

SUSTAINABLE CONCORD LANDSCAPE HANDBOOK



THE TOOLS YOU NEED

To design a space, construct the project, and maintain your sustainable landscape.



SUSTAINABLE CONCORD

Revolutionary

Resilient

Ready

The history of Concord is deeply rooted in conservation and preservation. Today that means mitigating our contribution to climate change and being resilient to the impacts of climate change including drought, flooding, winter storms, and extreme heat.

The way in which we manage our landscapes impact our water supply, water quality, biodiversity, energy consumption, and soil health.

Sustainable landscaping is a win-win solution for our community and our natural resources because it:

- Increases biodiversity
- Reduces demand on our limited water supply
- Improves water quality
- Mitigates of flash flooding
- Increases resiliency to drought
- Reduces energy consumption and maintenance needs
- Increases potential for carbon sequestration
- Enhances ground water recharge and reduced runoff during storms

This handbook is designed to help you create, install, and care for your landscape in a way that conserves water, takes the changing climate into account, and promotes the health of native species.

We hope you find this handbook useful in inspiring and creating your own sustainable landscape. We thank you for doing your part to create a sustainable Concord.

This handbook was created in partnership with Kim Lundgren Associates, Inc. and Bohler Engineering as part of a sustainable landscaping project that included a speaker series and three demonstration gardens of sustainable lawn alternatives planted throughout Concord. The sustainable landscaping project was made possible thanks to a grant provided by the Metropolitan Area Planning Council (MAPC) and the Barr Foundation. Special thanks to Concord Public Works, Concord Free Public Library, West Concord Green Thumbs, Concord-Carlisle High School administration and environmental science program, and Delia Kaye for their support of this project.

Yours in sustainability,
Kate Hanley, Director of Sustainability
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concordma.gov/greenskapes

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PHASE 1: Planning and Design



STEP 1

Getting Started. Who Will Do the Work?

Before you start your sustainable landscape project, ask yourself how much time you have and how involved you want to be in the process. Local professionals can help at any stage of your project and resources are available to help you complete your project on your own. Think about how to split up the work based on what you would like to tackle yourself and where you might want to work with a professional.

	DESIGN		INSTALLATION	
OPTION 1	YOU	➔	YOU	You can go through the design process and install the project yourself. This handbook provides steps for each phase in the process. Set achievable goals and start small.
OPTION 2	YOU	➔	CONTRACTOR	You can design the project and then have a contractor install. If the scope exceeds what you would like to get involved in, no worries! A contractor can work with you to bring your plan to life.
OPTION 3	PROFESSIONAL	➔	YOU (with assistance of a contractor)	You can have a professional design your property's landscape and then install what you can with the assistance of a contractor. Working hand in hand with a professional designer can be a great way to plan for your property and bring in creative ideas.
OPTION 4	PROFESSIONAL	➔	CONTRACTOR	You can hire a professional designer and a contractor to install. There are companies that will take care of the design and installation. This is called a design/build firm. This allows for an easier transition from each of the different phases from planning to construction, and in some cases, even maintenance.

STEP 1

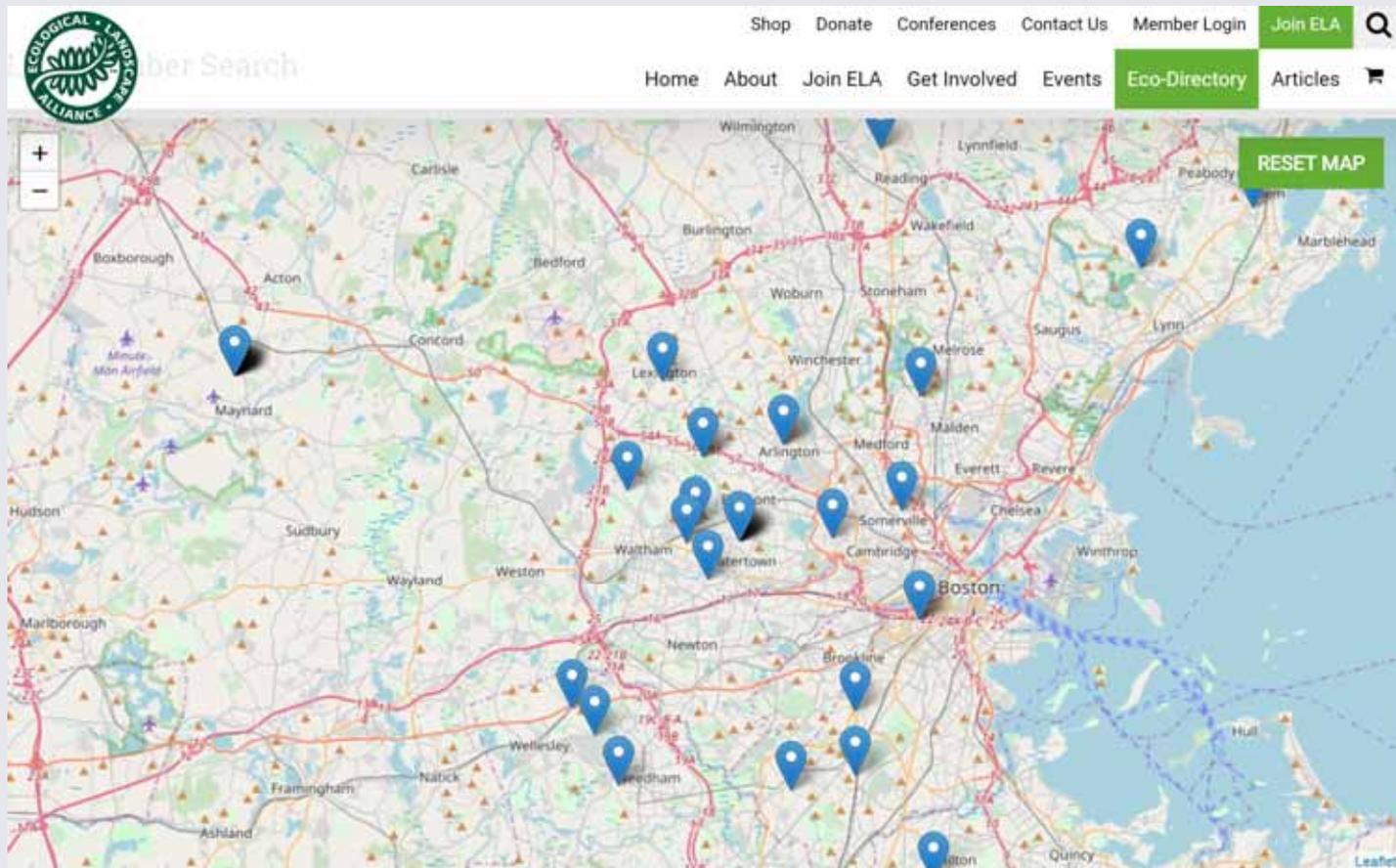
Getting Started. Who Will Do the Work?



FIND A PROFESSIONAL THAT CARES ABOUT SUSTAINABILITY

These resources can help you find a local professional with a focus on sustainable landscaping practices.

- [Tower Hill Botanical Garden](#) is a hub that can connect you to local sustainable designers and builders.
- [Ecological Landscape Alliance \(ELA\)](#) provides access to webinars, events, resources and connections to local professionals.
- [Massachusetts Horticulture Society](#) has online resources and lists of local events.
- [American Society of Landscape Architects](#) and [Boston Society of Landscape Architects](#) have databases to search for landscape designers in the area, as well as sustainability articles.
- [Grow Native Massachusetts](#) provides a list of landscapers with a sustainability mission.



An example search result for sustainable practitioners around Concord, through Ecological Landscape Alliance.

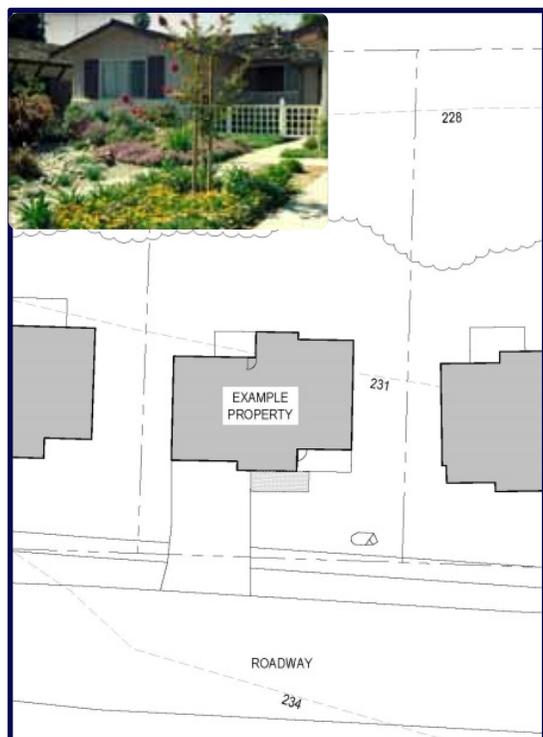
STEP 2

Draw a Scaled Map of Your Property

This is an important next step in the planning process. Having a scaled drawing of your property can help fuel a productive conversation with a contractor or get you started on the right foot in creating your own design.

WHAT TO INCLUDE:

- Property lines** - You want to ensure you're working only on your property and not your neighbor's! If you are unsure where your property lines are, you can reference [Concord's WebGIS map](#) or have a surveyor come out and identify them.
- Footprint of existing structures** – Be sure to include structures such as porches, sheds, decks, or existing patios.
- Existing trees, shrubs, plant beds** – Indicate where the softscape elements are including existing beds, trees or shrubs that you have.
- Location of utilities** – Mark septic system, light poles, overhead wires, and underground lines. Call Dig Safe® ((888) DIG-SAFE) if you need help locating underground utilities.
- Environmental constraints** (wetlands, streams, ponds, floodplain, vernal pools) – Know where these are on your property to understand if you need a permit from the Natural Resources Commission to construct your landscaping project. [Concord's GIS system](#) is a good place to start.
- Scale reference** – Always draw your plan to scale (i.e. 1-inch equals 10-feet). If you are off, it can cause challenges when it comes to installation. Show a scale bar so that you and others know what scale you are working at and can quickly measure from it.
- North arrow** – This will help you determine the sunny and shady areas on your property.



MAPPING RESOURCES

- [MassGIS/Oliver](#) provides data such as FEMA flood mapping, topography, areas of critical environmental concern, and conservation areas.
- [Concord Webmap GIS](#) is a localized mapping resource with town-specific information.



SUGGESTED SCALES

Small lot: 1 inch = 10 foot
Large lot: 1 inch = 20 foot



PRO TIP

Use graph paper and let one box equal a certain number of feet.

STEP 3

Analyze Your Property: Observe and Interact.

This step is often rushed or overlooked, but it is one of the most important aspects of planning your landscape. Take the time to analyze your property's characteristics and identify areas of concern and opportunity on your property. Areas of concern can be transformed into an opportunity for creative landscaping. Begin thinking about the potential your site offers, your landscape style, and the sustainable elements that you would like to incorporate.



ENVIRONMENTAL CONSIDERATIONS

WETLAND RESOURCE AREAS – State and local laws may apply to your landscaping project. Check with the [Natural Resource Division](#) before you begin.

EXISTING HABITATS – What types of habitat exist on your site? [Concord's BioMap](#) can help you determine if your property falls in a critical habitat and tips on how to preserve biodiversity.

WATER – What kind of plants will do well on your property? Understand the moisture regime of your soil so you can plant the right plants in the right spot.

STEEP SLOPES OR EROSION – Notice areas with significant slopes. Is this leading to erosion? Why?

INVASIVE PLANTS – Identify invasive plants on your site. [Concord's online guide](#) provides images along with helpful information. There are also several mobile apps, such as iNaturalist, FlowerChecker, and GardenGate that allow you to take a photo of a leaf and identify the plant.

SOILS – You can have your [soil tested](#) to understand what nutrients may be high or low in your soils.

LIGHT – This is another important consideration. Plant shade-tolerant plants in shady areas, and sun-loving plants in more open areas. The [Native Plant Trust](#) includes light and soil moisture considerations for all native plants.

ADDITIONAL CONSIDERATIONS

- Do you have kids or pets that use the space?
- Do you have a patio or other paved areas?
- Are there views you'd like to maintain?
- Where does the natural or artificial light come from?
- Do you want your space to feel private or public?
- Are there areas you want to screen?
- Where do you regularly walk?
- Where do animals travel?
- Where are the entrances/exits of the space?
- Where do you get deliveries?



STEP 3

Analyze Your Property. Observe and Interact.

Consider the following features when walking your property, examining existing constraints and opportunities. Look for space that is underutilized and brainstorm alternative uses. Observing your neighbors' landscaping can be a great place for inspiration. Don't be afraid to think outside the box.



Underground Utilities and Utility boxes

Opportunity: Shallow plantings to screen



Steep Slopes and Shade

Opportunity: Beautiful shade planting spot.
Let the slope plantings go wild with only native plants. Remove any invasive plants.



Roof Gutters Downspout

Opportunity: Collect rainwater in a rain barrel or redirect into a rain garden



Full Sun and Slope Towards House

Opportunity: Collect water from slope.
Sunny perennial pollinator plants

STEP 3

Analyze Your Property. Observe and Interact.



Exposed Utility Lines and Erosion Issues

Opportunity: Screen utilities with native plants. Direct water into rain garden at the base of the slope



Steep Slopes and Exposed Foundation

Opportunity: Native plantings to screen foundation



Poor Tree Selection

Opportunity: Remove and plant a native plant bed.



Downspout and AC unit

Opportunity: Collect water in rain barrel. Add foundation plantings.

STEP 4

Assess Your Needs and Set Goals

The final step of analyzing your property is to set sustainability goals and assess the needs you have in order to meet those goals. Start with small steps. If you have a goal (example: I want to create a raingarden in my backyard), break it down into steps of how you want to achieve that goal and assess if you will need help attaining that goal. Here are some ideas of sustainable landscaping goals you might consider.



REDUCE WATER USE – Is there a way to capture rainwater on your site and use it for your benefit? Think about converting lawn areas to planting beds that would require little to no water once the plants are established. If you have lawn areas, consider amending the soil with organics. You will be surprised how little water a lawn needs if the soil is healthy. See Phase 3 on maintenance for more information on how to reduce your water use.

CAPTURE RAINWATER – Think beyond the rain barrel. There are rain devices, like tanks, that fit between your deck joists, or bags that can hide in crawl spaces. Small pumps allow you to water your garden with this type of rain storage.

IMPROVE SOIL WITH ORGANIC MATERIAL – Consider mulching your leaves or adding compost. This is free food for your plants as the leaves begin to decompose. This is a great fall project.

REDUCE OR REMOVE IMPERVIOUS SURFACES – Concord is facing new and costly federal requirements to reduce the amount of polluted stormwater runoff it discharges to waterways. Facing similar challenges, a growing number of communities have established a stormwater utility to help them mitigate the financial burden associates with managing runoff that originates of private property. Reducing the amount of impervious cover—asphalt, concrete, etc.—on your property today could minimize the impact of any such fee, should a stormwater utility be adopted in Concord.

INCREASE POLLINATOR PLANTS - It's a fact that bee populations are declining. Why not help them out in your own backyard? You will begin to notice that [native pollinator plants](#) not only help the bees but a wide range of animals!

STEP 5

Determine Space Layout

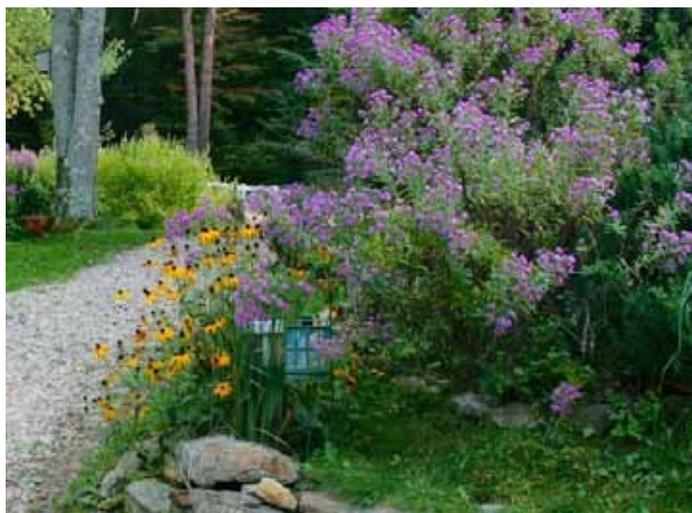
Keeping your goals and needs in mind, start designating areas of your land for specific landscaping elements.



PRO TIP



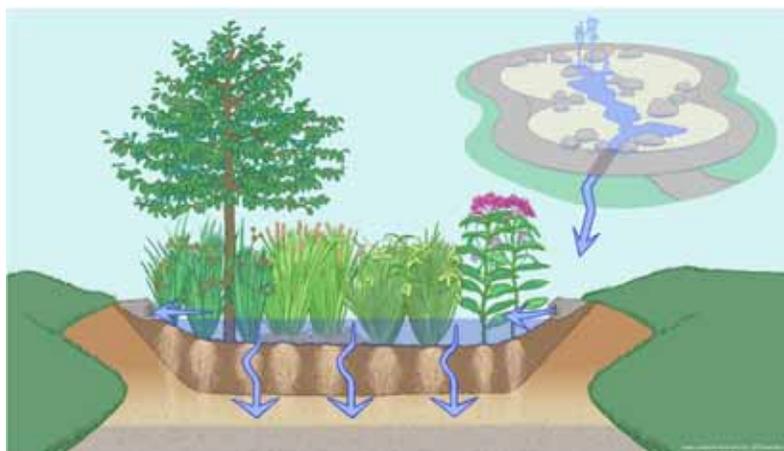
Make a rough [bubble diagram](#) to determine your space layout. A bubble diagram is a quick way to circle areas where potential upgrades could happen on your property. See the following page for what each bubble might represent.



PRO TIP



As you are planning where your plants will go, take seasonal winds into account and experiment with ways to maximize pleasant aromas in frequently visited spaces of your landscape. Imagine stepping out your door every spring morning, down wind from a blooming tree or bush!



PRO TIP

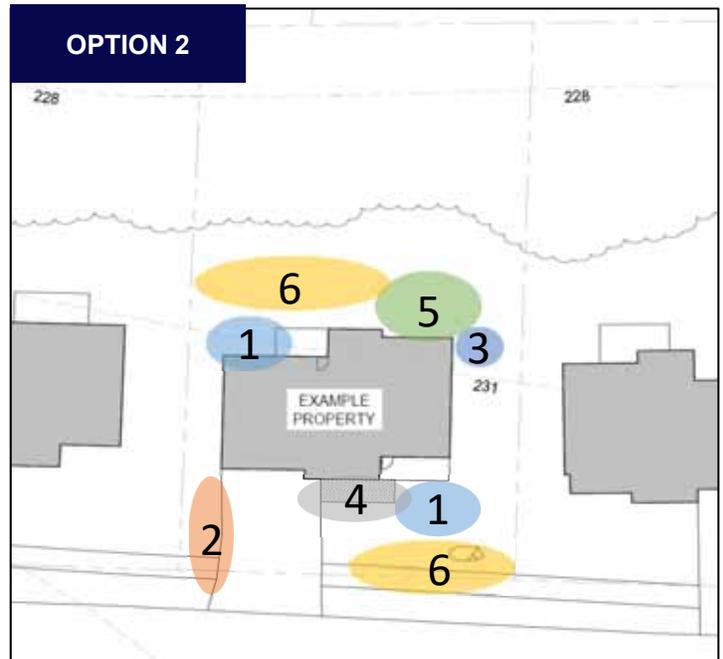
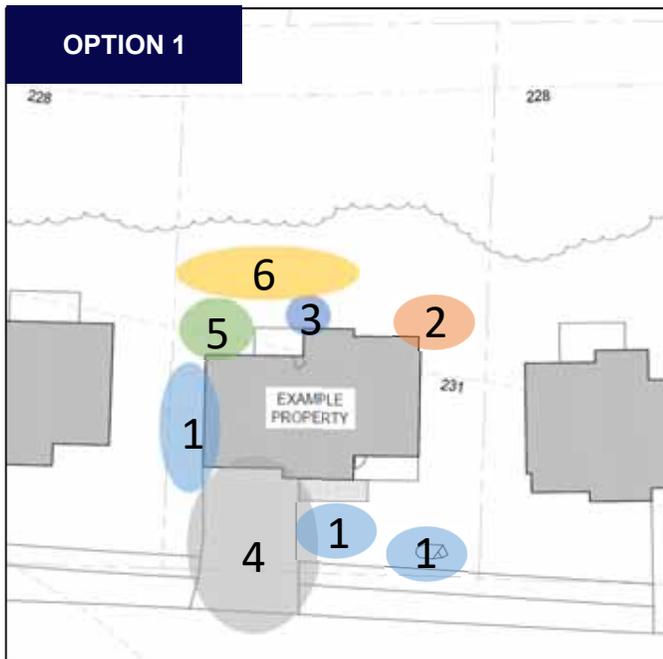


Consider how you can use dense plantings to block wind or create a visual screen to increase privacy on your property.

STEP 6

Create Your Design

Once you have made general land use designations, brainstorm alternative layouts. Consider what areas people travel through and how the space will be used. Try different combinations in relation to rooms of the house, surrounding areas, and potential views.



EXAMPLE COMPONENTS TO CONSIDER

1. Pollinator Plantings
2. Rain Garden
3. Rainwater Capture
4. Pervious Paving
5. Outdoor Patio
6. Lawn Alternatives and Reduction

Combine the best elements of your layouts to create your final design. Capitalize on how things work together and be mindful of plants that do not tolerate each other.



PRO TIP

Not all plants work for every space. [Research your plants](#) to make sure they meet the requirements of your space.



BEFORE

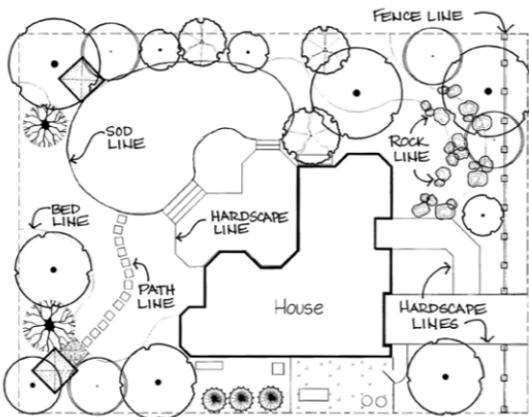


AFTER

STEP 6 Create Your Design

There are no hard and fast rules, but these guidelines, modified from the University of Florida's [Basic Principles of Landscape Design](#), will help you create an aesthetically pleasing and sustainable landscape:

LINES IN LANDSCAPE DESIGN.

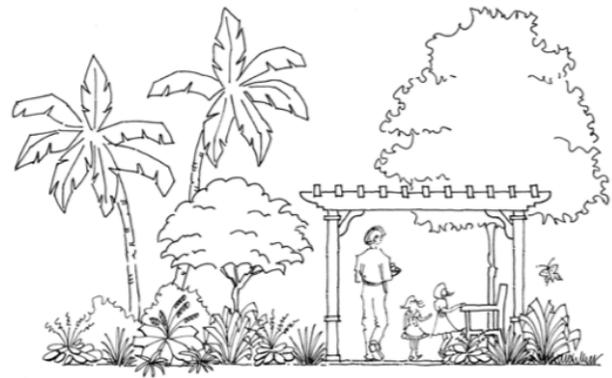


LINE: Line in the landscape is created by the edge of two materials. Lines control the movement of the eye and are therefore a powerful tool for a designer. Use different types of line to create a visually varied landscape:

- Straight: Structural, forceful, and lead the eye to a focal point
- Curved: Informal, natural, relaxed, move the eye more slowly, and add mystery by creating hidden views
- Vertical: Move the eye up, making the space feel larger
- Horizontal: Move the eye along the ground plane
- Mimicry: Complement the lines of your house and other structures with plantings

SIMPLICITY: The best designs are rarely the most complex. Keep it simple.

PROPORTION IN LANDSCAPE DESIGN.



PROPORTION: When plants, structures, and people are in proportion, it creates a balanced and harmonious composition. Also consider proportion of open space—people tend to feel more secure in smaller open areas, such as patios and terraces.

REPETITION: Use repetition with care—too much can create monotony, while too little can create confusion. Consider alternation or patterns to make simple repetition more interesting. Groups of three or other odd numbers are often most visually appealing.

UNITY: Unity refers to the perceived sense that everything is connected and works together to create the whole. Employing a design theme or style will help you achieve unity in your yard. Consider how to make your colors, plants, and layout create a unified style.

Other properties to consider include, color, texture, and form. The University of Florida's [Basic Principles of Landscape Design](#) has more information on design principals.

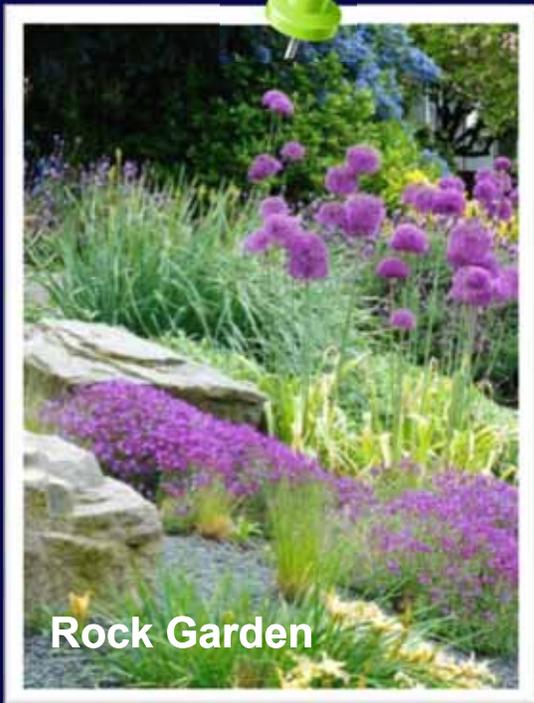
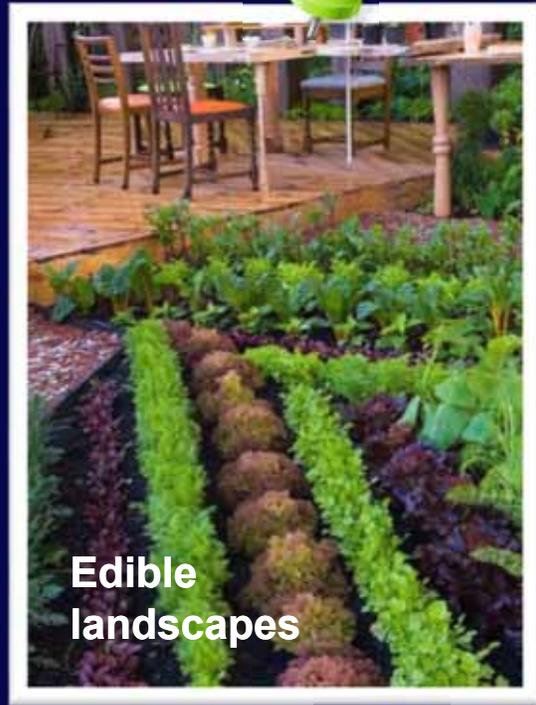
PRO TIP

Designers see space as “outdoor rooms.” Think of creative ways to make your space feel more comfortable.



Get to Know Your Style

THIS IS THE FUN PART!



PHASE 2: Construction and Installation



Metrics of Success

- Provides a focal point or view
- Includes low maintenance materials
- Includes lawns and plants that do not require irrigation
- Creates “outdoor rooms” for larger yards (see page 13)
- Provides space that feels like an extension of the house
- Offers smooth transitions from one space to the next
- Provides year-round interest
- Maximizes native plantings
- Provides wildlife habitat
- Incorporates on-site stormwater management
- Mitigates erosion

Sustainable Landscape Construction

by Kim Sorvig and J. William Thompson

This book provides a thorough reference on how to build landscapes that work with—rather than against—nature. The book highlights 10 core principals:

- 1. Keep healthy sites healthy**
- 2. Heal injured sites**
- 3. Favor living, flexible materials**
- 4. Respect the waters of life**
- 5. Pave less**
- 6. Consider origin and fate of materials**
- 7. Know the costs of energy over time**
- 8. Celebrate light; respect darkness**
- 9. Quietly defend silence**
- 10. Maintain to sustain**



STEP 1

Understand Local Bylaws and Regulations

It's crucial for the Town and the State to protect the natural environment. Each community has their own restrictions, buffer zones, and protected habitats. For more information about local environmental bylaws and sustainable landscaping, visit the [Garden Continuum](#).

REVIEW STATE AND LOCAL BYLAWS AND REGULATIONS

Check out the [Town's Bylaws](#) to determine whether your plans are permitted and identify restrictions. Specific bylaws to review include: [MA Wetlands Protection Act](#), [Concord Wetlands Bylaw](#), [Tree Preservation Bylaw](#), [Landscape Buffer and Corner Clearance](#) (page 35), [Water Use Restriction Bylaw](#)

FIND OUT WHERE UNDERGROUND UTILITIES ARE LOCATED

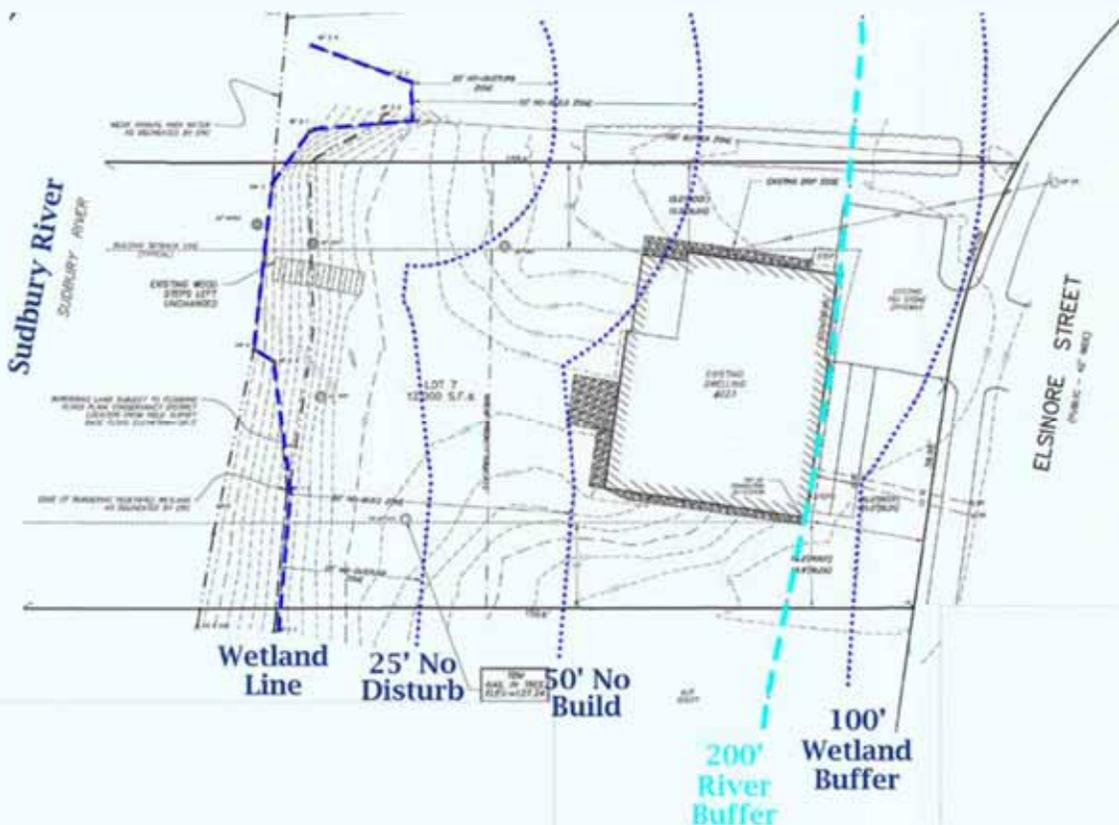
Call DIGSAFE (811) before you dig. It's the law!



ARE YOU IN A WETLAND AREA?

If your project falls within 100 feet of wetland resource areas, including Certified Vernal Pools, or 200 feet of perennial streams, review from the Natural Resources Commission may be required. Please contact the [Natural Resources Division](#) before you begin!

An example of wetland buffers shown on a site plan.



CHECK TO SEE IF YOUR PROPERTY OVERLAPS WITH ANY OF THESE ZONES:

- Wetland buffer
- Riverfront buffer
- Vernal pool buffer
- Perennial stream buffer
- No build zones
- [FEMA flood zones](#)

If so, contact the Concord Natural Resources Division for guidance on permit requirements.

STEP 1

Understand Local Bylaws and Regulations

IRRIGATION SYSTEM BYLAW

[Concord's Water Use Restriction Bylaw](#) requires the registration of all automatic irrigation systems permanently connected to the public water supply. All systems are required to have the capability to automatically limit operation, a rain sensor and a backflow prevention device. See Phase 3 of this handbook for additional information on Concord's water supply and water-saving tips.

	Homeowner		Irrigation Provider	Plumber
Call Water & Sewer to get a connection fee invoice		or		
Complete and Submit Backflow Device DDS				
Wait for Backflow Device Approval – Mailed to Property Owner				
Apply for Plumbing Permit				
Complete Irrigation Registration Form		or		
Sign and Submit Irrigation Registration Form				
Sign up for Public Information Pathways		and/or		
Call DigSafe				
Install Irrigation System				



R

RESOURCES:

- [Find a certified irrigation professional in your area](#)
- [Seasonal water demand management plan](#)

STEP 2

Deal with Invasive Species

Invasive species should be removed before you start planting any new plants. Plant natives as soon as invasives are removed to help prevent regrowth of invasive species. Invasives will need to be monitored and removed for a few seasons as there will still be seed and roots in the soil that can resprout. Even if it takes a full growing season to completely remove invasive species, it will ultimately save you time because ongoing invasive species management will be a very time-consuming task. Invasive species are covered in more detail in Phase 3.

MANAGING INVASIVE SPECIES ORGANICALLY

Herbicides should only be used as a last resort as they can run off during a storm, contaminating our waterways. Here are some alternative methods:

- Full Root Removal – Fully removing the plant with all of its roots is critical to prevent the plant from sprouting again.
- Consistent Cutting – Trimming, mowing, and weed-whacking puts a strain on plants and can deter them from growing back in full force. This needs to be done at least 8 to 10 times during the growing season to be effective at weakening invasive plants.
- [Solarization](#) – Let the sun do the work to overheat the ground and prevent noxious weeds from germinating
- Seed Bank Control – carefully removing all parts of the invasive plant, including seeds, stops the spreading of the plant.



Resource: [Massachusetts Invasive Plant Advisory Group](#) provides a list of the 35 invasive species in Massachusetts with additional links and resources. Information is also available on the [Town's website](#).

MANAGING INVASIVE SPECIES WITH TARGETED HERBICIDE

Some invasive species, such as Oriental Bittersweet and Knotweed, or large infestations of other invasives can be especially difficult to eliminate organically. If this is the case, limit the amount of herbicide needed by cutting the stems and dabbing what is left with herbicide. Avoid spraying plants to limit damage to surrounding plants and wildlife. If you need assistance, you can hire a licensed herbicide applicator.

If you are removing invasives within wetland resource areas or buffer zones, contact the Concord Natural Resources Division before you begin.

STEP 3

Limit Erosion

BEFORE YOU START PLANTING

It is important to stabilize any slopes on the property. You should consider stabilizing slopes with erosion control barriers (described below) when:

- The slope is greater than 3:1
- When water is being directed down the slope
- When soil conditions are not favorable and can easily wash away

SUSTAINABLE EROSION CONTROL METHODS

- Secure coir logs across the slope with stakes and plant uphill of the logs
- Jute netting
- Natural mesh with photodegradable netting
- Seed free straw with an organic tackifier to prevent fly-aways
- Soil stabilizing plants
- Deep rooted plants provide the best long-term erosion control!



Removing invasive species on a steep slope.



Securing netting over the slope and planting native grasses.



The slope reinforced by native plantings.

STEP 4

Mitigate Existing Drainage Issues

Notice areas where water is naturally draining near your house. You will want to direct water away from your house to avoid flooding issues. When addressing drainage issues keep the following tips in mind:

SLOW: all draining water should be moving slowly; avoid gushing water even during a storm.

SPREAD: evenly distribute drainage across the property.

SINK: direct water to the best area for it to infiltrate.

DRAIN WHEN NECESSARY: even in a wetland, not all the water can infiltrate. You will need to identify places where the water can ultimately exit and drain.

Remember
S.S.S.D



Example of water naturally channeling on a site. Soil stabilization techniques were used and plantings were put in place.

STEP 5

Choose Plants That Fit Site Conditions

Understanding your property's [Native Plant Community](#) will help establish what plants will thrive. Take cues from what plants are already there. As you choose plants to fit into your design, consider the following questions:

ARE YOU HOPING FOR A MORE TRADITIONAL OR NATURAL DESIGN SPACING?



TRADITIONAL: You can see the ground, tends to feel more formal



NATURAL: Wild groundcover gives a more natural feel

SHOULD YOU USE CONSERVATION GRADE OR BALLED AND BURLAPPED TREES?



Conservation grade trees are typically smaller and bought in 1-3 gallon pots. While smaller, these generally establish faster and catch up to more full-grown tree in 3-4 years. They only require regular watering for the first year. [Native Plant Trust](#) in Framingham and [Parterre Ecological](#) can help you find conservation grade trees.



Balled and burlapped trees are larger upon purchase but need more care to establish (daily watering for 2 years). These trees that have been cared for by a nursery for a couple years and are also going to be more expensive.

WHAT IS YOUR WATERING CAPACITY?

Consider how you will be watering your new plants and how much time you have to water them. Only choose plants that require a lot of watering to get established if you have the capacity to do so.

STEP 6 Create a Planting Layout



PLANT LAYOUT

- Situating the plants on the site where they will eventually be planted is a great way to help determine the correct spacing that is needed before full installation.
- Start with the large, structural plants (trees and shrubs). Choose location based on relation to existing structures (i.e., how far do you want the full-grown tree from the house or walkway?).
- Once your trees and shrubs are planted, lay out smaller plants, such as perennials.
- Finally, plant the groundcover. Ferns or no-mow grasses are low-maintenance groundcover choices to consider.



Square Planting Pattern

Plants Needed:	140
Based on # Sq. Ft.:	35.0
Plants Centered On:	6"

Triangle Planting Pattern

Plants Needed:	162
Based on # Sq. Ft.:	35.0
Plants Centered On:	6"

This [plant calculator](#) can help you determine the number of plants needed for an area.

STEP 7

Install Your Plants

PLANT INSTALLATION (TREES, SHRUBS)

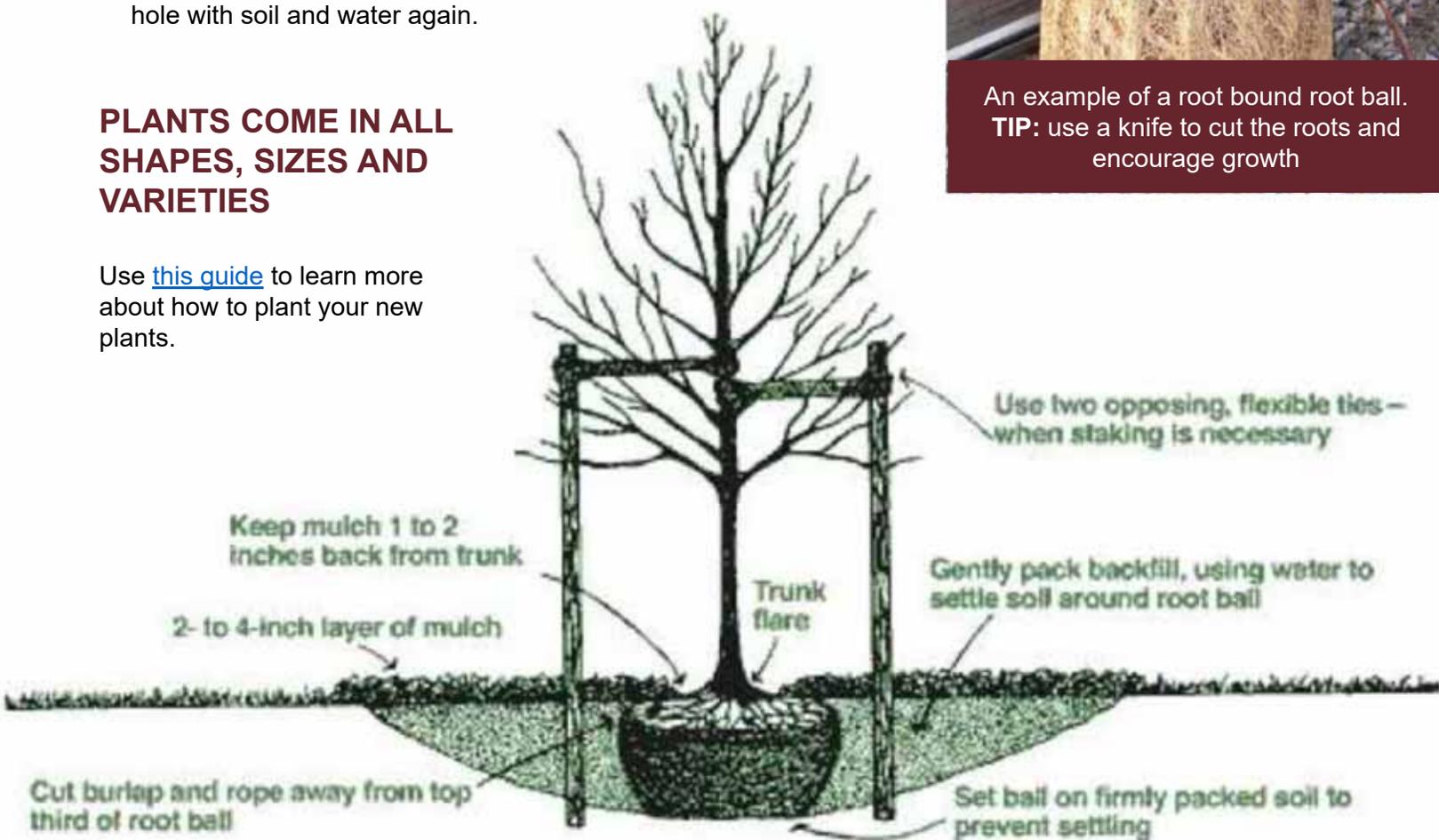
- Native plants planted in the right conditions require little to no amendments. Don't use compost – it is too nutrient-dense for native species.
- Find root flares on trees. The root flare is the area at the base of the tree where the trunk transitions to roots. Scrape off clay and excess soil to reveal the roots before planting.
- Tree holes should be twice the width of the root ball.
- Use water to eliminate air pockets. After placing the tree, put in about half the soil and water the hole. Then, fill the rest of the hole with soil and water again.

PLANTS COME IN ALL SHAPES, SIZES AND VARIETIES

Use [this guide](#) to learn more about how to plant your new plants.



An example of a root bound root ball.
TIP: use a knife to cut the roots and encourage growth



PRO TIP

After digging the hole, sprinkle in organic root starter to help promote healthy, strong roots



PRO TIP

Water all newly established plantings in the first year in order to help them establish new roots

STEP 7

Install Your Plants

PLANT INSTALLATION (NO MOW SEED)

- Plant in late spring or early fall
- Grade soil surface to reduce puddling or erosion
- Divide area into an even number of plots and divide seed accordingly to split up the work
- Toss the seed evenly by hand, making sure not to run out. Start with a light spread and add more until it's gone.
- Lightly rake into soil
- Increase seed to soil contact by rolling with a grass seed roller or packing down with the back side of a shovel

WHAT SEEDS SHOULD I BUY?

[Prairie Nursery](#), [Prairie Moon Nursery](#), and [Allen Seed's](#) websites all provide recommendations on what type of seed to buy.



PRO TIP

Applying too much seed can lead to over-competition and result in a dead spot.



STEP 7 Install Your Plants

LIVE STAKES

- Cuttings from dormant trees/shrubs can develop into new plants. The dormant season runs from late November to April.
- Use a cutting 2-3 feet in length and bury 2/3 below ground.
- The tree or shrub will mature in 3-5 years.



Learn more about live stake planting through the [Natural Resources Conservation Service](#).



PRO TIP

Put up a fence around new live stake plantings because deer love to chew them.

STEP 7

Install Your Plants: Meadows

If you have a sunny, open area in your yard, consider planting flowering plants and tall grasses and [converting the space to a meadow](#).

MEADOW INSTALLATION

- Seeding period: Late October to December and April to mid-June
- Eliminate existing vegetation and seed bank before planting meadow. This may take time but will save you time and maintenance in the long run.
- Carefully choose seed mix based on site conditions and desired outcome.
- Divide seed and area into groups to break up planting
- Rake seed lightly into soil
- Mow 3-5 times in first season to prevent weeds from setting seed
- Expect to see some color in year two, and for it to really take off in year three
- Never fertilize a native meadow!



STEP 8

Establish Your Landscape

ESTABLISHMENT

- After Installation, water once per day for the first two weeks (counting rain)
- Week 2-4: water 2-3 times per week unless there is a significant drought
- Water trees and shrubs during any dry periods for the first two years



WEEDING AND MANAGEMENT

- A light layer (2 inches) of leaf mulch (cut up dried leaves) will help decrease weeds. [Parterre Ecological](#) can deliver leaf mulch to Concord residents.
- Remove weeds by roots during the first two years.
- After two years, cut weeds at stem and let native species help manage weeds.
- Use rabbit repellent and deer fencing until the plants are established.



PROTIP

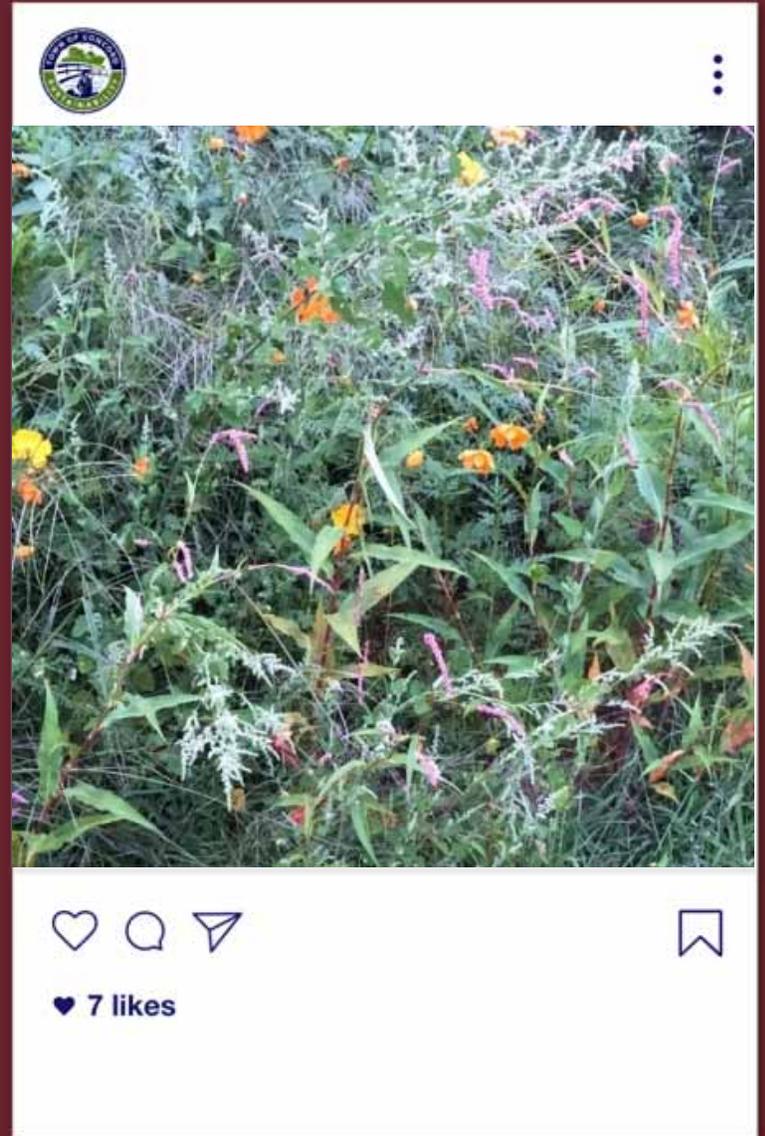
You can use [Irish Spring soap](#) to repel unwanted animals. There are also plenty of other [easy ways to prevent deer damage](#).

Key to Success...

PATIENCE



EXPECTATIONS FOR FIRST YEAR OF PLANTING...



...REALITY DURING FIRST YEAR OF GROWTH

PHASE 3: Maintenance



Landscapes are always changing. Therefore, it is important to keep up with the needs and demands of your yard. There are a number of variables that effect the survivability of plants, lawns, and even structures on a seasonal basis. For example, varying precipitation, changing temperatures, and extreme weather events will all change the needs of a landscape. Even a natural or wild-looking landscape requires careful maintenance. Phase 3 will help you care for your landscape in a way that conserves water, takes the changing climate into account, and promotes the health of native species.



A 3.5-acre wetland in Cambridge that is regularly maintained in order to mitigate flooding. Photo Credit: Miles Connors

Consider Community



As you contemplate your maintenance plan, make sure to consider the natural resources and habitats of your neighborhood and property. For example, if your property is adjacent to a red maple wetland, activities in upland areas immediately adjacent may adversely affect the functions and values of those wetlands, including clearing natural vegetation. Alternatively, if you live in an area that is plagued by invasive species, you will want to consider what native plants can effectively replace those.

HERE ARE SOME PLANTS YOU ARE LIKELY TO FIND IN THE NATURAL CONCORD LANDSCAPE



Red Maple,
Acer rubrum



Highbush Blueberry,
Vaccinium corymbosum



Winterberry,
Ilex verticillata



Sweet Pepperbush,
Clethra alnifolia



Swamp Azalea
Rhododendron viscosum



Blue Flag Iris
Iris versicolor



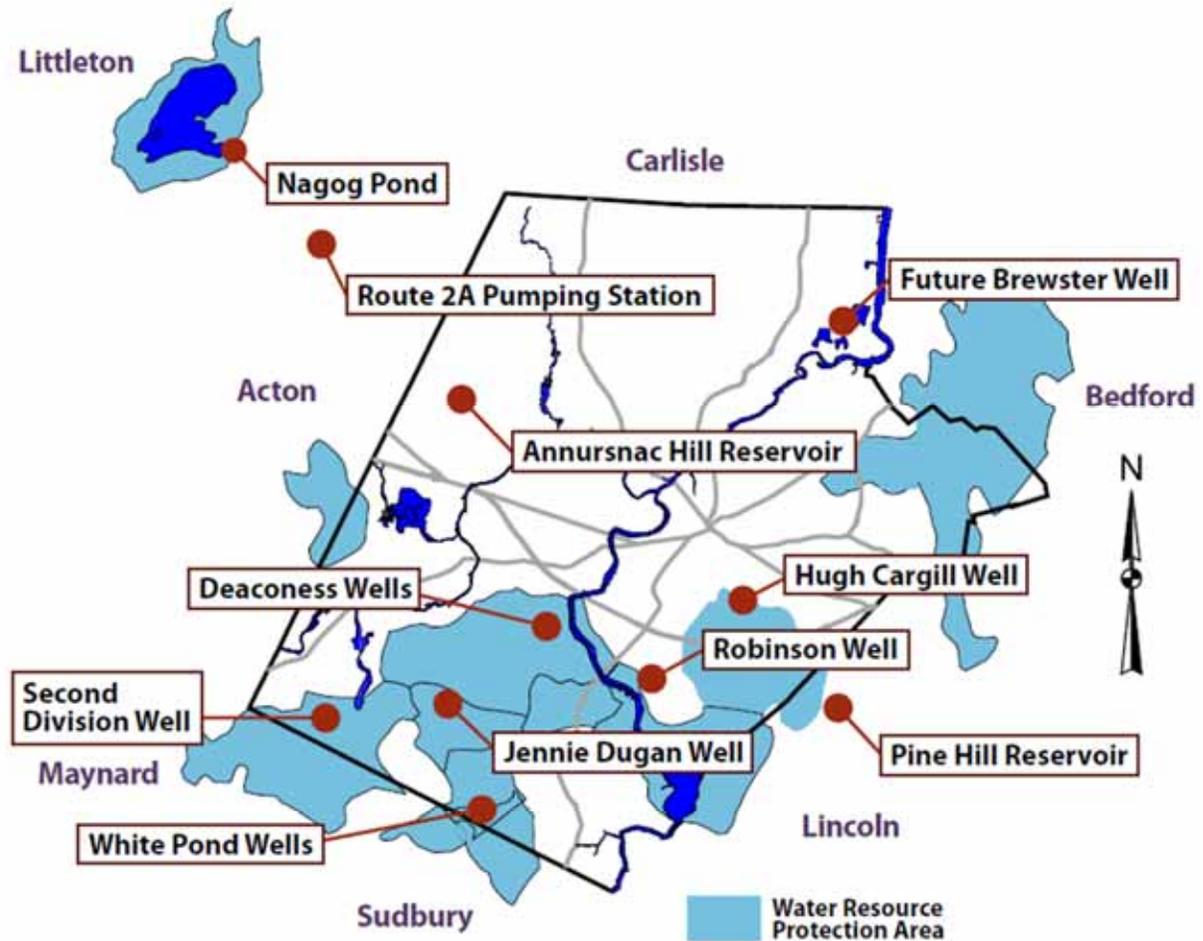
Spicebush,
Lindera benzoin



Ostrich Fern,
Matteuccia struthiopteris

Consider the Changing Climate

2019 was the hottest July on record, and the number of days over 90° F are projected to increase. We are also expected to get more rain, but less often – the rain that does fall will be in more intense precipitation. Concord’s water supply is growing more susceptible to drought, especially in the summer when a quarter of our daily water is used to water lawns (up to a million gallons during peak demand).



Concord has six groundwater wells located in Concord and one surface water reservoir located on the borders of Acton and Littleton. Groundwater wells are relatively shallow and especially susceptible to groundwater level drops caused by local droughts. The surface water reservoir offers greater resilience to droughts as water is captured during wetter periods of time and can be used during dryer periods.



DID YOU KNOW?

Customers with in-ground irrigation systems use, on average, 2.5 times more water than customers without.

Water Regime

THE BEST WATER REGIMES USE WATER INTELLIGENTLY AND EFFICIENTLY.

Here are six goals for a sustainable water regime:

1

Understand, protect, and restore any natural water system

2

Irrigate intelligently, deeply and sparingly

3

Reduce and treat stormwater runoff volume, flow rate and temperature of water

4

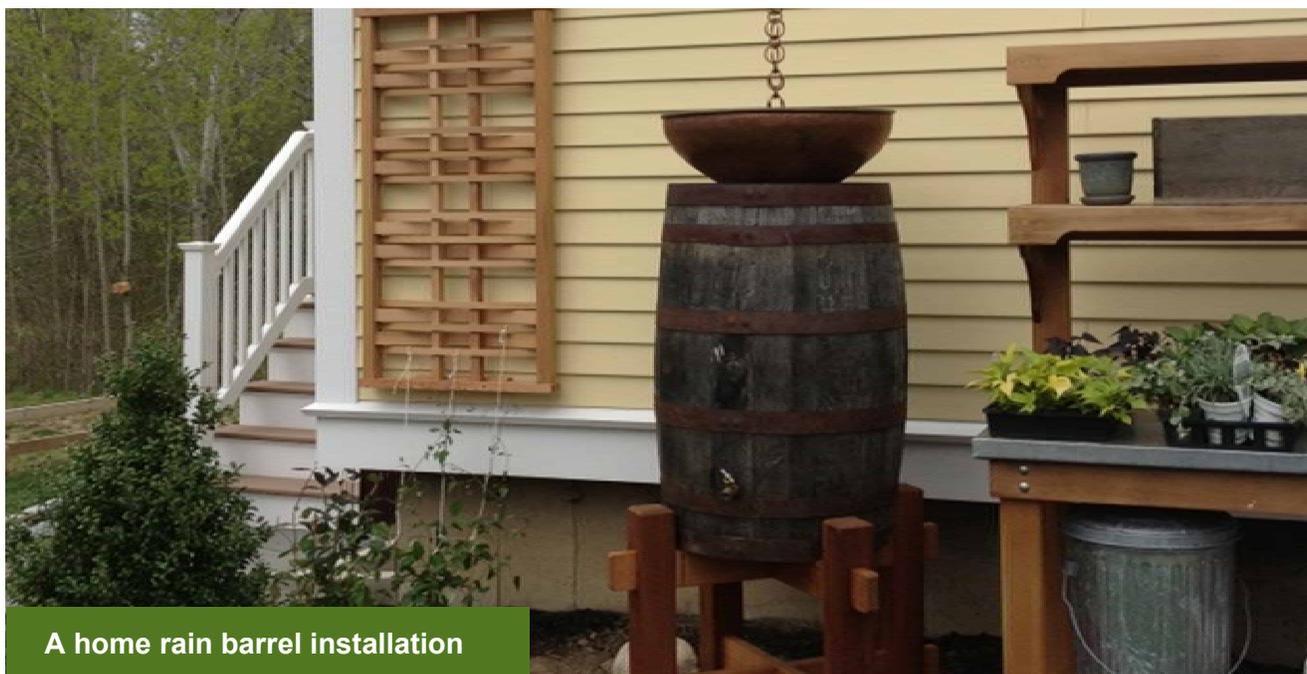
Provide increased wildlife habitat

5

Enhance the beauty of residential property

6

Collect and conserve water



A home rain barrel installation

See the following pages and [EPA's Water-Efficient Landscaping](#) for strategies on how to make these goals a reality.

Water Regime: Saving Water

Based on current trends and observations, Concord will not always be able to supply enough water to meet peak demand in the summer. To address this, the Town created a Seasonal Water Demand Management Plan which outlines best practices for various weather conditions for outdoor water use activities. This plan focuses on reducing lawn watering demand, our largest water hog.

		Seasonal Water Demand Management Plan		
		Seasonal Water Conservation Advisory	Lawn Watering Restriction	Lawn Watering Ban
		Best Management Practices	State of Water Supply Conservation Declaration by Public Works Commission Water Use Restriction Bylaw §4	
Outdoor Water Use Activities	Lawn & Turf Watering In-ground Irrigation Systems & Sprinklers	Recommended * 1 day or 1-inch per week www.concordma.gov/wateringday	Restricted ** 1 Day per Week Water Before 9AM or After 5PM www.concordma.gov/wateringday	Prohibited **
	Lawn & Turf Watering Hand-Held Watering & Drip Irrigation Systems	OK	Restricted ** Water Before 9AM or After 5PM <i>Handheld Watering only with an automatic shut off device</i>	Prohibited **
	Flower Beds, Shrubs, Trees & Veg. Gardens	OK	OK	
	Private Residential Swimming Pools	OK Filling or Topping Off	Restricted ** Topping Off Only	
	Washing Vehicle/Boat at home	OK Washing Vehicles at home with an automatic shutoff hose or bucket	Restricted ** Washing Vehicles at home with an automatic shutoff hose or bucket	
	Ornamental Fountains	OK	Restricted ** Recirculating Water Only	
	Pressure Washing	OK	Restricted ** <i>Pressure Washing - Spray nozzles should not use more than 3.5 gallons per minute Hose - The washing or cleaning of streets, driveways, sidewalks or other impervious areas is prohibited (Exception for health, sanitation and medical purposes)</i>	

* Unless otherwise advised by qualified lawn care specialist.

** Enforceable with fines (\$50 - 1st offense. \$100 - subsequent offenses)

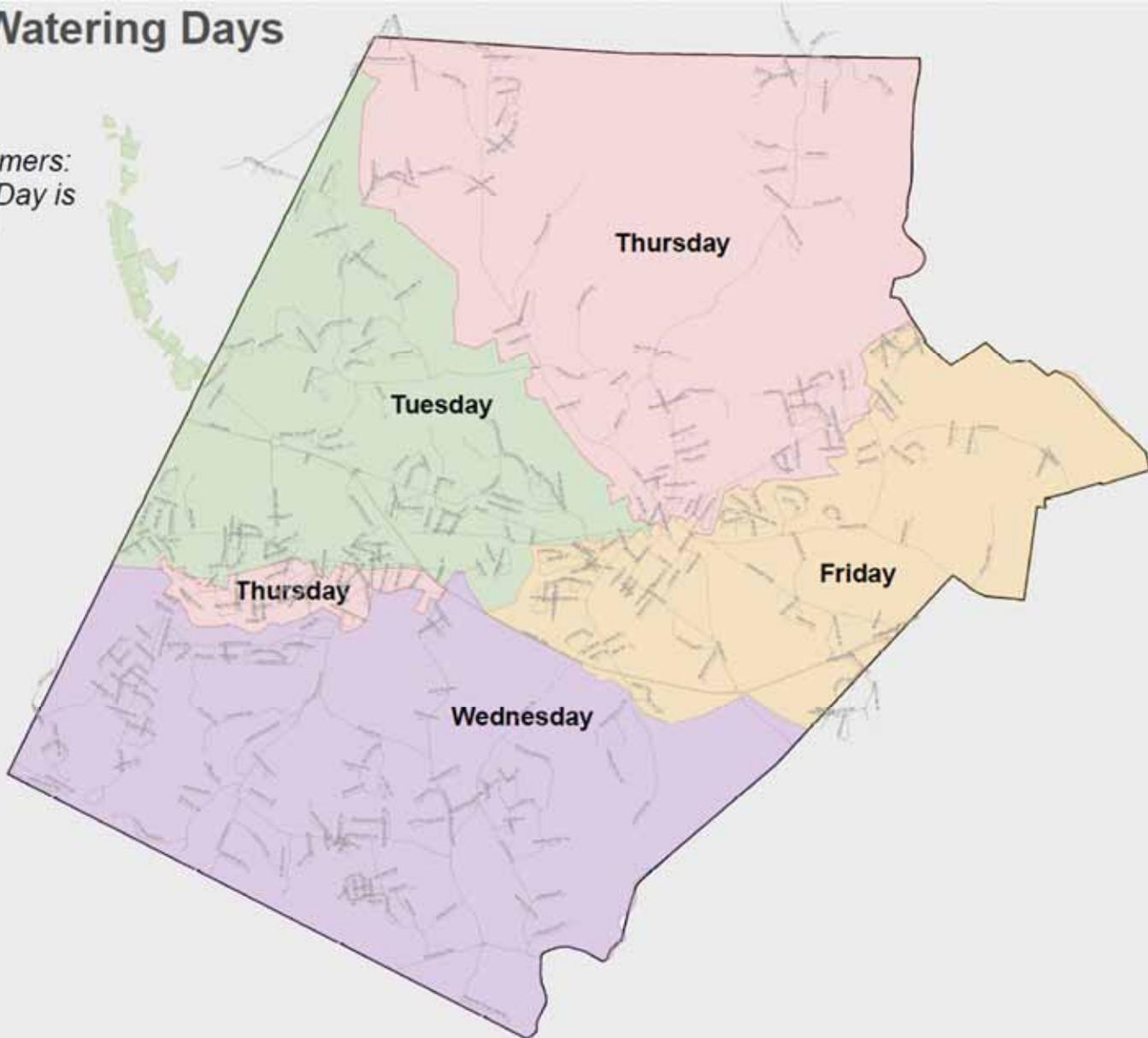
Water Regime: Saving Water

In an effort to decrease peak water demand, Concord has implemented watering days for those with irrigation systems when under water restrictions. See the map below to identify your water day. If you are unsure about what area you fall into, use this [interactive map](#) to find out.

Concord Watering Days 2018

All Acton customers:
Your Watering Day is
Tuesday

[Click Here for
Interactive Map](#)



www.concordma.gov/wateringday

Water Regime: Saving Water

HOW MUCH WATER DO I NEED?

The amount of water you need to care for your landscape, depends on your soil – and everyone's soil is different. For example, clay soil will hold water longer than sandy soil. A soil probe can help you determine what kind of soil you have.

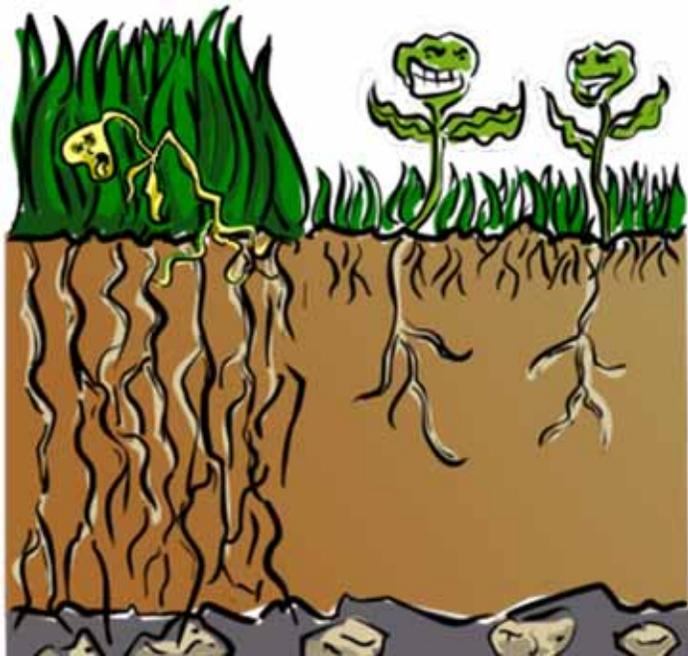


PRO-TIP

UMass Amherst provides a [soil and plant nutrient testing service](#) and can provide an analysis of your soil and recommendations on how to improve it.



While the amount of water you need can vary greatly based on your soil, the general recommendation is 1 inch of water per week. This comes out to 625 gallons per 1,000 square feet. You can monitor the amount you use by checking the meter on your irrigation system before and after using your system. If you do not have an irrigation system, there are other tools available! Rain gauges help you determine how much water your landscape is getting naturally from rain to avoid over watering. If less than one inch falls per week, consider using supplemental watering to keep new plants vigorous. Rain gauges are available for free from the [Concord Water and Sewer Division](#).



Water Regime: Irrigation Systems

When [installed correctly](#), drip irrigation is one of the most efficient ways to distribute water across your landscape. Interested in how drip irrigation works? Dig into the [engineering](#) behind it!



*App available with LNK WiFi Module, sold separately.

PRO-TIP

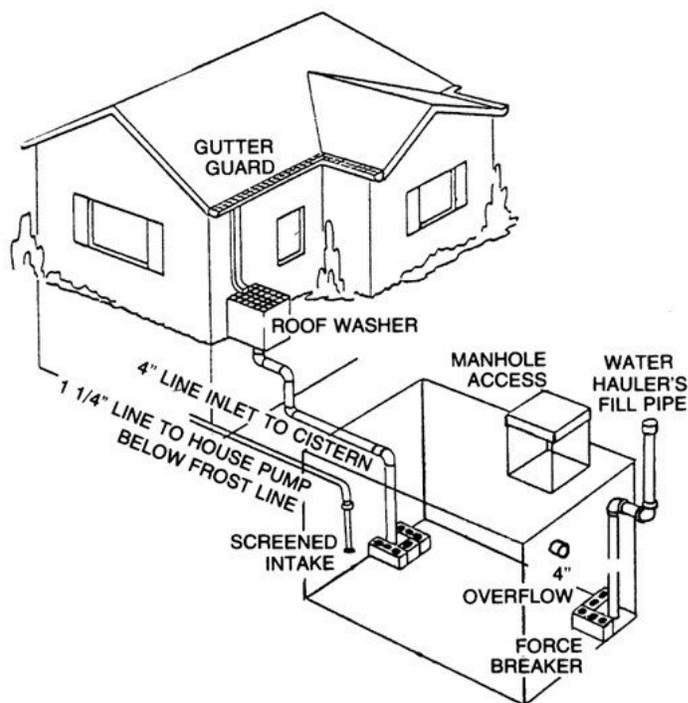
Wi-Fi irrigation systems can be a great way to monitor and control the amount of water you use. They automatically adjust based on the weather!

When watering water beds, micro-drip irrigation can be highly effective. These systems allow you to install mini emitters with various drip speeds, aimed directly at plant roots.



Water Regime: Rainwater Recapture

Reusing rainwater for your outdoor water needs is a great way to decrease your water consumption (and bills!). There are a number of ways to capture water and reuse it on your property.



Rainwater HOGs water storage tanks are narrow tanks that can be stored vertically against a wall or horizontally, tucked under a porch or other structure.

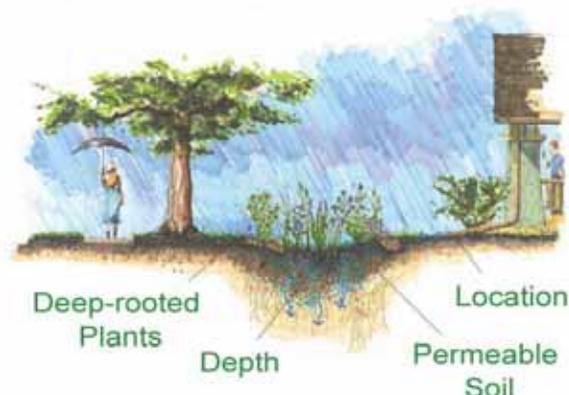
[Rainwater cisterns](#) utilize a system of gutters and downspouts that direct water from the roof to a storage tank, typically located underground. One can then use pumps to supply water back to the house for uses that don't require water that is of drinking quality.



A [rain barrel](#) is a simple system that collects and stores rainwater from your roof for reuse on your landscape.

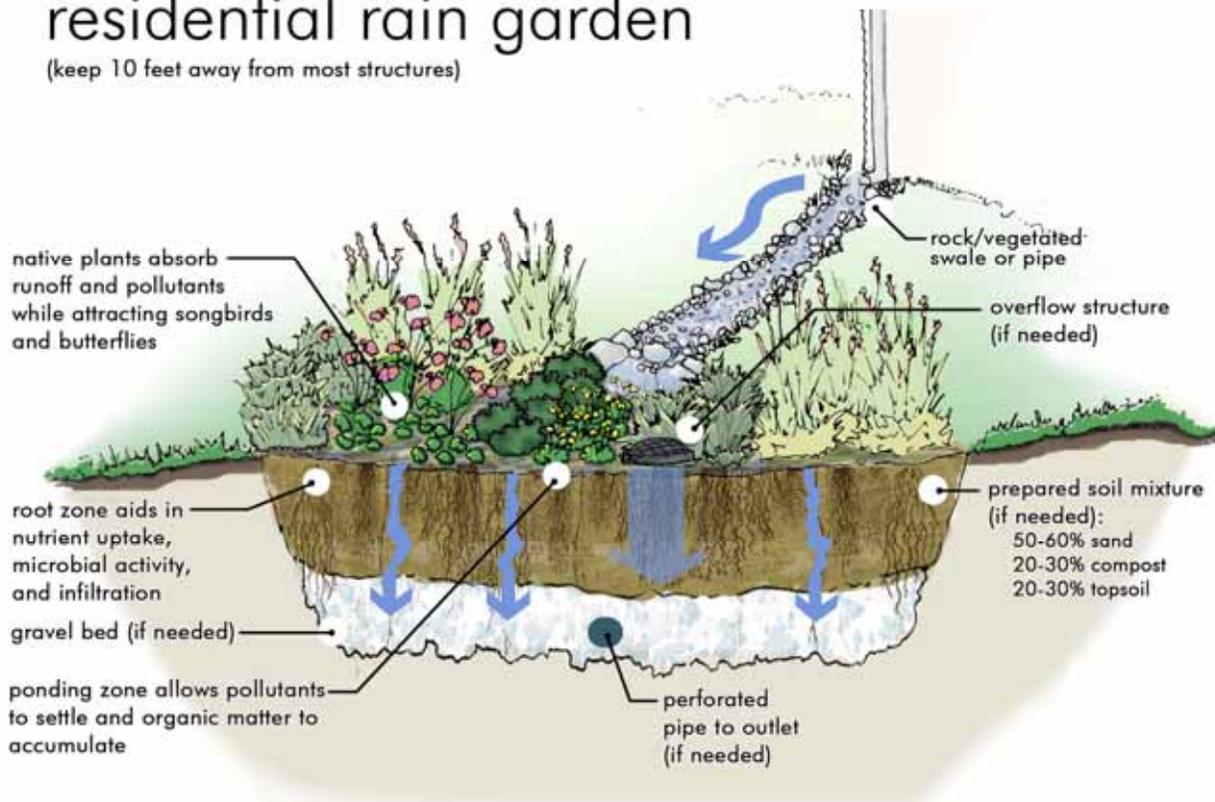
Water Regime: Rain Gardens

Rain gardens are depressions in the landscape designed to capture and infiltrate stormwater in permeable soils. They are designed to reduce the amount of stormwater runoff that carry pollutants into streams and rivers. The most effective rain gardens are designed with deep rooted native plants well adapted to the unique conditions they present. An added benefit of rain gardens is that they can create habitats that may not otherwise exist on your property.



residential rain garden

(keep 10 feet away from most structures)

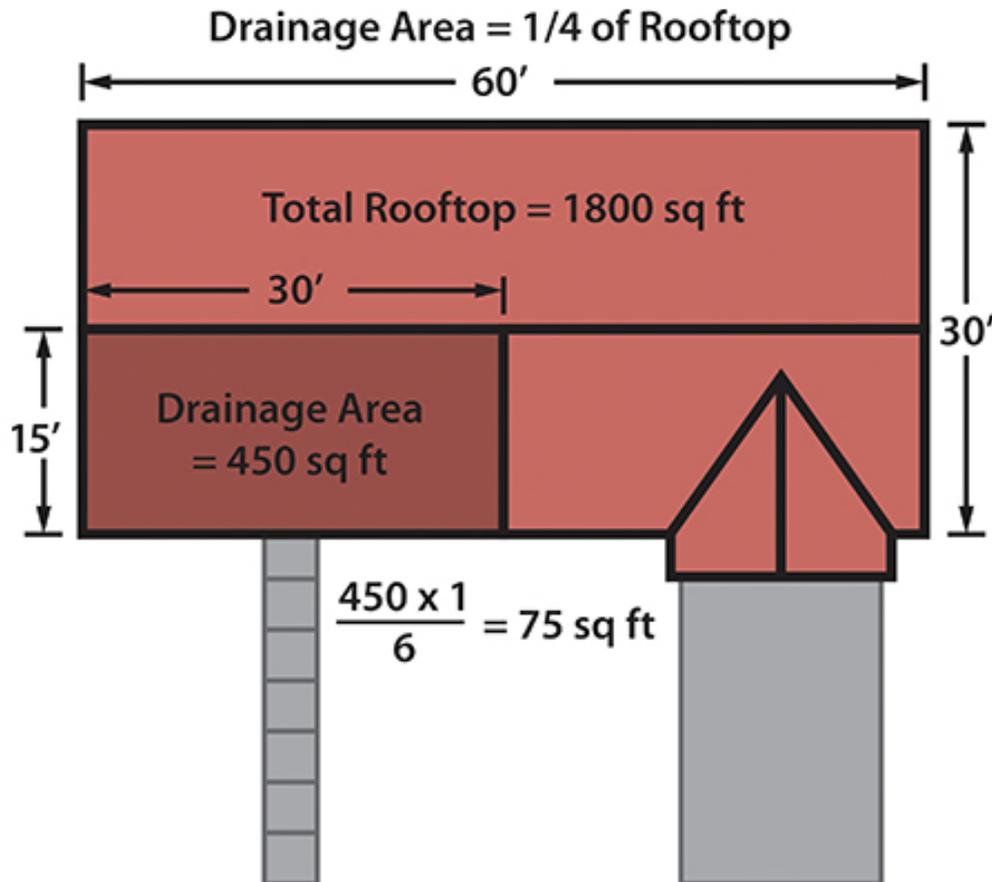


RAIN GARDEN BEST PRACTICES:

- Direct water from a down spout or other drainage system into a low-lying area at least 10 feet from buildings and other structures
- Ensure soil beneath is capable of infiltrating water
- Consider adding a gravel bed beneath the soil to help water infiltrate to the groundwater
- Consider adding a perforated pipe for additional drainage if you are concerned about water overflowing

Water Regime: Rain Gardens (continued)

Determining the size of your rain garden is easy! Follow the steps below to get a rough idea of how big your garden should be to accommodate water draining from your house and other areas of impervious surface.



- 1) Calculate the total impervious surface area draining to rain garden by multiplying width by length. This includes the rooftop, driveway, patio, walkways and compacted lawn areas.
- 2) Multiply the area by the amount of average rainfall (lets assume 1").
- 3) Divide by the depth of the rain garden (typically 6").

Certified Landscapes

While there is no water stretch code, there are a number of ways to formally certify your landscape as meeting certain sustainability criteria.



EPA WaterSense: has a number of [certification programs](#) for both professionals and homeowners.

LEED: While better known for its energy standards, LEED also includes criteria such as outside water reduction and inclusion of enough green open space



Innovation



Introduction of novel features and procedures

Indoor Environmental Quality



Use of natural light and efficient air conditioning

Materials and Resources



Responsible construction waste management and sustainable sourcing of materials

Location and Transportation



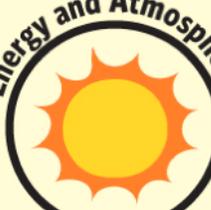
Land protection and access to public transportation and green vehicles

Sustainable Sites



Sufficient green open space and light pollution reduction

Energy and Atmosphere



Optimizing sustainable energy production and metering

Water Efficiency



Indoor and outdoor water reduction

Source: www.usgbc.org

Lawn Care

Open space for kids and pets to play is great, but over time lawns can become an issue if fertilizers and herbicides are used. Chemicals used on lawns turns into harmful runoff that pollutes our water bodies. Lawns are also contributing to [decreasing biodiversity](#). Alternative lawn care can reduce the negative environmental impacts of lawns.

NATURALLY REPLENISH SOIL NUTRIENTS:

The loss of available nutrients is why imported chemical fertilizers are often used. Instead:

- Make your own mulch out of lawn clippings and leaves. Simply, run over your leaves with your lawn mower (hopefully, hand-powered or electric!).
- Rake compost across your lawn. This is typically done in the Spring to help promote healthy soils all season long.
- These alternatives will naturally provide nutrients to your soil.



Compost on top of lawn

PRO-TIP

Leaves and lawn clippings can also be left in a compost pile and used as mulch for other plant and gardens.



BEST PRACTICE

Mt. Auburn Cemetery has a no-rake policy for leaves. Instead they chip and spread leaves on the lawn. When they started, the organic content of the soil was 2-3%. Now, ten years later, it's 8-10%.



PRO-TIP

Clover is not the enemy! Having naturally occurring species, like dandelions and white clover may have unexpected benefits, such as keeping rabbits away, fixing nitrogen, providing nectar and pollen for bees, and being evergreen during times of drought.

Controlling Invasive Species

Invasives tend to come in from people traveling abroad and coming home with seeds either intentionally or unintentionally. Once established, these plants will spread their seeds and will be eaten by local wildlife, spreading their seeds even further. Some invasive plants are problematic because they do not have any natural competitors and therefore spread rapidly and beat out native species, leading to decreased biodiversity. Invasive species are an ongoing concern, so they need to be addressed during Phase 2 and 3 of your landscaping project.



The SuAsCo Watershed's [Cooperative Invasive Species Management Area](#) – a partnership of organizations that intend to manage and control invasive species defined by the geography of the Sudbury, Assabet, and Concord (SuAsCo) watershed – have a comprehensive list of local invasive species. The following pages outline best practices to manage some of the most common invasive species in the Concord area.

Animals aren't the only ones spreading invasive species. Read how humans play a role as well, and how [proactive weeding](#) can help slow the spreading.



DID YOU KNOW?

According to the National Wildlife Federation, 42% of native plants and animals are at risk because of invasive species.

Controlling Invasive Species: Best Management Practices

While invasive species spread quickly and can seem overwhelming to control, there are a number of management best practices that do not require harmful herbicides.

MANUAL

Hand pulling is an effective method for small plants and those that are loose rooted.

Weed wrenches--available on loan through the Natural Resource Division—allow you to clamp onto the base of a plant and lever it out of the ground.

MECHANICAL

Only necessary for a very large-scale infestation, mechanical equipment can be used to remove the plants. Large amounts of exposed surfaces are vulnerable to rapid spreading of invasive species, so be sure to replant the area right away.

GRAZING

[Grazers](#), such as goats can be used for invasive species on the fringe between a meadow and wetland. However, goats can be picky and may not eat all invasive species.

BIOLOGICAL

Biological controls, such as releasing beetles, can also be used to control invasive species. This method does not completely eradicate the species but does allow for a balance with other species.



Fifth graders at a garlic mustard “pulling party”



Weed wrench



Controlling Invasive Species: Specific Tactics

Not all plants can be treated by grazing or by biological means. Discover what invasive plants might be in your yard and how you can take action.

ASIATIC BITTERSWEET

This very strong woody vine – most recognizable by its bright orange berries – strangles trees and, if left unchecked, will eventually pull them down. This plant has very distinctive orange roots, which need to be removed in their entirety to eliminate the plant. Birds eat the berries, which not only spreads the seeds, but may also have detrimental effects on the health of the birds as there is research indicating that the berries are very low in nutritional value. See the Natural Resource Conservation Service's management sheet for [removal tips](#).



GLOSSY BUCKTHORN

Recognized by glossy leaves and dark bark with light spots, Glossy Buckthorn can grow to by 15 to 18 feet tall. If it hasn't been cut, it is very easy to take out. However, mowing over this plant strengthens the root mass, making it more difficult to remove. See the Ecological Landscape Alliance for [removal tips](#).



Controlling Invasive Species: Specific Tactics

BLACK SWALLOW-WORT

Black swallow wort is a European milkweed relative, recognized by its small purple flowers. It is primarily a problem because it competes with our native milkweed, which monarch butterflies are dependent on. The roots are prone to snapping at the base of the plant, so removal requires digging up the roots. See the SuAsCo fact sheet for [removal tips](#).



GARLIC MUSTARD

In many places, garlic mustard has completely taken over herbaceous understories. It is a biannual plant, going from a rounded leaf in the first year to a more pointed leaf in the second year. Luckily, it is very easy to pull out. Visit East Multnomah Soil & Water Conservation District's site for [removal tips](#).



INVASIVE HONEYSUCKLES

This plant has a pale shredded bark and has very fragrant flowers in the spring. Loose rooted, invasive honeysuckles are easy to remove. However, if left unchecked, the plants can form a nearly impenetrable mass. The invasive honeysuckles are shrubs, whereas the native is a vine. See the Ecological Landscape Alliance's fact sheet for [removal tips](#).



Controlling Invasive Species: Native Alternatives

The following native species serve as great replacements for common invasive species.

THE INVASIVE BURNING BUSH CAN BE REPLACED WITH NATIVE Highbush Blueberry or Cranberry.



THERE ARE MANY PLANTS YOU CAN CHOOSE BETWEEN TO REPLACE WOODY INVASIVES.



Serviceberry
(shadbush)



Chokeberry



Red twig dogwood



Winterberry



Spicebush
swallowtail



Spicebush



Bayberry



Sweet pepperbush

Controlling Invasive Species: Native Alternatives



Below are effective substitutions for herbaceous invasives. These are all very beneficial for pollinators.



Milkweeds



Clustered mountainmint



Bergamot (bee balm)



Anise hyssop



New England aster



Cardinal flower



Foxglove beardtongue

[Native Plants Trust](#) is another resource for planting native species.

Other Maintenance Methods

Fall is a great time to work on your landscape as that is when seeds naturally fall and there is little weed competition.

HERE ARE SOME IDEAS FOR SUSTAINABLY IMPROVING YOUR LANDSCAPE IN THE FALL:

- [Leave native wildflower seed heads](#) to expand the amount of wildflowers next season
- Collect native seeds for future use. Other seed resources:
 - [New England Wetland Plants](#)
 - [Ernst](#)
 - Seed Library at the Fowler Library
- [Divide and transplant plants](#) to spread across your property to create larger plant beds for next season
- Prune overgrown plants
- Sheet mulch to reduce weeds
- Plant additional native trees, shrubs and perennials (conservation grade is recommended)



Planting for the Future

With a changing climate, planting zones are going to shift. As you plan your landscape, consider the impacts of changing weather, changing landscapes, and the increasing frequency and intensity of drought. Notice how your plants are changing and influencing other plants.



See the following page for a report on the benefits and constraints of trees common in the Greater Boston area.

As the impacts of climate change become more severe, it will be increasingly important to plant trees that are resilient to those impacts. The following chart shows benefits and constraints of select trees common in the Greater Boston area. This chart was pulled from Lawrence's [Green Streets Health Impact Assessment Report](#).

Table 5.0 – Selected Street Tree Species Benefits and Constraints

Botanical	Common Name	Tolerate Urban Conditions	Salt Spray	Soil Salt from Deicing	Drought	Native to MA	Storm water mgmt.*	Energy Efficiency*	Overall Air Quality*	Notes
<i>Celtis occidentalis</i>	Hackberry	Yes	Moderate	Good	Tolerant	Yes	Best	Best	Best	Requires wide tree lawn, produces galls
<i>Cladrastis kentuckea</i>	Yellowwood	Yes	Moderate	Moderate	Moderate	Yes	Better	Good	Better	
<i>Ginkgo biloba</i>	Ginkgo (fruitless)	Yes	Moderate	Moderate	Tolerant	No	Good	Good	Good	Get fruitless variety
<i>Gleditsia 'Skyline'</i>	Honeylocust	Yes	Moderate	Good	Tolerant	No	Better	Better	Best	Thornless, nearly fruitless variety. High energy efficiency benefits as tree gets larger.
<i>Gymnocladus dioicus</i>	Kentucky Coffeetree	Yes	Tolerant	Tolerant	Tolerant	Yes	Best	Best	Best	
<i>Liquidambar styraciflua</i>	Sweetgum	Yes	Tolerant	Tolerant	Tolerant	Yes	Good	Good	Good	Prickly balls can be messy. Rotundifolia is fruitless – less mess.
<i>Nyssa sylvatica</i>	Tupelo	Yes	Moderate	Moderate	Moderate	Yes	Better	Good	Best	Wide tree lawns
<i>Oxydendrum arboretum</i>	Sourwood	Yes	Moderate	Unknown	Moderate	Yes	Good	Good	Good	Small. Lower Ozone reduction. Good under power lines
<i>Prunus sargentii</i>	Sargent Cherry	Yes	Moderate	Tolerant	Intolerant	No	Good	Good	Good	Small. Lower Ozone reduction. Good under power lines.
<i>Prunus subhirtella 'autumnalis'</i>	Higan Cherry	Yes	Tolerant	Tolerant	Tolerant	No	Good	Good	Good	Small. Lower Ozone reduction. Prone to suckering.
<i>Styphnolobium japonicum</i>	Pagoda Tree	No	Moderate	Tolerant	Tolerant	No	Better	Good	Better	
<i>Syringa reticulata</i>	Japanese Tree Lilac	Yes	Tolerant	Tolerant	Intolerant	No	Good	Good	Good	Small. Lower ozone reduction. Good under power lines.
<i>Tilia cordata 'Greenspire'</i>	Littleleaf Linden	Yes	Intolerant	Moderate	Tolerant	No	Good	Good	Good	Not ideal close to road.
<i>Zelkova serrata</i>	Japanese Zelkova	Yes	Moderate	Tolerant	Tolerant	No	Best	Best	Best	
<i>Zelkova serrata 'City Sprite'</i>	Japanese Zelkova 'City Sprite'	Yes	Tolerant	Tolerant	Tolerant	No	Best	Best	Best	Small. Good under power lines.

Green: recommended street trees; any red highlights are caveats for their use. Note that "small" indicates a smaller tree that could be useful for streets with overhead wires or narrow neighborhood streets. They would be much less successful on broader streets where a large tree is needed to create a sense of volume under the tree canopy.

Red: caveats for the use of the recommended street trees.

Grey: reasons for the tree not being recommended for street tree planting. No evergreens are recommended.

* - Rankings based on data compiled based on Table 4.0 and is from <http://treebenefits.com>

Additional Resources



Native Plant Resources:

- Grownativemass.org
- [Audubon Native Plants Database](http://AudubonNativePlantsDatabase)
- [Bigelow Nursery](http://BigelowNursery)
- [New England Wetland Plants](http://NewEnglandWetlandPlants)
- PlantNative.org

Pollinator Resources:

- [MA Master Gardener Association](http://MAMasterGardenerAssociation)
- Massaudubon.org
- [Natural Resource Conservation Service Pollinator-Friendly Plants](http://NaturalResourceConservationServicePollinatorFriendlyPlants)
- NortheastPollinator.com
- [Xerces Society: Pollinator Conservation Resources](http://XercesSocietyPollinatorConservationResources)

Maintenance Resources:

- [Massachusetts Healthy Soil Action Plan](#)
- [Native Plant Trust](#)
- [Native Plant Trust: Go Botany](#)
- [Town of Concord Sustainability page](#)
- [Town of Concord: Water Conservation](#)
- [Town of Concord: Sustainable Landscaping](#)
- [Town of Concord: Invasive Species](#)
- [Natural Resources Division](#)



Sustainable Landscape Books:

- [“Design with Nature”](#) Ian L. McHarg
- [“Planting: A New Perspective”](#) Noel Kingsbury & Piet Oudolf
- [“The American Meadow Garden: Creating a Natural Alternative to the Traditional Lawn”](#) John Greenlee & Saxon Holt
- [“Designing the Sustainable Site: Integrated Design Strategies for Small Scale Sites and Residential Landscapes”](#) Heather L Venhaus & Herbert Dreiseitl
- [Basic Principals of Landscape Design](#) Gail Hanson
- Grow Native Massachusetts’ [list of best books](#)