# Rain Gardens

. . . absorb water, reduce runoff, prevent flooding

NRCS Natural Resources Conservation Service

2005

## What are rain gardens?

Rain gardens are depressional areas landscaped with perennial flowers and native vegetation that soak up rainwater. They are strategically located to capture runoff from impervious surfaces, such as roofs and streets. Rain gardens fill with a few inches of water after a storm and then water filters into the ground, rather than running off to a storm drain.

## Why are rain gardens important?

As cities and suburbs grow, increased storm water runoff from impervious surfaces becomes a problem. As more impervious surfaces are added to our communities, it is more important than ever to help rainwater infiltrate. This protects water quality and reduces storm water runoff.

Storm water runoff from developed areas increases flooding potential and carries pollutants from streets, parking lots and lawns into local streams and lakes. Rain gardens can absorb most rainfall events.

## Designing and Planting

Designing and planting a rain garden is very similar to creating other perennial gardens, with a few of the following exceptions:

### Location

Rain gardens must be located to intercept runoff from impervious areas. They can be placed anywhere good soils with adequate percolation rates exist. It is best to keep rain gardens away from building foundations, utilities, and septic systems.

### Size

Rain gardens are typically 5 to 10 percent the size of the impervious surface generating the runoff entering the garden. Measure the square footage of the impervious area (length x width); then multiply this by 0.07 (7 percent).

Continued on back page . . .

Photo courtesy of Fred Rozumalski

This rain garden is strategically placed to capture runoff from the lawn and street.

. . . Continued from front page

Determine a length and width of the rain garden that best fits the site. For example, a 2,000 sq./ft. roof, when multiplied by 7 percent, would call for a rain garden 140 sq./ft. in size, or 14' long by 10' wide.

### Garden Depth

A typical rain garden is between four and eight inches deep. A rain garden less than four inches deep will need too much surface area to provide enough water storage to infiltrate larger storms. Storm water runoff should spread evenly across the entire rain garden, to increase the opportunity for infiltration.

### Soil Amendments

To prepare for a rain garden, remove soil to create a depressional area. Blend in soil, sand, and compost mixture to enhance infiltration.

### Plant Selection

While rain gardens are a highly functional way to help protect water quality, they can also be an attractive part of your yard and neighborhood. Choose native plants based on site considerations for light, moisture, and soil. Vary plant structure, height, and flower color for seasonal appeal and butterfly habitat. Mowed grass borders are recommended around the garden.

Young plants, or plugs, are best for rain gardens because they are easier to establish and maintain. When laying plants out, randomly clump individual species in groups of 3 to 5 plants to provide bolder color. Be sure to repeat these individual groupings to create repetition and cohesion in a planting. It is a good idea to place plant labels next to each individual grouping. This will help identify the young native plants from weeds as you maintain the garden.

It is important to water rain gardens regularly throughout the first season. Once established, they will thrive without additional watering. A shredded wood mulch is an important part of a rain garden. Mulch helps retain moisture and discourages weed seeds from germinating.

## Low Impact Development (LID)

A rain garden is an example of the low impact development (LID) approach to storm water management. Traditionally, storm water management has involved the rapid conveyance of water via storm sewers to surface waters. Low impact development is a different approach that retains and infiltrates rainfall on-site. The LID approach emphasizes site design and planning techniques that mimic the natural infiltration-based, groundwater-driven hydrology of our historic landscape.

Native landscaping adds color, structure, and diversity to the landscape and provides habitat for butterflies.

## More Information about Rain Gardens

Find additional information about rain gardens by visiting the following websites:

www.iowasudas.org
www.raingardens.org
www.mninter.net/~stack/rain/
www.lowimpactdevelopment.org
www.cwp.org
www.stormwatercenter.net

# How To Design and Build A Rain Garden

Determine the location for a rain garden. The location should be situated so runoff from the impervious surface you want to manage can be intercepted. You may see in some information that a place that ponds water is a good location for a rain garden. This can be misleading. A rain garden must have adequate percolation rates. Remember the goal is to infiltrate impounded runoff in a relatively short period of time (i.e. 12 - 24 hours). A place that ponds water will obviously be a place where water moves to but if it ponds water for any length of time then it probably does not have adequate percolation rates for a rain garden. (See information on bioretention cells).

Conduct soil investigation to ensure you have adequate percolation rates. You should have a minimum perc rate of 0.5 inches/hour, but it's better to have 1 inch/hour or higher perc rates. (Check with Extension Service or County Health Department for information on how to conduct a perc test).

Measure the impervious surface (I.S.) that will contribute runoff to the rain garden in square feet. (length [L] x width [W] = I.S.).

Multiply the sq ft of I.S. by 0.07 (7%) to get the sq ft of surface area (S.A.) for the rain garden. For instance if you have a 50 ft L x 40 ft W roof the I.S. would equal 2,000 sq ft. x 0.07 = 140 sq ft of S.A. needed for the rain garden. (An alternative method for sizing the rain garden is to take the sq feet of impervious surface X 1"/12" (or 0.083) to determine sq feet of surface area. If you provide 1 foot of depth you will have a depressional area that will hold 100% of the runoff from a 1" rain. This method provides extra capacity because it takes no credit for infiltration rates or for pore space storage in the soil profile).

Now determine a length and width for the rain garden that will equal the surface area needed and that will fit the proposed location for the rain garden. Long and linear rain gardens are generally recommended because you want to be able to do installation and maintenance without having to be inside the boundary of the rain garden. Any traffic (equipment or foot traffic) will increase compaction within the rain garden. Compaction is the enemy of infiltration which the primary goal of installing a rain garden.

Lay out a rope to delineate the surface area of the rain garden. Rain gardens can be any shape but make the border of the rain garden blend in with the surrounding landscape in a pleasing manner.

Remove vegetative cover from the surface area of the rain garden. (If sod is present dig it up or kill it chemically. Avoid rotor tilling sod as root chunks may survive and cause competition with rain garden plants).

If deep topsoil exists (12 inches or more) simply create a 6 inch depression and plant. If soil quality is less than optimum, add amendments, like sand and compost, to improve soil quality.

Excavate and save about one inch of topsoil.

Excavate additional soil to get a hole 12" – 18" deep.

Mix sand and compost to the saved topsoil to create a soil matrix that will be about 50% sand, 30% compost and 20 % topsoil.

Since sand and compost is usually sold by the ton you will need to calculate the tons of material needed to this by using the following formulas:

Sand: Multiply the sq ft of surface area of the rain garden by 0.25 ft (or 3") to compute the cubic feet of sand needed. Then divide this by 27 (cubic ft per cubic yard) to convert to cubic yards and then multiply by 1.5 to convert cubic yards to tons of sand needed. (i.e. 140 sq ft X 0.25 = 35 cu ft divided by 27 = 1.3 cu yds x 1.5 = ~ 2 ton of sand needed).

Compost: Multiply the sq ft of surface area of the rain garden by 0.167 ft (2") to compute cu yards needed. Divide by 27 to convert to

cu yards. Multiply by 1200 lbs/cu yd and then divide by 2000 lbs/ton = tons of compost needed (i.e. 140 sq ft x 0.167 = 20 cu ft divided by 27 cu ft / cu yd = 0.75 cu yd x 1200 lbs/cu yd = 900 lbs divided by 2000 lbs/ton = about 0.5 tons of compost needed.

Blend sand, compost and topsoil uniformly and back fill soil matrix until depression in about 6 inches deep.

Plant selected species (natives or a mix of cultivars and natives) at 1.5 feet on center. See recommended lists of native species.

Mulch with 2" of shredded mulch.

Water weekly unless timely rains occur throughout the first year.

Weed, trim dead flower heads, and perform other maintenance as needed to keep the rain garden looking well kept. Remove and compost dead residue each spring or burn off if native plants are used.

# Bio-Retention Cell Construction Steps

Excavate surface area down to 42"…

Backfill with 12" of clean, washed, 1" aggregate.

Place subdrain tile in the rock bed…if the surrounding soil will percolate place tile in the upper part of the rock bed…if the surrounding soil won't perc place the tile at the bottom of the rock bed. (Have to have a convenient outlet for tile).

Blend sand (60%), compost (25%), and topsoil (15%) and backfill to within 6-8 inches of the top.

Formulas:

Calculate rock needs by using this formula:

L x W x 1'D divided by 27 = cu yds x 1.5 = tons of rock

Calculate sand needs by using this formula:

L x W x 2'D divided by 27 = cy yds x 0.6 (60%) x 1.5 = tons of sand

Calculate compost needs by using this formula:

L x W x 2' D divided by 27 = cu yds x .25 (25%) x 1200 lbs/cu yd divided by 2000 = tons of compost

Calculate topsoil needs by using this formula:

L x W x 2' D x .15 (15%) divided by 27 = cu yds

Or L x W x 2' D x .15 = cu ft x 100 lbs/cu ft divide by 2000 = tons of topsoil

Bioretention Cell

NRCS
Natural Resources Conservation Service

# Native Plants Suitable for Landscaping: Short List

www.prrcd.org/inl/recommended_plants.htm

| genus | species | common names | height | comments | forb/grass | $/LB PLS |
|---|---|---|---|---|---|---|
| *Anemone* | *patens* | pasque flower | 0.5 ft | spring ephemeral, dry soil | forb | $ 450.00 |
| *Aster* | *ptarmicoides* | upland white aster | 1-2 ft | dry soils | forb | $ 600.00 |
| *Aster* | *sericeus* | silky aster | 1-2 ft | loved by rabbits | forb | $ 750.00 |
| *Aster* | *oblongifolius* | oblong leaved aster | 1-2.5 ft | alternative to NE aster | forb | $ 450.00 |
| *Astragalus* | *crassicarpus* | ground plum | 1 ft | neato seed pods | forb | |
| *Bouteola* | *gracilis* | blue grama grass | 1-2 ft | w/toothbrush-topped flower stalk, dry s | tuft grass | $ 45.00 |
| *Callirhoe* | *involucrata* | purple poppy mallow | 6 in | ry soils, magenta flowers, spreading hab | forb | |
| *Campanula* | *rotundifolia* | harebells | 0.5 -2 ft | dry soils | forb | |
| *Crotolaria* | *sagittalis* | rattlebox | 1 ft | | forb | $ 45.00 |
| *Delphinium* | *virescens* | prairie larkspur | 2-4 f | | forb | $ 1,200.00 |
| *Koeleria* | *cristata* | June grass | 2 ft | dry sandy soils | tuft grass | $ 150.00 |
| *Liatris* | *punctata* | dotted blazing star | 1-2 ft | dry soils | forb | |
| *Liatris* | *squarrosa* | scaly blazing star | 1-2 ft | dry soils | forb | $ 300.00 |
| *Lupinus* | *perennis* | wild lupine | 2 ft | sandy soil | forb | $ 300.00 |
| *Monarda* | *punctata* | spotted bee balm | 2 ft | | forb | $ 150.00 |
| *Oenothera* | *macrocarpa* | MO evening primrose | 1 ft | very dry soil | forb | |
| *Penstemon* | *grandiflorus* | large flowered beardtongue | 2 ft | tolerates extremely dry soils | forb | $ 90.00 |
| *Penstemon* | *cobaea* | showy beardtongue | 2 ft | | forb | |
| *Sisyrinchium* | *campestre* | blue-eyed grass, prairie bl. e. gr | 0.5-1 ft | very similar to S. angustifolium (oXXXo) | grass-like leave | $ 1,600.00 |
| *Tradescantia* | *bracteata* | prairie spiderwort | 1 ft | dry soils | grass-like leave | $ 300.00 |
| | | | | | | |
| *Agastache* | *foeniculum* | anise hyssop | 3 ft | may self seed more than desired | forb | |
| *Bouteloua* | *gracilis* | blue grama | 1.5 ft | bunch grass | grass | |
| *Geranium* | *maculatum* | wild geranium | 1 ft | flowers add another ft, mod dry soil | forb | $ 900.00 |
| *Helianthus* | *mollis* | ashy sunflower, downy sunflower | 4-5 ft | dry soil, spreads by roots | forb | $ 300.00 |
| *Hystrix* | *patula* | bottlebrush grass | 3 ft | savanna species | grass | $ 150.00 |
| *Penstemon* | *digitalis* | foxglove penstemon | 2-3 ft | flower stalk adds another ft | forb | $ 75.00 |
| *Pycnanthemum* | *pilosum* | hairy mountain mint | 2-3 ft | mod dry soil | forb | |
| *Silene* | *regia* | royal catch fly | 2-4 ft | brilliant red flowers | forb | $ 950.00 |
| *Tridens* | *flavus* | purple top, grease grass | 4 ft | reddish seed heads | grass | $ 20.00 |
| *Zizia* | *aptera* | heart leaved alexanders | 1-3 ft | mod moist soil | forb | $ 450.00 |
| | | | | | | |
| *Allium* | *stellatum* | prairie onion | 1-2 ft | mod dry soil | grass-like leave | $ 90.00 |
| *Amorpha* | *canescens* | lead plant | 2-4 ft | od dry soil, shrubby:do not prune for win | forb | $ 180.00 |
| *Andropogon* | *scoparius* | little blue stem | 2 ft | dry soils | tuft grass | $ 45.00 |
| *Anemone* | *cylindrica* | thimbleweed | 2 ft | | forb | |
| *Aquilegia* | *canadensis* | columbine | 1-2 ft | flower stalk may add 1 ft, mod dry soil | forb | $ 750.00 |

**Some plants may grow taller than indicated, especially if fertilized or overwatered.**

last updated 1/20/2007

# Native Plants Suitable for Landscaping: Short List

www.prrcd.org/inl/recommended_plants.htm

| | | | | | | |
|---|---|---|---|---|---|---|
| *Artemesia* | *ludoviciana* | prairie sage | 2-3 ft | will runner on moist sites - keep dry | forb | $ 300.00 |
| *Asclepias* | *tuberosa* | butterfly milkweed | 1-4 ft | merges late spring, no milky sap, dry sc | forb | $ 225.00 |
| *Asclepias* | *verticillata* | whorled milkweed | 1-2 ft | dry soils | forb | $ 600.00 |
| *Baptisia* | *leucophaea* | cream wild indigo | 18-30 in | dry soils | forb | $ 1,600.00 |
| *Bouteola* | *curtipendula* | side oats grama | 2-3 ft | red anthers | grass | $ 45.00 |
| *Camassia* | *scilloides* | wild hyacinth | 2 ft | | | |
| *Cassia* | *fasiculata* | partridge pea | 1-3 ft | legume, annual, flings seeds far | forb | $ 15.00 |
| *Ceanothus* | *americanus* | new jersey tea | 2-3 ft | shrubby | forb | $ 900.00 |
| *Coreopsis* | *palmata* | prairie coreopsis | 1-2 ft | mod dry soil | forb | $ 300.00 |
| *Desmanthus* | *illinoensis* | IL bundle flower | 5 ft | too tall for small sites | forb | |
| *Echinacea* | *pallida* | pale purple coneflower | 3 ft | | | |
| *Lespedeza* | *capitata* | round headed bush clover | 4 ft | | | |
| *Liatris* | *aspera* | rough blazing star, button blzg str | 2-3 ft | mod dry soil | forb | $ 120.00 |
| *Liatris* | *scariosa* | northern blazing star | 2 ft | | | |
| *Onosmodium* | *molle* | false gromwell | 3 ft | | forb | $ 150.00 |
| *Petalostemum* | *purpureum* | purple prairie clover | 1-2+ ft | dry soils | forb | $ 45.00 |
| *Ruellia* | *humilis* | wild petunia | 1 ft | dry soils, late spring emergence | forb | $ 150.00 |
| *Solidago* | *speciosa* | showy goldenrod | 2-5 ft | self seeds like dandelion | forb | $ 300.00 |
| | | | | | | |
| *Anemone* | *canadensis* | Canada anemone | 1-2 ft | mod moist soil | forb | $ 225.00 |
| *Elymus* | *riparus* | riverbank rye | 4 ft | savanna species | grass | $ 150.00 |
| *Gentiana* | *andrewsii* | bottle gentian | | | | |
| *Liatris* | *ligulistylis* | meadow blazing star | ***3-5 ft*** | moderately moist soils | forb | $ 300.00 |
| *Phlox* | *glaberrima* | marsh phlox/smooth phlox | 1-3 ft | full sun | forb | |
| *Phlox* | *maculata* | wild sweet William/meadow ph. | 1- 3 ft | mod moist | forb | |
| | | | | | | |
| *Allium* | *cernuum* | nodding onion | 1-2 ft | mod moist soil | grass-like leave | $ 90.00 |
| *Bromus* | *kalmii* | prairie brome | 3 ft | | grass | $ 20.00 |
| *Dodecatheon* | *amethystinum* | amethyst shooting star | 1 ft | some shade | forb | |
| *Dodecatheon* | *meadia* | shooting star | 1 ft | | forb | |
| *Echinicea* | *purpurea* | purple coneflower | 4 ft | most overused native, only in S IA | forb | |
| *Elymus* | *villosus* | silky wild rye | 3 ft | | grass | $ 150.00 |
| *Eryngium* | *yuccifolium* | rattlesnake master | 2-3 ft | flower stalk adds another ft, mod dry soi | forb | $ 90.00 |
| *Gentiana* | *flavida* | cream gentian | 1-2 ft | mod moist soil | forb | $ 300.00 |
| *Lilium* | *philadelphicum* | prairie lily | 1 ft | | forb | |
| *Phlox* | *divaricata* | wild blue phlox | 1-2 ft | woodland/savanna spp. | forb | |
| *Pycnanthemum* | *tenuifolium* | slender mountain mint | 1-3 ft | not so agg as other pyc. | forb | $ 300.00 |
| *Rudbeckia* | *fulgida* | orange coneflower | 2-4 ft | mod dry soil | forb | $ 225.00 |

**Some plants may grow taller than indicated, especially if fertilized or overwatered.**

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| | | | | | | |
|---|---|---|---|---|---|---|
| *Silene* | *stellata* | starry campion | 3 ft | white flowers | forb | |
| *Stylophorum* | *diphyllum* | celandine poppy | 1 -2 ft | savanna | forb | |
| *Veronicastrum* | *virginicum* | Culver's root | ***3-6 ft*** | mod moist soils | forb | $ 600.00 |
| *Zizia* | *aurea* | golden alexanders | 1-3 ft | yellow dill-like flower, mod moist soil | forb | $ 90.00 |
| | | | | | | |
| *Baptisia* | *leucantha* | white wild indigo | 3-4 ft | med-dry, emerges very late spring | forb | $ 120.00 |
| *Elymus* | *canadensis* | Canada wild rye | 3-6 ft | can re-seed a lot in rich soil | grass | $ 45.00 |
| *Geum* | *triflorum* | prairie smoke | 1 ft | lowers add another ft, mod moist-dry so | forb | $ 300.00 |
| *Oenothera* | *biennis* | common evening primrose | 3-6 ft | biennial | | $ 60.00 |
| *Phlox* | *pilosa* | prairie phlox | 1-2 ft | dry soils | forb | $ 750.00 |
| *Rudbeckia* | *hirta* | black eyed susan | 2-3 ft | wide range of soils | forb | $ 45.00 |
| *Silphium* | *integrifolium* | rosin weed | 4-5 ft | can be rank | forb | |
| *Solidago* | *rigida* | stiff goldenrod | 2-5 ft | self sows like dandelions | forb | $ 60.00 |
| *Sporobolus* | *heterolepis* | prairie dropseed | 2-4 ft | tuft of grass leaves, dry soils | tuft grass | $ 180.00 |
| *Tradescantia* | *ohioensis* | ohio spiderwort | 2-3 ft | mod moist soils | grass-like leave | $ 300.00 |
| | | | | | | |
| *Aster* | *novae-angliae* | NE aster | 4 ft | stems dry up during drought | forb | $ 150.00 |
| *Chelone* | *glabra* | turtlehead | 3-4 ft | wetter sites | forb | $ 600.00 |
| *Filipendula* | *rubra* | queen of the prairie | ***3-5 ft*** | moist soils | forb | |
| *Gentiana* | *crinita* | fringed gentian | 1 ft | difficult | forb | |
| *Helenium* | *autumnale* | sneezeweed | ***2-5 ft.*** | moderately moist soils | forb | $ 120.00 |
| *Hibiscus* | *militaris* | rose mallow | **5 ft** | | forb | |
| *Hypericum* | *virginicum* | marsh St. John's wort | 1-2 ft | moist soils | forb | |
| *Lobelia* | *cardinalis* | cardinal flower | 2 -4 ft | brillian red flowers | forb | |
| *Mimulus* | *ringens* | monkey flower | 2 ft | | forb | |
| | | | | | | |
| *Asclepias* | *incarnata* | swamp milkweed | ***3-5 ft*** | moist to mod dry soil | forb | $ 225.00 |
| *Elymus* | *virginicus* | Virginia wild rye | 2-4 ft | mod moist soil | grass | $ 45.00 |
| *Helenium* | *flexuosum* | purple sneezeweed | 2-3 ft | smaller than H. autmnale | forb | |
| *Iris* | *virginica* | blue flag iris | 2-3 ft | moist soil | grass-like leave | $ 120.00 |
| *Liatris* | *pycnostachya* | prairie blazing star | 4 ft | may flop when flowering | forb | |
| *Liatris* | *spicata* | marsh blazing star | 3-5 ft | moist soils, may flop when flowering | forb | $ 120.00 |
| *Lobelia* | *siphilitica* | great blue lobelia | 2-4 ft | moist to moderately dry soils | forb | $ 300.00 |
| | | | | | | |
| *Carex* | *vulpinoidea* | brown fox sedge | 1-3 ft | moderately moist soils | grass-like leave | $ 45.00 |
| | | | | | | |
| | | | | | | |

**Some plants may grow taller than indicated, especially if fertilized or overwatered.**

last updated 1/20/2007

**Plants often recommended for Raingardens** **Use With Caution!** *updated April 21, 2007*

| Genus | species | common names | reason for caution | height |
|---|---|---|---|---|
| | | | | |
| Aster | novae-angliae | New England aster | gets leggy, stems ugly, too tall for smaller sites | 2 - 6 ft |
| Calamagrostis | canadensis | blue joint grass | rhizomatous - spreads aggressively by root, almost impossible to remove | 4 ft |
| Caltha | palustris | marsh marigold | wetland species - may not tolerate dry season | 6 in |
| Campanula | americana | tall bellflower | very pretty but too tall - suitable only for very large sites | 3 - 6 ft |
| Cassia | hebecarpia | wild senna | too tall - suitable only for very large sites | 5 - 6 ft |
| Desmodium | canadense | showy tick trefoil | produces obnoxious "stick-tights", too tall for smaller sites | 4 - 6 ft |
| Desmodium | illinoense | IL bundle flower, IL tick trefoil | too tall - suitable only for very large sites, not tolerant of wet sites | 5 - 6 ft |
| Echinacea | purpurea | purple coneflower | needs watering durng dry spells, native only to far S Iowa | 3 ft |
| Epilobium | angustifolium | fireweed | too tall - suitable only for very large sites | 4 - 7 ft |
| Eupatorium | purpureum | joe pye, boneset | too tall - suitable only for very large sites | 3 - 7 ft |
| Eupatorium | maculatum | spotted joe pye | too tall - suitable only for very large sites | 2 - 7 ft |
| Hydrophyllum | virginacum | VA waterleaf | invasive species | 1 - 2 ft |
| Leersia | oryzoides | rice cut grass | rhizomatous - spreads aggressively by root, almost impossible to remove | 4 ft |
| Liatris | spicata | marsh blazing star | may get tall and flop over, especially if it given any shade | 4 - 5 ft |
| Liatris | ligulistylis | meadow blazing star | may get tall and flop over, especially if it given any shade | 4 - 5 ft |
| Lobelia | cardinalis | cardinal flower | wetland species - may not tolerate dry season | 2 - 3 ft |
| Physostegia | virginiana | obedient plant | rhizomatous - spreads aggressively by root, almost impossible to remove | 2 - 3 ft |
| Pontederia | cordata | pickerel weed | wetland species - may not tolerate dry season | 1 - 3 ft |
| Ratibida | pinnata | yellow coneflower | gets rank, too big for smaller sites, reseeds profusely | 4 ft |
| Rosa | spp. | wild rose, prairie rose | rhizomatous - spreads aggressively by root, almost impossible to remove | 4 ft |
| Rudbeckia | subtomentosa | sweet coneflower | too tall - suitable only for very large sites | 4 - 6 ft |
| Sagittaria | latifolia | arrowhead | wetland species - may not tolerate dry season | 4 ft |
| Scirpus | atrovirens | dark green bulrush | too tall - suitable only for very large sites | 4 - 6 ft |
| Scirpus | validus | soft-stemmed bulrush | wetland species - may not tolerate dry season, rhizomatous | 8 ft |
| Scirpus | fluviatilis | river bulrush | wetland species - may not tolerate dry season | 3 - 5 ft |
| Silphium | spp. | cup plant, rosin weed etc. | too tall for smaller areas, all silphiums reseed profusely - **including into sod** | 4 - 8 ft |
| Solidago | spp. | goldenrods | reseed profusely, some also spread by rhizomatous roots | varies |
| Sparangium | eurycarpum | common bur-reed | wetland species - may not tolerate dry season | 2 - 4 ft |
| Spartina | pectinata | prairie cord grass | wetland species - may not tolerate dry season | 4 - 7 ft |
| Thalictrum | pubescens | tall meadow rue | too tall - suitable only for very large sites | 3 - 8 ft |
| Vernonia | fasciculata | ironweed | too tall - suitable only for very large sites | 4 - 6 ft |
| | | | | |
| Comments, additions? Contact Inger Lamb, 515.250.1693, ingerlamb3@mchsi.com | | | | |

# Bioswales

. . . absorb and transport large runoff events

NRCS Natural Resources Conservation Service

2005

## What are bioswales?

Bioswales are storm water runoff conveyance systems that provide an alternative to storm sewers. They can absorb low flows or carry runoff from heavy rains to storm sewer inlets or directly to surface waters. Bioswales improve water quality by infiltrating the first flush of storm water runoff and filtering the large storm flows they convey.

The majority of annual precipitation comes from frequent, small rain events. Much of the value of bioswales comes from infiltrating and filtering nearly all of this water.

## Designing a bioswale

For best results, enhance and utilize existing natural drainage swales whenever possible. Existing swales can be enhanced with native plants. The thicker and heavier the grasses, the better the swale can filter out contaminants. Additionally, subgrade drains and amended soils may be needed to facilitate infiltration.

Other considerations when designing or maintaining bioswales:

- Costs vary greatly depending on size, plant material, and site considerations. Bioswales are generally less expensive when used in place of underground piping.
- Deep-rooted native plants are preferred for infiltration and reduced maintenance.
- Soil infiltration rates should be greater than one-half inch per hour.
- A parabolic or trapezoidal shape is recommended with side slopes no steeper than 3:1.
- Avoid soil compaction during installation.
- Swales should be sized to convey at least a 10-year storm (or about 4.3 inches in 24 hours).

A bioswale featuring native vegetation shows its fall colors.

Photo Courtesy Jim Patchett

# Bioswales

NRCS Natural Resources Conservation Service

## Maintaining a bioswale

Once established, bioswales require less maintenance than turf grass because they need less water and no fertilizer. Native grasses and forbs are adapted to Iowa rainfall patterns. Natives also resist local pests and disease.

A road ditch can serve as a bioswale. The rock trench and wetland vegetation are notable features, along with the natural drainageway in the background that serves as a bioswale for residential runoff.

## For More Information

Find more information about low impact development and bioswales by visiting the following websites:

www.iowasudas.org
www.lid-stormwater.net
www.cwp.org
www.iowastormwater.org

## Low Impact Development

Traditionally, storm water management has involved the rapid conveyance of water via storm sewers to surface waters. Low Impact Development (LID) is a different approach that retains and infiltrates rainfall on-site. The LID approach emphasizes site design and planning techniques that mimic the natural infiltration-based, groundwater-driven hydrology of our historic landscape. Bioswales are one component of LID.

## Why is LID important:

**to the environment?**

- protects sensitive areas
- increases habitat for wildlife by preserving trees and vegetation
- protects local and regional water quality by reducing sediment and nutrient loads
- reduces streambank and channel erosion by reducing the frequent surges/bounces of higher flows from storm sewer discharges
- reduces frequent high and low flows associated with surface runoff, stabilizing stream flow volumes by restoring ground water discharges into receiving waters
- may reduce potential for flooding

**to residents?**

- increases community character
- improves quality of life
- more access to trails and open space
- pedestrian-friendly

**to developers?**

- reduces land clearing and grading costs
- reduces infrastructure costs (streets, curbs, gutters, sidewalks)
- increases community marketability

**to communities?**

- balances growth needs with environmental protection
- reduces infrastructure and utility maintenance costs

# Native Landscaping

. . . builds soil quality and enhances the landscape

NRCS Natural Resources Conservation Service

2005

## What are native plants?

Native plants are plants that grew naturally in the pre-settlement tallgrass prairies of Iowa. Tallgrass prairie developed in Iowa more than 10,000 years ago, after the retreat of glaciers. This ecosystem included grasses, flowering plants, insects, and other animals adapted to survive a wide range of conditions ranging from hot and dry to moist and boggy. Nearly all of the tallgrass prairie disappeared because of the growth of agricultural production.

## What is native landscaping?

Native landscaping is a simple way to reincorporate native grasses, flowers, shrubs and trees into the landscape. Native forbs, or flowers, bloom throughout the season and attract butterflies and hummingbirds. Hardy native grasses provide golden color for fall and winter appeal.

Once established, natives are easy to maintain because they are adapted to Iowa temperatures and rainfall patterns. They also resist local pests and disease. Native plants reduce soil erosion, build soil structure, and infiltrate rainfall.

Native grasses and plants show their fall colors in this urban landscape in eastern Iowa.

Native flowers show their summer colors.

## How do I incorporate native plants?

Native prairie plantings can be established from seed or young plants, or plugs. Plugs are best for residential areas because they are easier to establish and maintain. Plants can be incorporated to an existing garden bed or a new bed can be made by removing sod and loosening the soil.

In residential areas, it is usually best to use short native plants to create an aesthetically pleasing landscape. Native prairie plants can be located anywhere in a sunny landscape. They can be intermingled in more formal beds and borders or create a natural prairie garden. A turf border should be left to define the area or provide a path through the planting.

Choose plants based on site considerations for light, moisture, and soil. Vary plant structure, height, bloom succession, and flower color for seasonal appeal and butterfly habitat. After planting, a shredded-wood mulch layer helps establish natives by retaining moisture and discouraging weeds.

## Rain Gardens Can:

- •Help solve common drainage problems
- •Reduce runoff and recharge groundwater supplies
- [a]Keep sediments and pollutants out of streams
- •Attract birds and butterflies
- •Require less maintenance than grass lawns
- •Reduce the amount of water pollution

## Rain Garden FAQ's

Q. Will a rain garden provide a breeding ground for mosquitoes?
A. No. A properly designed rain garden will drain before mosquitoes can reproduce. It takes 10-14 days for a mosquito to develop from an egg into an adult. The rain gutters on your home are more likely to provide a better breeding ground than a rain garden.
Q. Do all rain gardens have a wild and messy appearance?
A. No. Rain gardens do have a natural rather than a manicured appearance, but they need not look messy. You can keep a rain garden looking neat and attractive by keeping the edges will defined. Taller plants often have a more unkempt appearance; so use shorter plants if you want your garden to have a cleaner look.
Q. Would a rain garden cause basement flooding?
A. Not if they are properly located and designed. Rain gardens should be located at least 10 feet away from buildings so that water does not drain along foundations. Also, your rain garden should drain away from rather than toward buildings.
Q. Would I need to water my rain garden during dry periods?
A. Maybe. How much water your rain garden needs will depend on the plants you choose. Native plants are adapted to a wide range of conditions, so they will only need watering in the driest seasons.

## Useful rain garden websites:

www.mninter.net/~stack/rain/
www.raingardens.org
www.dnr.state.wi.us/org/water/wm/nps/rg/RainGardenEducationKitContents.pdf
www.clean-water.uwex.edu/pubs/raingarden/index.html
www.greentopeka.com
www.consciouschoice.com/environs/raingardens1405.html
www.chicagowildernessmag.com/issues/spring2001/raingardens.html http://www.raingardens.org
http://www.rainkc.com/home/index.asp
http://www.ci.des-moines.ia.us/departments/PR/rain_gardens_tools.htm
http://www.prrcd.org/inl/recommended_plants.htm

Plant suppliers who may have photos include:
Prairie Moon Nursery in Winona, Minnesota, 866-417-8156 or www.prairiemoon.com.
Ion Exchange in Harpers Ferry, IA, 800-291-2143 or www.ionexchange.com.
Reeves Wildflower Nursery, Harper IA, 888-411-9767, rayreeves@lisco.com.