Script: The Value of Rain Gardens July 2007

_____INFORMATION FOR THE PRESENTER_____

The Value of Rain Gardens (approx. 40 minutes) is designed to be part of a more detailed program on rain gardens. It covers the topic of storm water relatively thoroughly without going into specific rules and regulations. We encourage you to add local interest and information. Depending on your knowledge of the topic, you may want to expand the script particularly in the area of regional control of storm water.
Many of the slides are designed to have a picture or a bulleted script be animated – coming in on a mouse click. Any time you see an asterisk (*) in the script, hit your mouse button for the next bullet/picture to come up.

This program and those listed below are from the *Wisconsin Rain Garden Educator's Kit*, produced by the Wisconsin Department of Natural Resources and the University of Wisconsin Extension, first printed in 2004 and updated in 2007. An alternative presentation designed at a slightly more introductory level is *Digging into Rain Gardens*. These two presentations are not designed to be used together, since much of the same information is presented in both. You may wish to use *The Value of Rain Gardens* in conjunction with *How To Build a Rain Garden*, however, for a longer, more detailed program.

When we knew the source of the photo we gave a photo credit in the slide notes. Most of the pictures are also included in the Rain Garden Kit photo library.

Slide 1

Welcome: I'm _____. I'm so pleased that all of you are here to learn more about rain gardens. I'm going to provide you some information on the value of rain gardens – and why we should work to have these installed at our homes, businesses and public buildings.

(Photo: Rain Garden at Willie Street Coop in Madison with water entering)

Slide 2

Water – Having clean, good tasting water is important to all of us. You may not realize it, but more than 80% of everyone in Wisconsin drinks water from wells. We depend on a having a reliable supply.

(Photo: Building mural in Watertown, WI, Ellen Rulseh photo credit)

Slide 3

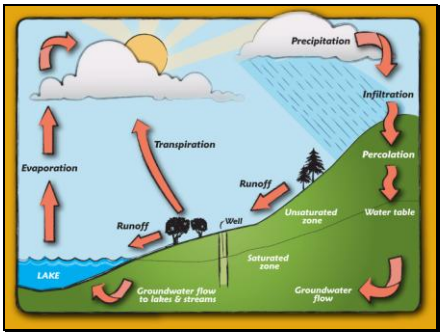
We also value and depend on our surface water: our lakes, rivers, streams and wetlands. Water is important to our lives for recreation, for business and for our sense of place, who we are and the uniqueness of where we live. Water from the ground and our surface waterways--are connected.

(Top left – Jefferson, photo by Suzanne Wade, top right, West Bend, photo credit Carolyn Johnson, bottom left, Pike Lake State Park, bottom right, Rock River Dodge County both photos by Suzanne Wade)

Slide 4

Here's how, when it rains, we usually think about it like the children's saying – rain, rain go away. But we don't often think about what ;going away' really means. Typically when rain falls, we try to move the water away as quickly as possible - this attitude has changed our environment and the life around us, let me explain:

Slide 5



Do you remember learning about the water cycle, probably around third grade? It rains, water flows down into streams and lakes, evaporates, forms clouds, and then becomes rain again. What is often forgotten is the critical part where rain or snowmelt soaks into the ground to become groundwater, where it might be used by plants and transpired back to the sky, or flow underground through the soil and rocks to lakes, streams or wetlands, or to people's wells. This picture is a very simplified version of the water cycle, that doesn't integrate other important features such as wetlands, but it does show the basic flow of the water cycle. *(point out the various parts of the water cycle in the graphic)*

The functioning of the water cycle is critically important, as where water goes impacts us immediately and into the future.

Slide 6

Let's go back and look at rain, where it falls and where it goes. Let's also examine how the way we manage rain and snowmelt and the storm water that results can impact the environment. Typically, rain that falls on forests, prairies, farm fields and places like this*
soaks into the earth where …

(photo Roger Bannerman)

Slide 7

...it moves down and becomes part of the groundwater and eventually *
comes out at streams, rivers, lakes or wetlands replenishing our waterways. This year round flow from groundwater is called base flow.

(photo: Sauk County, Bob Queen)

Slide 8

We can see this connection between groundwater and surface water at springs, such as this one, where a number of springs come together and * pour out with such a volume or water * that it is the headwaters for Token Creek, a major tributary to the *Madison lakes.

(first three photos Culver Springs, Dane County, Suzanne Wade photo credit; bottom right, Lake Monona and Madison; DNR file photo)

Slide 9

Spring are not only the headwaters for many lakes they are the life giving source of water to streams and wetlands of all types.

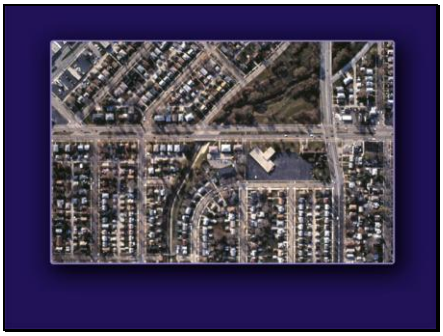
Top left, Angelica, Walworth County, Suzanne Wade, top right, heron, Bill Volkert, pink flower photo source unknown, wet prairie/fen Southern Kettle Moraine, Suzanne Wade)

Slide 10

When cities are small, or in conservation subdivisions such as this one, there is little impact to the water cycle and this important connection between groundwater and surface water.

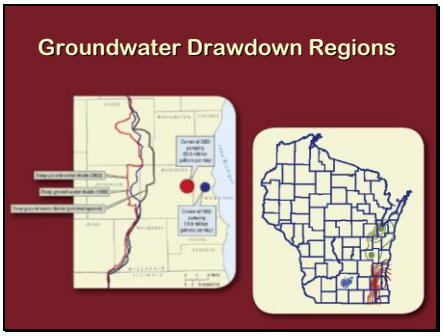
(Photo: This aerial photo is of a conservation subdivision where special practices have been put in to encourage infiltration. Larry Coffman photo credit)

Slide 11



But as communities grow the impact is huge. Think about how all these homes, streets and businesses impact the little stream running through it.

Slide 12



Let's look at how the use of water and not just city growth can impact groundwater and surface water.
The concentric circles on the state map show groundwater drawdown areas in the deep water aquifers in Wisconsin caused primarily by municipal pumping. *(Point out the drawdown areas in the Green Bay, Appleton and Fond du Lac region, Madison and the Milwaukee, Waukesha and Chicago area.)*
Each line represents 10 to 50 feet of drawdown. In the Milwaukee, Waukesha and Chicago drawdown area the water level in the deep aquifer has dropped up to 450 feet and in the Green Bay area it has dropped an astounding 700 plus feet.

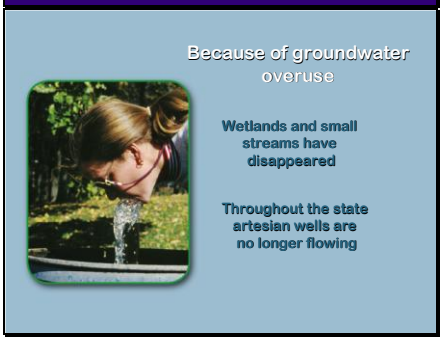
*This next map shows another impact, just like there are continental divides for surface water, *(explain more if you have*

time), there are continental divides for groundwater. The black line is the subcontinental divide for deep groundwater before European settlement in the Milwaukee area. Groundwater to the right of this line would flow to Lake Michigan and out to the Atlantic Ocean, and water on the left would flow to the Rock River eventually to the Mississippi and then to the Gulf of Mexico. The red line is where that divide fell in 2002. Notice how far into Jefferson and Dodge counties this line has moved, that means water that used to flow to the Rock and to the Mississippi is now going the other way – towards Lake Michigan. This is caused by the use of water in Waukesha and Milwaukee counties. This is a real impact that people are causing, not only here but in many areas of the country.

Slide 13

You can see the result of this by looking at the number of wells in this ten county region that have been replaced because the old well dried up. Many of these wells went dry due to the drawdown of groundwater by the deep wells installed in southeast Wisconsin

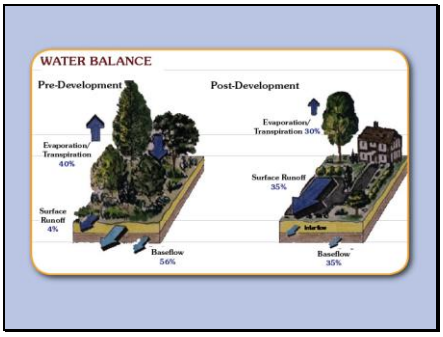
Slide 14



To summarize, as a direct result of people's use of groundwater for residential, business and agricultural uses, we have had, and continue to have a major impact on our groundwater resources. For example throughout our urbanizing areas, wetlands and streams have dried up and disappeared, many artesian wells are no longer flowing and many shallow wells have dried up or no longer produce sufficient amounts of water.

Photo – Suzanne Wade

Slide 15



And it's not just groundwater use that is a problem, let's look at how rain water moved through the environment before the land was developed with houses, businesses and roads, Most of the water 56 %, of the water soaked in and became groundwater and only 4% ran off. Because of the large number of plants, 40% was transpired through plants or evaporated off of the surface.

* Then (point to second picture) as development takes place more and more water runs off instead of soaking in – you can see the relative change just by looking at the size of the arrows. In a typical residential area today, 35% soaks in and 35% runs off. That's a big difference, in a commercial area with all of the large roofs and parking lots, very little water soaks in--only 15% -- just about a reverse of what happened naturally.

This change is greatly impacting out groundwater and our surface water – and here what is happening.

(Graphic: Center for Watershed Protection)

Slide 16

In cities, instead of all the rain that falls on roads, parking lots, roofs and other hard surfaces typically flows to storm drains or ditches. A much smaller portion of the land actually allows the water to soak in.

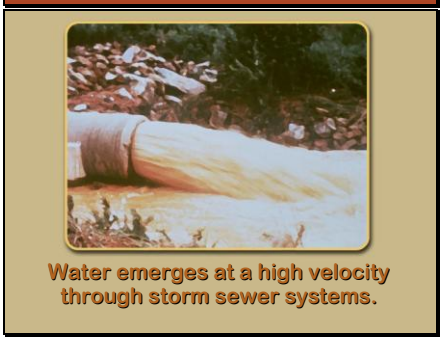
Slide 17

At commercial locations almost all of the rain ends up running off into storm drains or ditches instead of soaking in.

So where does this storm water go? *(Ask the question of the audience and see what folks say)*

(photo DNR file photo)

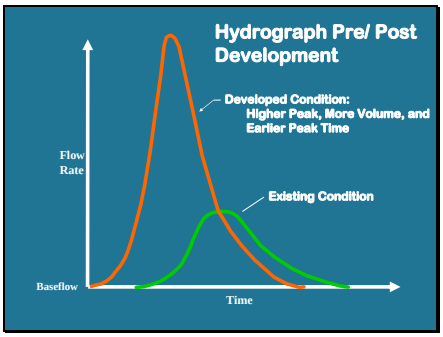
Slide 18



Many people don't realize that storm water is usually not treated, but instead pours out of storm sewers directly into lakes, rivers or streams, often with great force.

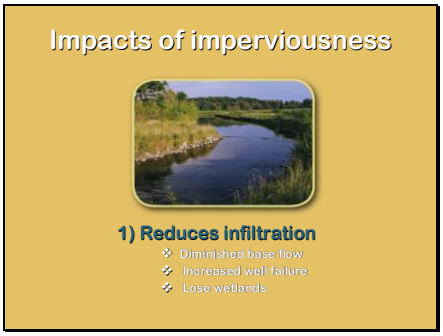
(DNR file photo)

Slide 19



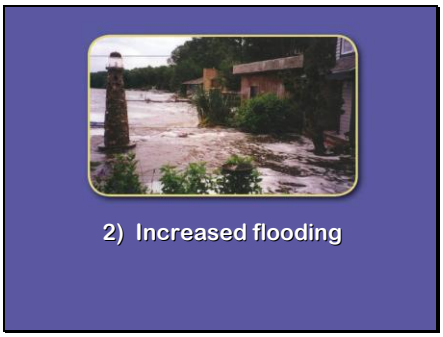
This graph represents the water levels in a stream. The green curve represents a stream in a watershed in its undeveloped, natural condition. The red line is what happens post-development. You can see that in natural conditions *(point to green curve),* the stream doesn't even know it's raining for a while, that's because as we've seen the rain water has to go through the earth first, the water level in the stream the gradually rises and then falls. The bottom of the graph is not zero flow but rather the typical amount of water that is in the stream year round, or the baseflow. In contrast, look what happens after the watershed has been developed and impervious surfaces have increased *(red curve).* Almost instantly after it starts raining, the water runs off in tremendous volumes. As soon as it stops raining, it's like turning off a faucet, the water level drops quickly and since so little groundwater is replenished, the water flow can drop well below the original baseflow of the stream, sometimes to zero flow. Thus streams that once flowed year round now have extreme floods in the spring and then dry up.
(add local information about such streams if available.)

Slide 20



This change from soaking in to running off causes three major problems
The first issue is the reduction of groundwater infiltration, resulting in, as we've discussed *
a real reduction in the amount of water flowing to our streams as baseflow *
less groundwater infiltration means some people with shallow wells will have their wells dry up. *
And it means fewer wetlands for flood control, pollution control and wildlife habitat.

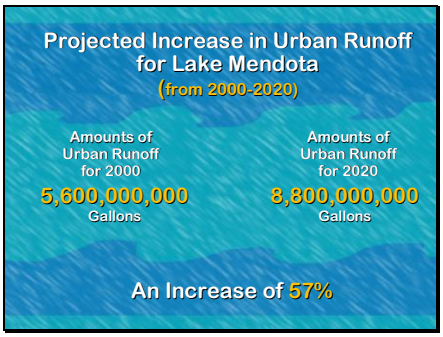
Slide 21



The second impact is the increase in flooding severity with so little soaking in. In the growing Madison urban area around Lakes Mendota and Monona, one large storm in 2000 caused significant flooding and property damage.

(Photo, Lake Monona Bell Isle, Candy Schrank)

Slide 22



For those of you who like numbers. Runoff volume from storms in 2000 was calculated at a total of 5.6 billion gallons!
Of course Madison and area are growing, so with the expected urban growth, if nothing is done to control stormwater in the year 2020 a similar storm would result in a 57% increase in the amount of water flowing into the lake--or 8.8 billion gallons!

What would this mean to Madison? Much of the Isthmus where the Capitol is, would be flooded and it would very likely destroy the locks separating the two lakes. Not to mention the property damage done to lakeside homes and homes down river.

Slide 23

This increased runoff also means and increase in dangerous flash floods in low areas throughout the city.

Slide 24

Urban storm water is a problem in rural areas as well. Many farmers who are downstream from cities are finding their fields flooding year after year instead of only occasionally. They're also seeing flooding not only in the spring, but sometimes several times a year. Meaning lost crops and increased erosion.

(Crawfish River Jefferson County, Suzanne Wade photo credit)

Slide 25

The third major problem of increased stormwater is erosion. The great force of this storm water runoff causes massive erosion along stream banks. This erosion occurred in the Milwaukee area after two large storms. The line of rocks shows you where the original stream bank was and how much land eroded away.

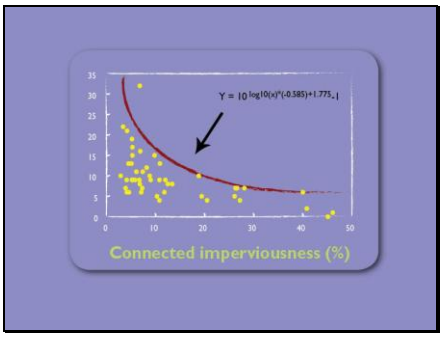
(Photo: Tree toppling: Lincoln Creek, Milwaukee 2000, flood crest three feet above normal. Original stream width was where the line of large rocks is. Roger Bannerman)

Slide 26

We've typically dealt with the increase in water volume by channelizing and armoring the streams. This is dangerous for people, especially risk taking teenagers and young children who don't recognize the danger. Its also hard on the stream critters that have too much water one minute, and not enough the next.

(Photo: Milwaukee, Roger Bannerman)

Slide 27



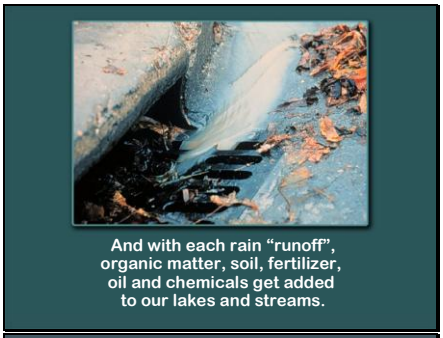
We do know that once a stream's watershed is developed greater than 15%, the stream is irretrievably damaged, and major damage occurs with as little as 8 to 10% of the watershed developed. Research shows how the number of fish species *the yellow dots* changes as the amount of impervious surfaces increases, represented by the red line. Here you can see that in areas with less than 10% impervious surface, fish species are abundant. However, as impervious surface area increase as you move to the right side of the graph, fish species decline to just a few, typically rough fish like carp and bullheads.

Slide 28

*Too much water isn't our only concern; *it's also what's in the runoff. The three greatest pollutants statewide are
* soil, *(resulting from erosion from construction sites or agricultural fields)*
* manure or other animal wastes, *(from farm animals but also in some areas geese, seagulls, and dogs, plus human feces through failing septic systems and sewage overflows)*
* and fertilizer. *(from over-application on urban lawns or farm fields)*

Throughout the state the biggest concern is soil, which can carry with it manure and other fertilizers and the nutrients like phosphorus that are associated with them.
(Photo: Milwaukee area, Roger Bannerman)

Slide 29



In urban areas the runoff contains a smorgasbord of organic matter such as leaves and grass clipping, soil, fertilizers, oil, and chemicals that flow through the storm drains directly to our lakes, rivers and streams.

(DNR file photo)

Slide 30

Mainly these pollutants--especially soil--impact habitats, which are the areas where animals live. A healthy stream will have a bottom rich with cobbles, gravels or sand…

(DNR file photo)

Slide 31

Which are the home for critters, large
* and small …the foundation of the water food chain.

(Photos: Crayfish, Suzanne Wade; mayfly unknown) *note this is a rusty crayfish, an exotic invasive, so you may wish to exchange this slide for another. If you have a nice large crayfish picture send it*

Slide 32

But every year when the snow melts and spring rains come, blankets of soil wash off the land and into our waterways. Ask: Why is this a problem, what does it do in streams or lakes?

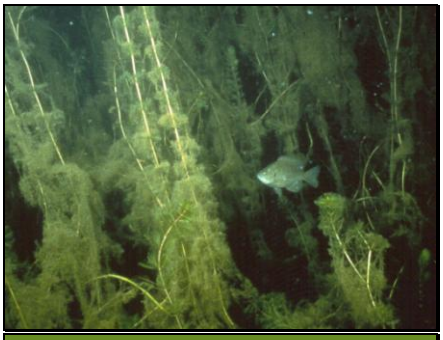
(Photo: Sediment plume from Six Mile Creek, Dane County)

Slide 33

The soil sifts down, filling in the spaces between the rocks and eliminating important habitat. It gradually fills in the deep holes where game fish live. These deep holes are also important refuges for small fish during droughts. What was once a vibrant stream with deep holes, rocky riffles and clean bottoms eventually degrades to a muddy bottom with little difference in depth, where little can live except for very hardy worms, insects and rough fish.

(Photo: unknown)

Slide 34



Additionally, soil and fertilizer do in water the same thing they do on land - grow plants. These plants and algae can cause significant problems when they grow excessively. This small fish may like the protection they provide, but game fish have a hard time catching their food. People don't like to swim when the water is green with algae or full of plants. Boat motors become fouled by the mats of plants as well.

(Photo: UWEX, Bob Korth)

Slide 35

An end result of this excessive plant and algae growth happens when the plants eventually die. Bacteria feed on the dead plants, breaking them down. The bacteria use all of the oxygen out of the water so there isn't enough for the fish, resulting in fish kills.

(Photo: Mason Lake, Adams County, Suzanne Wade)

Slide 36

No he's not wearing a hula skirt, excess plant growth is unsightly, and unpleasant as shown here. The use of beaches has greatly decreased because of water quality, ultimately this means for many cities increased cost to build and maintain pools.

(Photo: Lake Wingra, Madison David Thompson)

Slide 37

Storm water runoff impacts recreation and our health – beaches are often closed because of high bacteria levels in runoff.

Plus some forms of blue-green algae can release toxins which can sicken or kill dogs or people who swallow it.

(Photo: Lake Monona, Bob Queen)

Slide 38

The impact of poor water quality is felt not only by the animals that live in the streams and lakes or the people who recreate, it also impacts us economically. Water-based tourism brings in $12-$15 billion every year to Wisconsin's economy. (and this figure is ten years old – it's even greater today.)

(Photo: Algae in front of UW Hoofers Sailing Club dock – Madison. Roger Bannerman)

Slide 39

All of these reasons are why we have the goal of having our cityscapes function ecologically more like our rural landscapes.

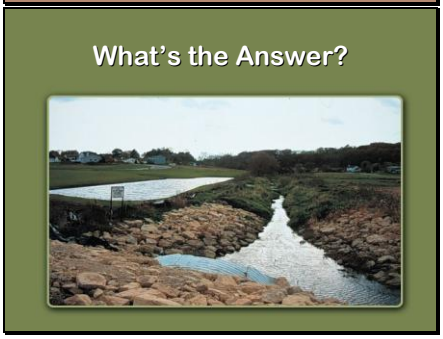
(Photo: city, unknown; Rock wall in woods – Southern Kettle Moraine, Suzanne Wade)

Slide 40

When we build, we have always engineered our homes and cities to collect rainwater and move it quickly away, collecting it, concentrating the flow, and conveying it quickly off the property. While this protects the home, it ends up sending the problem downstream.

(Photo: unknown)

Slide 41



Over the past ten years, we've then used engineered solutions to collect the storm water from a number of homes in detention ponds to try to control the storm water. This is expensive and over time can have aesthetic problems. So what's the answer?

(Photo: St Francis subdivision, Cross Plains, Roger Bannerman)

We can find the answer at both the community level and at the personal home level. In the Conventional Drainage picture you see a typical new development with wide streets, and curb and gutter.

Slide 42

Some developers are changing the look of new developments in order to incorporate designs that work with nature instead of against it. Here, in the second photo, streets are narrow, and gentle swales, or ditches, replace the storm sewer. These are just two ways to make an urban area act more like nature.

Our home landscape design can also function in an environmentally friendly way. In the first picture water moves from the roof, rapidly across grass to the street. In the second home, the planting in the front captures water from the driveway and house allowing it to soak in. The first house could easily be made to function ecologically by changing some of the plantings to hold and absorb water. These specially designed gardens are called…

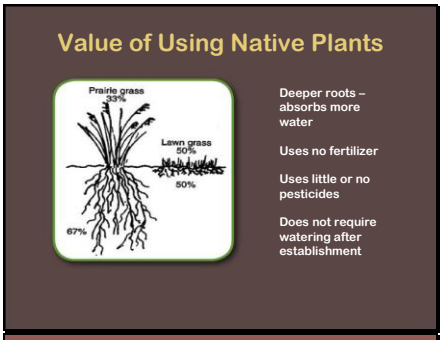
(Photos unknown)

Slide 43

Rain gardens and it is something each of us can do in our own yards.
Generally speaking, a rain garden is simply a slightly depressed garden located where it can catch the water from your downspout, driveway or yard.
Rain gardens are:
* typically dug out only 4-6 inches with a flat bottom *(range 3-8 inches)*
* The size is typically 1/3 of the area draining to it, and

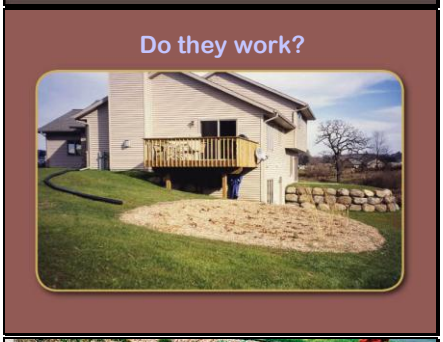
(Photo: Bannerman rain garden, Madison, Suzanne Wade)

Slide 44



Generally rain gardens are planted to native plants because they have evolved to survive in our native ecosystems with lots of water for periods of time, followed by drying. They have deeper, more expansive root systems to absorb more water. They require no fertilizers, little or no pesticides, and no watering after establishment.

Slide 45



Rain gardens do work – in one study, just putting in 3 rain gardens at each home, collecting clean water from the roof and lawn and letting it soak in, 60% of the development's infiltration goal were met – 60% without large expensive infiltration basin's or any other engineering practice.

(Photo: St Francis subdivision, Cross Plains, Roger Bannerman)

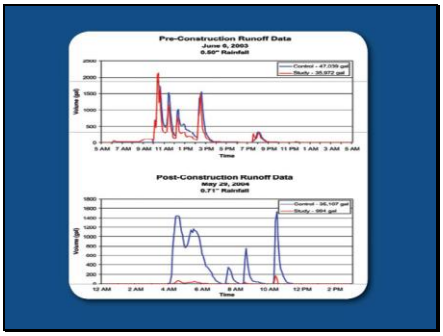
Slide 46

In one city they did a very involved study, where one street had rain gardens installed, taking not only runoff from the home, but from the street as well.

Another street was left alone –
What do you think the result was? How much water was infiltrated instead of running off to the river?

(Photo: Barr Engineering)

Slide 47



Here are the results from the Barr Engineering study – the top graph shows the runoff from both streets before the rain gardens were built. The lines are very similar, when it rained both streets had lots of runoff.

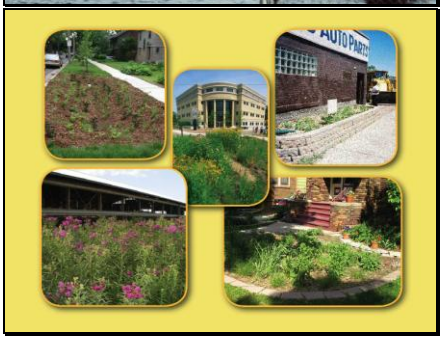
The lower graph shows the street with no controls in blue, but just look at the results from the rain garden street shown in red. Almost no rain ran off only 994 gallons - 90% infiltrated!
They were successful in getting their city to function ecologically the same as a forest or a prairie.

Slide 48

At this site, if each ½ acre lot put in a 600 square foot rain garden it would control 100% of the runoff from the property – if the soils had good infiltration, the rain garden would only need to be 400 square feet in size.

(Photo: unknown)

Slide 49



One of the beauties of rain gardens is they can be installed almost anywhere – by your home, next to streets, adjacent to or even in parking lots, at farms or in industrial areas.

(Photos: top left, Adams Street, Genesis Bichanich; Middle, Edgewood College, Bob Queen photo; Top right, Auto Salvage Yard, Milwaukee, Earth and Water Works, LLC; bottom left, Pond Hill Dairy, Jefferson County, Margaret Burlingham, bottom right, Madison home, Jim Bertolacini)

Slide 50

There are many benefits to rain gardens.
* First as we have been discussing, it can help restore the natural water flow,
* allowing rainwater to soak in,
* plus it can trap pollutants.

On a 2000 sq ft house with rain gardens at each downspout, rain gardens can catch and infiltrate 32,000 gallons of water a year.

(Photo: Langmanor Farm rain garden, Palmyra, Margaret Burlingham)

Slide 51

Plus the native plants are beautiful whether individually or as a community, attracting butterflies, bees, and birds.
(photos: Pale purple coneflower and rain garden, Bob Queen)

Slide 52

So while storm water is a concern – we can take the problem by the horns and do something about it both personally and in our communities.

(Photo: Midvale Neighborhood sign, a pickax was needed to get holes for the plant plugs and still doing well. photo by Suzanne Wade)

Slide 53

Thank you – I hope you see the concerns we have with storm water and are inspired to plant your own rain garden. We do have available either for purchase or for free download from the web a complete how-to manual. The website is on the screen.

(If in a workshop setting, mention that another section will be on how to build a rain garden.)

(Photo: Edgewood College, Madison, Bob Queen)