardeners would cringe at—hot, dry, sandy, acidic, nutrient-poor. Do not alter soil conditions to feature specific plants in a soil that otherwise would not support them. It is simpler and more sustainable and economical to simply use native plants that are adapted to the site conditions. Exceptions, to some degree, may be made for turf areas and vegetable or cut flower gardens.

### **Change the pH only if absolutely necessary.**

For conservation landscaping, a pH in the wide range of 4.5 to 8.0 can support a wide range of native plants. A soil test will reveal the pH of your soil and guide your plant selection. If the soil test reveals a pH that is so extreme that it severely limits plant selection, then the soil can be altered by adding appropriate amounts of limestone to raise pH or elemental sulfur to lower it. Compost also helps ameliorate pH extremes. The soil test results will provide the appropriate recommendations for changing the pH, but this will likely not be necessary for most of your conservation landscape (only for extreme conditions). You may need to manage the pH in a vegetable garden, where the ideal pH for fertile soil is 6.5 to 7.0 (neutral). After applying amendments, it is important to test the soil again before finalizing the planting plan. Soil pH will not change overnight, and it may need testing and further amending in future years. Retest the soil every 3 to 5 years, and adjust the management practices accordingly.

### **Limit fertilizer use.**

Conservation landscapes that use native plants suited to the existing site conditions are self-sustaining and do not benefit from fertilization. Small lawns and vegetable or cut flower gardens may require some fertilization, depending on the needs of the soil compared to the requirements of

the plants to be grown. For these areas, test the soil to determine what nutrients are lacking and apply amendments accordingly. In some older neighborhoods, decades of lawn over-fertilization have caused phosphorus to build up in soils, making further applications unnecessary. Applying excess fertilizer may be bad for plants and soil health, wastes money, and leads to water pollution. Too much fertilizer results in weak and tender plants that are especially appetizing to pests. Nitrogen that cannot be used by the plants leaches into groundwater or runoff, and excess phosphorus can be carried away with eroding soils. It is also important to fertilize at the appropriate time. For example, fertilizing cool- season grasses in spring can actually help weeds outcompete the grass. Fertilizing warm season grasses in the fall can kill them. Test the soil every 3 to 5 years, and adjust fertilizer applications accordingly. For more information on proper timing and amounts of fertilization, check your local Extension Service website.

### **Recycle organic materials onsite.**

Whenever possible, use organic material from the site itself, such as fallen leaves and needles from trees, branches, lawn clippings and pruning debris. This debris is part of the natural process of decomposition that is important to the soil and the needs of all landscape plants. Use a mulching mower to chop up fallen leaves and use them in garden areas. If mulch must be brought in, purchase from a reputable or known source to ensure high quality material. Mulch applied should be free of weed seed; an occasional problem with free mulches such as those obtained from community leaf collection or composting programs. Do not use peat moss, as it is mined from living bogs and is not a renewable resource.

### ***MULCH CORRECTLY***

The use of mulch can be desirable in landscaping beds and vegetable gardens to help prevent erosion and weed growth, retain soil moisture, and encourage healthy soils. Soil surfaces should be covered with mulch or, preferably, a dense cover of plants at all times. Excessive use of mulch is discouraged as it is expensive, does not reflect conservation landscaping practices, and because it can be detrimental to plant growth when it's too deep or when native plants require less fertile soil conditions. In particular, piling large quantities of deep mulch around tree trunks, "volcano mulching" should be avoided. This practice effectively smothers trees and encourages root growth above the soil which can seriously damage or kill trees.

### **Use the correct type of mulch.**

The type of mulch used needs to be appropriate to the requirements of the plants in the landscape. Acidic mulch, such as pine needles or bark, is appropriate for plants that prefer acidic soils (pH below 6.0) but can damage plants that require more basic/alkaline conditions (pH above 7.0). Hardwood bark mulch (pH 7.0-8.0) may be used for newly installed landscaping or plants that require basic/alkaline conditions. For annual (or as needed) mulching, larger particle size mulches (wood chips or bark nuggets) will last longer in your landscape but may be more susceptible to washout. Smaller particle size mulches (shredded bark/wood/leaves or pine needles/straw) will be less likely to float or washout. Wood chips or bark can be excellent choices for covering garden paths and will reduce compaction from foot traffic and promote beneficial fungi and microorganisms that help nourish native woodland plants. Some mulches, particularly those that are dyed (red, black, or other colors), contain shredded material from old wooden pallets, discarded furniture, demolished buildings, or lumber scraps. These are not appropriate for use with plants because they may contain toxins, nails, and other debris.

### Use the correct amount of mulch.

To figure out how much organic material a plant species needs, take a look at the plant's natural habitat. Native plants that thrive best in rich, organic soils require more mulch. Many woodland and wetland species appreciate organic matter, whereas plants native to dunes, steep slopes, and dry meadows do best in lean, nutrient-poor soils and thus require less mulch. In any case, the depth of mulch around plants should not exceed two inches, and it should be cleared from direct contact with plant stems, trunks, or bark. Once plants are established and ground is covered, reduce or eliminate the addition of more mulch. See the information below for a formula to calculate the amount of mulch needed for a given area or use an online mulch calculator:

#### TO CALCULATE AMOUNT OF MULCH OR SOIL NEEDED

The volume is measured in cubic yards (CY) = # feet  $\div$  27

Cubic feet (ft<sup>3</sup>) = square feet \* feet (ft)

\*square feet: sq ft, SF, or ft<sup>2</sup>

Formula:  $\frac{\text{planting area (SF)} \times \text{depth in feet}}{27} = \text{\#CY}$

Depth for mulch is in inches, but it needs to be converted to feet for the calculation:

1 inch deep =  $1 \div 12 = .083$  ft

2 inches deep =  $1 \div 12 = .16$  ft

3 inches deep =  $1 \div 12 = .25$  ft

To calculate soil volume for a raised mound, use the the desired height:

8 inches high =  $8 \div 12 = .67$ ... and so on.

If not using bulk mulch, then determine the appropriate number of bags of mulch needed:

1CY = 9 bags mulch or soil if each bag holds 3 cu ft. = 13.5 bags hold 2 cu ft each

## *Learn more about it*

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### **RARE SOILS**

Some soils are unique and should be given great consideration when planning construction or landscaping activities at a site. Examples of unusual soils in the Chesapeake watershed include organic soils outside of the tidal zone, soils developed over ancient shell middens, and soils over unique bedrock, such as thin soils over serpentine bedrock. Unique soils are often associated with unusual plant and animal communities. For assistance in identifying soils and appropriate conservation strategies, consult with natural resource experts such as state or federal soil scientists, wetland delineators, foresters, and botanists. Good contacts include the Natural Resource Conservation Service or your local Extension Agent.

## **References and Resources**

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### SOIL TESTING LABS

- Pennsylvania: <https://agsci.psu.edu/aasl/soil-testing>
- Virginia: [www.soiltest.vt.edu/](http://www.soiltest.vt.edu/)
- Waypoint Analytical <https://www.waypointanalytical.com/>
- West Virginia Extension: [https://extension.wvu.edu/natural-resources/soil-water/soil-testing#:~:text=The%20WVU%20Soil%20Testing%20Lab,a%20micronutrient%20package%20\(MN\)](https://extension.wvu.edu/natural-resources/soil-water/soil-testing#:~:text=The%20WVU%20Soil%20Testing%20Lab,a%20micronutrient%20package%20(MN))

### ADDITIONAL REFERENCES AND RESOURCES

- Building Healthy Soil: <https://www.pubs.ext.vt.edu/426/426-711/426-711.html>
- Ingam, Elaine. Soil Biology and the Landscape/ Soil Food Web [https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/biology/?cid=nrcs142p2\\_053868](https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/soils/health/biology/?cid=nrcs142p2_053868)
- Lowenfels, J. and W. Lewis. Teaming with Microbes: The Organic Gardener's Guide to the Soil Food Web. Timber Press 2010.
- Matheny, Nelda. Trees and Development: A Technical Guide to Preservation of Trees During Land Development. 1998
- Nutrient Management In Your Backyard: [https://www.nrcs.usda.gov/sites/default/files/2022-09/Texas\\_Conservation\\_in\\_Your\\_Backyard\\_\\_Nutrient\\_Management\\_Accessible.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Texas_Conservation_in_Your_Backyard__Nutrient_Management_Accessible.pdf)
- Saving Your Soil and the Chesapeake Bay: <https://www.cbf.org/join-us/more-things-you-can-do/in-your-yard/index.html#:~:text=Reduce%20or%20avoid%20chemicals%20and%20fertilizers.&text=Ask%20for%20recommendations%20for%20organic,end%20up%20in%20the%20Bay.>
- Symphony of the Soil Project (Films about healthy soils and sustainable soil practices) <https://symphonyofthesoil.com/>



## 8- MANAGEMENT

*A conservation landscape is managed to conserve energy, reduce waste, and eliminate or minimize the use of pesticides and fertilizers.*

How you manage your own or your client's landscape can have an important impact on the health of your local environment and nearby waters, including the Chesapeake Bay. Embrace that responsibility; be a guardian of the property. Your landscape may be the one piece of land you have full opportunity to manage well.

The rewards of a well-maintained conservation landscape are many. It reflects positively on its owner and the professional who maintains it. It beautifies the home and neighborhood. It affords a comfortable place to entertain and offers a place for relaxation. Most importantly, it works with, supports and integrates into the surrounding landscapes and environment.

Nothing worth having comes for free, and no conservation landscape happens without some work. But conservation landscaping doesn't have to require more time than a conventional landscape. Setting up an endless cycle of continual human intervention which is common in traditional landscapes wastes both time and resources. Furthermore, intensive maintenance practices, including use of pesticides and herbicides, excessive or poorly timed irrigation, and frequent mowing and trimming tend to be environmentally damaging. Conservation landscaping elements help you develop a site design and management program that works with natural processes, recycles resources onsite, and achieves a self-sustaining landscape.

The Chesapeake Bay Landscape Professional (CBLP) publication, *Sustainable Landscape Maintenance Manual for the Chesapeake Bay Watershed*, by Cheryl Corson, provides an in-depth resource for landscape professionals on the rationale and methods for adaptive sustainable landscape maintenance plans (LMP). This manual advocates for the use of an adaptive management strategy, in which site conditions are assessed at regular intervals and conservation landscape principles and techniques are applied as needed over time to encourage regenerative processes. Adaptive management is critical to our ability to address resilience planning in a world facing the impacts of climate change, and to the creation of a natural, self-sustaining environment.

What follows is a condensed summary of the topics covered in the *CBLP maintenance manual*, specifically tailored for designers, contractors, and other interested parties to improve the environment and water quality. A practical Seasonal Maintenance Sample Conservation Landscaping Calendar is included at the end of this chapter, and may be adapted for use by professionals and novices, alike.

## How?

### **Select the right plant for the right place.**

Plants suited to the site conditions will thrive and are less susceptible to disease and pests. Carefully chosen plants, placed where they can grow to their natural size and shape, are healthier and more attractive. Begin with locally grown native plants whenever possible.

### **Reduce your waste stream.**

Prevent fertilizer, pesticides, yard debris, and pet waste from entering the waste stream or becoming pollution in local waterways. Reduce, reuse, and recycle are watchwords in conservation landscaping. Reducing waste starts with not generating it in the first place.

Prune selectively to complement the natural form and strengthen the structure of your plants. Selective pruning avoids unnecessary plant debris. Watering and fertilizing wisely prevents rampant plant growth that weakens the plants and generates plant waste. In particular, don't overwater or over-fertilize lawn areas, as these practices create the need to mow more frequently.

### **Practice grasscycling.**

When mowing lawn, set the mower at the correct setting for the type of grass (as high as possible) and allow the clippings to filter down into the turf as a natural fertilizer. Warm season grasses like bermuda, zoysia and St. Augustine are usually mowed at 2-3 inches, while cool season grasses like fescue, rye and blue are mowed higher at 4-6 inches. Check with your local Extension office for specific lawn maintenance recommendations

### **Leave the leaves.**

Fallen leaves support pollinators and other invertebrates and provide them with the winter cover they need. Consider leaving standing dead plants and leaves in place or in garden beds until springtime cleanup or longer if possible. Many bees, butterflies, and moths overwinter in leaf litter as eggs, caterpillars, chrysalises, or adults. In addition, leaving overwintering leaves whole rather than shredding them avoids the potential of harming the beneficial insects using them for cover. Fallen leaves can be added to garden beds and can even take the place of mulching in spring. The dead stems of perennials are also places where insects shelter over the winter. They should be left standing and removed in spring just before active growth begins. If you prefer to cut the stems in the fall, then gather them into a bundle and stand them up in an ornamental small tomato cage or tie the bundle with a ribbon and stand the stems upright against a fence or somewhere in the yard. If a tree dies and can be left standing in the landscape without being a hazard to people or structures, it makes a great home for cavity nesting birds. If the tree needs to be removed, then consider only removing the canopy and leaving the trunk standing for the birds.

### **Compost.**

Plant and grass trimmings, leaves, and other organic material can be composted. Using the compost as mulch or natural fertilizer improves soil structure and fertility and creates a healthy microbial habitat. Build a compost pile or participate in local yard waste collection programs to keep plant material out of local landfills. Dumping yard waste offsite or down storm drains is strongly discouraged!

### **Be thoughtful and creative.**

Material use is another important consideration in conservation landscaping. Using recycled content and salvaged, durable, or local materials conserves resources and reduces the amount of embodied energy that is consumed by the landscape.

### **Water wisely.**

Overwatering wastes resources, is not good for the lawn or the garden, and it can spread pollutants to other sites and to waterways as runoff leaves your site. If you have an irrigation system, do a monthly audit to make sure there are no leaks or broken heads. Make sure the heads are applying water in the correct pattern to cover the landscape without irrigating the road, sidewalk or driveway. Can part of the irrigation system be converted to drip, which is more efficient and better for the plants? Use a programmable timer to set different irrigation zones for different plant needs. Annuals, vegetables and lawns require more water while shrubs and trees require less. Water early in the day so water doesn't evaporate in the heat of the day and so plant foliage has the most time to dry to prevent diseases. Install a rain sensor or soil moisture sensors to turn off your irrigation system when there is sufficient rainfall. Whether using an irrigation system or watering by hand, one inch of water per week is the general recommendation for healthy plants. Watering deeply once or twice a week instead of every day will promote deep, dense and healthy roots. When installing new shrubs and trees consider using watering bags for the first year. Fill them once a week. The water seeps out slowly to keep the rootball moist and help new roots grow and establish quickly.

### ***MANAGE GARDEN PESTS WITH INTEGRATED PEST MANAGEMENT (IPM)***

The ability to identify specific pest or disease problems and treat them effectively is key to maintaining a healthy landscape. Pesticides (herbicides, insecticides and fungicides) are toxic and can pollute groundwater and nearby waterways, harming wildlife, pets, and family members. To keep your landscape safe and healthy for your family's enjoyment, practice integrated pest management. IPM offers an ecological approach to controlling pests and disease. For more information on IPM, see the links at the end of this section.

- Monitor/scout regularly for signs of plant problems (insects, diseases, weeds, nutrient deficiencies). Apply management practices before problems get out of hand. Obviously, it is critical to identify the problem (for example the insect or disease and its life cycle) so you can look at your management options and pick the best one for your situation. Your local Extension office can help with identifying the problem and recommending practices.
- Pesticides should not be used routinely or indiscriminately. It is unrealistic to expect a totally insect- and disease-free landscape. IPM advocates the tolerance of occasional minor pest outbreaks wherever possible. Recognize that some plant damage is okay and will likely not affect the long-term health of the plant. In fact, allowing a low level of pest presence will attract beneficial insects and songbirds that will aid in managing the pests.
- If chemicals are deemed necessary, use the least toxic methods first. Hand picking insect pests and diseased leaves from plants will often be sufficient. Removing weeds when they are young requires less effort and prevents them from developing seed. Insect traps, promotion of beneficial insects, and mulching to prevent weeds are non-toxic management options. When necessary, use environmentally friendly and/or organic pesticides such as horticultural oils and

soaps, *Bacillus thuringiensis* (Bt) for mosquitoes, and botanical insecticides whenever possible. Other pest prevention ideas include removing infected plant debris and diseased plants to prevent the spread of disease from one plant to another and from one season to the next; choosing resistant varieties of plants, especially local native plants; and using plants (such as members of the mint and aster families) that attract beneficial insects to the garden.

- Use pesticides ONLY when and where they are absolutely needed and only as instructed on the label. Before using pesticides or fertilizers, read and follow the label instructions. The label is the law. Dispose of unused pesticides and fertilizers through local hazardous waste recycling programs. Keep pets and children away from areas treated with pesticides. Remember, it is poison!

## **MANAGE UNDESIRABLE VEGETATION**

A “weed” can be any plant that is out of place, growing where it doesn’t “belong,” ecologically speaking, or where it is not wanted in landscaping. Some tolerance for weeds helps to reduce the tendency to overmanage the landscape. Furthermore, the prevalent American preference for “tidiness” in the landscape is contributing to a reduction in our regional biodiversity.

Developing an understanding of plant values and allowing some areas to remain “naturalized” as appropriate will help to remove the stress on natural resources. Many native species that people consider “weeds” are important to the survival of insects and other wildlife.

However, there are certainly situations where vegetation removal or management is necessary. Unwanted plants that volunteer in a planting bed and outcompete what was planted, or detract from the desired aesthetic, will need to be removed. Aggressive and invasive plants (especially state-designated invasive and “noxious” weeds) will require management. When removing vegetation, choose the method that will have the least negative impact on the soil, plants, animals, local water or air quality, and people. (For more information on these measures, see Element 7, Healthy Soils, and Element 3, Invasive Plant Management.)

### **Manual plant removal.**

- Pulling is advisable for small, manageable situations. Be sure to remove as much of the roots as possible. Gloves and protective clothing help prevent skin rash, irritation, or injury from many types of plants. Use caution when removing weeds manually to avoid making the problem worse with excessive soil disturbance which promotes weed seed germination.
- Repeatedly cutting weeds as low as possible will weaken them and is less likely to stimulate new weed growth caused by pulling and soil disturbance.
- Smothering weeds and preventing weed seeds from germinating can be done with materials such as layers of paper, cardboard or heavy mulch. These are environmentally sound options that require time— several weeks or months. Solarizing uses thin clear plastic to create high temperatures which kill weeds and seeds in the soil. This is best done in the heat of summer and requires soil moisture for success. Dead vegetation will need to be removed by raking or allowed to decompose fully into the soil. Solarizing will not effectively control perennial weeds or many weeds with aggressive root systems.

## **Mechanical plant removal.**

- Use hand tools such as shovels, cultivators, hoes, and weed-pulling devices to remove entire plants. Propane torches or steam may be used for spot-treating individual plants or small areas. Fire protection measures and permits may be necessary for flame use. A torch is generally used on weeds in sidewalks, driveways or roads as it could catch your mulch on fire if used in a landscape bed. Do not burn poison ivy as it spreads toxic fumes.
- Use machinery to mow or cut vegetation to prevent seeding and vegetative spread, such as by rhizomes or vines. For some plants, cutting only multiplies their sprouting, so proper plant identification and management information are important to successful removal. Some woody plants can be removed with one cutting. Other plants, particularly perennial species, will require repeated cutting and may need complete removal by another means.
- Shallow tilling, while not recommended because of the aforementioned associated damage to soil structure and microorganisms, may be prescribed to eradicate weed seeds present in the soil; particularly to prepare a site for lawn or meadow seeding. A program of repeated tilling, or alternate tilling and herbiciding, may be needed. Shallow tilling means a maximum depth of one to two inches. Remember that tilling is a disturbance that brings weeds to the surface where they will germinate, so it can increase the weed problem if not done repeatedly to significantly reduce the seed numbers.
- In an IPM program, chemical measures are usually a last resort, and organic alternatives such as corn gluten products or natural acetic acids are encouraged when appropriate. For large areas impacted by invasive species, the application of herbicides is often less harmful than the long-term negative effects of the invasive plants. Do your homework before using any chemical. Check the manufacturer's website for specific information on contents, safety, and use. Consider side effects to non-target plant species, children, adults with chemical sensitivity, pets, and wildlife including insects and aquatic life. Determine the chemical's effectiveness and specificity for the site and/or plant(s) to be controlled, application method and timing of application, and its breakdown time or persistence in the soil. For specific advice, it is best to consult a weed specialist through the state or local agriculture department or Extension office.
- Minimize soil disturbance, as it promotes more weeds. Prevent further spread by cleaning seeds and root material from clothing and equipment prior to moving to another site. Do not compost weeds or chemically treated vegetation. Bag invasives and dispose in a landfill so they will not resprout or spread seeds.

## **CONSERVE ENERGY**

With the use of mowers, blowers, weed whips and saws, chemical fertilizers and pesticides, conventional landscape maintenance is very consumptive of fossil fuels. The need to conserve energy is as important in conservation landscaping as the need to conserve water.

- Well placed trees can reduce energy use in buildings. When properly placed, mature trees can reduce the interior temperature of a building by as much as 20 degrees; reducing summer cooling costs by 25–40 percent. Select and place trees to shade adjacent buildings in the summer or protect them from prevailing winter winds. It's also helpful to shade your air conditioner and paved areas. Plant deciduous trees to the west and southwest of a building for maximum shading benefit. Avoid planting trees that block solar collectors or are in front of south-facing windows that allow the low winter sun to warm a home. Large deciduous trees

will be of greater value for summer cooling and winter solar gain. Select native evergreen trees for windbreaks, and plant them on the north and west sides of your property where they will shield your home from chilling winter winds.

- Reduce the amount of lawn in your landscape. Lawn mowing is easily the most energy consumptive routine landscape maintenance practice. The unavoidable fact is that reducing the amount of lawn in the landscape is an important step toward reducing energy consumption. Lawns also provide relatively little habitat or food value for wildlife. Keep only enough lawn for specific recreational or aesthetic needs, and convert the rest to more environmentally friendly plantings.
- Choose and maintain your garden equipment with energy conservation in mind. When using machinery, choose the smallest, most fuel efficient, lowest emission machinery required to get the job done. Use hand-powered equipment whenever possible. Electric or battery powered garden tools are less polluting than gas-powered equipment, and are usually more than adequate for most landscapes.
- Use recycled materials, and avoid petroleum-based products, including synthetic fertilizers. Remember, recycling plant debris on site will minimize fuel and energy consumption used in creating man-made products. What's more, buying local products reduces the environmental costs of transporting materials, such as pollution and energy consumption.

### ***TELL THE NEIGHBORS AND YOUR CLIENTS ABOUT IT***

Neighbors will be curious about conservation landscaping activities, especially as a yard takes on some new characteristics. Their curiosity is an opportunity. Tell them about it. You can help educate them about your process of creating a conservation landscape. Ideally, the conservation landscape will become an example that encourages other members of the community to follow suit, and conservation landscapes are even more effective when they occur in groups or corridors. The more people that know about conservation landscaping, the better. There is strength in numbers. Spread the word! Collectively, we can make a difference.

## ***Learn more about it***

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### ***CHECK OUT ONE COMMUNITY EXAMPLE:***

Naturescaping: Appreciating, Preserving and Restoring Reston's Natural Resources, Reston Association (Virginia): <https://www.reston.org/nature-environmental-overview>

### ***INTEGRATED PEST MANAGEMENT***

Home and Garden Information Center: <https://extension.umd.edu/resource/ipm-prevent-identify-and-manage-plant-problems>

National IPM Center: <https://www.northeastipm.org/ipm-in-action/what-is-ipm/>

U.S. Environmental Protection Agency IPM principles: <https://www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles>

## References and Resources

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Audubon International, IPM <https://auduboninternational.org/wp-content/uploads/2019/03/CURS-Landscape-ecomangement.pdf>

Bay-Wise Program, Maryland: [www.extension.umd.edu/baywise](http://www.extension.umd.edu/baywise)

BayScapes Program, The Alliance for Chesapeake Bay: [www.allianceforthebay.org](http://www.allianceforthebay.org)

Chesapeake Conservation Landscaping Council: [www.chesapeakelandscape.org](http://www.chesapeakelandscape.org)

Corson, Cheryl. "Sustainable Landscape Maintenance Manual for the Chesapeake Bay Watershed." 2017. Chesapeake Bay Landscape Development Professional Certification Program, <https://cblpro.org/downloads/CBLPMaintenanceManual.pdf> Ecological Landscaping Alliance: [www.ecolandscaping.org/](http://www.ecolandscaping.org/)

Homegrown National Park: <https://homegrownnationalpark.org/>

Landscape for Life: <https://landscapeforlife.org>

MidAtlantic Ecological Landscapes Partnership (MAEscapes): [extension.psu.edu/plants/gardening/maescapes](http://extension.psu.edu/plants/gardening/maescapes)

Plant NOVA Natives: <https://www.plantnovanatives.org/>

Plant Virginia Natives: <https://www.plantvirginianatives.org>

Turner, Thomas. "Lawns and the Chesapeake Bay." November 28, 2022. University of Maryland Extension. [https://mda.maryland.gov/resource\\_conservation/documents/lawncareservice.pdf](https://mda.maryland.gov/resource_conservation/documents/lawncareservice.pdf)

"Ask Before you Hire: Choose a Lawn Care Service That's Right for You...and the Chesapeake Bay" University of Maryland Extension.: <https://extension.umd.edu/resource/lawns-and-chesapeake-bay>

"Backyard Conservation, USDA Natural Resources Conservation Service." USDA. <https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/texas/backyard-conservation>

"Caring for Your Native Plant Wildlife Sanctuary." Plant NOVA Natives. <https://www.plantnovanatives.org/landscape-maintenance>

"Home and Garden Information Center". University of Maryland Extension.: <https://extension.umd.edu/programs/environment-natural-resources/program-areas/home-and-garden-information-center>

"Lawn and Garden" Virginia Extension Garden and Landscape Resources.: <https://ext.vt.edu/lawn-garden.html>

"Pruning Tree and Shrub Basics" University of Maryland Extension. : <https://extension.umd.edu/resource/pruning-tree-and-shrub-basics>

While some maintenance practices are more generally applied, maintenance such as pruning, requires knowledge of specific plant species and their habits and requirements.. In conservation landscaping, some "traditional" practices may not be used altogether. If you are used to regularly scheduled cutting, shearing, clearing, fertilizing, and so on, you will find this approach very different. The schedule described here is only an example, taken from a model conservation landscaping project. A customized schedule could be developed for each site as a new service to offer customers, or you may find some practices here to promote and use more widely in your own landscape.

## SEASONAL MAINTENANCE: A SAMPLE CONSERVATION LANDSCAPING CALENDAR

### LATE FALL/WINTER (*late October/early November*):

- Leave most plants standing throughout winter, as long as is aesthetically possible, to provide cover and food/seed for birds and overwintering insects.
- Remove dead canes that have fallen over; leave all remaining plants standing; dig fresh edges of garden beds (trenches) as necessary;
- Manually remove remaining weeds and stray turfgrass such as crabgrass;
- Mulch bare areas 1 to 2 inches deep with fallen leaves to help prevent late season weeds, and provide winter protection;
- Identify problem areas from the growing season and plan management strategies before the spring season (for example, recurring weeds that will need early spring direct application of a specific, safe pre-emergent herbicide);
- Divide/ remove plants that have spread as necessary/as appropriate, depending on species (divide some species in spring);
- Remove and dispose of plant parts that are harboring pests, such as overwintering borers, or disease that could spread, such as fungus (do not compost these materials).

### WINTER (*November through February*):

- Monthly, check for any areas needing early removal of spent vegetation for aesthetic reasons—such as after a particularly heavy snowfall (after snow melts);
- Confirm and/or adjust management plans for upcoming year;
- Prune shrubs and trees minimally as necessary and as appropriate to particular species, using naturalistic/ selective pruning (as opposed to shearing and shaping), some multi-stemmed trees are desired.

## SEASONAL MAINTENANCE: A SAMPLE CONSERVATION LANDSCAPING CALENDAR

### LATE WINTER/EARLY SPRING (*mid- to late March*):

- Cut back all perennial plants and remove cut vegetation—bunch grasses should be cut back to a height of 4-6 inches; leave all green basal leaves of plants (such as black-eyed Susans);
- Rake area lightly (thorough cleanup is not necessary; some organic debris such as light leaf litter is desired and necessary for plant and animal health, though diseased plant material should be clipped or raked and disposed of;
- Leave mulching leaves and/or add 1 to 2 inches of an appropriate organic mulch to all bare, open areas of garden beds, being careful not to bury seedlings or new growth of emerging perennials (do not create mulch “volcanoes” around trees or pile mulch up against tree trunks/bark)—if mulch was applied in the fall, this may not be needed, do not re-mulch if a 2-3 inch layer already exists;
- Dig new trench edge to garden beds;
- If adjacent turf areas or paths require spot overseeding, avoid spreading seed in garden areas.

### SPRING/SUMMER (*April-September*):

- Weed (manually) once per month (twice monthly may be necessary April through June) to remove commonly recognized weeds— identification is important for allowing the native species planted in the garden to spread as desired;
- Divide/remove plants that have spread as necessary/ as appropriate depending on species (divide some species in fall); mow grass paths or edges as needed;
- Maintain garden edge as needed;
- Water ONLY during extended periods of drought, as plants begin to show signs of stress— many native plant species tolerate normal periods of hot, dry weather; a few will not survive over-watering;
- Trim asters, removing up to a third of the plant’s height every 2 weeks mid-May to July 1 to promote branching so plants will support a heavy bloom;
- Lawn treatment (if any) should be part of an approved IPM program, and only prescribed where lawn health and annual soil tests deem necessary.

