The Southern Lake Michigan Rain Garden Manual

"Gardening to Absorb the Storm"

Helping to protect and restore the rivers and lakes of the southern Lake Michigan region




LAWN TO LAKE

PURDUE UNIVERSITY CALUMET

Lake Champlain Sea Grant

Great Lakes RESTORATION

Sea Grant ILLINOIS - INDIANA

UNIVERSITY OF ILLINOIS EXTENSION

NORTHWESTERN INDIANA REGIONAL PLANNING COMMISSION

This is an adapted version of the successful Vermont Rain Garden Manual applied to the local conditions to the Southern Lake Michigan region. The original 1st Edition of the Vermont Rain Garden Manual was printed in 2008. Minor updates were made for the 2nd Edition, published in 2009.

The Purpose of this Manual

This manual is a Southern Lake Michigan specific resource developed for homeowners, landscape architects, city planners, and anyone else interested in protecting local rivers and lakes through gardening. The contents of the manual will clarify the process of installing a rain garden and demonstrate that rain gardens are cost-effective stormwater management tools, which can be incorporated into a variety of landscapes. The Southern Lake Michigan Rain Garden Manual will also illustrate the importance of reducing the volume of stormwater runoff to improve water quality.

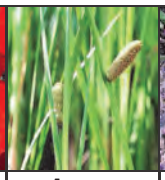
Contents

This manual is broken into sections to illustrate the step by step process of building a rain garden. The sections include:

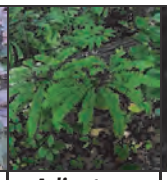
This manual also includes:

**Photographs of species appropriate for rain gardens are arranged alphabetically, by scientific name, throughout the manual. See the plant list in the center of this manual for the common names of the border plants.*


Acer rubrum


Acorus americanus


Actaea racemosa


Adiantum pedatum

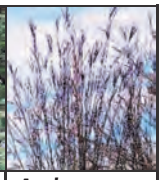

Agalinis purpurea


Allium cernuum


Alnus incana spp. rugosa


Amelanchier laevis


Amorpha canescens


Andropogon gerardii

What is a rain garden?

A rain garden is a bowl-shaped garden designed to capture and absorb rainfall and snowmelt (collectively referred to as "stormwater"). When stormwater runs off impervious surfaces such as parking lots, roofs, compacted soils, and roads, it accumulates pollutants and delivers them to a nearby lake or river either directly or via a storm drain. Stormwater pollutants typically include sediment, pesticides, nutrients (nitrogen and phosphorus), pathogens, oil, grease, and heavy metals. Excess stormwater also causes increased flooding, which erodes stream banks resulting in additional problems. However, if captured by a rain garden, stormwater soaks into the ground and recharges the groundwater at a rate 30% greater than that of a typical lawn. Through allowing stormwater to infiltrate into the ground, rain gardens help to reduce the volume of stormwater runoff thus preventing excess nutrients, sediment, pollutants, and high stormwater flows from entering local waterways. Ultimately, if we all work together to create landscape features that absorb stormwater, we can help preserve the waterways that make the southern Lake Michigan region so beautiful.

Choosing a Location

- ☑ If capturing roof runoff, place the garden at least 10 feet away from the building to prevent potential water seepage into the basement.
- ☑ Do not place a rain garden over a septic tank or leach field.
- ☑ Do not place a rain garden near a drinking water well.
- ☑ Call 811 at least two days before digging to avoid underground pipes and utilities.
- ☑ Check for any private wiring or underground utilities such as driveway lights and sheds with electricity.
- ☑ Select a flat area, if possible, to make installation easier.
- ☑ Do not place the rain garden in a naturally wet area.
- ☑ Avoid disturbing tree roots. Trees may be injured by digging and may not tolerate the additional soil moisture.

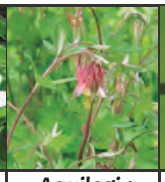

Capture runoff from your roof

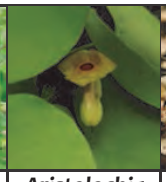

Capture runoff from a road


Capture runoff from a parking lot

Photo courtesy of Connecticut NEMO


Anemone canadensis


Aquilegia canadensis


Aristolochia tomentosa


Aronia arbutifolia


Aronia melanocarpa


Arisaema triphyllum

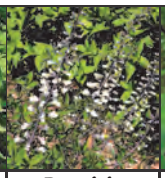

Asarum canadense


Asclepias incarnata


Asclepias sullivantii


Asclepias tuberosa

Athyrium filix-femina



Baptisia alba

Betula nigra

Boltonia asteroides

Bouteloua curtipendula

Caltha palustris

Campanulastrum americanum

Carex crinita

Carex emoryi

Carex grayi

Sizing Your Rain Garden (4 Steps)

Step 1: Drainage Area

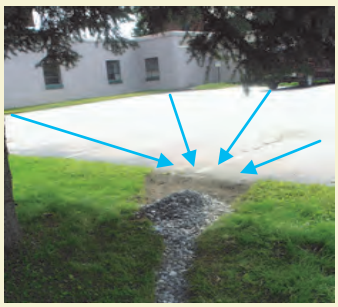
To calculate the drainage area (the area that will drain to the rain garden) from a roof, parking lot, sidewalk, or other impervious surface, multiply the length by the width.

(Length) x (Width) = _____ ft^2 (drainage area)

Add together the drainage areas of multiple roofs.

Combine your roof runoff with a neighbor's.

Rain gardens can capture stormwater from a dripline just as well as from a gutter system.



Estimating the stormwater that runs off streets, sidewalks, and parking lots can be tricky. It is best to visit the impervious area during a rain event to clearly see the extent of the drainage area.

Step 2: Soil

To determine if your soil type is suitable for a rain garden, first perform a simple pit test:

1. Dig a 6" deep hole and fill with water.
2. Choose a new location if the water is still standing after 24—48 hours.

After conducting the pit test, identify the soil type as sand, silt, or clay. Sandy soils have the fastest infiltration; clay soils have the slowest. Since clay soils take longer to drain water, they require a larger rain garden area. You can determine your soil type by performing the ribbon test:

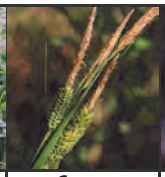
1. Grab a handful of moist soil (you may need to moisten the soil yourself) and roll it into a ball in your hand.
2. Place the ball of soil between your thumb and the side of your forefinger and gently push the soil forward with your thumb, squeezing it upwards to form a ribbon about ¼" thick.
3. Try to keep the ribbon uniform thickness and width. Repeat the motion to lengthen the ribbon until it breaks under its own weight. Measure the ribbon and evaluate below:

SAND: Soil does not form a ribbon at all
SILT: A weak ribbon < 1.5" is formed before breaking
CLAY: A ribbon > 1.5" is formed

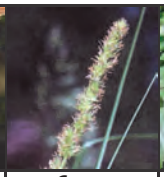
Photo Courtesy of North Dakota State University

The ribbon formed here depicts a clay soil because it is greater than 1.5" in length.

Carex muskingumensis



Carex stricta



Carex vulpinoidea

Carpinus caroliniana

Caulophyllum thalictroides

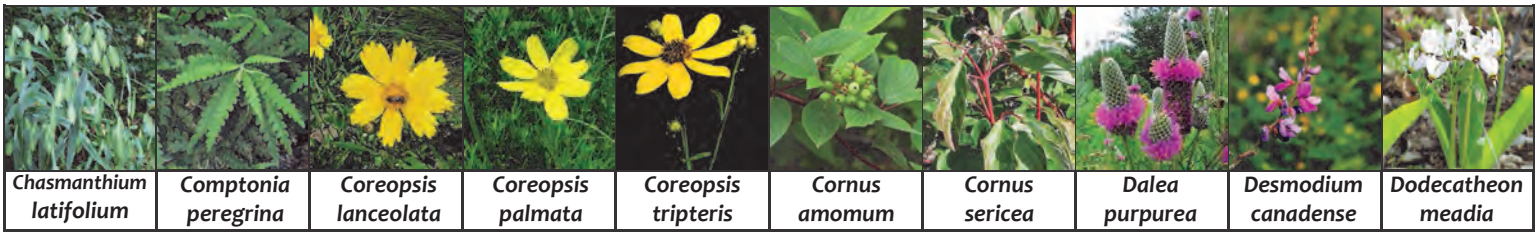
Celtis occidentalis

Cephalanthus occidentalis

Chelone glabra

Cinna latifolia

Chamerion angustifolium



Chasmanthium latifolium	*Comptonia peregrina*	*Coreopsis lanceolata*	*Coreopsis palmata*	*Coreopsis tripteris*	*Cornus amomum*	*Cornus sericea*	*Dalea purpurea*	*Desmodium canadense*	*Dodecatheon meadia*

Step 3: Slope

Calculate the slope to determine the rain garden's depth:

1. Place one stake at the uphill end of the rain garden and another at the downhill end as illustrated in Figure 1.
2. Level the string between the two stakes.
3. Measure the total length of the string and the height of the string at the downhill stake in inches.
4. Divide the height by the length and multiply the result by 100. This is the slope (as a %). Slope = (height/length) x100
5. Use Table 1 to determine the recommended rain garden depth.

Table 1	
Slope	**Depth**
< 4%	3-5 in
5-7%	6-7 in
8-12%	8 in+

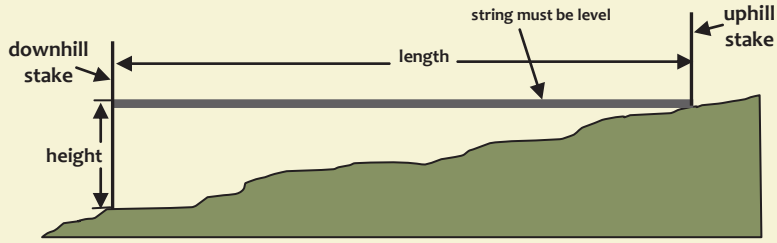


Figure 1: Determine the slope of the landscape.

Adapted from Rain Gardens: A How-to Manual for Homeowners, UWEX

Step 4: Size

Finally, determine the appropriate size for your rain garden:

1. Use Table 2 to determine the size factor. The size factor describes how large the rain garden should be relative to the size of the drainage area.
2. Multiply the size factor by the drainage area, determined in Step 1. This is the recommended rain garden size.

Table 2	Depth		
Soil Type	**3-5 in**	**6-7 in**	**8 in +**
Sand	0.19	0.15	0.08
Silt	0.34	0.25	0.16
Clay	0.43	0.32	0.20

_____ X _____ = _____

Size Factor **Drainage Area** **Rain Garden Area**

Note: If the rain garden is > 30 ft away from the drainage area then the area of the rain garden can be a half size smaller than calculated above. This is because a large amount of stormwater will be absorbed along the pathway that leads to the rain garden.

Benefits of a Rain Garden

Reduce the volume of storm-water runoff

Recharge groundwater

Sustain stream base flows

Help control flash flooding

Remove pollutants

Improve water quality

Provide wildlife habitat

Are an attractive alternative to detention ponds

Are easy and inexpensive to install and maintain

Can be retrofit into existing urban landscapes

Echinacea pallida	*Enemion biternatum*	*Eryngium yuccifolium*	*Erythronium americanum*	*Eupatorium perfoliatum*	*Eupatorium rugosum*	*Euthamia graminifolia*	*Eutrochium maculatum*	*Filipendula rubra*	*Gaylussacia baccata*

Gentiana andrewsii

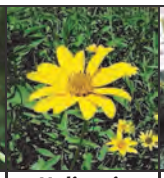
Geranium maculatum

Hamamelis virginiana

Helenium autumnale

Helianthus angustifolius

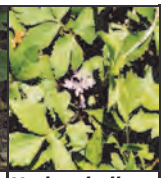
Helianthus occidentalis



Heliopsis helianthoides

Heuchera richardsonii

Hibiscus moscheutos



Hydrophyllum virginianum

Designing Your Rain Garden (4 Steps)

Step 1: Determine the Shape

Your rain garden can be any shape but it MUST have a level bed.

Step 2: Design the Entrance

Stabilize the area where runoff enters your rain garden with stone or gravel to slow stormwater flow and prevent erosion within the garden. Place hardy plants that thrive in moist conditions where the stormwater enters the garden.

Some common methods for directing water from the drainage area to the rain garden include:

Gutter Extensions: Designed to attach to the end of your downspout.

PVC & Plastic Corrugated Piping: Can be attached to gutter extensions and buried to carry stormwater underground.

Grass-lined & Rock-lined Swales: Can be used to direct water to the rain garden. Ideal for heavy flows from roads or parking lots. Swales should be sloped at a 2:1 ratio (1 ft rise for every 2 ft across).

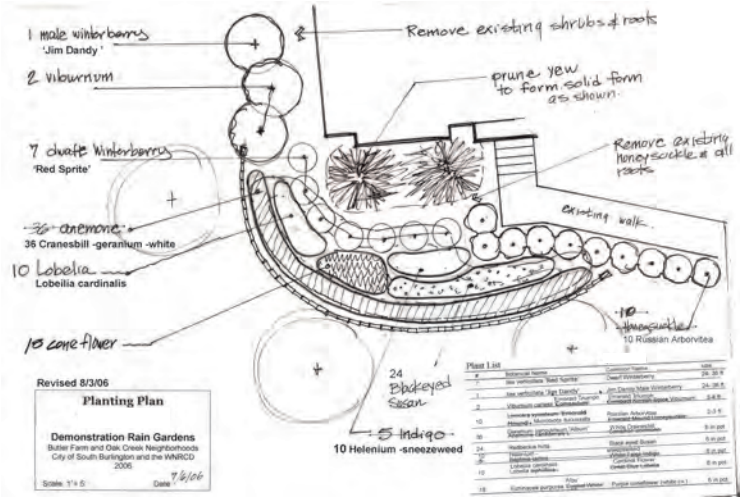
Step 3: Select Plants

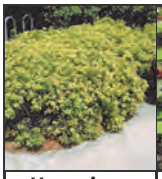
Plants must be able to tolerate the moist conditions typical of a rain garden. When choosing plants it is important to remember that rain gardens are not wetlands; rain gardens mimic upland forest systems. Plants that consistently require wet soils or standing water are not appropriate. Refer to the Rain Garden Plant List beginning on page 12 of this manual to select plants for your rain garden.

There are likely many more plants suitable for southern Lake Michigan rain gardens than are not included in the plant list. To evaluate the suitability of each additional plant, use the following criteria: A suitable rain garden plant 1) is greater then 6" in height when mature and does not have low basal leaves—these plants may struggle when overcome by heavy flows; 2) can tolerate both wet and dry conditions; and 3) is native and can survive in the local hardiness zone. Refer to the Plant Hardiness Zones map on the back cover.

Step 4: Final Rain Garden Design Sketch

Complete a scale drawing of the rain garden before breaking ground.





Hypericum kalmianum

Ilex verticillata

Impatiens capensis

Iris virginica

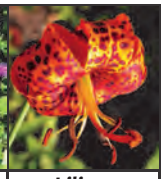
Juncus effusus

Koeleria macrantha

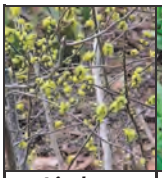
Liatris aspera

Liatris pycnostachya

Liatris spicata



Lilium michiganense

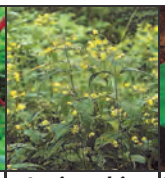


Lindera benzoin

Lobelia cardinalis

Lobelia siphilitica

Lobelia spicata



Lysimachia ciliata ssp.

Maianthemum canadense

Mertensia virginica

Mimulus ringens

Mitella diphylla

Monarda fistulosa

Installing Your Rain Garden

Build the berm with sod

Borders defined by an earthen berm

Create a berm with landscaping stone

Borders defined by edging

Step 1: Define the Borders

Delineate the outline of the rain garden on the ground using string or spray paint. The berm or edging will go outside the string.

Step 2: Remove the Grass

If you want to avoid digging through the sod, kill the grass first by laying black plastic or a tarp on the lawn for several weeks. Using a herbicide is not recommended; it could harm the newly installed plants.

Step 3: Start Digging

Building on a slope: If the rain garden is built on a slope, a berm or low wall on the downhill side will be needed to increase the water holding capacity of the garden. Create the berm while digging the rain garden by heaping soil around the edges where the berm will be (See Figure 2 on page 8). The berm height should be level with the uphill side of the garden, making the entire perimeter of the garden the same height. After shaping the berm, compact the soil and cover with sod, mulch, or a groundcover. Use straw or other matting to protect the berm from erosion while the grass or groundcover takes root.

Building on level ground: If the rain garden is built on level ground, the profile of the garden can vary depending on available space and aesthetic preference. If space permits, the rain garden can have gently sloping sides (See Figure 3). Note that soil conditions in the upper slope of this type of rain garden may be too dry for a typical rain garden plant to survive; a variety of upland plants might be appropriate here. If there is not a lot of space, then the profile in Figure 4 might be appropriate. Only plants that can tolerate very moist soil conditions should be planted in this type of rain garden. This design is common in urban settings where a curb-cut is used to direct stormwater into the garden. A berm does not need to be constructed in a rain garden that is built on level ground because the stormwater is held in by the depression that is dug. Excavated soil therefore should be removed from the site. Landscaping stone or other edging material can be used to help hold water in the garden as well as to prevent grass from growing into the bed.

Nyssa sylvatica

Oligoneuron riddellii

Onoclea sensibilis

Osmunda cinnamomea

Osmunda claytoniana

Osmunda regalis

Ostrya virginiana

Panicum virgatum

Parthenium integrifolium

Penstemon digitalis

Phlox divaricata

Physocarpus opulifolius

Physostegia virginiana

Polygonatum biflorum

Polystichum acrostichoides

Pontederia cordata

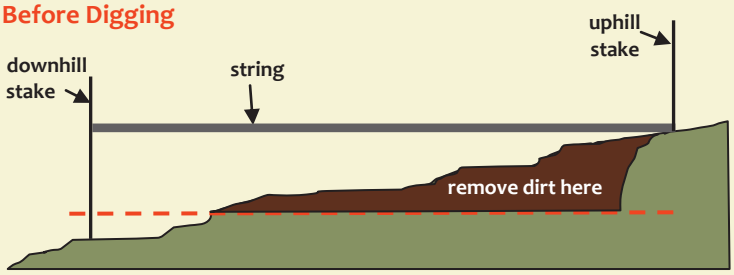
Pycnanthemum virginianum

Quercus bicolor

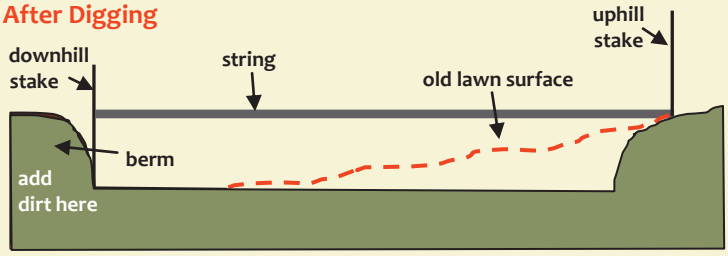
Quercus palustris

Quercus rubra

Before Digging



After Digging



Adapted from Rain Gardens: A How-to Manual for Homeowners, UWEX

Figure 2: When building a rain garden on a slope, a berm must be created to hold water in the garden. A bubble level should be used to be sure the string is level and then that the base of your bed is level. When leveling the bed, use the dirt that you remove to build the berm.

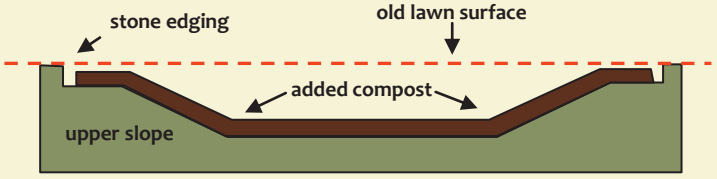


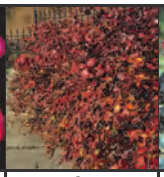
Figure 3: Level bed with sloping edges. This design requires more space. Only plants that can thrive in drier soil conditions can be planted on the upper slope of this type of rain garden; typical rain garden plants will not thrive here.

Figure 4: Level bed without sloping edges. Ideal design for tight spaces.

***Remember to build your rain garden 10ft away from* the footer of your home**

Ratibida pinnata

Rhexia virginica

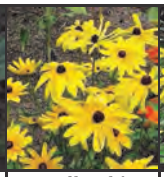


Rhus aromatica

Rhus copallinum

Rosa palustris

Rudbeckia fulgida var. speciosa



Rudbeckia hirta

Rudbeckia subtomentosa

Sagittaria latifolia

Salix discolor

Salix humilis

Sambucus nigra spp. canadensis

Sanguinaria canadensis

Schizachyrium scoparium

Scirpus atrovirens

Senna hebecarpa

Silene regia

Silene virginica

Silphium integrifolium

Silphium perfoliatum

Level the bed

Improve the soil

Plant

Mulch

Water

Step 4: Level the Bed

Dig the rain garden bed 4-6" deeper than determined earlier to allow for the addition of compost and mulch. Maintain the rain garden's ability to absorb water by avoiding soil compaction. Work from one side to the other, or from the center to the outside. Loosen soil with a shovel if it becomes compacted. When the whole area has been dug out to the appropriate depth, lay a 2x4 in the rain garden and set a carpenter's level on the board. Adjust the bed to form a flat bottom. When the rain garden is completely level, rake the soil. *Tip:* Avoid digging and planting under wet conditions, especially when working in clay soils — disturbing wet soils can result in compaction.

Step 5: Improve the Soil

At least two inches of compost should be added to the rain garden and mixed into the native soil. This will help the soil retain moisture and improve plant growth. Using a rotor-tiller to mix in the compost will make the job much easier.

Step 6: Plant

Set the plants out in the garden to match the planting plan. When removing the plants from pots, gently loosen the root ball with your fingers before placing plants in the ground. Water immediately after planting.

Step 7: Mulch

Apply a 2-3" layer of mulch to help retain soil moisture and discourage weeds. A cubic yard of mulch will cover a 100 square foot area with about three inches of mulch.

Care & Maintenance

- **Water:** New plants need to be watered regularly until their roots are established, even though the rain garden catches stormwater.
- **Weed:** Frequent weeding will be necessary in the first few years before plants become established.
- **Mulch:** A 2-3" layer of mulch should be applied when you first establish the rain garden. Mulch can move during large storms; rake the garden to distribute mulch evenly after the storm. Once the garden has been established, apply mulch after a few years or "spot mulch" in areas that have lost mulch during large storms.
- **Maintenance Plan:** If the rain garden is managed by a city, a maintenance plan needs to be in place identifying the department responsible for maintenance. If the rain garden is maintained by a volunteer group, then the volunteer group should work with the city on developing an annual plan for maintenance.

Solidago flexicaulis

Solidago speciosa

Sorghastrum nutans

Sporobolus heterolepis

Symphyotrichum ericoides

Symphyotrichum laeve

Symphyotrichum novae-angliae

Symphyotrichum puniceum

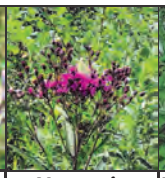
Thelypteris noveboracensis

Thuja occidentalis


Tradescantia ohiensis


Vaccinium corymbosum


Verbena hastata


Vernonia gigantea ssp. gigantea


Veronicastrum virginicum


Viburnum dentatum


Viburnum lentago


Viola pedata


Viburnum nudum var. cassinoides


Zizia aurea

Curb-Cut Rain Gardens

Rain gardens designed with a curb-cut can be effective in capturing stormwater from streets, parking lots, and other paved areas. In addition to reducing stormwater volume, curb-cut rain gardens provide beauty in an urban landscape, reduce pollutant concentrations, and help counteract the urban heat island effect. A sample curb-cut rain garden planting plan is included on page 17 of this manual. Below are some things to consider when designing a curb-cut rain garden:

Plant Height: When planting in a streetscape, be sure to consider overhead conflicts (utility lines) and visibility issues, especially when planting in a median.

Salt Tolerance: Plants in a curb-cut rain garden must be able to tolerate road salt that accumulates in the soil and on exposed trunks and branches in the winter months.

Right-of-Way: Anyone wishing to work within the right-of-way must obtain permission from the state or local municipality. A permit may be required. Contact the Indiana Department of Transportation or your local municipality for more information.

Pretreatment: If stormwater runoff is collected from a road or parking lot it is best to pre-treat the stormwater before it enters the curb-cut rain garden to prevent clogging due to excess sediment. Examples of pretreatment include grass and gravel filters.

Photos courtesy of Bureau of Environmental Services, Portland, Oregon and Connecticut NEMO

Frequently Asked Questions

Does a rain garden form a pond?
No. After most storms a properly constructed rain garden will absorb water within a period of 24 hours, depending on the soil type. For larger storms, water should be absorbed within 48 hours.

Do mosquitoes breed in rain gardens?
No. Mosquitoes require 7 to 12 days of standing water to lay and hatch eggs. Standing water will only last a few hours after most storms.

Do they require maintenance?
Like any garden, diligent weeding and watering will be needed in the first two years. As the garden matures, maintenance requirements will lessen. Plants may need to be thinned after a few years.

How much does a rain garden cost?
The cost varies depending on who does the work, the size of the garden, where the plants come from, and the planting density. If you purchase the plants and materials but you do all the labor, the cost will be roughly $4-$6 per sq ft. If you hire a professional to design and install the garden, it will cost roughly $10-$14 per sq ft.

Should a rain garden be placed where there is typically standing water?
Rain gardens are designed to infiltrate water. Standing water indicates poor infiltration, and we do not recommend directing additional water to these naturally wet areas.

What if there is a dry spell?
Plants suitable for a rain garden can handle both wet and dry conditions. However, during a dry spell, it is best to water the rain garden.

Do I need a permit?
Check with your local municipality for any potentially relevant ordinances.

Rain Garden Planning Worksheet

Step 1 (Drainage Area):

(Length) x (Width) =_____ ft^2 (drainage area)

Step 2 (Soil):

Soil Type: _____ (sand, silt, clay)

Step 3 (Slope):

Slope: _____%

Rain Garden Depth: _____ in

Table 1	
Slope	**Depth**
< 4%	3-5 in
5-7%	6-7 in
8-12%	8 in+

Step 4 (Size):

Size Factor: _____ (from table 2)

Drainage Area: _____ ft^2 (step 1)

Rain Garden Area: _____ ft^2

Table 2	Depth		
Soil Type	**3-5 in**	**6-7 in**	**8 in +**
Sand	0.19	0.15	0.08
Silt	0.34	0.25	0.16
Clay	0.43	0.32	0.20

_____ X _____ = _____

Size Factor | Drainage Area | Rain Garden Area

Rain Garden Design Sketch Space

**Common names of the plants shown throughout the manual **

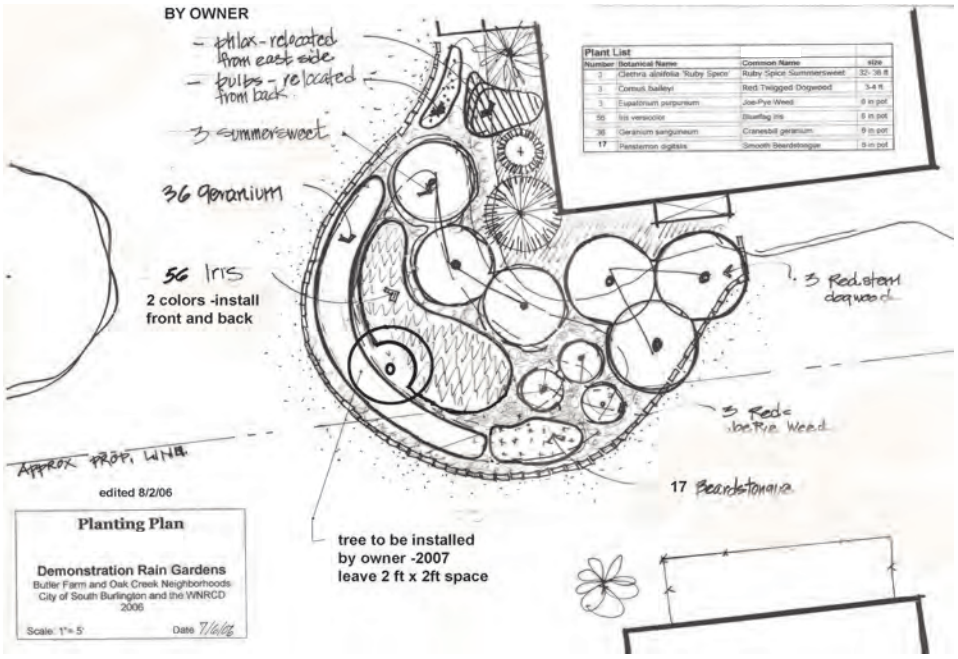
Scientific Name	Common Name	Scientific Name	Common Name
Acer rubrum	red maple	*Cornus amomum*	silky dogwood
Acorus americanus	sweetflag	*Cornus sericea*	redosier dogwood
Actaea racemosa	black baneberry	*Dalea purpurea*	purple prairie clover
Adiantum pedatum	northern maidenhair	*Desmodium canadense*	showy ticktrefoil
Agalinis purpurea	purple false foxglove	*Dodecatheon meadia*	pride of Ohio
Allium cernuum	nodding onion	*Echinacea pallida*	pale purple coneflower
Alnus incana spp. rugosa	speckled alder	*Enemion biternatum*	eastern false rue anemone
Amelanchier laevis	Allegheny serviceberry	*Eryngium yuccifolium*	rattlesnake master
Amorpha canescens	leadplant	*Erythronium americanum*	dogtooth violet
Andropogon gerardii	big bluestem	*Eupatorium perfoliatum*	common boneset
Anemone canadensis	Canadian anemone	*Eupatorium rugosum*	white snakeroot
Aquilegia canadensis	red columbine	*Euthamia graminifolia*	flat-top goldentop
Aristolochia tomentosa	woolly dutchman's pipe	*Eutrochium maculatum*	spotted joe pye weed
Aronia arbutifolia	chokeberry	*Filipendula rubra*	queen of the prairie
Aronia melanocarpa	black chokeberry	*Gaylussacia baccata*	black huckleberry
Arisaema triphyllum	Jack in the pulpit	*Gentiana andrewsii*	closed bottle gentian
Asarum canadense	Canadian wildginger	*Geranium maculatum*	spotted geranium
Asclepias incarnata	swamp milkweed	*Hamamelis virginiana*	American witchhazel
Asclepias sullivantii	prairie milkweed	*Helenium autumnale*	common sneezeweed
Asclepias tuberosa	butterfly milkweed	*Helianthus angustifolius*	swamp sunflower
Athyrium filix-femina	lady fern	*Helianthus occidentalis*	fewleaf sunflower
Baptisia alba	white wild indigo	*Heliopsis helianthoides*	smooth oxeye
Betula nigra	river birch	*Heuchera richardsonii*	prairie alumroot
Boltonia asteroides	white doll's daisy	*Hibiscus moscheutos*	crimsoneyed rosemallow
Bouteloua curtipendula	sideoats grama	*Hydrophyllum virginianum*	eastern waterleaf
Caltha palustris	yellow marsh marigold	*Hypericum kalmianum*	Kalm's St. Johnswort
Campanulastrum americanum	American bellflower	*Ilex verticillata*	common winterberry
Carex crinita	caterpillar sedge	*Impatiens capensis*	Jewelweed
Carex emoryi	Emory's sedge	*Iris virginica*	Virginia iris
Carex grayi	Gray's sedge	*Juncus effusus*	common rush
Carex muskingumensis	Muskingum sedge	*Koeleria cristata*	june grass
Carex stricta	upright sedge	*Liatris aspera*	blazing star
Carex vulpinoidea	fox sedge	*Liatris pycnostachya*	prairie blazing star
Carpinus caroliniana	American hornbeam	*Liatris spicata*	dense blazing star
Caulophyllum thalictroides	blue cohosh	*Lilium michiganense*	Michigan lily
Celtis occidentalis	common hackberry	*Lindera benzoin*	northern spicebush
Cephalanthus occidentalis	common buttonbush	*Lobelia cardinalis*	cardinalflower
Chelone glabra	white turtlehead	*Lobelia siphilitica*	great blue lobelia
Cinna latifolia	drooping woodreed	*Lobelia spicata*	palespike lobelia
Chamerion angustifolium	fireweed	*Lysimachia ciliata spp.*	fringed loosestrife
Chasmanthium latifolium	Indian woodoats	*Maianthemum canadense*	Canada mayflower
Comptonia peregrina	sweet fern	*Mertensia virginica*	Virginia bluebells
Coreopsis lanceolata	lanceleaf tickseed	*Mimulus ringens*	Allegheny monkeyflower
Coreopsis palmata	tickseed	*Mitella diphylla*	twoleaf miterwort
Coreopsis tripteris	tall tickseed	*Monarda fistulosa*	wild bergamot

**Common names of the plants shown throughout the manual **

Scientific Name	Common Name
Nyssa sylvatica	blackgum
Oligoneuron riddellii	Riddell's goldenrod
Onoclea sensibilis	sensitive fern
Osmunda cinnamomea	cinnamon fern
Osmunda claytoniana	interrupted fern
Osmunda regalis	royal fern
Ostrya virginiana	hophornbeam
Panicum virgatum	switchgrass
Parthenium integrifolium	wild quinine
Penstemon digitalis	foxglove beardtongue
Phlox divaricata	wild blue phlox
Physocarpus opulifolius	common ninebark
Physostegia virginiana	obedient plant
Polygonatum biflorum	smooth Solomon's seal
Polystichum acrostichoides	Christmas fern
Pontederia cordata	pickerelweed
Pycnanthemum virginianum	Virginia mountainmint
Quercus bicolor	swamp white oak
Quercus palustris	pin oak
Quercus rubra	northern red oak
Ratibida pinnata	pinnate prairie coneflower
Rhexia virginica	handsome Harry
Rhus aromatica	fragrant sumac
Rhus copallinum	winged sumac
Rosa palustris	swamp rose
Rudbeckia fulgida var. speciosa	orange coneflower
Rudbeckia hirta	blackeyed Susan
Rudbuckia subtomentosa	sweet black-eyed Susan
Sagittaria latifolia	broadleaf arrowhead
Salix discolor	pussy willow
Salix humilis	prairie willow
Sambucus nigra spp. canadensis	American black elderberry
Sanguinaria canadensis	bloodroot
Schizachyrium scoparium	little bluestem
Scirpus atrovirens	green bullrush
Senna hebecarpa	American senna
Silene regia	royal catchfly
Silene virginica	fire pink
Silphium integrifolium	wholeleaf rosinweed
Silphium perfoliatum	cup plant
Solidago flexicaulis	zigzag goldenrod
Solidago speciosa	showy goldenrod
Sorghastrum nutans	Indiangrass
Sporobolus heterolepis	prairie dropseed
Symphyotrichum ericoides	white heath aster
Symphyotrichum laeve	smooth blue aster
Symphyotrichum novae-angliae	New England aster
Symphyotrichum puniceum	purplestem aster
Thelypteris noveboracensis	New York fern
Thuja occidentalis	arborvitae
Tradescantia ohiensis	bluejacket
Vaccinium corymbosum	highbush blueberry
Verbena hastata	swamp verbena
Vernonia gigantea ssp. gigantea	giant ironweed
Veronicastrum virginicum	Culver's root
Viburnum dentatum	southern arrowwood
Viburnum lentago	nannyberry
Viola pedata	birdfoot violet
Viburnum nudum var. cassinoides	withe-rod
Zizia aurea	golden Alexander

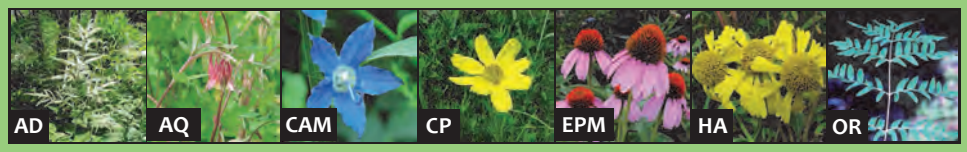
Sample Rain Garden Planting Plans

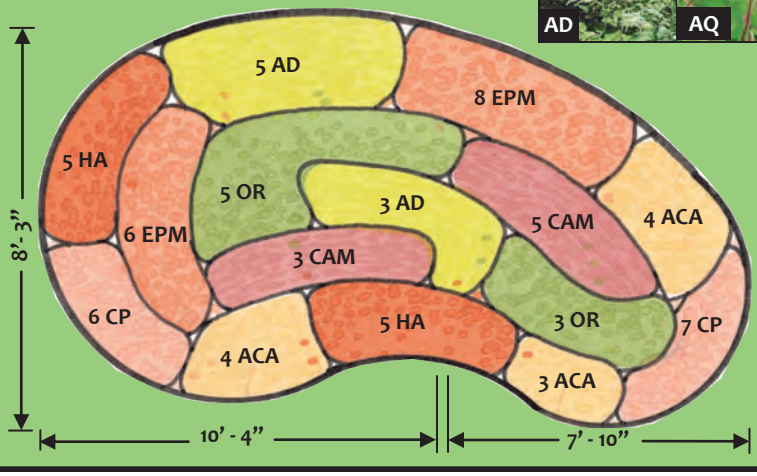
A well thought out planting plan will increase the success rate of each plant and will make installation easier. The placement of each plant should be based on a plant's moisture tolerance, height, and complimentary plant combinations. The following planting plans are designed for a 150 square foot rain garden. Each planting plan includes light exposure, a planting schedule, plant photos, a plant layout diagram, and a sizing chart. The sizing chart can be used to plan for gardens greater or less than the 150 square foot template provided. The quantity and spacing of the plantings shown below is dependent on local climatic conditions and the condition of the plant purchased.



The Enchanted Garden - Part Shade

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest
AD	8	*Aruncis dioicus*	Goatsbeard	5'	2-4'	Spring
ACA	11	*Aquilegia canadensis*	Red Columbine	2'-3'	1-1.5'	Spring
CAM	8	*Campanulastrum americanam*	American Bellflower	3-6'	1-2'	Summer
CP	13	*Coreopsis palmata*	Tickseed	1.5-2.5'	1-1.5'	Spring, Summer
EPM	14	*Echinacea purpurea*	Coneflower	2.5-3'	1-1.5'	Summer
HA	10	*Helenium autumnale*	Sneezeweed	3-5'	2-3'	Summer, Fall
OR	8	*Osmunda regalis*	Royal Fern	3-4'	2-3'	Spring, Summer, Fall



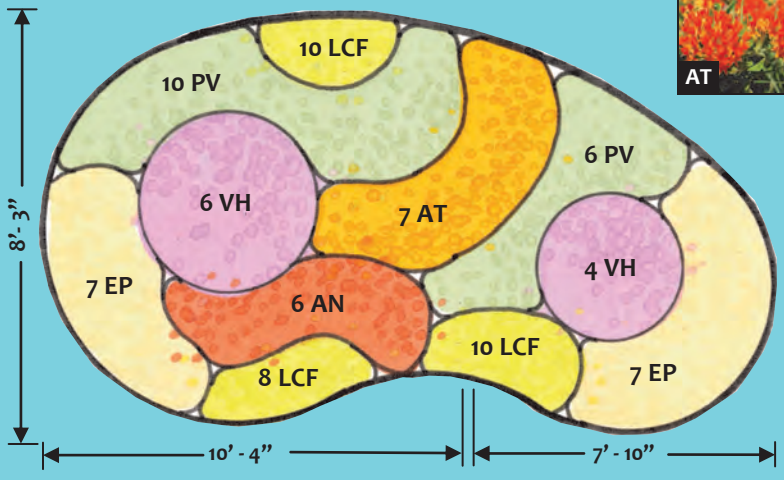


Sizing Chart

Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	3	24	6' x 4'-6"
100	5	48	8'-6" x 6'-4"
150	7	72	18'-2" x 8'-3"
200	7	96	12' x 9'
250	7	120	13'-5" x 10'

The Bird & Butterfly Meadow - Sun

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest
AT	7	*Asclepias tuberosa*	Butterfly Plant	1-2.5’	1-1.5’	Summer
AN	6	*Aster novae-angliae*	New England Aster	18”	1.5-2’	Fall
EP	14	*Echinacea purpurea*	Coneflower	30”	1-2’	Summer
LCF	11	*Lysimachia ciliata*	Fringed Loosestrife	1-3’	2-2.5’	Summer
PV	16	*Panicum virgatum*	Switch Grass	3-4’	2-3’	Spring, Summer, Fall
VH	10	*Verbena hastata*	Blue Vervain	2-6’	1-1.5’	Summer, Fall

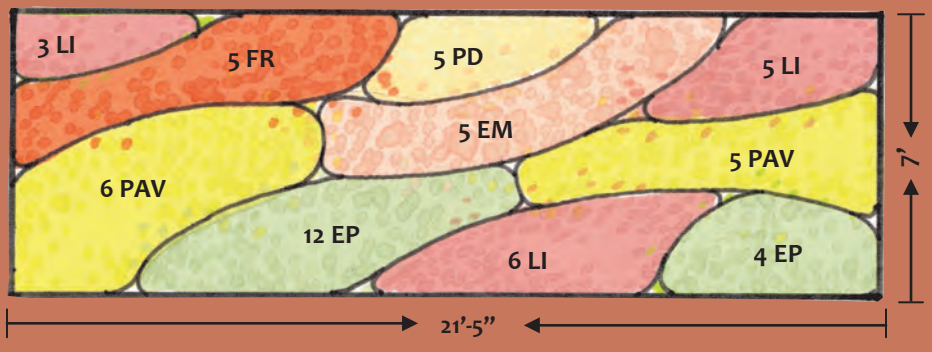


Sizing Chart

Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	4	21	6’ x 4’-6”
100	4	42	8’-6” x 6’-4”
150	6	64	18’-2” x 8’-3”
200	6	85	12’ x 9’
250	6	106	13’-5” x 10’

The Bold Color Garden - Sun

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest
EM	5	*Eupatorium maculatum*	Joe Pye Weed	4-6’	2-4’	Summer
FR	5	*Filipendula rubra*	Queen of the Prairie	4-5’	3-4’	Spring, Summer
LI	5	*Liatris aspera*	Blazing Star	2-3’	1-1.5’	Summer, Fall
PAV	11	*Panicum virgatum*	Switch Grass	3-6’	2-3’	Summer, Fall, Winter
PD	14	*Penstemon digitalis*	Foxglove Beard Tongue	3-5’	1.5-2’	Spring, Summer
SS	16	*Solidago speciosa*	Showy Goldenrod	2-3’	2-3’	Summer, Fall

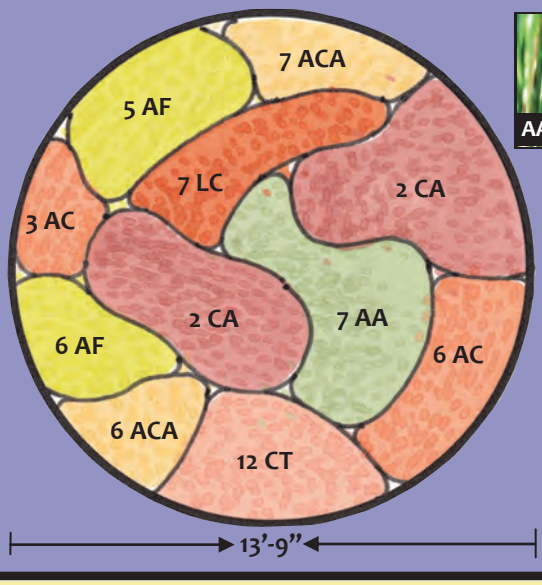


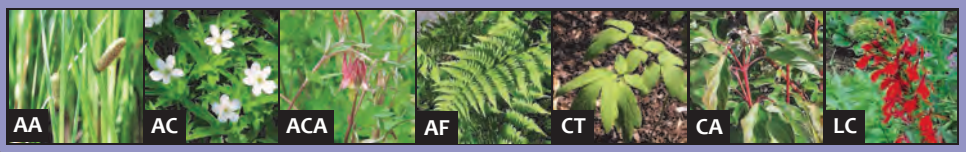
Sizing Chart

Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	3	19	5’ x 10’
100	5	37	16’-8” x 6’
150	7	56	21’-5” x 7’
200	7	75	25’ x 8’
250	7	93	20’ x 12’-6”

The Native Woodland & Wildlife Garden - Part Shade

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest
AA	7	*Acorus americanus*	Sweet Flag	3'	1.5-2'	Spring, Summer, Fall
AC	7	*Anemone canadensis*	Windflower	1-2'	2-2.5'	Spring
ACA	13	*Aquilegia canadensis*	Red Columbine	2-3'	1-1.5'	Spring
AF	11	*Athyrium filix-femina*	Lady Fern	2-3'	1-1.5'	Spring, Summer
CT	12	*Caulophyllum thalictroides*	Blue Cohosh	1-2'	0.5-1'	Summer
CA	4	*Cornus sericea*	Red Osier Dogwood	3-4'	3-4'	Spring, Summer, Fall
LC	7	*Lobelia cardinalis*	Cardinal Flower	2-4'	1-2'	Summer





Sizing Chart

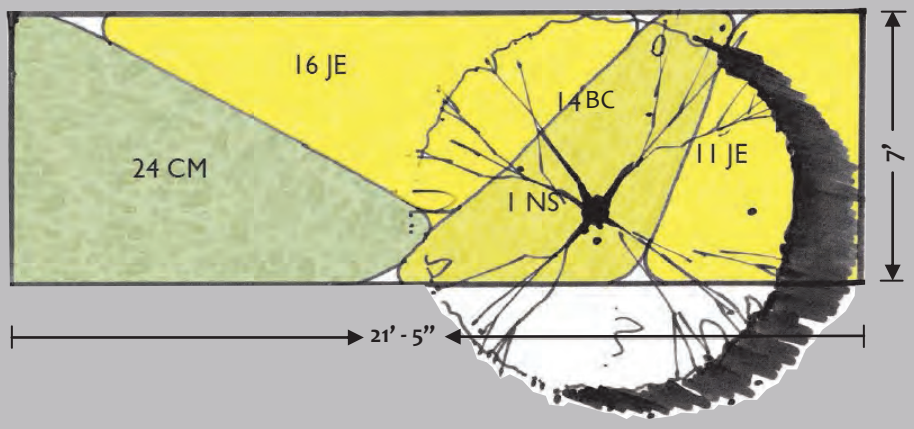
Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	3	20	8' Diameter
100	5	41	11'-4" Diameter
150	7	61	13'-9" Diameter
200	7	82	16' Diameter
250	7	103	17'-10" Diameter

Urban Curb-Cut Rain Garden - Sun/Part Shade

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest
BC	14	*Bouteloua curtipendula*	Sideoats Grama	1.5-2.5'	1.5-2'	Summer
CM	24	*Carex muskingumensis*	Variegated Palm Sedge	2-3'	2-3'	Spring, Summer, Fall
JE	27	*Juncus effusus*	Common Rush	2-3'	2-3'	Spring, Summer, Fall
NS	1	*Nyssa sylvatica*	Tupelo, Black Gum	35'	25'	Fall

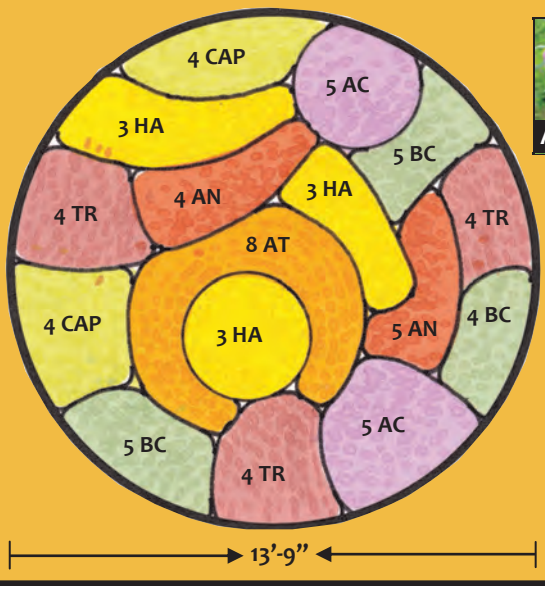
Sizing Chart

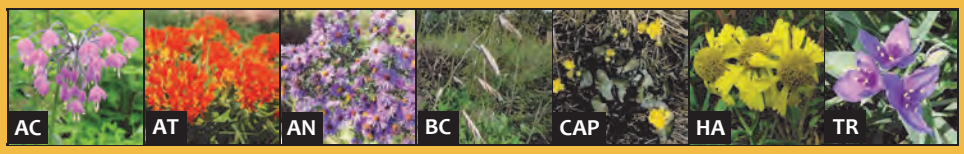
Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	2	19	5' x 10'
100	2 to 3	37	16'-8" x 6'
150	4	56	21'-5" x 7'
200	4	75	25' x 8'
250	4	93	20' x 12'-6"



The Children's Discovery Garden - Sun

Abr	Qty	Botanical Name	Common Name	Height	Spread	S. Interest
AC	20	*Allium cernuum*	Nodding Onion	1-3'	3-6"	Spring
AT	8	*Asclepias tuberosa*	Butterfly Plant	1-2.5'	1-1.5'	Summer
AN	7	*Aster novae-angliae*	New England Aster	18"	1.5-2'	Fall
BC	10	*Bouteloua curtipendula*	Sideoats Grama	1.5-2.5'	1.5-2'	Summer, Fall
CAP	8	*Caltha palustris*	Marsh Marigold	1-1.5'	1-1.5'	Spring, Summer
HA	9	*Helenium autumnale*	Sneezeweed	3-4'	2-3'	Summer, Fall
TR	12	*Tradescantia ohiensis*	Bluejacket	2-3'	1.5-2.5'	Spring, Summer





Sizing Chart

Sq Ft	Qty of Diff. Species	Total Plant Qty	Ex. Garden Dimensions
50	3	22	8' Diameter
100	5	45	11'-4" Diameter
150	7	68	13'-9" Diameter
200	7	90	16' Diameter
250	7	113	17'-10" Diameter

Rain Gardens Plants for Shade and Clay Soils

The following list of plants can tolerate clay/shade rain gardens. Some may even thrive in these conditions.

FERN	
Onoclea sensibilis	Sensitive Fern
Osmunda cinnamomea	Cinnamon Fern
GRASS	
Panicum virgatum	Switch Grass
PERENNIALS	
Aquilegia canadensis	Red Columbine
Caltha palustris	Marsh Marigold, Cowslip
Chelone ssp.	Turtlehead
Cimicifuga (Actaea)	Tall Bugbane
Iris versicolor	Blue Flag Iris
Lobelia cardinalis	Cardinal Flower
Lobelia spicata	Spiked Lobelia
Polemonium reptans	Jacob's Ladder

PERENNIALS Continued...	
Physostegia virginiana	Obedient Plant
Silene virginica	Fire Pink
Zizia aurea	Golden Alexander
SHRUBS	
Alnus rugosa	Speckled Alder
Aronia melanocarpa	Black Chokeberry
Cornus amomum	Silky Dogwood
Rhus aromatica	Fragrant Sumac
Salix discolor	Pussy Willow
Vaccinium corymbosum	Highbush Blueberry
TREES	
Acer rubrum	Red Maple
Carpinus caroliniana	Musclewood
Hamamelis virginiana	Witch hazel

Additional Resources

Visit the Northwestern Indiana Planning Commission website for rain garden educational materials as well as information about rain gardens: http:// nirpc.org/environment/water/what-you-can-do/rain-gardens.aspx.

Information on tree selection, tree planting, and care of young trees is available on the Indiana's Community and Urban Forestry Program's website: http://www.in.gov/dnr/forestry/2854.htm.

For more information on salt tolerant plants, consult the UW extension publication, "Winter Salt Injury and Salt-Tolerant Landscape Plants": http://pdf.countyofdane.com/myfairlakes/A3877.pdf.

For gardening information contact the Purdue Master Gardeners Program in Indiana (http://www.hort.purdue.edu/mg/) and University of Illinois Extension Master Gardeners (http://web.extension.illinois.edu/mg/) in Illinois to find your local extension unit.

For information on selecting native plants consult the following resources: Indiana Native Plant and Wildflower Society (www.inpaws.org) or Blue Thumb (www.bluethumb.org/plants).

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Wilson, L., and M. Gilbertson, *Adding a Rain Garden to Your Landscape*, bulletin 2702 of the Landscapes for Maine series. Orono, ME: University Maine Cooperative Extension, 2006

Plant Photo Credits

With permission, the rain garden plant list photos were primarily provided by the following individuals and organizations:

Knoll Gardens: http://www.knollgardens.co.uk/

Missouri Botanic Garden PlantFinder: www.mobot.org/gardeninghelp/plantfinder/Alpha.asp

Northwest Indiana Planning Commission

USDA, NRCS. The PLANTS Database, National Plant Data Center, Baton Rouge, LA 70874-4490 USA, 2007: http://plants.usda.gov

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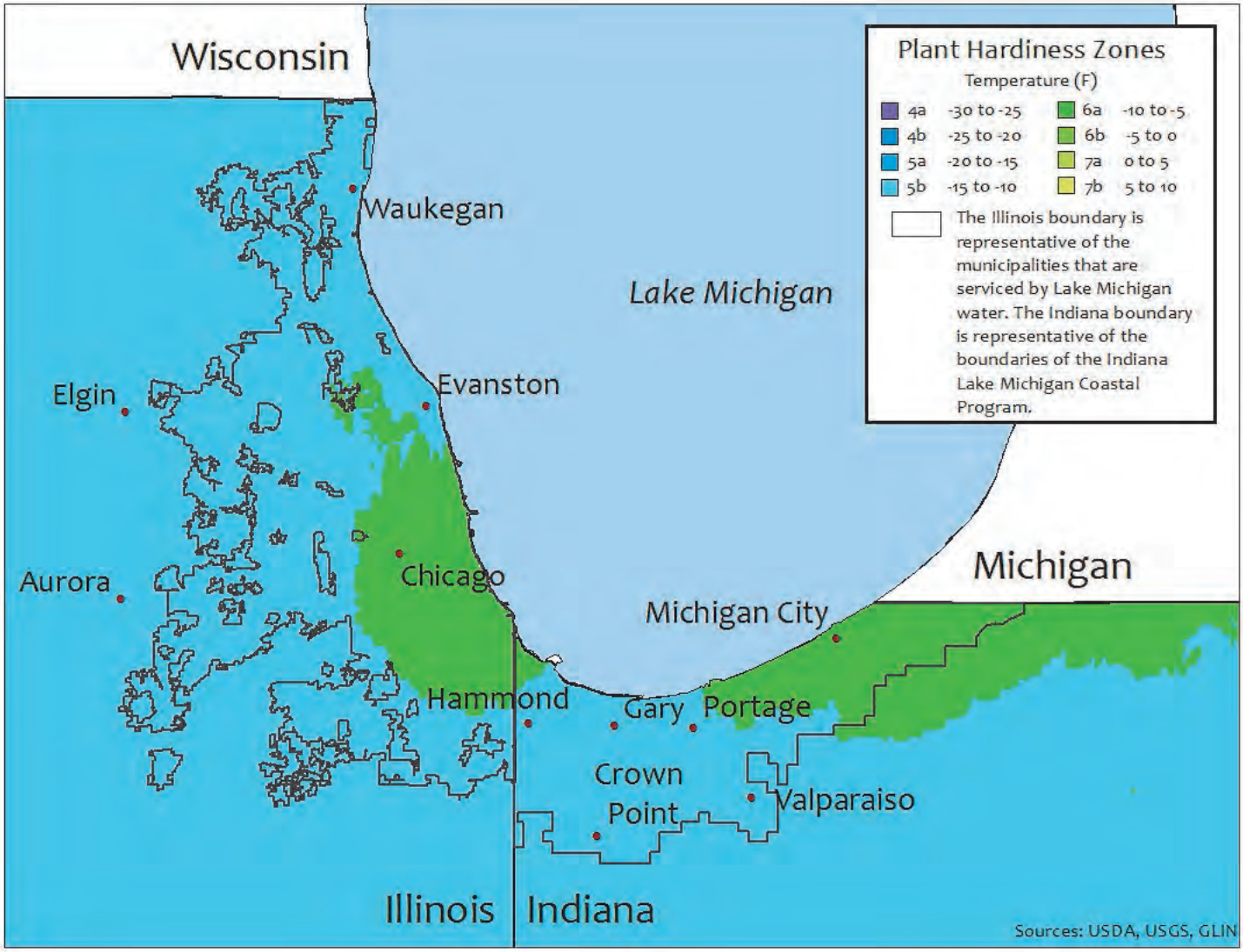

Lawn to Lake

Lawn to Lake is a collaborative program to protect water resources in the Great Lakes region by promoting healthy lawn and landscape practices. With funding from the U.S. EPA Great Lakes Restoration Initiative, partners are coordinating a pollution prevention campaign addressing the needs of those responsible for lawn and landscape care in the Southern Lake Michigan basin. Visit www.lawntogreatlakes.org.

Illinois-Indiana Sea Grant

Illinois-Indiana Sea Grant (IISG) is one of 32 college programs nationwide, and is dedicated to conducting research, education, and outreach to serve Lake Michigan's southern coast. With its mandate to bring the latest university-based science to those who need it, IISG brings together scientists, educators, policy makers, community decision makers, outreach specialists, business leaders, and the general public to work towards a sustainable environment and economy. Visit www.iiseagrant.org.

Purdue University Calumet

Purdue University Calumet, a vital part of Purdue University and the leading post-secondary institution in the Calumet region, is a comprehensive, public university in the land grant tradition offering educational programs of excellence focused on the professional, general educational, and lifelong learning needs of the people of the Calumet region. See www.purduecal.edu for more information.

Northwestern Indiana Regional Planning Commission

NIRPC is a regional council of local governments serving the citizens of Lake, Porter, and LaPorte counties in Northwest Indiana. NIRPC provides a forum that enables the citizens of Northwest Indiana to address regional issues relating to transportation, the environment, and community and economic development. NIRPC has developed a 2040 regional comprehensive plan for the northwestern Indiana region providing vision and implementation actions. Visit http://www.nirpc.org.

University of Illinois Extension

University of Illinois Extension is the flagship outreach effort of the University of Illinois at Urbana-Champaign, offering educational programs to residents of all of Illinois' 102 counties — and far beyond. Through learning partnerships that put knowledge to work, U of I Extension's programs are aimed at making life better, healthier, safer, and more profitable for individuals and their communities. See web.extension.illinois.edu/state for more information and urbanext.illinois.edu/lawntalk for more information on lawn care.

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