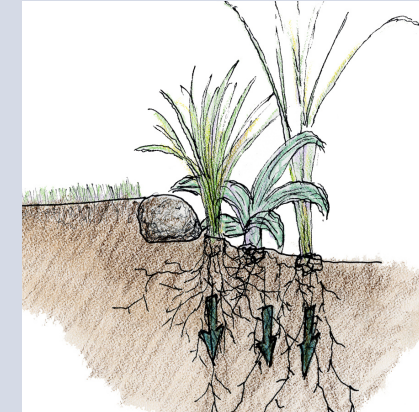
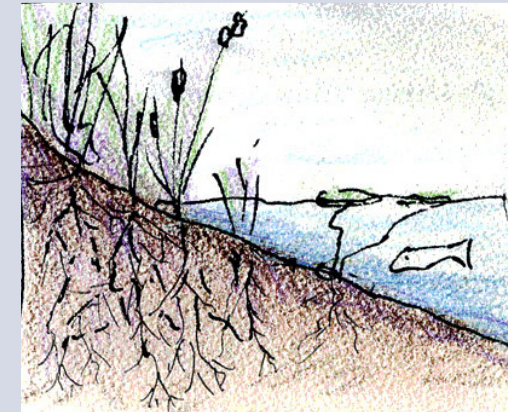


# A Homeowner's Guide to Watershed Protection



## Depot Park-Clarkston, Michigan



University of Michigan

Clarkston Watershed Group

City of the Village of Clarkston

Notes:

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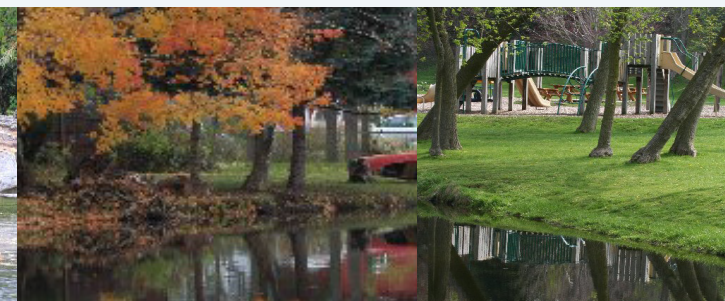
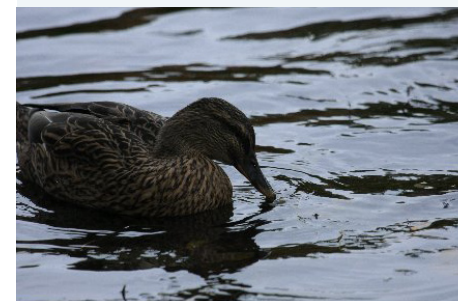
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### Index



What is A Watershed?	Page 3-4	Vegetated Buffer	Page 17-18
Protecting Our Watershed	Page 5-6	Rain Barrels	Page 19
Household Impacts	Page 7-8	Sustainable Design Examples	Page 20
Low Impact Development	Page 9-10	Native Plants	Page 21-24
Rain Garden	Page 11-14	Resources & References	Page 25
Alternative Lawns	Page 15-16		



# Our Mission:



This book aims to provide a resource for community members to understand the ecological design principles showcased at Depot Park in Clarkston, Michigan. By implementing these best practices in your own home, you are contributing to the community's collective effort and can make a great difference in the health of the Clinton River Watershed and all of Michigan.

Implementing these techniques in your own home will renew our waterways, provide a safe habitat for animal and plant species that we love, and treat our native environment with respect and care.

## What are Ecological Principles?

Principles that examine and aim to improve the interrelationships between organisms and their environment.

-Ecological Society of America

## What is Sustainability?

Sustainability is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

-World Commission on the Environment and Development

# Resources:

## Books:

Steiner, Lynne M. *Landscaping with Native Plants of Michigan*, Voyageur Press. 2006

Clinton River Watershed Group *Citizens Guide to Native Landscaping and Lawn Care*

Upper Clinton Subwatershed Management Plan, Oakland County, Michigan

Gosselink JG, and Mitsch W. *Wetlands*. John D. Wiley and Sons Press. New York, NY. 3rd Ed. 2000

## Websites:

Michigan State University Agricultural Extension Oakland County  
[http://www.msue.msu.edu/portal/default.cfm?pageset\\_id=28354](http://www.msue.msu.edu/portal/default.cfm?pageset_id=28354)

Rain Gardens of Western Michigan  
<http://www.raingardens.org/Index.php>

Michigan Department of Environmental Quality: Streambank stabilization manual  
<http://www.deq.state.mi.us/documents/deq-sqw-nps-sbs.pdf>

Southeast Michigan Council of Governments  
<http://www.semco.org/>

The Clinton River Watershed Council  
<http://www.crvwc.org/info/about.html>

The Low Impact Design Center  
<http://www.lowimpactdevelopment.org/>

The Springfield Township Michigan Native Vegetation Enhancement Project  
<http://www.epa.gov/ecopage/springfieldtwp/index.html>

Ann Arbor Native Plants Webpage  
<http://www.a2gov.org/government/publicservices/fieldoperations/NAP/NativePlants/Pages/NativePlants.aspx>

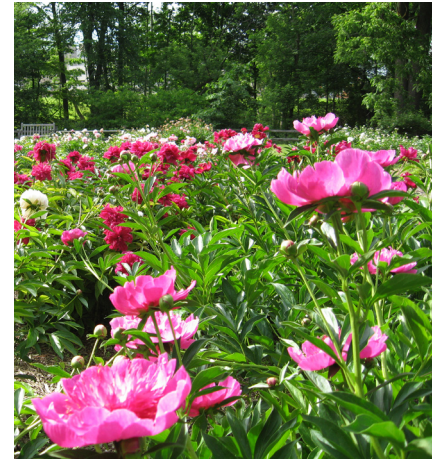


Photo taken by Susie Mattke-Robinson

University of Michigan Masters Team 2008  
 Eric Bauer  
 Stephen Layton  
 Susie Mattke-Robinson

The U of M Master's team would like to extend our thanks to the Clarkston Watershed Group, with a special thanks to Colleen Hogan-Schmidt, Jim Brueck, Cory Johnston, and Laura Gruzowski. Additionally, we would like to thank the city council of Clarkston, and the community members of Clarkston.

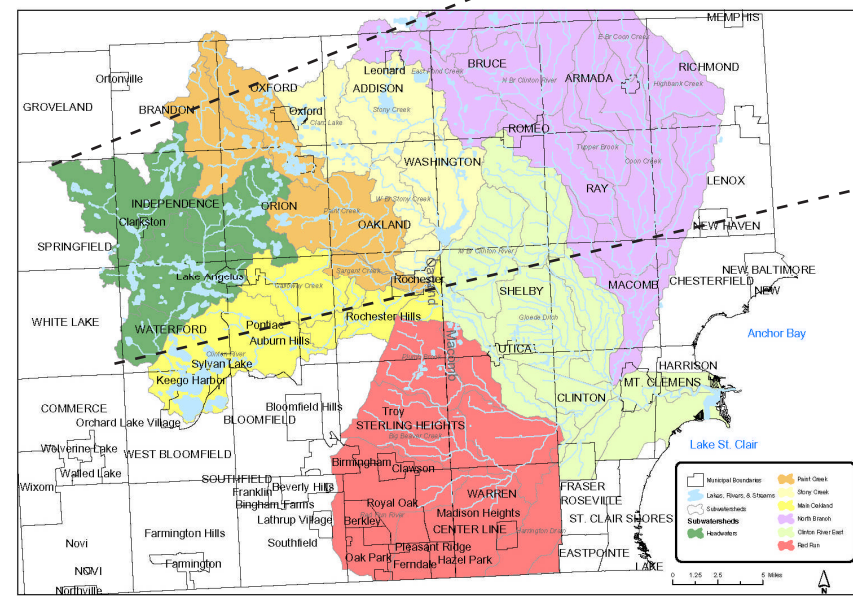
We would also like to thank our advisors, Dr. MaryCarol Hunter and Professor Bob Grese from the University of Michigan.

# What is a Watershed?

A watershed is the area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake, or groundwater.

-Conservation Technology Information Center

## The Clinton River Watershed



This map is provided by the Environmental Stewardship Group of Oakland County Planning & Economic Development Services  
 L. Brooks Patterson, County Executive



## Upper Clinton River Subwatershed Boundary

### Our Subwatershed Facts:

Area: 86 sq. miles  
 Counties: Oakland  
 Population: appx. 279,000

### Primary Land Uses:

- Residential (43%),
- Vacant/Water/Right-of-Way (30%);
- Recreation/Conservation (13%)
- Open Water: 21% of land area\*

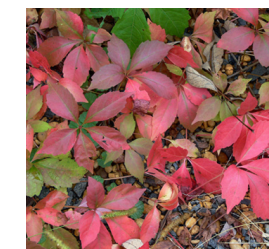
\*including Sashabaw Creek, Clinton River headwaters, & other lakes and wetlands

# Native Plantings Attract Wildlife:

Several types of native plants provide hummingbirds or butterflies with food sources such as nectar. They also attract these species with their vibrant colors and provide beautiful accents to native gardens.



Cardinal flower lobelia  
*Lobelia cardinalis*



Virginia creeper  
*Parthenocissus quinquefolia*

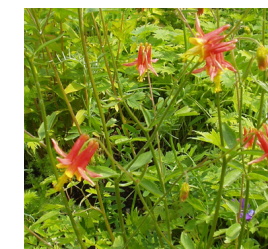
## Plants to Attract Hummingbirds:

### Trees and shrubs:

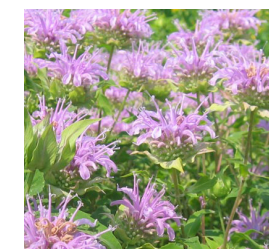
- Ohio Buckeye (*Aesculus glabra*)
- Virginia creeper (*Parthenocissus quinquefolia*)
- Snowberry (*Symphiocarpos albus*)

### Hardy perennials:

- Columbine (*Aquilegia canadensis*)
- Cardinal Flower Lobelia (*Lobelia cardinalis*)
- Beardtongues (*Penstemon species*)
- Woodland Phlox (*Phlox Species*)
- Fire Pink (*Silene virginica*)



Columbine  
*Aquilegia canadensis*



Wild Bergamot/Bee Balm  
*Monarda fistulosa*

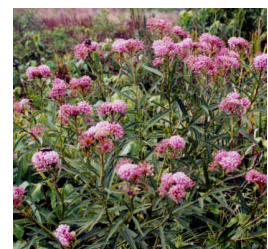
## Plants to Attract Butterflies:

### Trees and shrubs:

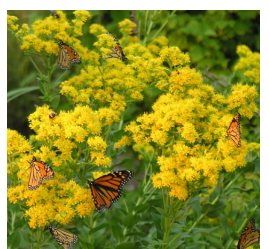
- New Jersey Tea (*Ceanothus americanum*)
- Dogwood (*Cornus Species*)
- White Meadowsweet (*Spiraea alba*)

### Hardy perennials:

- Asclepias species (Milkweed species)
- Echinacea purpurea (Purple Coneflower)
- Lilium michiganense (Michigan lily)
- Monarda species (Wild Bergamot)
- Solidago species (Goldenrod species)



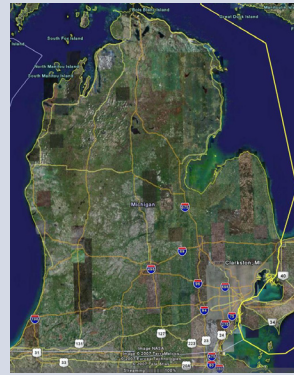
Milkweed  
*Asclepias incarnata*



Upright Goldenrod  
*Solidago rigida*

## Importance of Our Watershed

Our community's position at the top of the Clinton River watershed provides the greatest opportunity to have an impact. The actions of our residents has a direct impact on the health of Lake St. Claire and surrounding ecosystems.



Lower Peninsula, Michigan

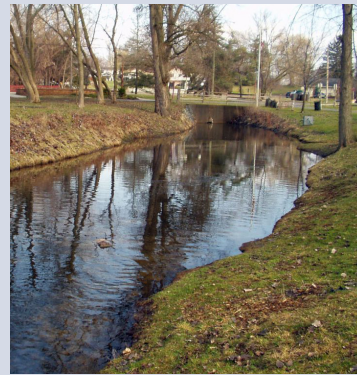


photo courtesy of Laura Colvin  
Depot Park- Clarkston, MI



photo courtesy of Laura Colvin  
Clarkston, MI

The population of Southeast Michigan is growing and is increasing the ecological impact on the surrounding watershed. There are approximately . . .

- \* 4.9 million people in Southeast Michigan.
- By 2030, there will be 5.4 million.
- \* 2.0 million homes in Southeast Michigan.
- \* over 11,000 inland lakes in Michigan
- \* over 35,000 miles of rivers and streams in Michigan.

5

The river provides valuable recreation, economic, and natural resources for our community.

*We care about our homes and have a responsibility to leave a beautiful environment for our future generations.*

## Household Impacts

Our household choices have an impact on the health of the watershed. We can make a few simple changes in our everyday lives to protect our water quality and environment. The Southeast Michigan Partners for Clean Water have developed 7 simple steps for individuals to reduce the impact on water quality:

1. Help keep pollution out of storm drains
2. Fertilize sparingly and carefully
3. Carefully store and dispose of household cleaners and oil
4. Clean up after your pet
5. Practice good car care
6. Choose earth friendly landscaping materials
7. Save water



photo courtesy of Laura Colvin

Southeast Michigan residents are willing to take action to protect our water resources.:

- \* 93% are willing to dispose of household hazardous wastes at approved disposal centers
- \* 90% are willing to switch to products that are environmentally friendly
- \* 79% are willing to change the type of fertilizer on their lawn

If we act together, we can make a real difference for the Clinton River and Michigan as a whole!

7

## Benefits of Native Plantings



<http://www.fbrowne.com/html/Riparian%20Plants/nannyberry.jpg>

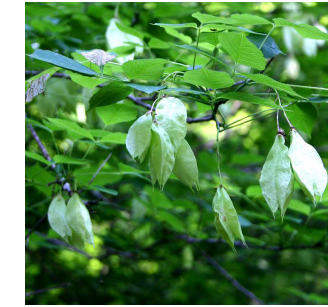
Red-Twig Dogwood  
*Cornus stolonifera*

Planting with native species reduces the negative impacts of erosion in the landscape. The root systems of these plants hold the soil in place, and also promote rainwater infiltration, which is essential to healthy ecosystems.

By planting with native species, you are preventing the spread of invasive plants. Balanced ecosystems contain a diverse array of native species.

Some native plants can break down chemicals that would normally pollute water sources. These plants can change chemicals from surface run-off into less harmful elements, thus protecting soil and water quality.

## Ornamental Native Tree Species



<http://spectrum.troy.edu/~diamond/pikepics/Staphylea%20trifoliata.JPG>

Bladdernut  
*Staphylea trifoliata*  
\*showy seed pods



[http://wikiflow.utexas.edu/Image:Archive/320x240/PCD1779/PCD1779\\_IMG0001.JPG](http://wikiflow.utexas.edu/Image:Archive/320x240/PCD1779/PCD1779_IMG0001.JPG)

Alternate-Leaf Dogwood  
*Cornus alternifolia*  
\*white spring flowers



<http://www.fbrowne.com/html/Riparian%20Plants/nannyberry.jpg>

Nannyberry  
*Viburnum lentago*  
\*white spring flowers



<http://www.jardimdoceleste.com/images/583.jpg>

Redbud  
*Cercis canadensis*  
\*showy pink flowers

22

## Urban Examples of Low Impact Development

Roadside rainwater garden systems are a wonderful ecological amenity for neighborhoods. In addition to their aesthetic appeal, these gardens filter harmful runoff coming from impervious roadways. They also prevent flash-flooding by infiltrating rainwater on site.



Rain gardens by Nigel Dunnett 2007



Rain gardens by Nigel Dunnett 2007



[http://www.engin.umich.edu/~cre/web\\_mod/wetlands/wetlands%20main.jpg](http://www.engin.umich.edu/~cre/web_mod/wetlands/wetlands%20main.jpg)



<http://www.lid-stormwater.net/images/biowall2.jpg>

These can include curb bump-outs with rain gardens, small infiltration beds.

20

# Native Plants for Native Habitats:

In Michigan, native plants grow successfully in a variety of ecosystems having particular sun and soil conditions. We recommend some of the following beautiful, low-maintenance perennial plants and shrubs native to Michigan:

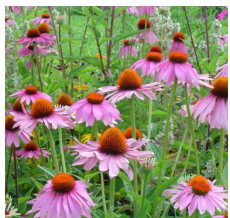
**Full Sun:**  
In the Midwest, full-sun environments are often prairie ecosystems that include beautiful flowering plants and grasses. Soil types are often dry, and plants are naturally tolerant of drought.



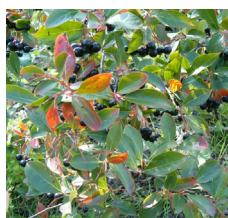
Grey-head coneflower  
*Ratibida pinnata*



Butterfly Weed  
*Asclepias tuberosa*



Purple Coneflower  
*Echinacea purpurea*



Black Chokeberry  
*Aronia melanocarpa*



Blazing Star  
*Liatris spicata*



Switchgrass  
*Panicum virgatum*

**Part Sun/ Shade:**  
In this region, part sun/ shade environments are often woodland ecosystems that include spring ephemerals, perennials and ferns. Soil types can be wet or dry.



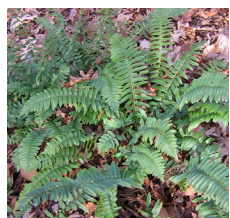
Foamflower  
*Tiarella cordifolia*



Great Solomon's Seal  
*Polygonatum biflorum*



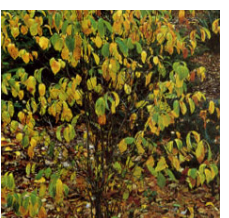
Witch-Hazel  
*Hamamelis virginiana*



Christmas Fern  
*Polystichum acrostichoides*



Wild Geranium  
*Geranium maculatum*

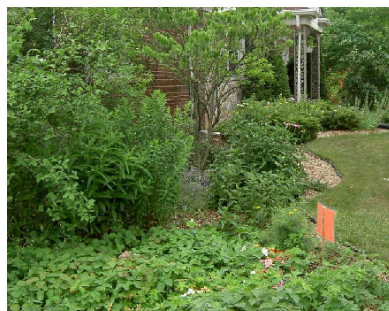


Spicebush  
*Lindera benzoin*

# Native Plantings

Why are native plants important in an ecological design?

**Native Communities & Invasive prevention:**  
Native species play a pivotal role in ecosystem function, and ensure the health and balance of a local environment and surrounding watershed.



By planting with Native species, you are also helping to protect that area from the spread of invasive plants.

**Low Maintenance:**  
Most native species have adapted over centuries through self-selection within their region. Thus, plants that are native to a region are often disease and pest resistant. They also require less maintenance and water than non-native species.



*Aronia melanocarpa*  
Black Chokeberry



*Asclepias syriaca*  
Milkweed



*Mainthemum canadense*  
Mayflower

**Animal Habitat Value:**  
Native plants provide habitat spaces for living creatures of all sizes. This habitat includes both shelter and food for micro-organisms and animals that are a vital part of the local ecosystem.

*When we use native plantings, we are showcasing the unique forms and textures of our local ecosystem.*



# Our Watershed Facts

## The Clinton River Watershed Facts:

The Clinton River and its tributaries include over 760 miles of land in Southeast Michigan. *Clinton River Watershed Group (CRWG)*

Clarkston is located on the Clinton River Watershed and located at the Upper Clinton Subwatershed

The Clinton River drains into Lake St. Clair

More than 200 sites within the Clinton River Watershed are listed as contaminated, with 27 on the Environmental Protection Agency's "Superfund" list and four on the National Priority List

More than 1.4 million people in over 60 municipalities inhabit the watershed



<http://www.geocities.com/lookpik/2/negcrb.jpg>



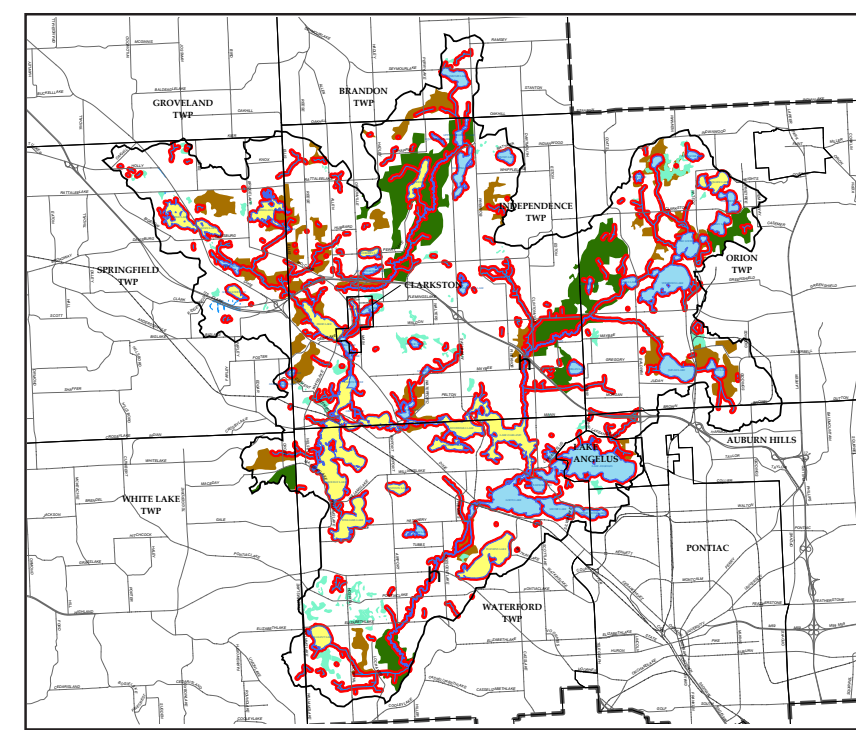
Headwaters of the Clinton River in Springfield Township. Photo by Nancy Strole, May 2005



[http://andrewsullivan.theatlantic.com/the\\_daily\\_dish/images/2007/07/08/clarkston-mi735pm.jpg](http://andrewsullivan.theatlantic.com/the_daily_dish/images/2007/07/08/clarkston-mi735pm.jpg)

# The Clinton River Watershed

Much of the Upper Clinton Subwatershed is listed as a potential area of critical concern. These issues affect us currently, and the community must act now to preserve this amazing area of the country.



**Legend**

- Upper Clinton Subwatershed
- Rivers/Streams/Drains
- Lakes

**Factors Defining the Existing and Potential Areas of Critical Concern**

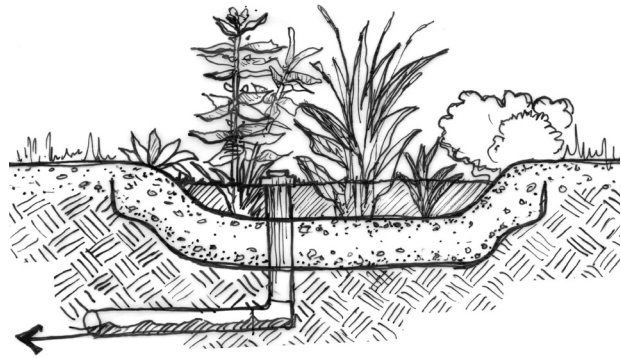
- Lakes with Known Impairments
- 250 Foot Areas Around All Lakes & Streams
- Priority One MNFI Areas
- Priority Two MNFI Areas
- Other Potential Areas of Hydrological Significance
- Stream Locations with Known Impairments

**MAP 8**  
**EXISTING AND POTENTIAL AREAS OF CRITICAL CONCERN**  
UPPER CLINTON SUBWATERSHED  
MANAGEMENT PLAN  
Carlisle/Wortman Associates, Inc.  
Community Planners & Landscape Architects

0 1 2 Miles  
PLOT GENERATION: AUGUST 31, 2015  
SOURCE: OAKLAND COUNTY

# What is a Rain Garden?

A rain garden is a simple and beautiful way to reduce your household input into storm sewers or local streams. Rain gardens are simply inverted planting beds. Instead of bringing in expensive topsoil to create a mound, rain gardens are created by digging down to create a depression.



This depression can hold a portion of the water that runs off of your roof or driveway. By choosing plants that are tolerant of both drought and short term flooding, you can create a remarkably low-maintenance garden feature.

- Rain gardens serve many ecological functions:
- Reduced storm surge/flooding
  - Increased soil infiltration
  - Ground water recharge
  - Animal habitat creation

11

# Rain Barrels

Rain barrels are a wonderful way to collect rain water to water indoor plants and outdoor gardens. They provide an excellent source of water for watering pots on your patio, your vegetable garden or other landscape elements.

Rain barrels can be made from plastic or wood. They are hooked to a downspout and an overflow is provided to move water away from your home's foundation. You can connect this to a rain garden!



[http://www.artec.net/SustainableLiving/Rain\\_Barrel.jpg](http://www.artec.net/SustainableLiving/Rain_Barrel.jpg)



[http://www.biblio.tu-bs.de/geobot/vr-exkursion/exk\\_05/069.jpg](http://www.biblio.tu-bs.de/geobot/vr-exkursion/exk_05/069.jpg)

\*Some gardeners believe that rain water's light acidity can help to mobilize nutrients in the soil that increase plant growth!

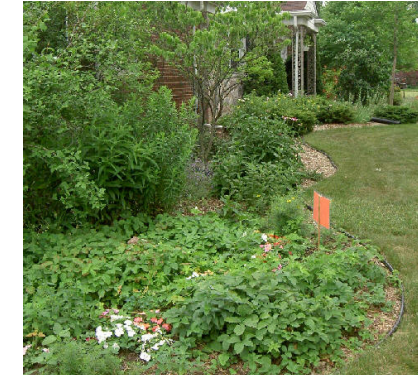
\*Shop locally or make your own!

19

# More Alternative Lawns

A third type of lawn was common during the second world war, known as the freedom lawn. Since many chemical resources were being diverted to the war effort, people avoided the use of herbicides and chemical fertilizers.

The freedom lawn is like a typical lawn but does not use herbicide applications. Clovers are allowed to intersperse with the usual grasses, and they fix nitrogen from the atmosphere into the soil, thus acting as a natural fertilizer.

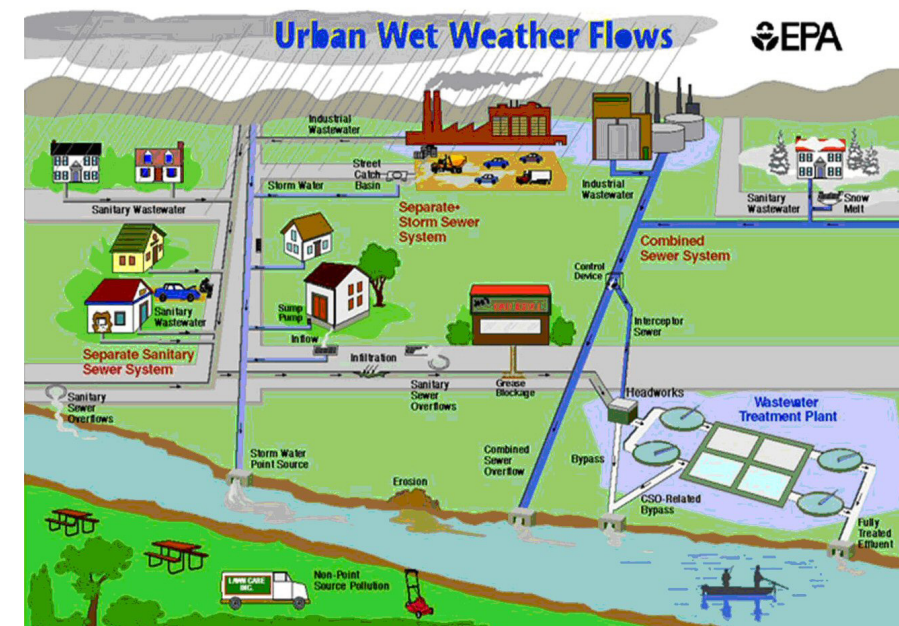


A fourth and increasingly popular alternative is to redevelop a lawn into a large planting bed. There are many varieties of low-maintenance perennial plants and shrubs that provide aesthetic interest (and wildlife habitat!) for all four seasons.

16

# Household Impacts

Phosphorus is the primary nutrient of concern in the Upper Clinton subwatershed, and in all of Southeast Michigan. Excess phosphorus can lead to algal blooms which have been seen at Mill Ponds in Clarkston. Common sources of phosphorus contamination include residential fertilizer use, stormwater runoff, and failing and/or poorly maintained septic systems.



[http://www.epa.state.oh.us/dsw/cso/wet\\_weather\\_flow\\_graphic.jpg](http://www.epa.state.oh.us/dsw/cso/wet_weather_flow_graphic.jpg)

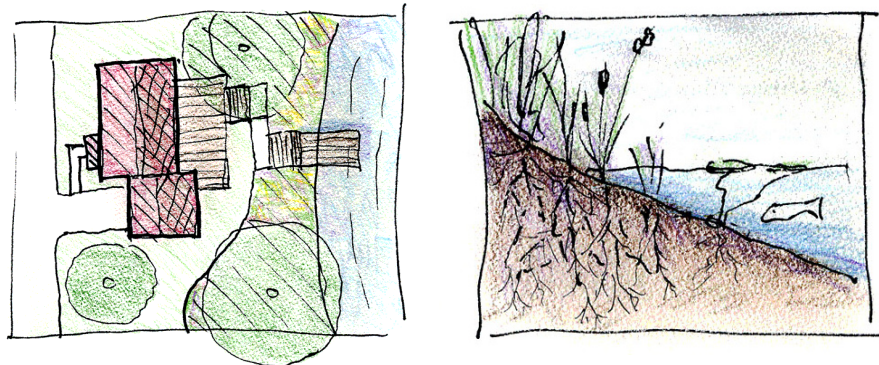
8



<http://andoverma.gov/stormwater/systems.jpg>

# What Are Vegetative Buffers?

If your home backs up to a stream or lake, you can take simple measures to protect these waterways with native vegetation plantings. During yard construction, use silt fencing to keep sediment out of water. Once your yard is established, filter run off through the use of vegetated buffers. This run-off can be high in sediment, oil, nitrogen, phosphate, heavy metals and many other elements that are routinely placed on our driveways, roofs and lawns.



By planting a strip of native perennials along the shoreline, you can greatly reduce sediment and chemical loads from your property. Another benefit (instead of creating turf or a sand beach) is that their deep roots reduce erosion. The shoreline you have today will remain intact for the future, thus preserving your property value.



<http://www.ifgene.org/brinton1.jpg>

Benefits include:

- Cleaner and clearer water
- Improved habitat quality for fish and wildlife
- Improved biodiversity for plants and animals
- Reduced erosion of streambanks
- Improved habitat connectivity

# Low Impact Development

What is Low Impact Development (LID)?

These are a set of design practices that protect our local habitat. They function to infiltrate stormwater onsite and promote healthy ecosystems across many scales of projects.

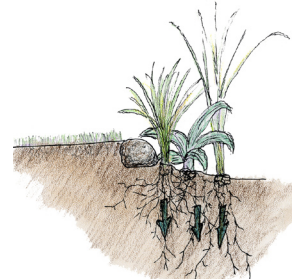
- Rain Gardens with native plantings
- Bioswales
- Rain barrels or cisterns
- Permeable paving



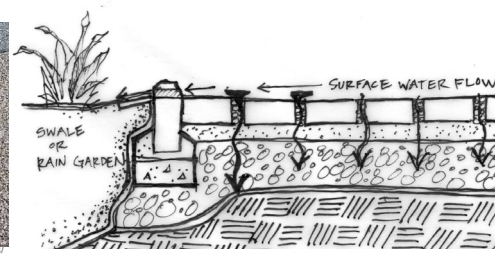
<http://www.uvm.edu/~rain/toolbox/images/raingarden04.jpg>



<http://www.apwa.net/Images/Publications/Reporter/Maplewood1.JPG>



[http://www.sustainablemerit.com/assets/photos/SUSTAINABLEMERIT\\_STRAITFORD-PLACEHOSED.jpg](http://www.sustainablemerit.com/assets/photos/SUSTAINABLEMERIT_STRAITFORD-PLACEHOSED.jpg)



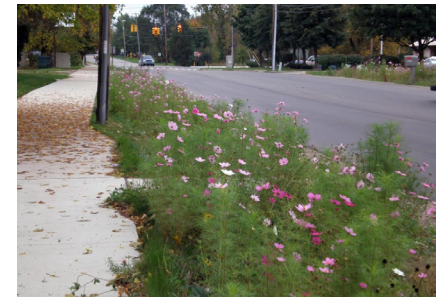
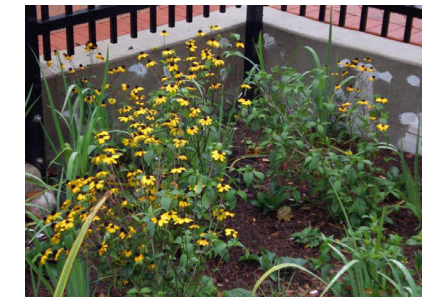
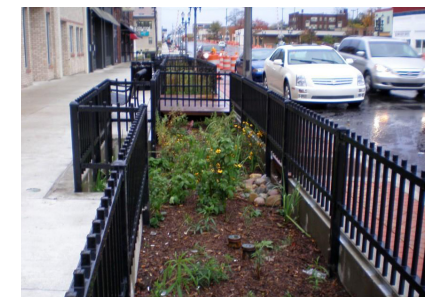
# Local Low Impact Development

Check out examples of local Low Impact Development designs! These include urban infiltration beds that manage rainwater runoff from adjacent road systems.

Note that these designs use hardy native perennials, shrubs, and even trees that provide shade, wildlife habitat, and aesthetic appeal.



Rain gardens by Nigel Dunnett 2007



# Ideas for Creating Vegetative Buffers

Provide controlled human access to the water.

Use new plantings to screen undesirable views and frame desirable views.

Think about providing both shelter and food sources for birds or small mammals they can be joy and easily encouraged to roost in your backyard.



<http://www.hrwc.org/gr/grprog/lvegbuffer.jpg>

Provide 25' of rough vegetation with deep roots. These will increase soil aeration and prevent erosion.

Carefully select native plants that will require low maintenance along streambanks. You can select from a variety of submerged aquatic plants to semi-wet species.

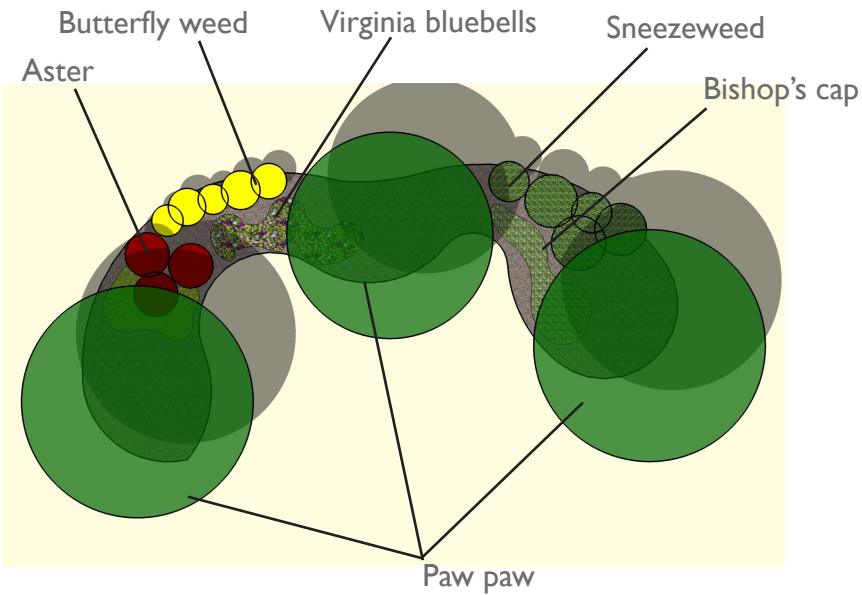


# Rain Garden Planting Plans

Here are two rain garden planting plans that you can alter to suit your property. They feature native plants of Michigan that can tolerate both wet and dry conditions.



<http://www.martinswcd.net/swcdpics/rain%20garden2.jpg>



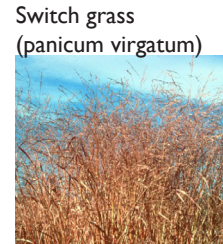
# Rain Garden Plants

Rain gardens often rely heavily on plants native to the prairies of the Midwest as they are well adapted to drought as well as temporary flooding. We recommend the following beautiful plant options that survive in different types of soil conditions:

## Occasionally wet conditions

(after rainstorms)

- Butterfly weed
- Joe pye weed
- Purple coneflower
- Black-eyed Susan
- Bicknell's sedge
- Red twig dogwood
- Switch grass
- Common milkweed
- Beebalm



[http://www.coloradonga.org/documents/Panicum\\_virgatum\\_large.JPG](http://www.coloradonga.org/documents/Panicum_virgatum_large.JPG)

Butterfly milkweed (Asclepias tuberosa)



<http://people.uis.edu/braeb1/uisprairieproject/images/butter2.jpg>

Reg twig dogwood (Cornus stolonifera)



<http://www.maes.umn.edu/releases/images/2865-V-010.jpg>

Bicknell sedge (Carex bicknellii)



[http://www.illinoiswildflowers.info/grasses/photos/bicknell\\_sedge1.jpg](http://www.illinoiswildflowers.info/grasses/photos/bicknell_sedge1.jpg)



photo courtesy of Laura Colvin

## Constantly Wet Conditions:

Marsh Marigold (Caltha palustris)



Wild Blue Flag Iris (Iris versicolor)



<http://www.watercolorsquasic.com/iris-hexagona.jpg>

Cardinal Lobelia (Lobelia cardinalis)



[http://www.fs.fed.us/wildflowers/pollinator/pollinator-of-the-month/images/rubythroat/lobelia\\_cardinalis\\_lg.jpg](http://www.fs.fed.us/wildflowers/pollinator/pollinator-of-the-month/images/rubythroat/lobelia_cardinalis_lg.jpg)

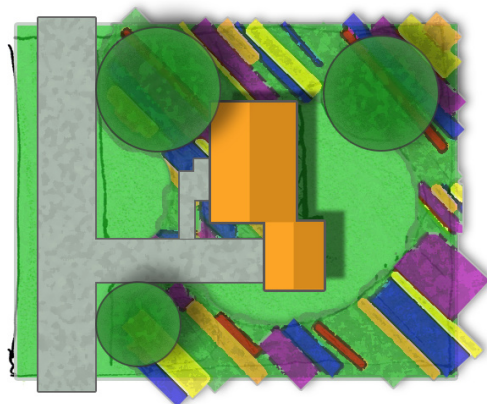
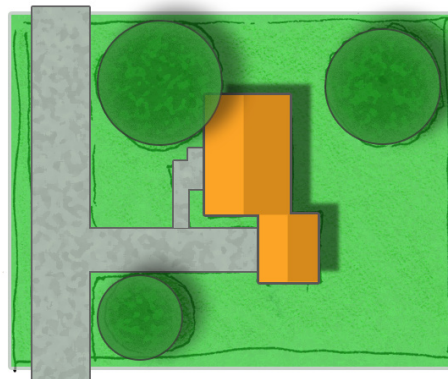
## Alternative Lawns

Typical turf grass lawns are high maintenance and should be considered carefully in the landscape. There are significant chemical inputs that are needed to maintain a healthy turf lawn as well as frequent watering and huge amounts of time or money that could be spent in a more enjoyable manner.

The first option is simply to reduce the size of your lawn. Large portions of the typical lawn can be converted to planting beds with stunning results for relatively low cost and significantly lower maintenance.

The second option would be to choose a lower maintenance planting alternative instead of typical turf grass. There are several options ranging from the wild fall color of purple love grass to the fairly typical look of a Pennsylvania sedge or buffalo grass. All turf grass alternatives share the common characteristics low water consumption, slow growth rate and reduced dependency

15



## Tips for building a Rain Garden:

The first step in building a rain garden is finding a section of your property that is both convenient and functional. This site should be lower than the downspouts on your house, and at least ten feet from the foundation in order to avoid water damage.

Next, you can develop the shape of the raingarden. This should reflect aesthetic appeal and the size of the area from which you will be collecting water. Try to detain the first half inch or "first flush" of a storm, and make sure that the gardens will drain in less than three days. Standing water for longer periods of time could lead to mosquito problems.

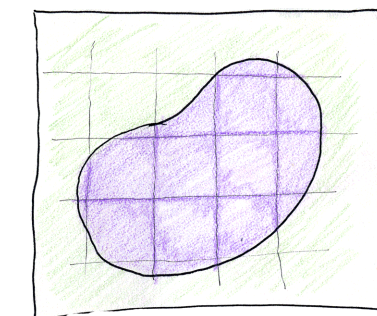
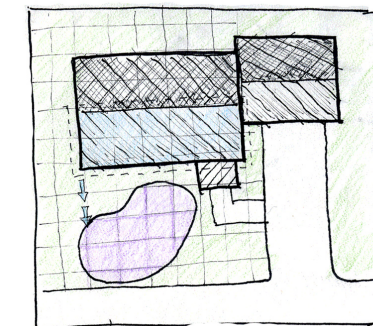
Sides of the garden should be shallow, as erosion occurs if earthen slopes exceed 1 foot of drop per 4 feet of run. A nice way to add both depth and volume to a rain garden are to ring it with native field stone. Setting the stones flush with the surrounding surfaces as shown to the left creates a durable edge that is resistant to erosion.

### Sizing Calculations:

Use graph paper to calculate the area of an irregular shape. You can simply count squares instead of using complicated equations to calculate area.

The "first flush" is 1/24th of a foot. Divide the square footage of the collection area by 24 to calculate the volume needed to hold the "first flush".

*Don't be discouraged if the area you are considering cannot hold the whole of the first flush. Every bit that can be held back makes a difference.*



12