

Rain gardens...nature's way to control runoff pollution

OUTLINE

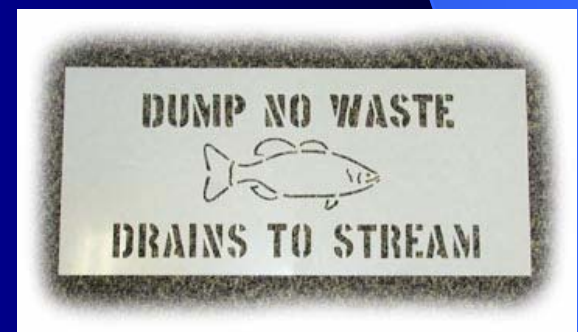
- Background information
- Long-term benefits
- Myths
- Installation steps
 - Site selection considerations:
erosion problem, soils, microclimate, etc.
 - Native plants > why?
 - Plant lists
 - 10 steps to follow for success
- Techniques/example sites
- Handouts/references
- Questions?



Patrick Goggin - County Conservationist
Vilas County
Land and Water Conservation Department

Problem of polluted runoff

- Excess lawn & garden fertilizer
- Yard waste
- Sediment
- Lawn & garden pesticides & herbicides
- Animal waste draining into water resources



Polluted runoff impacts

- These substances find their way into the state's waterways & groundwater producing a wide range of problems negatively affecting water quality
- Ultimately impact our health & economic well-being



Quantity/quality of runoff is problem



- Polluted runoff from house rooftops, lawns, and driveways cause excessive weeds, turbid water, a build-up of sediments, and beach closures
- Might cause a loss of stream & lake habitat
- Can reduce base flows
- Negative effect on wetlands
- It is expensive to address these impacts

Why build a rain garden?

- Water that soaks in through a RG replenishes groundwater and helps prevent flooding
- A RG protects water quality by trapping sediment, fertilizers and other pollutants
- RG need no additional fertilizer and little if any pesticides
- Native plants in RG provide food and shelter for butterflies, songbirds, and other wildlife

Rain garden > definition



- Relatively small planted area near drain spout of a house or building or by a paved area (such as a driveway).
- Rain gardens are shallow depressions (3-4 inches to two feet) planted with native wildflowers and other plants that soak up rainwater or melted snow from your rooftop, driveway and lawn. The gardens allow water to infiltrate into the soil rather than becoming runoff.
- A rain garden can soak up to 30% more water than a traditional lawn. This helps to protect the quality of water downstream by preventing runoff from getting to the storm drains and helps reduce the chances of local flooding.

Rain gardens

- Provide an easy, natural way of reducing the amount of water that flows from rooftops, lawns, and driveway
- Runoff captured in a rain garden helps restore the natural infiltration
- A property might need more than one rain garden to capture and filter runoff effectively
- A few inches of runoff in a 10' by 12' rain garden will soak in within hours



Types of rain gardens

➤ Ponding area



➤ Vegetated buffer strips



Maplewood, Minnesota (near St. Paul)
Rain gardens installed by city as part of street replacement project

Long-term benefits

- Requires only occasional weeding and little other maintenance
- Can be a deterrent to flash flooding and drainage problems
- Helps protect streams and lakes from damaging flows and reduces erosion of the stream banks and lakeshores
- Reduces the need for costly municipal storm water treatment structures
- Helps to sustain adequate flows in streams during dry spells
- Attracts wildlife like birds, butterflies, and amphibians
- Provides an attractive addition to a property and neighborhood
- Helps recharge and renew local neighborhood groundwater



Myth / reality

- **Myth 1: - Isn't making a rain garden in my yard hard?**

Reality > Wrong--simply dig a shallow depression and plant with native perennials

- **Myth 2: - Don't rain gardens attract a lot of mosquitoes/provide a breeding ground?**

Reality > No. Mosquitoes need 7 to 12 days to lay and hatch eggs, and standing water in the rain garden will last for a few hours after most storms. Mosquitoes are more likely to lay eggs in bird baths, storm sewers, lawns, old tires, tin cans, or other debris laying about than in a sunny rain garden area. There is rarely standing water long enough for mosquito reproduction in a well-designed rain garden.

- **Myth 3: - I can't create a rain garden that doesn't look too wild or messy.**

Reality > The way to make a rain garden, or any garden, appear '*well kept*' is to keep the edges tidy. Tall plants and grasses tend to "flop-over" so if you want a neat silhouette, stick to shorter herbaceous species.

- **Myth 4: - Won't the water-tolerant plants in a rain garden die during a dry spell?**

Reality > Native plants can withstand a range of weather conditions. Native plants that do well in poorly drained soil will be fine during dry weather.

Myth / reality

- **Myth 5: - A rain garden needs to be huge in order to be worthwhile.**
Reality > Any water that seeps into the ground instead of running into a storm sewer helps water quality and is effective. A rain garden of any size has a positive impact.
- **Myth 6: - Doesn't a rain garden form a big pond?**
Reality > No. The rain water will soak in so the rain garden is dry between rainfalls (Note: some rain gardens can be designed to include a permanent pond if desired).
- **Myth 7: - Rain gardens require a lot of maintenance.**
Reality > rain gardens can be maintained with little effort after the plants are established. Some weeding and watering will be needed in the first two years, and perhaps some thinning in later years as the plants mature.
- **Myth 8: - Rain gardens are expensive.**
Reality > They don't have to be expensive. A family and a few friends can provide the labor. The main cost will be purchasing the plants, and even this cost can be minimized by using some native plants that might already exist in the yard or received from a friendly neighbor.

Ten steps to successful rain garden

- Feasibility
- Location
- Shape
- Size
- Cost estimate
- Site preparation/installation
- Planting plan design
- Plant layout
- Getting plant material/plant it
- Maintenance



Step 1: Feasibility



- Will a rain garden effectively abate my erosion control problem?
- Do I have the means and resources to complete the project?

Step 2: Location

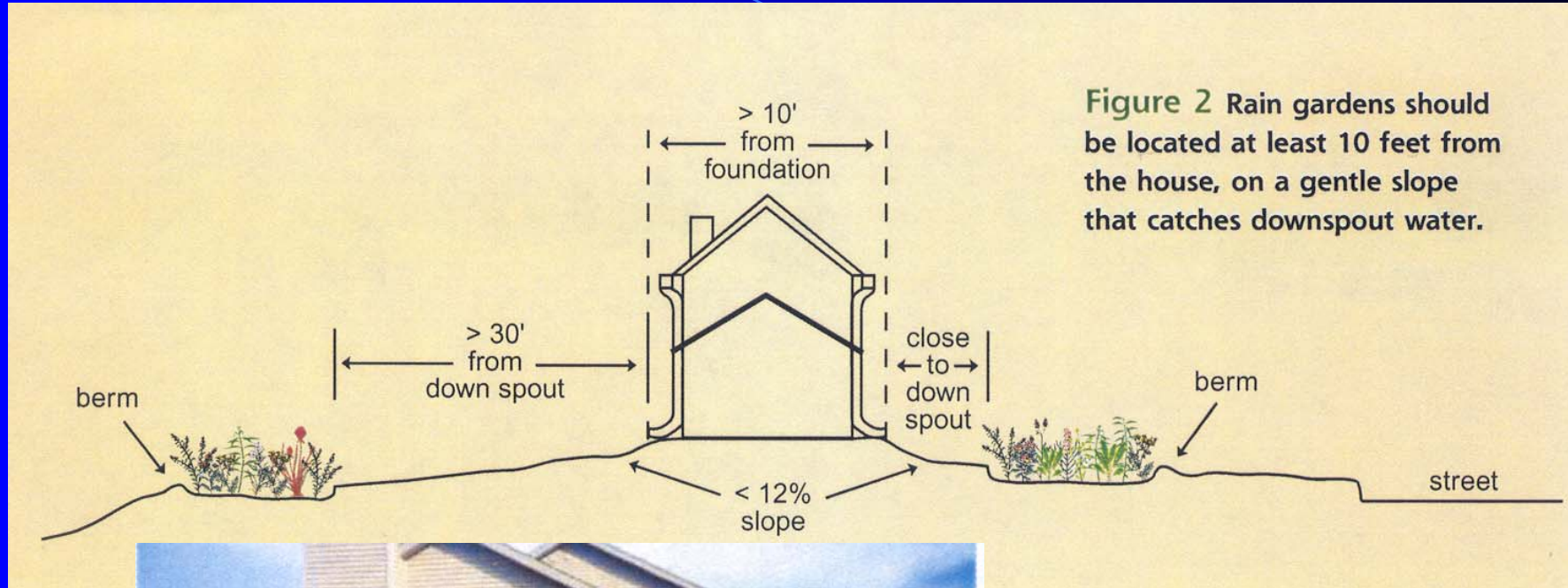


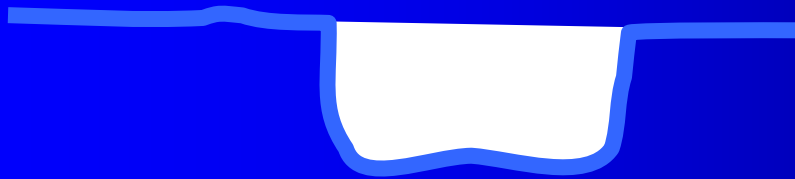
Figure 2 Rain gardens should be located at least 10 feet from the house, on a gentle slope that catches downspout water.



Location - important points

- The rain garden should be at least 10 feet from the house so infiltrating water does not seep into the foundation.
- Do not place the rain garden directly over a septic system.
- It may be tempting to put the rain garden in a part of the yard where water already ponds. Don't! The goal of a rain garden is to encourage infiltration, and your yard's wet patches show where infiltration is slow.
- It is better to build the rain garden in full or partial sun, not directly under a big tree; consider the location as it relates to existing and future landscaping—for example, pay attention to views of it from the house, deck or patio.
- Putting the rain garden in a flatter part of the yard will make digging much easier. For example, a rain garden 10 feet wide on a 10% slope must be 12 inches deep to be level, unless you import topsoil or use cut and fill.
- Before you start digging call Digger's Hotline at 1-(800)-242-8511.

Rain garden depth



Balance Between Depth and Surface Area

- Minimize drain time - less than 1 day.
- Minimize digging.
- Suggest depths between 3 to 8 inches

Selection of rain garden depth - slope very important

- Slope < 4% = 3 to 5 inches deep
- Slope of 5 to 7 % = 6 to 7 inches deep
- Slope of 8 to 12 % = about 8 inches deep
- Slope > 12 % suggest another site

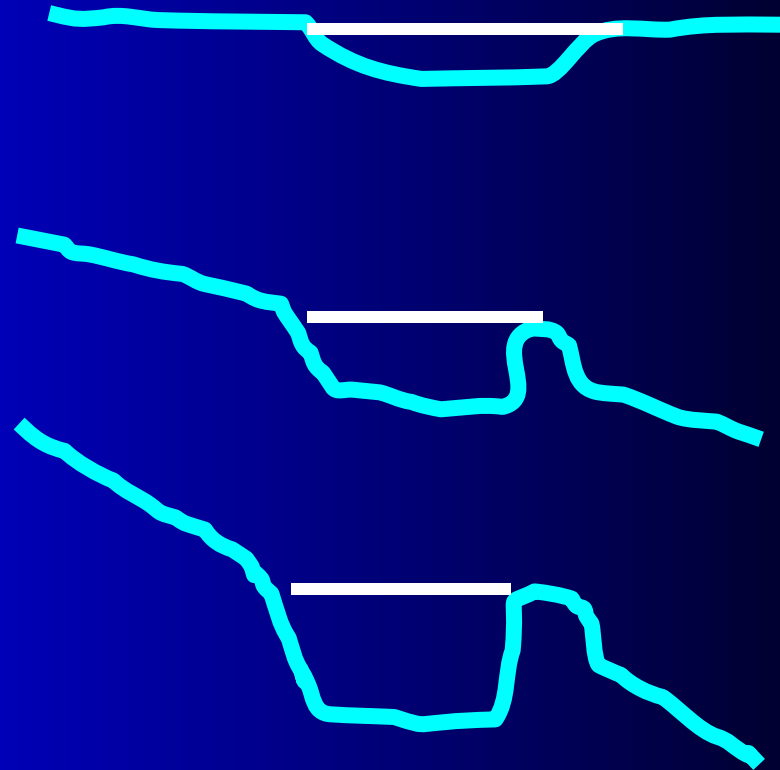
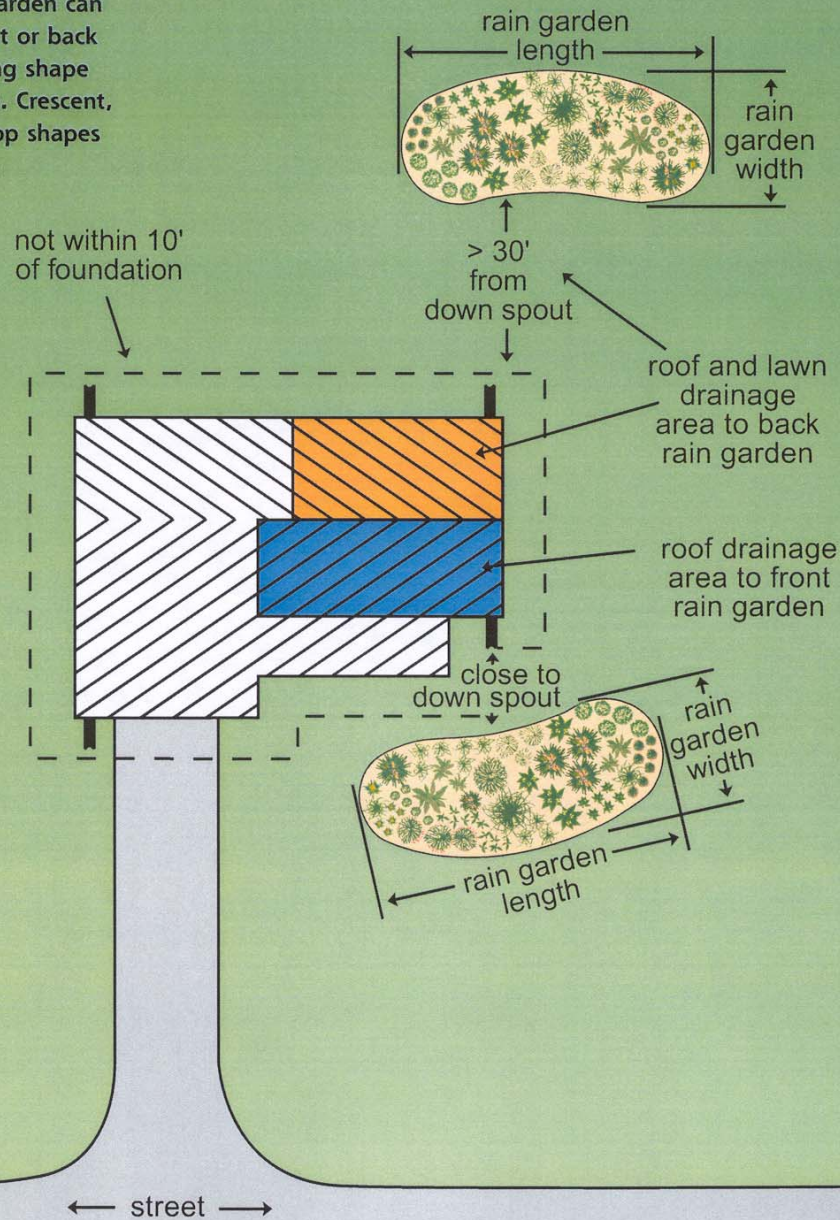


Figure 1 A rain garden can be built in the front or back yard. Pick a pleasing shape for the rain garden. Crescent, kidney, and teardrop shapes seem to work well.



Step 3: Choosing the shape

- Crescent
- Kidney
- Teardrop

Step 4: Size estimation

- Rain gardens require less space than one might expect
- A rain garden's optimum area is 10 to 25% of the contributing impervious surface's area
- That means that an effective rain garden only needs to be one-tenth the size of your roof!
- Establishing this 100% runoff goal helps compensate for any errors that might creep into the design and construction
- The rain garden can be up to 30% smaller and still control almost 90% of the annual runoff



- See pages 8 and 10 of "*Rain gardens how to manual for homeowners*" for more information on sizing

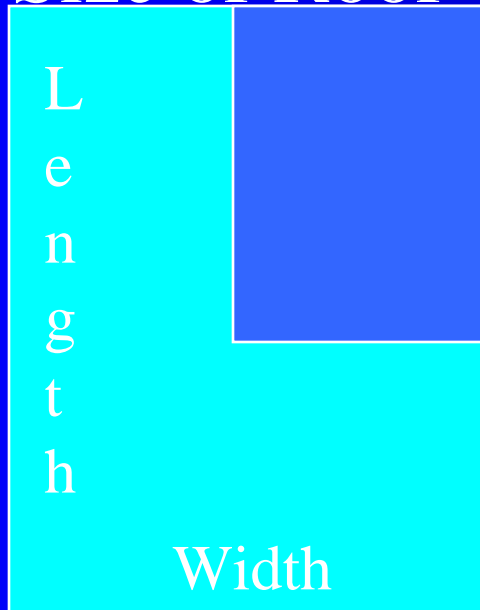
Size estimation - important points

- The surface area of the rain garden can be almost any size, but time and cost will always be important considerations in sizing decisions.
- A typical residential rain garden ranges from 100 to 300 square feet.
- A typical rain garden is between four and eight inches deep.
- The size of the rain garden will depend on: how deep the garden will be in the end; what type of soils the garden will be planted in; and how much roof and/or lawn will drain to the rain garden area.



Calculation of drainage area

Size of Roof



Example calculation:

- Length = 100 feet
- Width = 20 feet
- $L \times W = 2000$ sq feet
- 2000 sq. ft. / 4 = 500 square feet

Step 5: Cost estimate tips

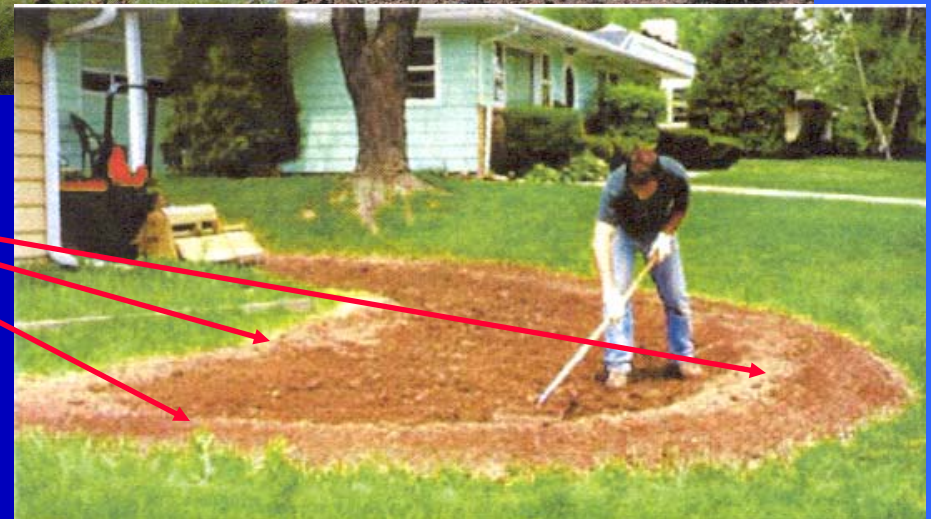
- The following costs may not apply to all rain gardens.
- The cost will vary depending on how much work you do yourself and the types of plants you want. (Native plants are cheaper than ornamentals and they are more beneficial for the local wildlife).
- A rain garden will cost ~\$3-\$5.00 per square foot if the landowner does all the work plus purchasing the plant material; if a landscaper does everything, it will cost ~\$10-\$12.00 per square foot.

Construction	\$3.00/ sq. ft.
Design	\$1.00/ sq. ft.
Planting	\$3.00-\$4.00/ sq. ft.
Plant material	\$2.5-\$4.5/ sq. ft.
Total costs	\$11.00-\$13.00/ sq. ft.

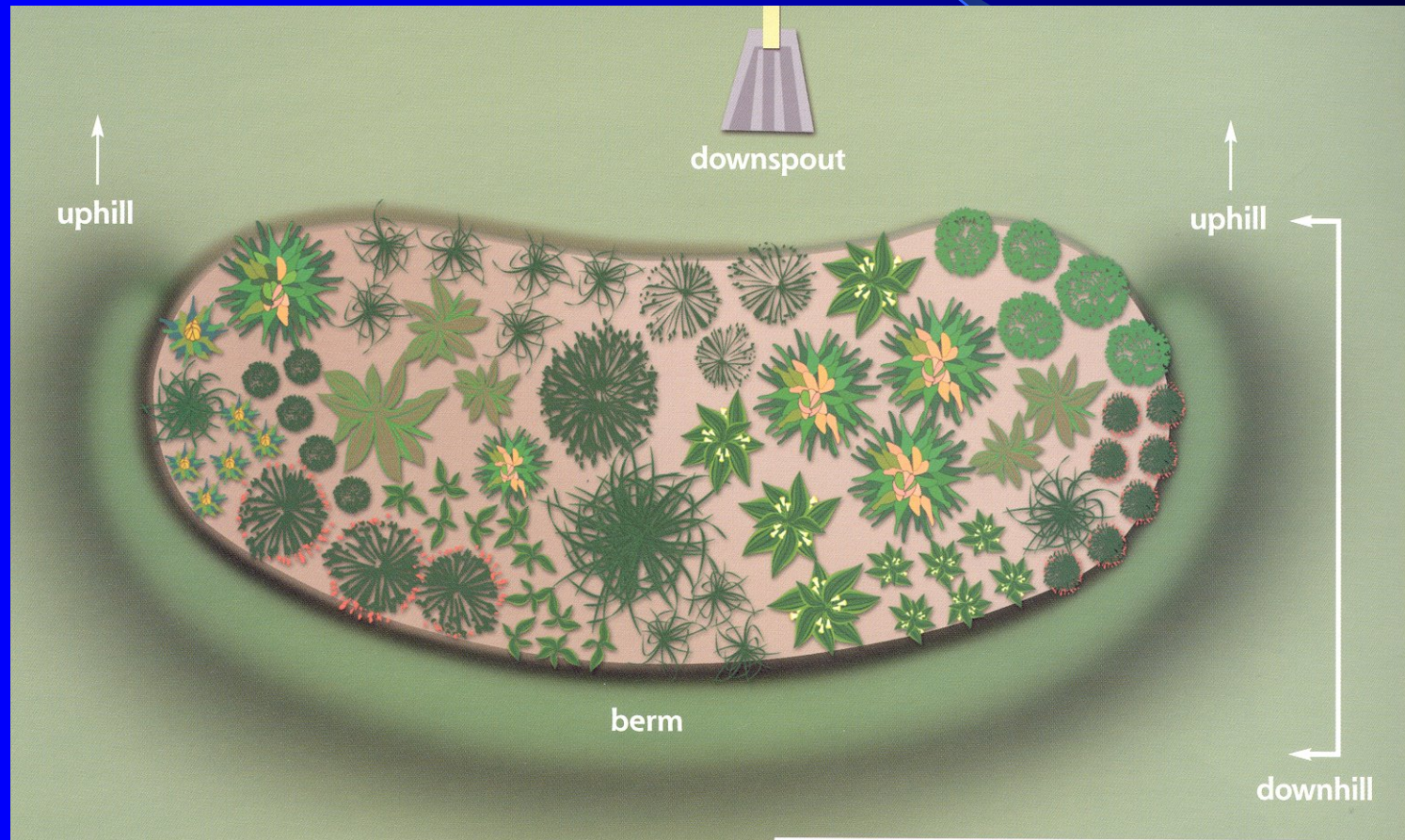
*Cost tips are courtesy of Roger Bannerman of the Wisconsin Department of Natural Resources

Step 6: Site preparation/installation

- Depth is a key part of proper preparation and installation
- A typical rain garden is between 4" and 8" deep
- No matter what the depth of the rain garden, the goal is to keep the garden level
- Digging a very shallow rain garden on a steep lawn will require bringing in extra topsoil to bring the down-slope part of the garden up to the same height as the up-slope part
- A berm [low "wall" around three sides of the rain garden that holds water in during a storm event] is critical to a successful rain garden--see pages 7 and 14 of "*Rain gardens how to manual for homeowners*" for more information on site prep



Step 6: Site preparation/installation





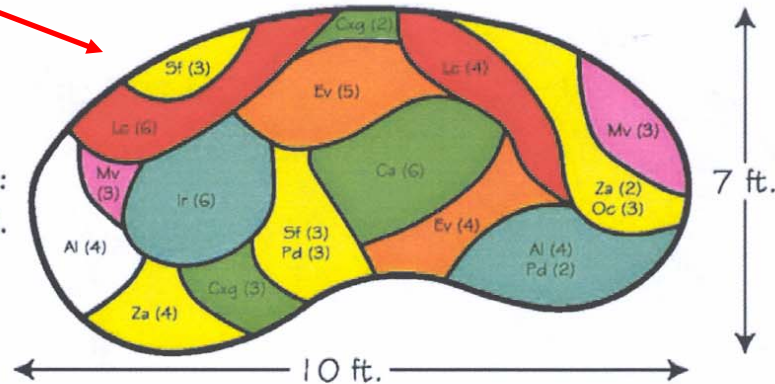
Step 7: Planting plan design

Rain garden diagram

Plant symbol

10 feet wide;
full to partial
shade with silty
& sandy
soils

Total Area:
70 sq. ft.



Scientific
plant name

Symbol	Species Name	Common Name	No. of Plants
Al	<i>Aster lateriflorus</i>	Side-flowering aster	8
Ca	<i>Campanula americana</i>	Tall bellflower	6
Cxg	<i>Carex Grayii</i>	Bur sedge	5
Ev	<i>Elymus virginicus</i>	Virginia wild rye	9
Ir	<i>Iris virginica-shrevei</i>	Wild blue flag iris	6
Lc	<i>Lobelia cardinalis</i>	Cardinal flower	10
Mv	<i>Mertensia virginica</i>	Virginia bluebells	6
Oc	<i>Osmunda claytoniana</i>	Interrupted fern	3
Pd	<i>Phlox divaricata</i>	Woodland phlox	5
Sf	<i>Solidago flexicaulis</i>	Zig zag goldenrod	6
Za	<i>Zizia aurea</i>	Golden Alexander	6
Total Plants Needed			70

Common
plant
name

How many plants
of each?

Using native plants > why?

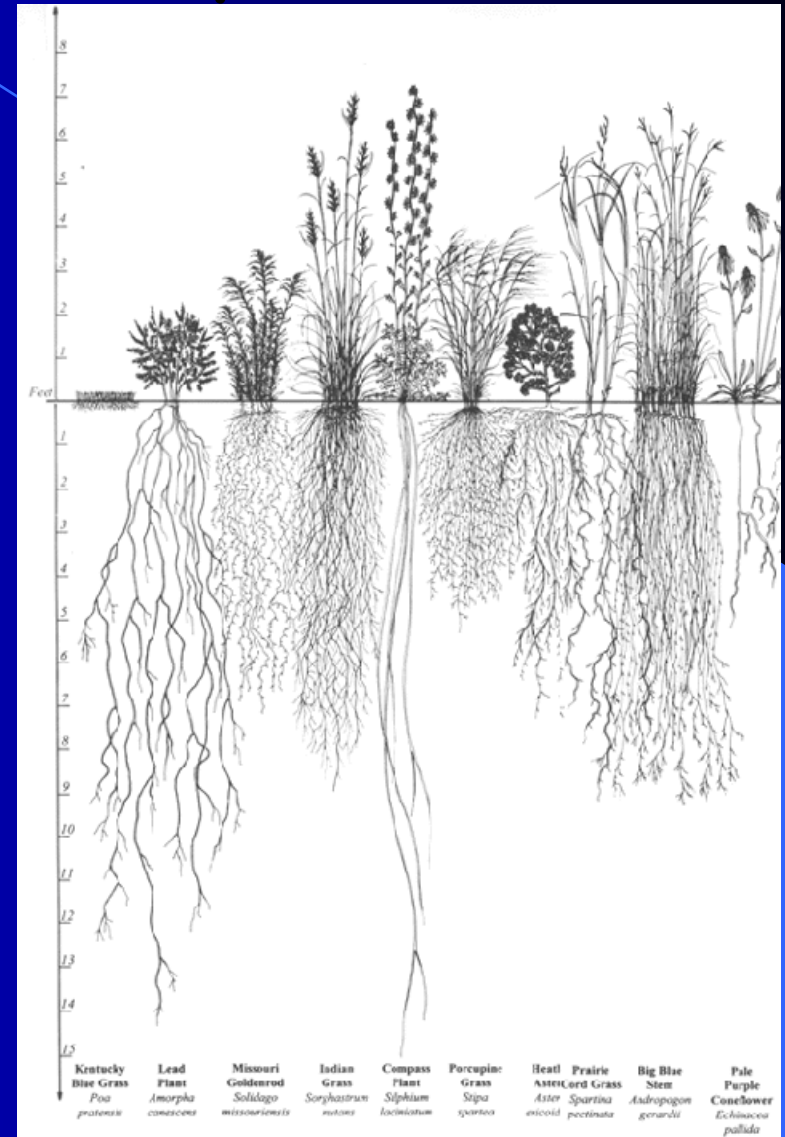
Native plant gardens:

- increase biodiversity;
- provide habitat for a wide variety of creatures such as birds, amphibians, and butterflies;
- native plants are sensitized to area climatic conditions;
- provide a home for many native plants that are becoming increasingly rare in the wild;
- require little maintenance; and
- eliminate the need for chemical inputs such as pesticides, herbicides and fertilizers.



Using native plants > why? [continued]

- With roots growing down twice as deep as the plants are tall, native plants are very efficient at absorbing water
- Each year ~one-third of the roots die providing deep tunnels overtime for water to filter into the ground

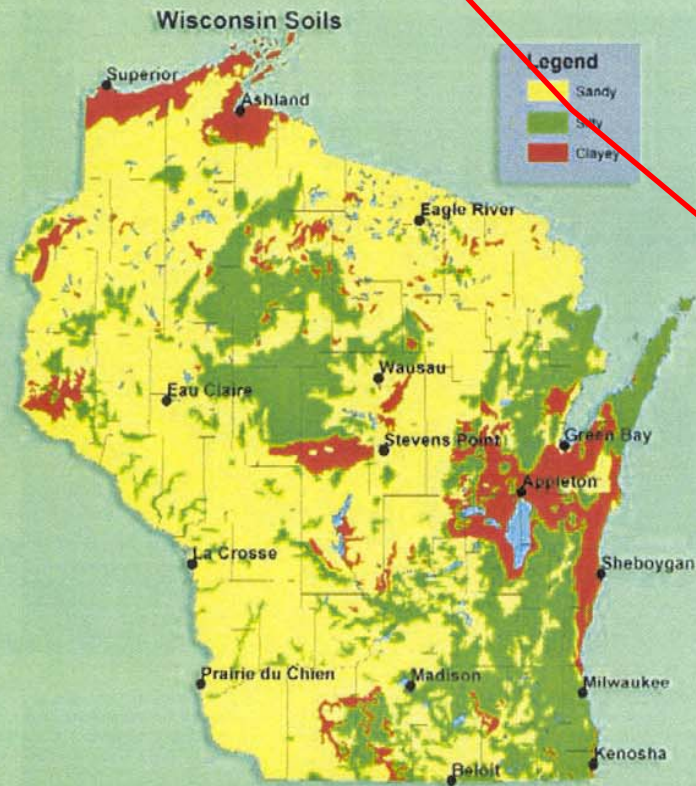


Root Systems of Prairie Plants

Soils

- Mini perk test
- Ribbon test

- A blend of 20% organic matter, 50% sandy soil, and 30% topsoil is an optimal mix
- Ph 5.5 to 6.5 is best



Simple soil tests

Two small tests can ensure your soil can handle a rain garden:

- Dig a hole about 6 inches deep where the rain garden is to go and fill the hole with water. If the water takes more than 24 hours to soak in, the soil is not suitable for a rain garden.
- Take a handful of soil and dampen it with a few drops of water. After kneading the soil in your fingers, squeeze the soil into a ball. If it remains in a ball, then work the soil between your forefinger and thumb, squeezing it upward into a ribbon of uniform thickness. Allow the ribbon to emerge and extend over the forefinger until it breaks from its own weight. If the soil forms a ribbon more than an inch long before it breaks, and it also feels more smooth than gritty, the soil is not suitable for a rain garden.



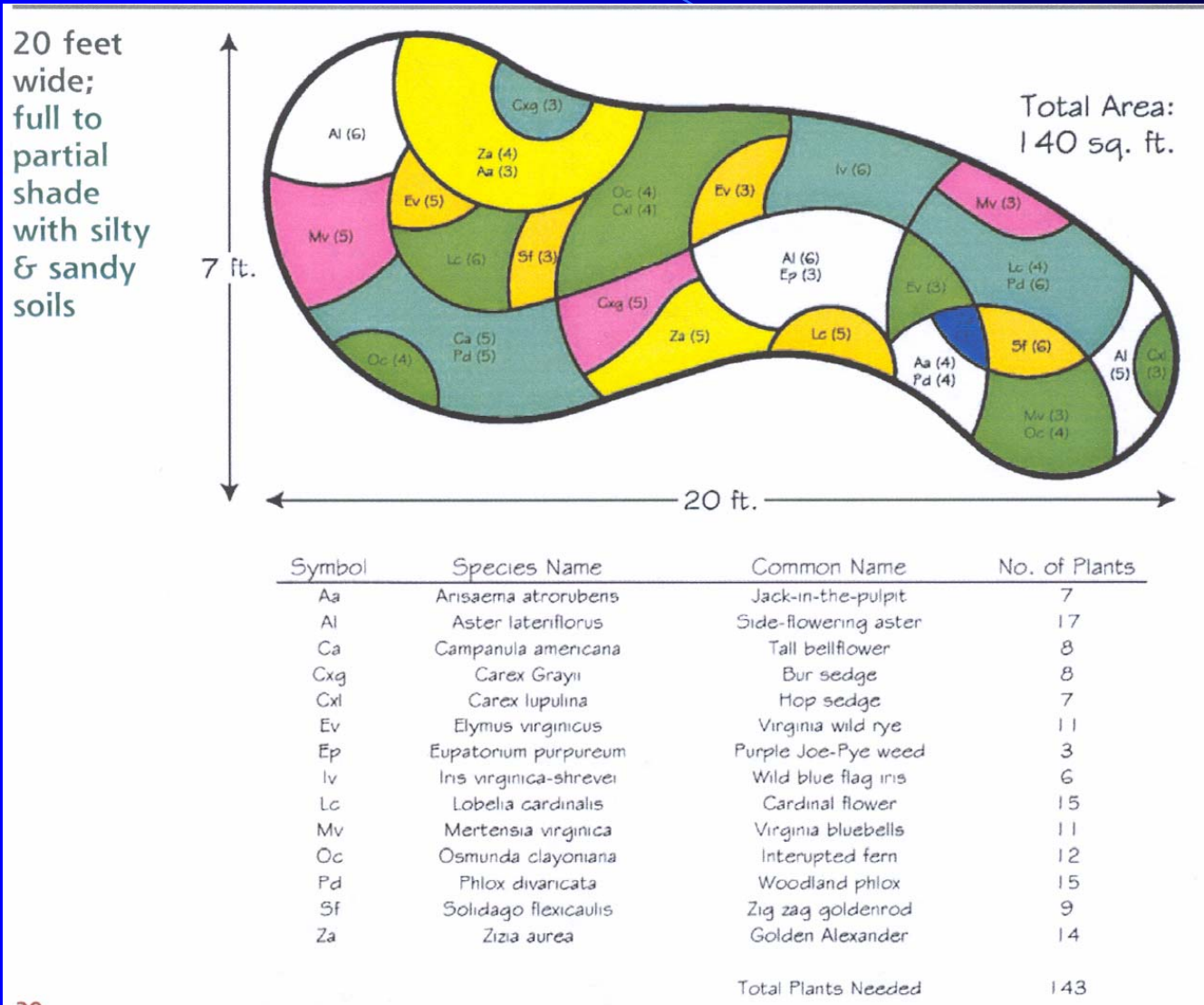
The map is a starting point for assessing what type of soils you might find in your yard. However, the soil on a small plot of a yard can be very different from the soils indicated on the map. Use the simple soil test described here for a more accurate representation of the soils in the possible rain garden location. More information about sampling and testing lawn and garden soils can be obtained at county UW-Extension offices.

Importance of soil type

The higher the infiltration rate the smaller the rain garden surface area

- Infiltration rate of sandy soils: 2.5 in/hr
- Infiltration rate of silty soils: 0.5 in/hr
- Infiltration rate of clayey soils: 0.3 in/hr

7' X 20' silty/sandy soils design



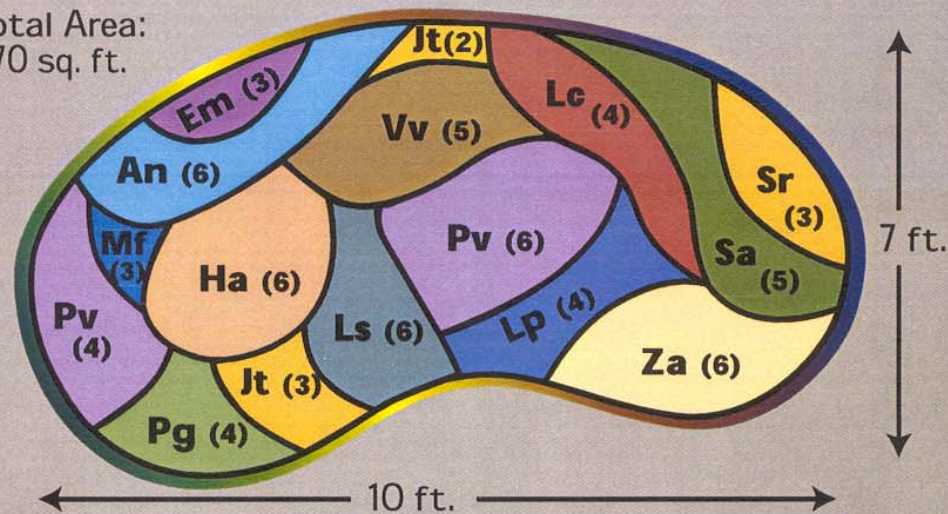
Well-drained, sandy soils design

Shown here are two suggested Rain Garden layouts, depending upon your soil type. The abbreviation of each species name is followed (in parentheses) by a recommended quantity you should install for best results. As you purchase your native plants, check (✓) the boxes provided below to be sure you've got them all for maximum Rain Garden beauty!

RAIN GARDEN: Well-Drained to Sandy Soils



Total Area:
70 sq. ft.



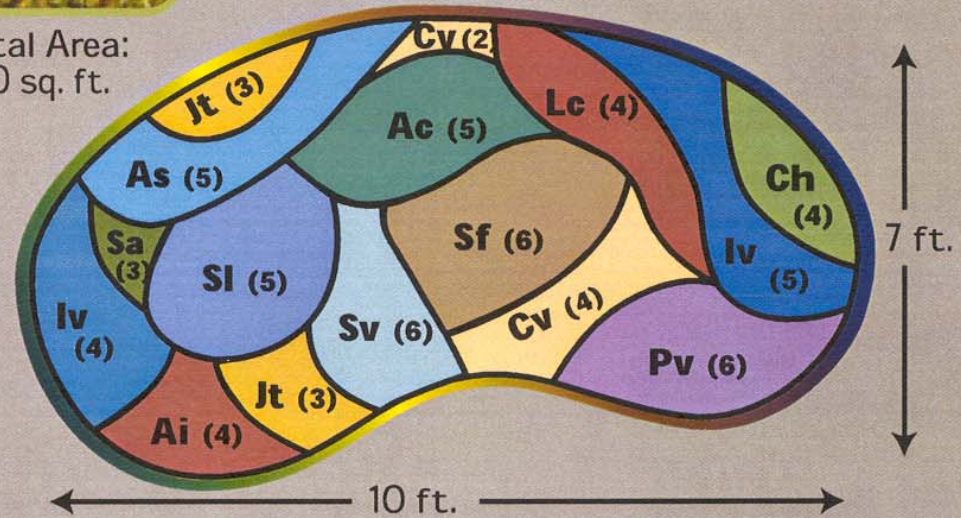
Abbrev.	Common Name	Species Name	No. of Plants	Shopping List	Abbrev.	Common Name	Species Name	No. of Plants	Shopping List
An	New England aster	<i>Aster novae-angliae</i>	6	<input type="checkbox"/>	Pg	Marsh phlox	<i>Phlox glaberrima</i>	4	<input type="checkbox"/>
Em	Spotted Joe-Pye weed	<i>Eupatorium maculatum</i>	3	<input type="checkbox"/>	Pv	Mountain mint	<i>Pycnanthemum virginianum</i>	10	<input type="checkbox"/>
Ha	Sneezeweed	<i>Helenium autumnale</i>	6	<input type="checkbox"/>	Sa	Green bulrush	<i>scirpus atrovirens</i>	5	<input type="checkbox"/>
Jt	Torrey's rush	<i>Juncus torreyi</i>	5	<input type="checkbox"/>	Sr	Stiff goldenrod	<i>Solidago rigida</i>	3	<input type="checkbox"/>
Lp	Prairie blazing star	<i>Liatris pycnostachya</i>	4	<input type="checkbox"/>	Vv	Culver's root	<i>Veronicastrum virginicum</i>	5	<input type="checkbox"/>
Lc	Cardinal flower	<i>Lobelia cardinalis</i>	4	<input type="checkbox"/>	Za	Golden Alexander	<i>Zizia aurea</i>	6	<input type="checkbox"/>
Ls	Great blue lobelia	<i>Lobelia siphilitica</i>	6	<input type="checkbox"/>					
Mf	Wild bergamot	<i>Monarda fistulosa</i>	3	<input type="checkbox"/>					
								Total Plants Needed	70

Clay soils design

RAIN GARDEN: Clay Soils



Total Area:
70 sq. ft.



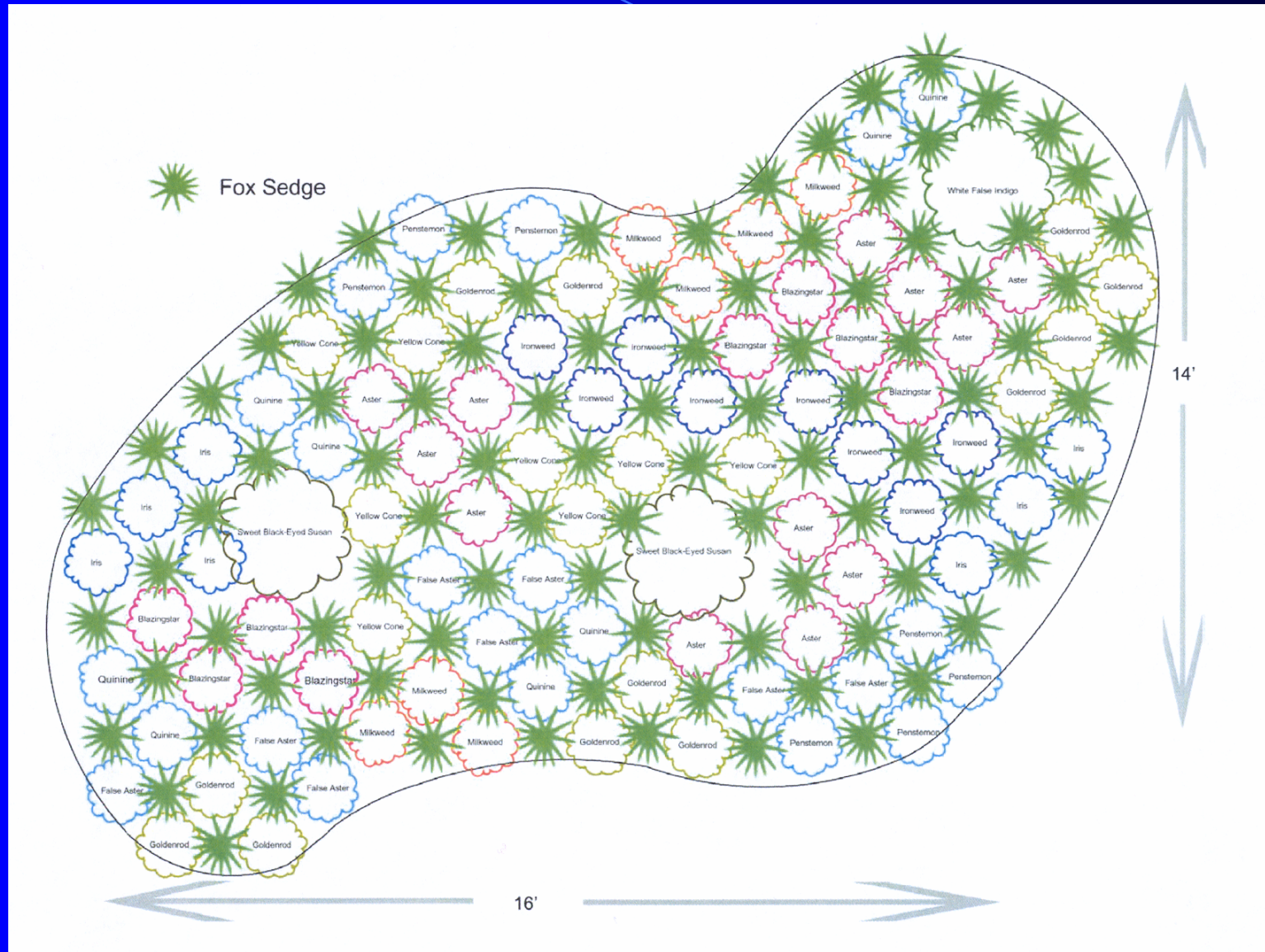
Abbrev.	Common Name	Species Name	No. of Plants	Shopping List	Abbrev.	Common Name	Species Name	No. of Plants	Shopping List
Ac	Sweet flag	<i>Acorus calamus</i>	5	<input type="checkbox"/>	Jt	Torrey's rush	<i>Juncus torreyi</i>	6	<input type="checkbox"/>
Ai	Swamp milkweed	<i>Asclepias incarnata</i>	4	<input type="checkbox"/>	Lc	Cardinal flower	<i>Lobelia cardinalis</i>	4	<input type="checkbox"/>
As	Water plantain	<i>Alisma subcordatum</i>	5	<input type="checkbox"/>	Pv	False dragon's head	<i>Physostegia virginiana</i>	6	<input type="checkbox"/>
Ch	Bottle brush sedge	<i>Carex hystricina</i>	4	<input type="checkbox"/>	Sl	Arrowhead	<i>Sagittaria latifolia</i>	5	<input type="checkbox"/>
Cv	Fox sedge	<i>Carex vulpinoidea</i>	6	<input type="checkbox"/>	Sa	Green bulrush	<i>Scirpus atrovirens</i>	3	<input type="checkbox"/>
Iv	Wild blue flag iris	<i>Iris virginica shrevei</i>	9	<input type="checkbox"/>	Sf	River bulrush	<i>Scirpus fluviatilis</i>	6	<input type="checkbox"/>
					Sv	Soft-stemmed bulrush	<i>Scirpus validus</i>	6	<input type="checkbox"/>
Total Plants Needed								69	

Step 8: Planting layout

- Species compartmentalized
- Spacing ~12" to 18" apart depending on species
- Use species of various colors, wildlife value, and bloom times [early spring to late summer]



Planting layout > example



Step 9: Getting plant material/plant it

- Green side up
- Water immediately and apply a good layer of weed-seed free mulch
- Seed can work too
- Neighbors and friends can help
- Takes only a couple of hours
- Plugs work best, but you can start your own plants from seed, use smaller seedlings, or transplant mature plants—it depends on how much money you want to spend, the time of year in which the work is undertaken, and current weather conditions











Step 10: Minor maintenance

- Initial watering may be required and weeding until plant material becomes established
- The best way to knock back weeds and stimulate most native plants is to burn off dead plant material periodically; however, burning is banned in many municipalities—mowing vegetation at a height of 6" can work too—rake up and compost the clippings



Potential sites

- Residential construction
- Existing lots
- Businesses
- Schools
- Urban areas
- Along streets / curbs



Edgewood College: culvert release example



Downspout with pool example

Early after planting



Later after planting



Culvert release example

Before



Prep



Culvert release example

Planting



Mulch



Final



Edgewood College: exposed slope example

Before



Layout > note terraces



Example
2:
exposed
slope

After with
planting



Madison area residential: downspout example

Layout



Site preparation



Madison area residential: downspout example

Planting layout



Completed planting -
note spacing



Madison area residential: downspout example

2-years
later



Madison area residential: wet pond



- Avoid basement flooding
- Focus water flow to designated area

Downspout example

Mini retaining wall



Mini retaining wall in front of a small business

Downspout example



Tips for designing an attractive rain garden

- When choosing native plants for the garden, consider the height of each plant, bloom time and color, the wildlife it attracts, and its overall texture.
- Try incorporating a diverse mixture of sedges, rushes, and grasses with your flowering species.
- Consider enhancing your rain garden by using local or existing stone, a trail addition, garden benches, or additional wildflower plantings.



A rain barrel is used to collect rooftop runoff using a gutter/downspout system

Tips for a productive rain garden

- A rain garden is not a prairie—focus on using wildflowers versus grasses, although some grasses can be used
- Tell landowners to ask friends to help plant—a few people helping plant for an hour can cover a lot of ground
- In the weeks following installation of plants, weed out dandelions and other weeds until garden plants become established
- Leave dead or dormant plants standing overwinter—these plants provide cover and food for wildlife—cut back dead vegetation in spring
- Installation of a rain garden is slightly more work than a comparable area of lawn, but maintenance is low once plants mature

















High Lake – Vilas County







TFT rain garden



Rain gardens - conclusion

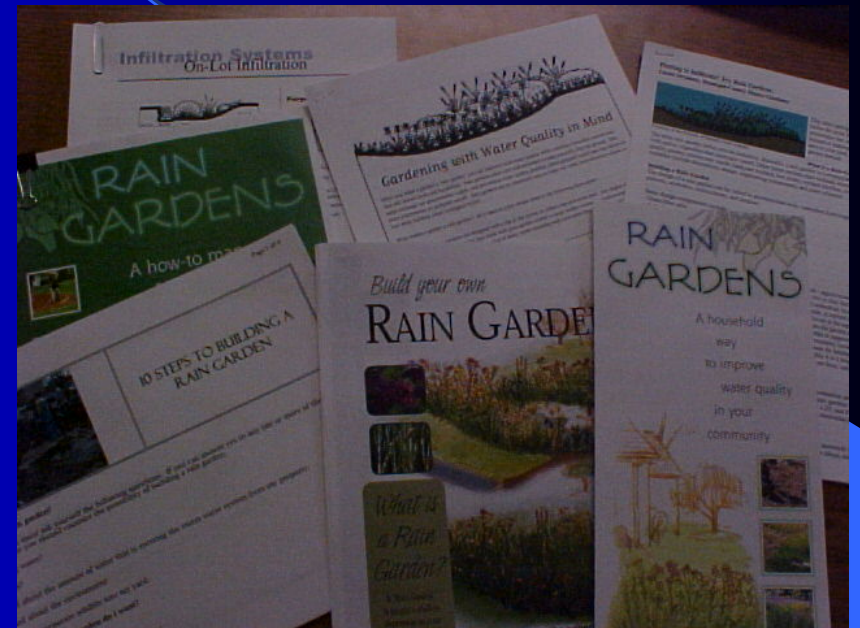
- By reducing stormwater runoff, rain gardens can be a valuable part in lessening the impacts of flooding, erosion and sedimentation, pollutants from streets, etc.
- Collectively rain gardens can produce substantial benefits to neighborhoods and communities





Handouts

- Web sites listings
- Plant list
- *"Rain gardens"* brochure
- *"Protecting our living shorelines"* pamphlet
- *Grow Native* flyer



Questions ?

