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

- Vegetated buffer strips
- Ponding area

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 rainwater 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?
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
Step 3: Choosing the shape

- Crescent
- Kidney
- Teardrop
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

Example calculation:

- Length = 100 feet
- Width = 20 feet
- L X 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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tr>
<td>Construction</td>
<td>$3.00/ sq. ft.</td>
</tr>
<tr>
<td>Design</td>
<td>$1.00/ sq. ft.</td>
</tr>
<tr>
<td>Planting</td>
<td>$3.00-$4.00/ sq. ft.</td>
</tr>
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<td>Plant material</td>
<td>$2.5-$4.5/ sq. ft.</td>
</tr>
<tr>
<td><strong>Total costs</strong></td>
<td>$11.00-$13.00/ sq. ft.</td>
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*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 bring 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

Scientific plant name

Common plant name

How many plants of each?

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Species Name</th>
<th>Common Name</th>
<th>No. of Plants</th>
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<tbody>
<tr>
<td>Al</td>
<td>Aster lateriflorus</td>
<td>Side-flowering aster</td>
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<tr>
<td>Ca</td>
<td>Campanula americana</td>
<td>Tall bellflower</td>
<td>6</td>
</tr>
<tr>
<td>Cxg</td>
<td>Carex Grayi</td>
<td>Bar sedge</td>
<td>5</td>
</tr>
<tr>
<td>Ev</td>
<td>Elymus virginicus</td>
<td>Virginia wild rye</td>
<td>9</td>
</tr>
<tr>
<td>Iv</td>
<td>Iris virginica-shrevei</td>
<td>Wild blue flag ins</td>
<td>6</td>
</tr>
<tr>
<td>Lc</td>
<td>Lobelia cardinalis</td>
<td>Cardinal flower</td>
<td>10</td>
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<tr>
<td>Mv</td>
<td>Mertensia virginica</td>
<td>Virginia bluebells</td>
<td>6</td>
</tr>
<tr>
<td>Oc</td>
<td>Osmunda claytoniana</td>
<td>Interrupted fern</td>
<td>3</td>
</tr>
<tr>
<td>Pd</td>
<td>Pachysandra disticha</td>
<td>Woodland phlox</td>
<td>5</td>
</tr>
<tr>
<td>St</td>
<td>Sedge flexicaulis</td>
<td>Zig zag goldenrood</td>
<td>6</td>
</tr>
<tr>
<td>Za</td>
<td>Zizia aurea</td>
<td>Golden Alexander</td>
<td>6</td>
</tr>
</tbody>
</table>

Total Area: 70 sq. ft.

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

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

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**Table:**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Species Name</th>
<th>Common Name</th>
<th>No. of Plants</th>
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<td>Aa</td>
<td>Anisaa atrorubens</td>
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<td>Campanula americana</td>
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<td>Cg</td>
<td>Carex Grayi</td>
<td>Bur sedge</td>
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<td>Cr</td>
<td>Carex lupulina</td>
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<td>Ev</td>
<td>Elymus virginicus</td>
<td>Virginia wild rye</td>
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<td>EPr</td>
<td>Eupatorium purpureum</td>
<td>Purple Joe-Pye wood</td>
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<td>Iv</td>
<td>Iris virginica-shrevei</td>
<td>Wild blue flag iris</td>
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<tr>
<td>Lc</td>
<td>Lobelia cardinalis</td>
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<td>Mv</td>
<td>Mertensia virginica</td>
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<td>Oc</td>
<td>Osmunda clayoniana</td>
<td>Interrupted fern</td>
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</tr>
<tr>
<td>Pd</td>
<td>Phlox divaricata</td>
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<td>15</td>
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<td>Sf</td>
<td>Solidago flexicaulis</td>
<td>Zig zag goldenrod</td>
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</tr>
<tr>
<td>Za</td>
<td>Zizia aurea</td>
<td>Golden Alexander</td>
<td>14</td>
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Total Plants Needed: 143

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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

<table>
<thead>
<tr>
<th>Abbrev.</th>
<th>Common Name</th>
<th>Species Name</th>
<th>No. of Plants</th>
<th>Shopping List</th>
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<tr>
<td>An</td>
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<td>Em</td>
<td>Spotted Joe-Pye weed</td>
<td>Eupatorium maculatum</td>
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<td>Ha</td>
<td>Sneezeweed</td>
<td>Helianthus autumnale</td>
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<tr>
<td>Jt</td>
<td>Torrey's rush</td>
<td>Juncus torreyi</td>
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<tr>
<td>Lp</td>
<td>Prairie blazing star</td>
<td>Liatris pycnostachya</td>
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<td>Le</td>
<td>Cardinal flower</td>
<td>Lobelia cardinalis</td>
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<td>Ls</td>
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<td>Lobelia siphilitica</td>
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<td>Wild bergamot</td>
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<td>Pg</td>
<td>Marsh phlox</td>
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<td>Pv</td>
<td>Mountain mint</td>
<td>Pycanthemum virginianum</td>
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<td>Sa</td>
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<td>Sr</td>
<td>Stiff goldenrod</td>
<td>Solidago rigidol</td>
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<td>Vv</td>
<td>Culver's root</td>
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**Total Plants Needed**: 70
### Clay Garden: Clay Soils

#### Total Area: 70 sq. ft.

<table>
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<tr>
<th>Abbrev.</th>
<th>Common Name</th>
<th>Species Name</th>
<th>No. of Plants</th>
<th>Shopping List</th>
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<td>Ai</td>
<td>Swamp milkweed</td>
<td>Asclepias incarnata</td>
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<tr>
<td>As</td>
<td>Water plantain</td>
<td>Alisma subcordatum</td>
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<tr>
<td>Ch</td>
<td>Bottle brush sedge</td>
<td>Carex hystricina</td>
<td>4</td>
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<tr>
<td>Cv</td>
<td>Fox sedge</td>
<td>Carex vulpinoidea</td>
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<td>Iv</td>
<td>Wild blue flag iris</td>
<td>Iris virginica shrevei</td>
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<tr>
<td>Jt</td>
<td>Torrey’s rush</td>
<td>Juncus torreyi</td>
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<tr>
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<td></td>
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<td>Scirpus validus</td>
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**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
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
Avoid basement flooding

Focus water flow to designated area
Mini retaining wall
Mini retaining wall in front of a small business
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.
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
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 ?