# CREATING RESILIENT LANDSCAPES

# Blue Thumb

# PLANTING FOR CLEAN WATER

# Anticipation of the second sec

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# Metro Blooms

A non-profit 501(c)(3) organization that partners with communities to create resilient landscapes and foster clean watersheds, embracing the values of equity and inclusion to solve environmental challenges. Metro Blooms coordinates the Blue Thumb program.

# Blue Thumb - Planting for Clean Water

A public/private partnership helping property owners reduce runoff and improve water quality. Blue Thumb partners include cities, watershed districts, landscape designers, contractors and native plant nurseries.

# CREATING RESILIENT LANDSCAPES

Resilience generally refers to the ability to bounce back or recover easily from a setback. But what does it mean when we talk about a Resilient Yard? Pavement and kentucky bluegrass are fine things when and where necessary, but they don't supply food or habitat to struggling pollinators and they send polluted water after a storm directly to lakes and rivers. They make our landscape and ecosystem increasingly brittle at the same time that weather patterns in Minnesota are changing. We are seeing more frequent and powerful rain storms throughout the year, resulting in frequent flooding.

With such environmental stresses, we should expect each aspect of our landscape to serve multiple functions. Boulevards can absorb water and provide forage for pollinators; patios can be gathering spaces and also infiltrate water; and turf and traditional gardens can incorporate plant species selected for their resistance to drought, or ability to provide shade and habitat.

This booklet explores a variety of plantings and projects that can help your yard, and your community, flourish. Although they may seem small in comparison to global issues, interventions at the residential scale make a difference. Any runoff you retain on your property reduces the volume that flows to our over-stressed and aging storm sewer infrastructure. Our urban gardens can start to rebuild the critical habitat corridors displaced by land use changes and shifting habitat zones. Your actions are an educational tool for friends and family. Improving the ecological resilience in your yard ensures that the small piece of land you (and so many others) call home flourishes in the face of change. This resilience translates to your community, region and global environment.



Behavior changes can be among the easiest changes to start creating a resilient yard.

- Keep grass clippings and leaves out of the street. They can be used as mulch or ingredients for compost.
- Adopt a drain—keep your local stormsewer drain clear of debris. For more information, check out adopt-a-drain.org.
- Clean up pet waste. It can cause algal blooms and disease when washed into lakes and rivers.
- Stop using fertilizer, pesticides and herbicides. You may be applying more chemicals than are needed and the excess gets washed into our storm drains and waterways, impacting wildlife and water quality. Native plants don't require chemicals and provide a greater benefit to our native pollinators and other wildlife.
- Raise mower blade to at least 3". Turf grass generally grows roots as deep as it grows high. Taller leaves and deeper roots make it healthier, and help to infiltrate more runoff.
- Water intentionally. Adjust sprinkler systems to account for recent rain. Water before 10am to allow for water to soak in before the heat of the day.
- Avoid salt usage when possible. 1 teaspoon of salt permanently pollutes 5 gallons of fresh water. Instead, shovel walks & drives promptly and use grit if needed for traction.
- Compost your organic waste.
- Make a plan for a resilient yard!



Water early in morning, before evaporation can occur.



Dig up weeds before they get too big!

# SITE ASSESSMENT

#### Function

- If you are not actively using your lawn, consider removing some to add native perennials, shrubs and trees.
- If there is an opportunity to capture stormwater runoff that is currently getting away, consider installing a raingarden. Raingardens can be incorporated into larger planting beds.
- Think about the paths of travel throughout the yard. Consider the seating, play and pet areas, as well as your existing landscape beds and trees. Would reorganizing any of these functional areas create any new opportunities for stormwater capture or native plantings?
- Call 811 to have underground utilities located, and be aware of private utilities connecting to garages.

#### Hydrology - How water flows across your property

- Draw arrows showing how rain flows across your yard. Notice the areas where water can absorb into the ground (pervious surfaces), and areas it quickly flows off (impervious surfaces). Walk around your yard when it is raining and look for where water is leaving your yard and flowing to a storm drain.
- What are the high and low points in the yard? Is there pooling/ flooding in your yard?
- Map the downspouts of the gutters on your roof and estimate the roof areas that are draining to each downspout (see picture on p. 23).
- Are there areas of erosion, where soil is being washed away, near a downspout?

#### Sun/Shade

• Consider the trajectory of the sun in relation to your yard. Is your house facing east or west, so the front and back yards receive equal amounts of sun throughout the day? Or does it face north or south and receive drastically different amounts of sunlight?

Site design tip: A nuisance, damaged, or misplaced tree can be a design opportunity. A new raingarden placement could be an impetus for the removal of an unwanted tree or large shrub.

• How do the trees and buildings on your property shade the yard? There are plenty of plant options for sun or shade, but you will need to choose accordingly.



#### LEGEND

- HP = High Point
- LP = Low Point
- DS = Downspout
  - = Water Flow
  - = Slope Break
- 📯 = New Tree
- = New Planting Bed

Site assessment drawn on an aerial image

# DRAWING PLANS FOR A SITE

#### Concept Plan

After assessing your yard, you might end up with a plan that looks like this. For example, it might show areas of pavement to be removed, areas for native plantings, as well as raingardens placed to infiltrate runoff from downspouts.



# DOWNSPOUT REDIRECTION

Roof surfaces contribute large volumes of stormwater runoff, and typically this water is collected and conveyed using gutters and downspouts. Redirecting the flow of water from downspouts is one of the simplest and easiest ways to solve a drainage problem and capture rainwater runoff in rain gardens. Here are just a few creative ways that water can be used as an interesting and dynamic feature in your landscape.



Rain Barrel



Catch Basin

Atrium grate







Overhead conveyance to rain chain



Downspout and sump pump to dry creek bed



Splash rock for slowing water



Planted swale

Dry creek beds and planted swales are examples of great design solutions to convey runoff to your raingarden!

# STORMWATER RUNOFF DIVERSION

On a typical urban property, the driveway is often the greatest contributor of runoff and pollutants to the local lake or river. This stormwater has little or no chance of infiltrating before flowing to the storm sewer system. Luckily, it is possible to divert runoff from your driveway or walking path into a raingarden via a channel drain. This is most afforable when you are replacing an old (or installing a new) driveway.



Channel drain



Driveway channel drain directing runoff to a raingarden



Gutter redirection



Gutter and sump pump redirection

#### A channel drain

can help you divert water to a raingarden and decrease stormwater runoff from your property. Other diversion opportunities include gutter redirection and sump pump and downspout extensions.

# PERMEABLE PAVEMENT

Conventional paving such as concrete, asphalt, and even compacted gravel is impervious to water, contributing large amounts of stormwater runoff to our lakes and rivers every time it rains. If you are planning any paving in your future landscaping projects, consider using permeable pavement for your driveway, patio, parking area, or sidewalks. Understanding the capacity of your soil to infiltrate water is important. These systems work best in well drained soils. Talk to a designer if considering permeable pavement around foundations and basements.





Permeable pavement infiltrates water into rock storage chambers and soils below



Permeable pavers



Permeable pavers with bedding course

Permeable paver surfaces look very similar to conventional paver surfaces, but construction of the subbase is much deeper and built to collect and temporarily store stormwater.

# NURTURING HEALTHY SOILS

Healthy soil plays a very important role in creating a resilient yard and ecosystem. Soil is the foundation upon which plants grow. Healthy soil anchors mature trees, seedlings, and everything in between. Healthy soil is alive! It has pores and channels throughout the soil structure, and is held together by the action of billions of thriving microbes. Healthy soils capture water more effectively during heavy rains, are more resilient during drought, recharge groundwater and support healthy plants. It is time to consider what is below the surface of the soil when creating resilient landscapes above it. This section describes some of the challenges to healthy soil and suggestions for improving soil health in your yard.

Soil compaction is a major challenge to healthy soil, especially in an urban and suburban environment. Soils get compacted from many common human activities. Heavy trucks used to build a house, tilling, even fertilizers and pesticides can destroy healthy soil. Healthy soil has air pockets that allow oxygen to reach microorganisms in the soil. When soil has been compacted or crushed by heavy machinery, those air pockets go away and so do the microorganisms that rely on them. Tilling does the same thing by pulverizing the structure of the soil. Chemicals such as synthetic fertilizers and pesticides have much the same effect by harming the microorganisms in the soil that help create its structure and overall health.



#### What can you do?

**Keep the soil covered!** Bare soil will get compacted and lose it's structure when rain beats down upon it. To restore soil health, start by keeping shredded hardwood mulch, dried leaves, grass clippings or groundcovers on the soil. Using mulch has additional benefits like reducing weeds, holding moisture in the soil and adding organic matter to the soil as the mulch breaks down. If you need to turn your soil, use a shovel instead of a tiller. And avoid spraying herbicides or pesticides on your soil.

**Increase Plant Diversity!** Plants have incredibly diverse root systems, and having a diversity of plants in your yard will mean that there is a diversity of root structures below ground. We're talking about trees, shrubs and perennials. Some native prairie plants have fibrous root systems that extend 15 feet into the ground! When 30% of their roots die back every winter, they add organic matter and leave channels for water to percolate through the soil. Talk about a great way to re-engineer your soil, while supporting pollinators at the same time!



Prairie roots

# Deep-rooted prairie natives



White Wild Indigo



Joe Pye Weed



Butterfly Milkweed



Prairie Blazingstar



Pale Purple Coneflower



Little Bluestem



Greenheaded Coneflower



Showy Goldenrod

# NURTURING HEALTHY SOILS

#### Living Soils

Did you know that there are billions of living organisms in healthy soil? Soil is not just made up of minerals and organic matter, it is the living organisms in soil that are essential to plant growth and healthy soil ecosystems. **One teaspoon of healthy soil contains 100 million to 1 billion individual microorganisms.** By minimizing tilling and chemicals, and keeping your soil covered you are providing a healthy environment for the microorganisms in your soil.

Living in the soil are plant roots, bacteria, fungi, protozoa, algae, mites, nematodes, worms, ants, maggots, insects and grubs, and larger animals. The millions of species and billions of organisms in soil represent the greatest concentration of biomass anywhere on the planet. These organisms create the soil food web.



Soil microorganisms

# There are many ways that the soil food web is an integral part of landscape processes:

- Soil organisms decompose organic matter such as manure, decaying plants, and pesticides, preventing them from entering water and becoming pollutants.
- They sequester nitrogen and other nutrients that might otherwise enter groundwater, and they fix nitrogen from the atmosphere, making it available to plants.
- Soil organisms help plants get nutrients from the soil and help defend against pests.
- Mycorrhizal fungi serve as root extensions that take minerals from soil and trade them with plants for sugars.
- Many soil organisms enhance soil structure by increasing open space in the soil and encouraging smaller particles to bind together, thereby increasing infiltration of runoff.



Soil macroorganisms

#### Myccorhizae

Soil mycorrhizae are fungal communities that are especially important for healthy plants and soil. They are the underground parent organisms that produce mushrooms, and form a network of filaments that are associated with plant roots. These networks transfer water and nutrients to the roots that the plant roots would not otherwise be able to access. In turn, the plant roots provide sugars to the mycorrhizal network. Soil mycorrhizae clump particles of soil together, helping soil to resist erosion, retain moisture and reduce compaction.

Research has shown that plants inoculated with mycorrhizae grow faster and larger than those without inoculation, but their effectiveness is often unproven in the landscape. It is recommended to incorporate wood-based mulch as a natural inoculant and a microbial food source instead.

#### The Rusty Patched Bumblebee

also calls the soil "home." In the spring, the queen bee builds a nest in the ground, either by digging one of its own in loose soil or by claiming an abandoned rodent's burrow. Throughout the spring and early summer she'll raise a group of worker bees who then help raise a new batch of queens and drones. In the fall, the new queens and drones leave the nest to mate, and the queens bury themselves under a few inches of undisturbed soil to overwinter and start their own colonies next spring.



Examples of soil myccorhizae

# NURTURING HEALTHY SOILS

#### Organic matter and soil amendments

Organic matter is an essential component of healthy soil. By building soil organic matter and allowing for the creation of soil aggregates and good soil structure, you can create a healthy soil.

#### Benefits of Soil Organic Matter:

- Provides food and energy for soil and animals
- Increases water infiltration and retention
- Holds nutrients which are then available for plants
- Helps sand, silt and clay form aggregates
- Improves soil structure, which increases pore space and decreases compaction

Organic matter derived from plants or animals, such as manure, leaf or yard waste, compost or compost tea (water in which compost has been steeped), are great options as they break down easily into the nutrients that are readily available to plants and soil organisms. When using these materials you are not supporting the production of synthetic chemical fertilizers, which can often leave residues of salts in the soil, can more easily leach excess nutrients causing water pollution, and can kill beneficial microorganisms.

High quality natural soil amendments can vary greatly but here's what to look for to provide the most benefit, while minimizing nutrient leaching:

- Organic matter should be at least 25% of the compost by weight.
- Manure, yard waste and composted food waste (in that order) have been found to be beneficial.
- A lower Carbon-to-Nitrogen ratio (C:N) is helpful for plant establishment and a C:N ratio of 10:1 or 20:1 is ideal for larger, established plants.

**Good compost** should smell earthy. Bagged compost can go bad due to a lack of oxygen. Try to smell it before buying; an offensive odor means it has spoiled.



Mulching leaves back into a lawn



Compost is broken down organic material



Spraying compost tea on a lawn



Double-shredded hardwood mulch



Spread shredded leaves on perennial beds



Wild geranium and dead nettle ground cover

#### Mulch

As we mentioned earlier, keeping the soil covered is a first step to improving soil health. Let's take a closer look at how you can do this!

#### **Double-shredded Wood Mulch**

- Available at garden centers, in bulk and in bags.
- Binds together and is great for weed suppression and holding moisture in the soil.
- Apply it 2-3" deep under existing trees (but not against their trunk!), shrubs, perennials and in any landscaped areas.
- Breaks down over time (adding organic matter to soil), may need to be replenished every few years.
- Use wood mulch until your plants get bigger and fill in, then you may only need to replenish it in small areas between the plants to cover the soil.

#### Leaves and grass clippings

- Leaves and grass clippings provide great, free mulch.
- In the fall, use a bagging mower to chop up leaves that fall just on your lawn, then add them to your landscaped areas.
- It is important to not chop up ALL your leaves.
   Many native insects, including fireflies and some butterflies, spend their winters rolled up in leaves.
- In the summer, apply your lawn clippings to your perennials beds for added nitrogen and cover.

#### Living Mulch & Groundcovers

These are low-growing plants that cover the soil below larger perennials, shrubs and trees. Examples include: Dutch white clover, wild ginger, penn sedge, wild strawberry, violets, creeping phlox, and wild geranium.

**Not recommended for ground cover:** Dyed mulch, shredded tire & rubber mulch, plastic landscape fabric, and rock.

# THE VALUE OF TREES IN THE LANDSCAPE

# Trees and shrubs play a very important role in the landscape

- Many trees and shrubs flower early (often in March-May) providing critical early season food for pollinators.
- Trees absorb huge amounts of stormwater runoff.
- Shade from trees combat the urban heat island, cooling the ground by up to 40 F.
- Planting a diversity of trees and shrubs creates a resilient landscape.
- Root systems host billions of microbes that break down pollutants and supply nutrients to plants.



American basswood planted as a street tree

• Documented benefits of trees in the landscape include improving public health, sequestration of carbon dioxide from the atmosphere, and increased property values.

#### When selecting a tree for your yard, consider a few factors to make sure you choose the right tree. Things to consider:

- How much space is there for the tree to grow to maturity? If there are overhead power lines or lots of existing trees, consider an understory tree.
- Don't plant the tree too close to your house. Think about your roof overhang. A Metro Bloom's rule of thumb: 10 feet from any structure, or the height that the structure/basement goes into the ground.
- If you have space for a large, overstory tree, go for it! Planting on the west side of your house can provide late day shade, but allow for sunlight from the south in winter.
- Locate underground utilities: call Gopher One at 811. Plant new trees 10' away from existing underground utility lines such as water and sanitary sewer lines.





Serviceberry



Northern Pin Oak

#### Online Tree Resources

- UMN Extension's Trees and Shrubs
  - Climate Ready Woodlands

- Minnesota Tree Care Advocate
- Arbor Day Foundation

#### TREES (large to small)

Common Name	Latin Name	Height	Width	Soil	Light
Bur Oak	Quercus macrocarpa	70-80′	70-80'	Dry/Medium	Sun
American Basswood/Linden	Tilia americana	50'-80'	30'-50'	Medium	Sun
River Birch	Betula nigra	50-75′	35-50′	Medium/Wet	Sun/Part
Kentucky Coffee Tree	Gymnocladus dioica	50-70′	30-50'	Sun	
Swamp White Oak	Quercus bicolor	50-60'	50-60'	Medium/Wet	Sun
Honey locust	Gleditsia triacanthos	60-80'	60-80'	Medium	Sun
Hackberry	Celtis occidentalis	40'-60'	40'-60'	Medium/Wet	Sun/Part
Ironwood/Hop Hornbeam	Ostrya virginiana	20'-40'	15'-30'	Medium	Part/Shade
Blue Beech/Hornbeam	Carpinus caroliniana	20'-35'	20'-35'	Medium	Part/Shade
Eastern Redbud	Cercis canadensis	20'-30'	25'-30'	Medium	Sun/Part
Pagoda Dogwood	Cornus alternifolia	15'-25'	20'-25'	Medium	Part/Shade
American Plum	Prunus americana	15'-25'	15'-25'	Dry/Medium	Sun/Part
Eastern White Cedar/Arborvitae	Thuja occidentalis	10'-40'	10'-20'	Medium	Sun
Eastern Red Cedar	Juniperus virginiana	10'-30'	6'-15'	Dry/Medium	Sun/Part
Serviceberry	Amalenchier arborea	15'-25'	15'-25'	Medium/Wet	Sun/Part

#### SHRUBS (large to small)

Common Name	Latin Name	Height	Width	Soil	Light
Red Buckeye	Aesculus pavia	12'-15'	12'-15'	Medium	Sun/Part
Eastern Wahoo	Euonymus atropurpureus	12'-20'	15'-25'	Medium/Wet	Sun/Part
Witch Hazel	Hamamelis virginiana	10'-20'	10'-20'	Medium	Sun/Part
Pussy Willow	Salix discolor	6'-15'	4'-12'	Medium/Wet	Sun/Part
Winterberry	llex verticillata	5'-12'	5'-12'	Medium/Wet	Sun/Part
Elderberry	Sambucus canadensis	5'-12'	5'-10'	Medium/Wet	Sun/Part
Buttonbush	Cephalanthus occidentalis	4'-12'	4'-8'	Medium/Wet	Sun/Part
Red-osier Dogwood	Cornus sericea	6'-9'	7'-10'	Medium/Wet	Sun/Part
Ninebark	Physocarpus opulifolius	5'-8'	4'-6'	Dry/Medium	Sun/Part
Black Chokeberry	Aronia melanocarpa	3'-8'	2'-6'	Medium	Part/Shade
Meadow Rose	Rosa blanda	3'-5'	1'-2'	Dry/Medium	Sun/Part
Dwarf Bush Honeysuckle	Diervilla lonicera	2'-3'	2'-4'	Medium	Sun/Shade
New Jersey Tea	Ceanothus americanus	1'-3'	2'	Dry	Sun/Part

Rusty Patched Bumblebee Preferred Plant

#### How to plant a tree or a shrub

- Dig a wide, shallow hole the same depth as the container or root ball of the tree or shrub you plan to plant, and 2-3 times as wide as the container. The hole should be as wide at the bottom as it is at the top. Roughen sides of the hole.
- If you are planning to add compost, add it to the hole and mix it in thoroughly to existing soil.
- Fill the hole with water and allow it to soak into the ground prior to planting.
- Remove the tree or shrub from the container. If the roots are circling the root ball, use a hand saw to cut off the circling roots. This will not hurt the tree! It is much better to cut the circling roots than to leave them where they will eventually strangle and kill the tree.
- Plant the tree or shrub so that the root flare, the spot where the trunk flares out to the roots, is 1" above the soil surface. Ensure the tree is straight.
- Backfill the soil into the hole a little at a time, gently packing the soil around the base of the root ball to stabilize it as you go.
- Mulch around the base of the tree with 2"-3" of double-shredded hardwood mulch. Do not place mulch up to the trunk. Place a ring of mulch around the tree at least 2" from the trunk. Do not grow lawn up to the base of the tree as mowing and weed-trimming can damage the trunk.
- Water thoroughly after planting. Water slowly and for longer rather than all at once. Provide extra water for the first two growing seasons.

#### Tree planting detail



Make sure that mulch is not piled up against the tree. The root crown should be just above the surrounding grade, and mulch should not be touching its bark. Trees with root crowns planted below ground or with mulch piled up against them can suffer from root girdling or rot.

# TURF ALTERNATIVES

Add a diversity of species to your lawn areas with turf alternatives. This approach is useful in areas where you want to maintain the "look" of lawn but don't use the lawn areas much. This is because many of the plants used in turf alternatives cannot tolerate heavy foot traffic as well as Kentucky Bluegrass, the most common traditional turf species.

Unlike traditional turfgrass, the options below are drought tolerant once established and do not require fertilizer application to maintain a healthy appearance, saving resources and helping your lawn flourish in a changing climate. However, keep in mind that starting a new lawn from seed can be challenging and require diligent watering and care, so we recommend overseeding a diversity of species, such as fescue and self heal, into your existing lawn.

Turf Alternatives offer less support for pollinators compared to a small garden or tree planting, so consider them as a supplemental feature of your sustainable outdoor space. Where you can, prioritize removing areas of lawn that you don't typically use and replace them with diverse, perennial native pocket plantings. If you would like to replace turf with a short native planting, consider perennial ground covers.

#### **Fescue Lawn**

Similar to typical lawn but made up of species needing less inputs

- Can be used in frequently used areas
- Generally planted by seed
- Species for the northern climate include fine and tall fescues

#### **Bee and Pollinator-Friendly Lawn**

Introduce low-growing plants to provide food for pollinators.

- Not a traditional, "picture-perfect" lawn
- Best for areas that receive low to moderate use
- Best for sun or part-sun sites
- Generally planted by seed
- Common seed mixes include fine fescue, clover, self heal, creeping thyme

#### **Perennial Ground Cover**

Remove turf & replace with low-growing native plants

- Best for areas that don't receive foot traffic
- Requires hands-on maintenance for 2-3 growing seasons
- Typically established with plant plugs
- Suitable for sun or shade
- Species to consider for perennial ground covers include woodland and wild strawberry, Pennsylvania sedge, ivory sedge, prairie smoke, pussy toes, common violet, path rush, and Virginia waterleaf







Pollinator friendly lawns contain a mixture of turfgrass and low-growing flowers. These plantings are designed to maintain the recreation and aesthetics traditionally associated with a lawn, while providing high quality forage for pollinators. Pollinator lawns can be installed via overseeding, where flower seed is spread evenly across an already established lawn, or as a lawn renovation, where pre-existing turf is removed and new grass and flower seed are spread at the same time across the soil.



Common name	Latin name	Seeding rate
Fine fescue*	Festuca spp.	4 lbs/1000 sq ft
Dutch white clover	Trifolium repens	3.2 oz/1000sq ft
Creeping thyme	Thymus serpyllum	1.0 oz/1000sq ft
Self-heal	Prunella vulgaris	3.6 oz/1000 sq ft

Seeding rates for bee lawn species

**Pollinator lawn fun fact:** Over 60 species of bees have been observed on pollinator lawns in Minneapolis alone!

Bee Lawn Establishment							
Overseeding	Lawn Renovation						
<ol> <li>MOW your lawn as short as possible. A low mow will improve seed to soil contact upon seeding.</li> <li>RAKE away lawn clippings to expose the soil.</li> <li>SPREAD the pollinator lawn seed mix evenly throughout the lawn area.</li> <li>WATER for 5 minutes in the morning and 5 minutes in the evening every day for 2 weeks, then cut back to the morning only for 2 weeks.</li> </ol>	<ol> <li>REMOVE your existing turfgrass. Use a sodcutter for a small area, or contact a local landscape professional for a larger area.</li> <li>SPREAD the pollinator lawn seed mix evenly throughout the lawn area.</li> <li>WATER for 5 minutes in the morning and 5 minutes in the evening every day for 2 weeks, then cut back to the morning only for 2 weeks. Continue</li> </ol>						
Continue to provide supplemental water 2-3 x per week as needed depending on temperature and soil moisture. *NOTE* ONLY overseed into lawns containing either Kentucky bluegrass (KYBG) or fine fescue (FF).	to provide supplemental water 2-3 x per week as needed depending on temperature and soil moisture. *NOTE* Lawn renovation should be considered if lawn is overrun by weeds, or if turf present is not KYBG or FF.						



# **BOULEVARD GARDENS**

#### Urban boulevards tend to rise over

time as as leaves and plant material break down and additional soil is washed in from neighboring properties. This tends to block water from flowing into the boulevard and results in thirsty grass and trees. This can also cause dangerous ice problems in the winter. Boulevard gardens can alleviate these common problems, provide pollinator habitat and serve to beautify your neighborhood.

The key is to lower the soil below the level of the sidewalk to encourage water to flow into the boulevard and infiltrate into the ground. This new condition allows plants in the boulevard to utilize more rainwater, and will keep walkways dry.

If you decide to plant your boulevard with flowering plants, make sure that the level of mulch is below the level of the sidewalk. This ensures that the mulch will be held in place and not end up all over the sidewalk or even worse, in the storm drain!

Many cities have height restrictions for boulevard plantings. Most require that they are under 36", and under 24" if you are on a corner. Check local ordinances so that you can choose plants that will be in compliance.



Typical Urban Boulevard



Lowered Turf Boulevard



Boulevard bioswale



#### **Boulevard Plant Palettes**

# RAINGARDENS

A raingarden is a bowl-shaped garden with a flat bottom that is designed to collect and infiltrate stormwater runoff from impervious surfaces such as roads, driveways, roofs, and sidewalks. Minnesota's lakes and rivers are increasingly polluted and one of the biggest sources of water pollution is from stormwater runoff.



Stormwater runoff affects wildlife and our drinking water supply. Water that flows over developed landscapes picks up road salt, sediment, oils, heavy metals, pet waste, fertilizers, and organic wastes. Raingardens capture runoff before it flows into the storm sewer system and help to clean water the way nature originally intended.

Raingardens are typically 6 - 9" in depth and drain completely within a 24 - 48 hour period. Most raingardens are designed with plants that are welladapted to the unique conditions of our region.



Ripley Gardens, Minneapolis 2019

For more information: Bluethumb.org/raingardens

# RAINGARDEN PLANNING

#### Infiltration Test

#### How much water can your soils infiltrate?

- Dig a coffee can-sized hole in your chosen location.
- Fill your hole with water and let all of that water soak into the ground.
- Fill the hole with water again; mark the full water level with a stick or pencil (as shown in the photo) to keep track of how long it takes all of the water to infiltrate.
- Measure the distance from the stick to the top of the water after one hour. Use the equation below to calculate the depth of your raingarden.
- Even though your soils may have the capacity to infiltrate more than 12" of stormwater, residential raingardens are typically 4 9" deep.

#### Dial 811 Before You Dig!



Filling test hole with water

1 hour measurement (inches) x 24 hours = Amount of water your soil can infiltrate For example: 1/4" per hour x 24 hours = 6" deep raingarden

THIS CALCULATES MAXIMUM DEPTH OF YOUR RAIN GARDEN

#### Siting Your Raingarden

#### Where can your raingarden be built?

- Look for a spot that is a minimum of 10' from any basement foundation.
- Avoid trees. Stay out of the dripline—roots generally extend at least as far as the leaves above them.
- Avoid utility lines and septic tanks.
- Direct downspouts, sump pump outlets, and/or driveway water runoff into raingarden.



Raingarden basin sited the proper distance from a house

# RAINGARDEN DESIGN

#### Sizing Your Raingarden

 A = Area of your property draining to the raingarden, measured in square feet... (length x width)

Area of roof draining to raingarden

 D = Depth of raingarden in inches (from your percolation test)

Downspout extension – Raingarden –



Raingarden capturing specific part of roof

#### A / D = Garden Size

(This equation is for a 1-inch / 24-hr rain event)

#### Here is an example:

- Michelle's Driveway = 450 square feet
- Michelle's infiltration test indicated that she could get 6" of water to soak into the ground within 24 hours:

# 450 sq ft of driveway / 6" depth =75 square feet of rain garden



#### Raingardens on a Slope

- If your yard is sloped, a small berm or retaining wall may be needed on the downhill side in order to hold water in the garden.
- Use stakes and a string to level the top of the garden and help you decide how high to make the berm or wall.
- Practice cut and fill; use soil dug from the basin to build the berm.



Drawing of raingarden basin on a slope



Raingarden at Ralph Rapson Hall - University of MN Twin Cities Campus



Raingarden capturing driveway runoff



Raingarden capturing roof runoff

# RAINGARDEN INSTALLATION



#### 1. Materials

Double-shredded hardwood mulch, organic compost, rock (for conveyance), plants



**2.** Lay out the Garden Using spray paint or a garden hose.



#### 3. Remove Sod

Healthy sod can be rolled up and reused, composted, or given away.



**5.** Amend with Compost If your raingarden is sandy, spread a layer 1" thick. A little bit goes a long way with natives! Mix thoroughly to 12".



#### 4. Dig the Basin

Start by excavating the basin area to desired depth, then simply turn over the side slope area.



**6. Grade Slopes and Flatten Bottom** Check that the overflow/outlet is lower than the top of the inlet; be careful not to step in your garden.



**7. Check Your Level** Use a 4' level to make sure that the basin is flat.



9. Then Plant

Break apart root ball and make sure to plant roots into soil rather than just the mulch.



#### 8. Mulch First

Applying mulch first is much easier, and it reduces soil compaction during planting!



#### **10. Water** Plantings should receive at least 1" per week for the first year following installation.

**Raingarden Installation Tip:** Reuse the soil excavated from the basin for a berm on the downhill side of the garden or in a different place in the yard. Flip over sod rolls to serve as the base of a larger berm.

### DESIGNING WITH NATIVE PLANTS FOR POLLINATORS





#### **Soil Moisture Tolerance**

Moisture tolerance refers to the level of pooled water that specific species of plant will be able to tolerate within a raingarden. This is one of the more important plant characteristics required for your planting design because not all native plants can thrive in the basin of a raingarden where water will collect.

You can use the charts on pages 29-31 to help you make decisions about plants, and even incorporate shrubs from page 16 if your garden is large enough.

The important thing to remember is that plants chosen for your raingarden basin are not wetland plants. Wetland plants need constantly wet conditions, similar to a wetland or the edge of a lakeshore. Raingarden basin plants are prairie plants that can tolerate temporary inundation, but not constant wetness. Plants that are good choices for raingarden basins are plants with a wet to medium soil moisture tolerance.



Plantings in the basin must be able to withstand periods of inundation

#### **Natives for Shade**

There are many wonderful native plant species that will work for raingardens in shaded areas. Typically, natives for shady areas are plants that would be found in woodland areas throughout our region. Shade tolerance can be a rather complex set of characteristics unique to each species, but in general shade conditions receive less than 3 hours of sunlight. Also, the quality of the available sunlight will be defined by the time of day the area will receive direct light. A shade- to part-shade garden will be more appropriate where there is some filtered light in the morning or late afternoon.



Shady landscape planting created by EnergyScapes

Plant Selection Tip Full sun > 6 hours Part sun/shade 3 - 6 hours Shade < 3 hours

For more information on native plants, visit the Blue Thumb native plant finder: **bluethumb.org/plants/** 





# NATIVE PLANTS FOR RESILIENT YARDS

# Native trees, shrubs and perennials help improve water quality by mitigating stormwater runoff

and reducing the load of pollutants that reach our waterways. These plants have deep roots that can break up compacted soils and allow water to infiltrate into the earth on your property. Root systems also host billions of microbes that break down pollutants and supply nutrients. Additional benefits include lowering energy consumption, improvement of public health, sequestration of carbon dioxide from the atmosphere, providing food and habitat for pollinators, and the creation of aesthetically pleasing spaces for your neighborhood.



Viceroy on Rattlesnake master plant

	Latin Nama	Soil		Dimensions		Bloom Period					
Common Name	Latin Name		Med	Dry	Height	Width	EARLY	SPRING	SUMMER	FALL	LATE
Soft Rush	Juncus effusus	х	х		1-2'	1-2'		х	х	х	
Blue Lobelia	Lobelia siphilitica	х	х		1-3'	2′			х	х	х
Tussock Sedge	Carex stricta	х	х		1-3′	1-2'		х			
Wild Garlic	Allium canadense	х	х	х	2′	6″		х	х		
Mountain Mint	Pycnanthemum virginianum	х	х		3′	1'		х	х	х	
Swamp Milkweed	Asclepias incarnata	х	х		3′	1'		х	х		
Stiff Goldenrod	Solidago rigida	х	х	х	4′	1'				х	х
White Wild Indigo	Baptisia alba	х	х	х	4'	3'		х	х		
Wild Bergamot (bee balm)	Monarda fistulosa	x	x	x	4'	2′			х	х	
Blue False Indigo	Baptisia australis	х	х		4'	2′		х	х		
Joe-Pye Weed	Eutrochium purpureum	х	х		4'	2′			х	х	
Prairie Blazing Star	Liatris pycnostachya	х	х		4′	1'			х	х	
Purple Coneflower	Echinacea purpurea	х	х		4'	1-2'			х	х	х
Boneset	Eupatorium perfoliatum	х			4′	1′			х	х	
Sneezeweed	Helenium autumnale	х			4′	2′				х	х
Indian Grass	Sorghastrum nutans	х	х	х	4-7′	1-2'				х	х
Blue Vervain	Verbena hastata	х	х		5′	1′			х	х	
Tall Bellflower	Campanula americana	х	х		5′	1-2'			х	х	х
Big Bluestem	Andropogon gerardii	х	х	х	5-9′	2-3'			х		
Wild Golden Glow	Rudbeckia laciniata	х	х		7′	3'			х	х	х
Amethyst Shooting Star	Dodecatheon amethystinum		х		1′	1'	х	х			
Midland Shooting Star	Dodecatheon meadia		х		1'	6"	х	х			
White Prairie Clover	Dalea candida		х		1-3′	1'		х	х		
Blue Eyed Grass	Sisyrinchium montanum		х		2'	1'		х			

#### Sun/Part-sun perennials \*sorted by soil moisture

**Rusty Patched Bumblebee Preferred Plant** 

Common Nomo	Latin Name	Soil			Dimensions		Bloom Period				
Common Name		Wet	Med	Dry	Height	Width	EARLY	SPRING	SUMMER	FALL	LATE
Nodding Onion	Allium cernuum		х		2′	6″			х		
Narrowleaf Purple Coneflower	Echinacea angustifolia		x	x	2'	1'		x	х		
Butterfly Milkweed	Asclepias tuberosa		х	х	2′	1-2'		x	х		
Cream Indigo	Baptisia bracteata		х	х	2′	2'		х			
Pale Purple Coneflower	Echinacea pallida		x	x	2'	1'		×	x		
Showy Beardtongue	Penstemon cobaea		х	х	2′	1'	х	х			
Silky Aster	Symphyotrichum sericeum		х	х	2′	1'				х	х
Purple Prairie Clover	Dalea purpurea		х	х	2′	1'			х	х	
Bradbury's Monarda	Monarda bradburniana		х		2′	1'		x	х		
New England Aster	Symphyotrichum novae-angliae		х		2′	3'				х	х
Little Bluestem	Schizacarium scoparium		х	х	2-4'	1-2'					
Common Yarrow	Achillea millefolium		х	х	3'	1'		х	х	х	
Large-flowered Beardtongue	Penstemon grandiflorus		х	х	3′	1'		х			
Beardtongue	Penstemon digitalis		х	х	3'	1'		х	х		
Button Blazing Star	Liatris aspera		х	х	3'	1'			х	х	х
Common Milkweed	Asclepias syriaca		х	х	3′	1'		х	х		
Lead Plant	Amorpha canascens		х	х	3′	2'		х	х		
Anise Hyssop	Agastache foeniculum		х		3′	1'		х	х	х	
Black-eyed Susan	Rudbeckia hirta		х		3′	2′		х	х	х	
Golden Alexanders	Zizia aurea		х		3′	1'	х	х			
Orange Coneflower	Rudbeckia fulgida		х		3′	2′			х	х	
Prairie Coneflower	Ratibida pinnata		х		3′	1-2'			х	х	
Giant Hyssop	Agastache scrophulariaefolia		х		4′	2'			х	х	
Rattlesnake Master	Eryngium yuccifolium		х	х	4'	1-2'			х	х	
Showy Goldenrod	Solidago speciosa		х	х	5′	2'			х	х	
Meadow Blazing Star	Liatris ligulistylis		х		5′	1'				х	
Poke Milkweed	Asclepias exaltata		х		5′	2'		х	х		
Common Ironweed	Vernonia fasciculata		х		6′	2′			х	х	
Prairie Smoke	Geum triflorum			х	1'	1'	х	х			
Pussy Toes	Antennaria neglecta			х	1′	1'	х	х			
Prairie Dropseed	Sporobolus heterolepis			х	1-2'	2-3'				х	х
Prairie Junegrass	Koeleria marcantha			х	1-2'	1-2'		х	х		
Prairie Onion	Allium stellatum			х	1-2'	1'			х		
Aromatic Aster	Symphyotrichum oblongifolium			х	2′	1'			х	х	х
Wild Lupine	Lupinus perennis			х	2′	1'		х	х		
Hoary Vervain	Verbena stricta			х	2′	1′		х	х	х	
Lance-Leaf Coreopsis	Coreopsis lancelota			х	2'	1′		х	x		
Canada Wild Rye	Elymus canadensis			х	2-5′	2-3'				х	х
Pearly Everlasting	Anaphalis margaritacea			х	3′	1'			х	х	х

Rusty Patched Bumblebee Preferred Plant

# NATIVE PLANTS FOR RESILIENT YARDS

#### Shade/Part-shade perennials

\*sorted by soil moisture

		Soil		Dimensions		Bloom Period					
Common Name	Latin Name		Med	Dry	Height	Width	Early	Spring	Summer	Fall	Late
Bloodroot	Sanguinaria canadensis	х	х		6″	6″	х				
Wild Ginger	Asarum canadense	х	х		6″	1′	х	х			
Canada Anemone	Anemone canadensis	х	х		1'	1′		х	x		
Jacob's Ladder	Polemonium reptans	х	х		1'	1′	х	х			
Fox Sedge	Carex vulinoidea	х	х		1-2.5'	1-1.5′		х	х		
Virginia Bluebells	Mertensia virginica	х	х		2'	1-2′	х				
Big-leaved Aster	Symphyotrichum macrophyllus	х	х	х	2′	2′				х	х
Solomon's Plume	Smilacina racemosa	х	х	х	2'	1-2′	х	х			
Mist Flower	Eupaturium coelestinum	х	х		2'	1′			х	х	х
Ohio Spiderwort	Tradescantia ohiensis	х	х	х	3'	1′		х	х		
Great Blue Lobelia	Lobelia siphilitica	х	x		3'	1'			х	х	х
Rose Turtlehead	Chelone obliqua	х	х		3'	2′			х		
Zig-Zag Goldenrod	Solidago flexicaulis	х	х		3'	1′				х	х
Culvers Root	Veronicastrum vernonia	х	х		5′	2′		х	х		
White Turtlehead	Chelone glabra	х			5′	2′			х	х	
Black Cohosh	Cimicifuga racemosa	х	х		6′	2′		х	х		
Penn Sedge	Carex pensylvanica		х	х	6″	6″	х	х			
Wood Betony	Pedicularis canadensis		х	х	1'	6″	х				
Wild Geranium	Geranium maculatum		х		1'	1'	х	х	х		
Virginia Waterleaf	Hydrophyllum virginianum		х		1-2'	1′		х	x		
Alumroot	Heuchera richardsonii		х	х	2′	3'		х	х		
Bottle Gentain	Gentiana andrewsii		х	х	2′	1'				х	
Cream Gentian	Gentiana flavida		х		2′	1'				х	х
Columbine	Aquilegia canadensis		х	х	2′	1'	х	х			
Tall Thimbleweed	Anemone virginiana		х		2'	1-2'		х	х		
Heart-Leaved Aster	Symphyotrichum cordifolius		х		3'	1′				х	х
Switchgrass	Panicum virgatum		х	х	3-6'	2-3'			x	х	х

Rusty Patched Bumblebee Preferred Plant

For more information on Native Plants, visit the Blue Thumb native plant selector: bluethumb.org/plants

#### Plants for the Rusty Patch Bumblebee



# GARDEN MAINTENANCE

Maintaining your garden is important, especially during its first two to three growing seasons while the plants establish themselves. The more you know about your plants, the better you can provide for their needs and the better they will perform once established.

Spring	<ul> <li>Cut back last year's growth. Leave 18" of stem for pollinators to nest in</li> </ul>	cut back before new growth begins.
	Inspect for erosion	I his will increase insect and bird
	Pull weeds	Magitar rein gerdang for any arguing
	Maintain mulch if desired	Monitor rain gardens for any erosion     of the inlet or outlet, and ponding
	Divide / Transplant	water; ensure that water flows into the raingarden freely
Summer	<ul> <li>Inspect for erosion and proper drainage after rainstorms</li> </ul>	
	Pull weeds	An P
	<ul> <li>Water as needed during drought periods</li> </ul>	Growing Seasons 2-3
	Take pictures!	Weed raingarden as needed (see next page
		Replace mulch in bare areas if     desired: after year three replace as
Fall	Clean up excess leaves and trim shrubs	needed
	<ul> <li>Deadhead and/or disperse seeds if desired (not necessary for garden health)</li> </ul>	Replace any plants that did not survive.
	<ul> <li>Leave plant duff until spring</li> </ul>	Cut back last year's growth before spring emergence of new growth
		Clear rain garden basin of any leaves, sediment or trash that may
Winter	Try to avoid plowing or shoveling	have collected over the winter
	excess snow into your raingar- den.	Monitor rain gardens for any erosion
	<ul> <li>Keep de-icing salts out of the garden</li> </ul>	water; ensure that water flows into
	<ul> <li>Dream up new garden possibili- ties for next season!</li> </ul>	the raingarden freely

#### Plant Establishment

#### **Growing Season 1**

- Ensure plants get a minimum of 1" of • water per week, saturating the soil
- Weed as needed (see next page)
- Leave 'duff' (decaying plant material) g of the following year and before new growth begins. ncrease insect and bird oughout winter dormancy
- ain gardens for any erosion t or outlet, and ponding sure that water flows into rden freely

#### Seasons 2-3

- garden as needed (see
- ulch in bare areas if ter year three replace as
- ny plants that did not
  - ast year's growth before ergence of new growth

#### **Pulling Weeds**

Cool-season weeds sprout and spread seed by Memorial Day (on a year with normal spring temperatures). It is imperative that they are pulled prior to spreading seed. The longer they persist, the more established the weed population will become. Avoid using herbicides to remove weeds as this often results in harm to desirable garden plants and is detrimental to beneficial insects and soil health. Weeding becomes less demanding as a garden matures. A newly planted garden will need to be weeded often throughout the season, but once established the plants will naturally suppress weed growth. If unruly weeds continually sprout up in the garden, take time to discover their source.

Pull all warm-season weeds and volunteer trees (ash, elm, hackberry, boxelder, buckthorn) prior to the Fourth of July. Monitor weed emergence throughout the growing season and pull as necessary.



Yellow Nutsedge



Lambsquarter



Common Ragweed



#### What is a weed?

These plants tend to be aggressive and difficult to remove once established—at the same time, a few still support wildlife or even make a tasty salad or beverage. Some will invariably find their way into your garden; if you choose not to remove them outright, at least keep an eye on their behavior.

#### Cool Season Weeds

- **Barnyard Grass**
- **Common Plantain**
- **Curly Dock**
- **Creeping Charlie**
- Lambsquarter
- Perennial Rye
- Quackgrass
- **Reed Canary Grass**

#### Warm Season Weeds

- **Common Burdock**
- **Common Ragweed**
- **Common Spurge**
- Crabgrass
- **Daisy Fleabane**
- Foxtail
- Horseweed or Mare's Tail
- Mullein
- **Prickly Lettuce**
- Sandburs
- Smartweed
- Stinging Nettle
- Thistles
- White Campion
- Yellow Nutsedge

For more information visit the University of Minnesota Extension: www.extension.umn.edu/garden/yard-garden/weeds

# BLUE THUMB RESOURCES

#### Plant Finder

The Blue Thumb Plant Finder is a tool to help people find Minnesota native plants that will thrive where they're planted. It is composed of plants that are generally commercially available, and can be used to create planting plans for all types of projects. You can search by plant type, sunlight requirements, soil moisture tolerance, and more!

#### Partner Finder

The Blue Thumb Partnership is a network of clean water and native plant stewards creating change to bridge the gap between knowledge and action by offering resources and programs to Minnesotan residents. Use the Partner Finder tool to search for local government units, non-profit organizations, and private companies who can assist in your project goals.

#### **Resources Page**

The public Resources page is regularly updated with printable or downloadable resources to help tackle a DIY planting project. Available resources include design templates to take the guess work out of planning a new garden, plant lists, and guides for a variety of projects.

Find all of these resources and more at Bluethumb.org!



# WHO WE ARE

#### Visit our websites to learn about:

#### Blue Thumb

Blue Thumb is an education program that promotes creating and caring for landscapes that protect pollinators and improve water quality. Our goal is to help folks bridge the gap between knowledge and action through DIY resources, workshops, and community support. We help coordinate Lawns to Legumes, a statewide program that gives Minnesotans funds to put pollinator habitat in their yards. We're run by the nonprofit Metro Blooms and rely on the support of our network of partners, which include nonprofits, governmental units, and companies in gardening and landscape design.

#### Metro Blooms

Metro Bloom's mission is to partner with communities to create resilient landscapes and foster clean watersheds, embracing the values of equity and inclusion to solve environmental challenges.

We partner with residents, neighborhood groups, churches, small businesses, youth, elders, nonprofits and local governments, to co-create natural outdoor spaces to help mitigate the effects of climate change – supporting pollinators and people along the way.

At Metro Blooms we strive to make engagement equitable through real relationships, supporting opportunities for silenced voices to be heard, and implementing what we've heard from those most impacted by environmental and social injustices. We prioritize partnering with Black, Indigenous, People of Color, renters, and low-income communities.

#### Metro Blooms Design + Build

Metro Blooms Design+Build provides high quality, resilient, and sustainable design, installation, and landcare services for residential and commercial landscapes. Metro Blooms Design+Build works to change landscaping norms towards more earth-friendly practices including rain gardens, native plants and pollinator-friendly lawns. Metro Blooms Design+Build is a for-profit entity that supports the work of Metro Blooms non-profit.



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# PLANTING FOR CLEAN WATER®



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