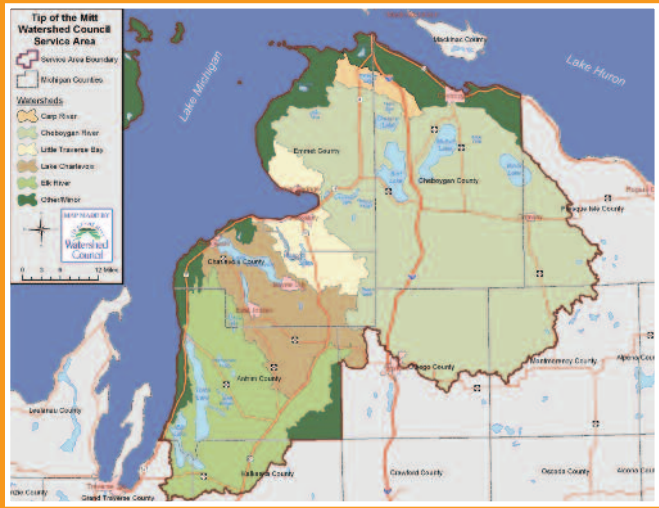
A Homeowner's Guide to Watershed Protection

Simple, practical, and water-friendly ways to protect

Little Traverse Bay



OUR MISSION

The Tip of the Mitt Watershed Council speaks for Northern Michigan's waters. We are dedicated to protecting our lakes, streams, wetlands, and groundwater through respected advocacy, innovative education, technically sound water quality monitoring, thorough research, and restoration actions. We achieve our mission by empowering others and we believe in the capacity to make a positive difference. We work locally, regionally, and throughout the Great Lakes Basin to achieve our goals.

OUR SERVICE AREA

Tip of the Mitt Watershed Council is the lead organization for water resources protection in Antrim, Charlevoix, Cheboygan, and Emmet Counties. Water resources in our service area include:

- More than 2,500 miles of rivers and streams
- Multiple blue-ribbon trout streams
- 14 lakes larger than 1,000 acres (among the largest in the State)
- 38 lakes between 100 - 1,000 acres
- 184 lakes between 10 - 100 acres
- 1,600 lakes that are less than 10 acres
- 339,000 acres of wetlands

Tip of the Mitt Watershed Council
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www.watershedcouncil.org

Greetings Little Traverse Bay Watershed Resident!

As a resident of the Little Traverse Bay Watershed, you are aware of the area's wonderful water resources – Walloon Lake to the Bear River and its tributaries, to Tannery Creek and the Bay itself. We live, work, and play here. The Little Traverse Bay Watershed is home.

This publication serves as a resource to Little Traverse Bay Watershed residents. It includes information on how you can do your part by putting into practice simple, practical, and water friendly ways to protect the Little Traverse Bay Watershed.

Please share the information with friends, family, and neighbors so that together we can have a positive impact on our Watershed.

What is a Watershed?

A watershed is an area of land that feeds all the water running under it and draining off of it into a body of water. It combines with other watersheds to form a network of rivers and streams that progressively drain into larger water areas.

Homes, farms, ranches, forests, small towns, big cities, and more can make up watersheds. Some watersheds cross country, state, and even international borders. Watersheds come in all shapes and sizes. Some are millions of square miles, others are just a few acres. ***Wherever you are, wherever you go, you're in a watershed.***

Everything that happens in a watershed affects its water quality.

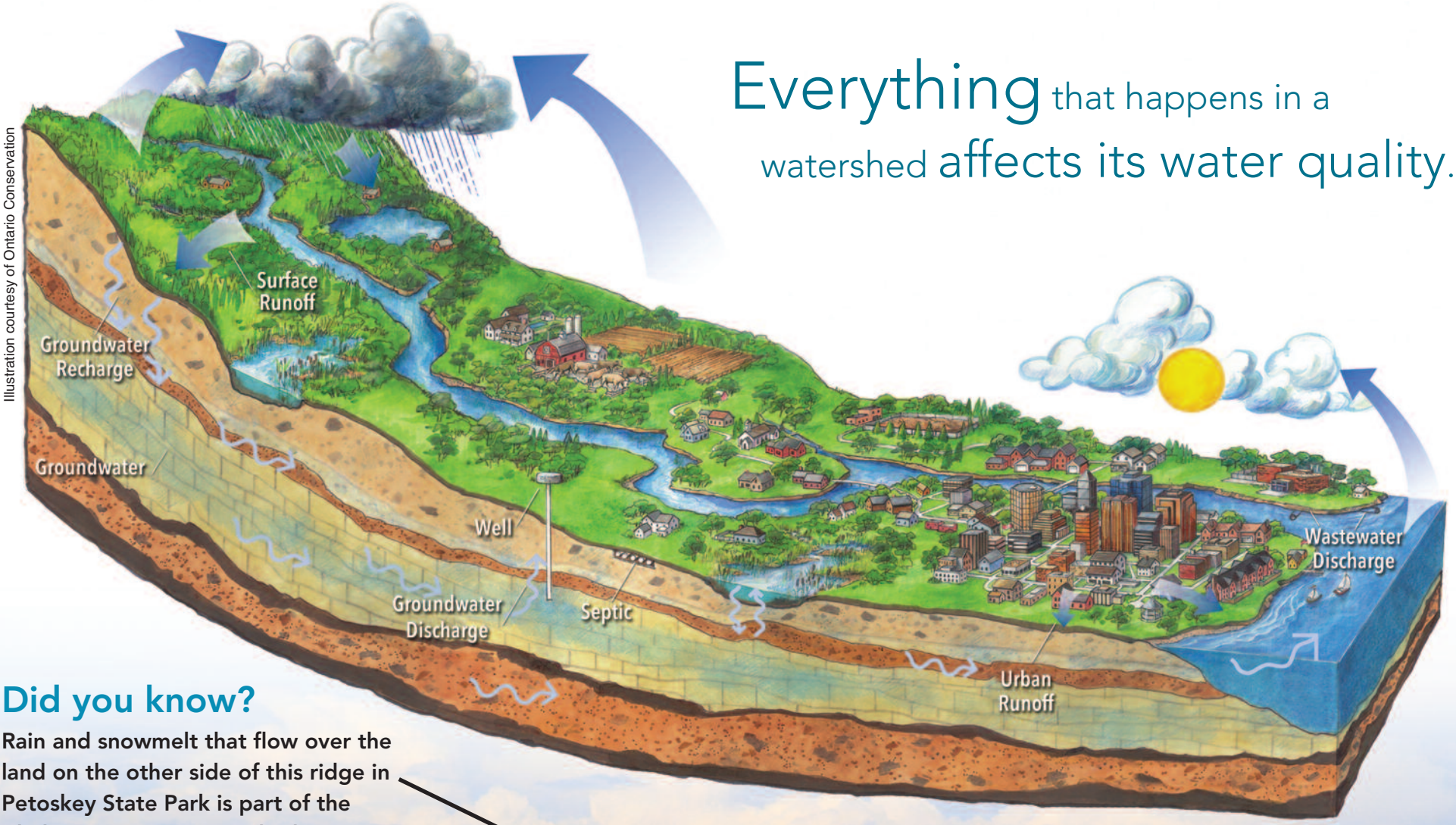
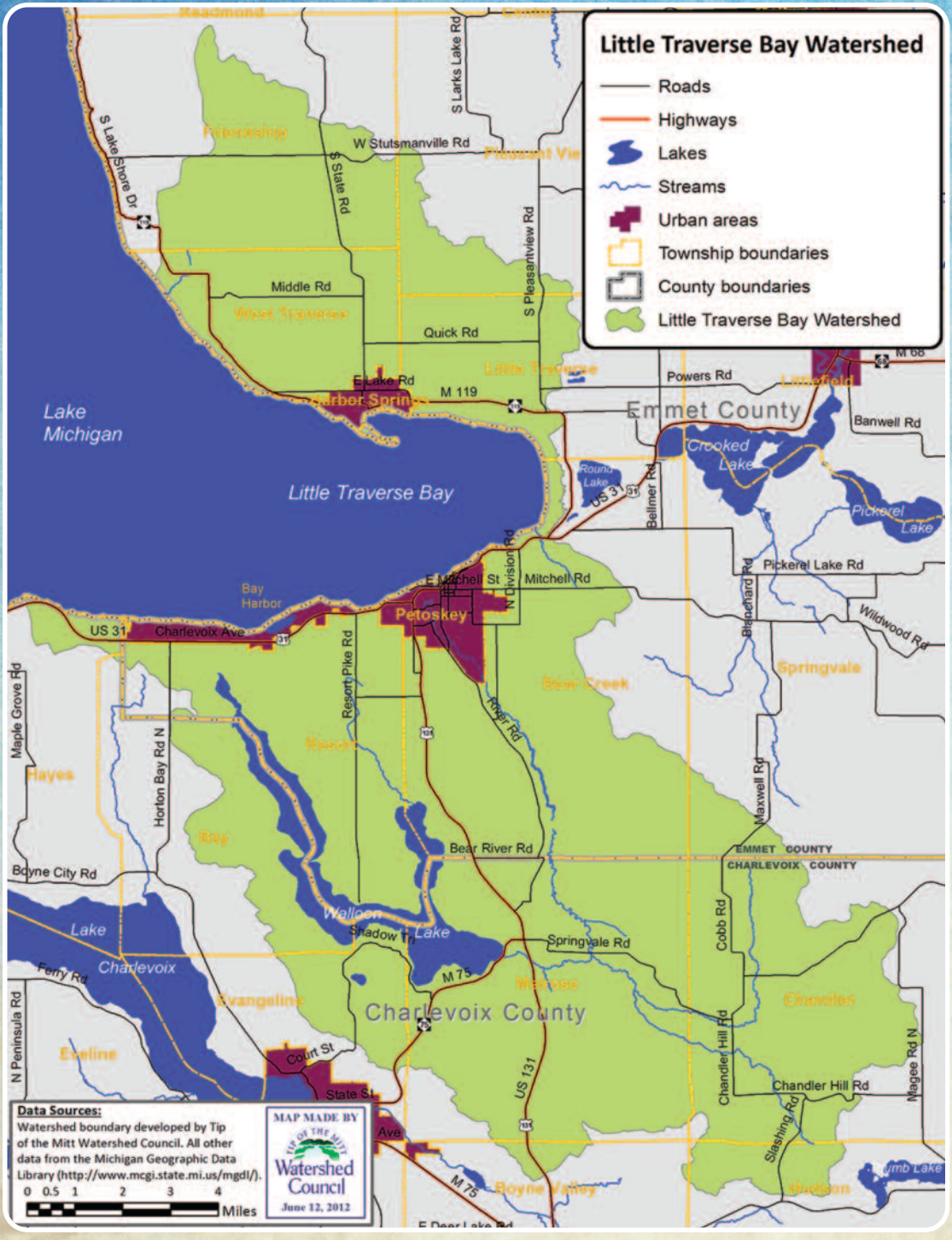


Illustration courtesy of Ontario Conservation

Did you know?

Rain and snowmelt that flow over the land on the other side of this ridge in Petoskey State Park is part of the Cheboygan River Watershed.

Rain and snow melt that flow over this side of the ridge in Petoskey State Park is part of the Little Traverse Bay Watershed.



Little Traverse Bay Watershed

- At approximately 45 square miles, Little Traverse Bay is Lake Michigan's fourth largest bay, behind Green Bay, Grand Traverse Bay, and Bay DeNoc.
- The Bay is 3.5 miles wide between Petoskey and Harbor Springs, eight miles wide between Nine Mile Point and Seven Mile Point, and approximately 10 miles long.
- The Little Traverse Bay Watershed land area covers 174 square miles and contains a diversity of water resources, including Walloon Lake, the Bear River, and its tributaries.

Little Traverse Bay

For centuries, the Odawa Indians made their home along the lakeshore of Little Traverse Bay. The strategic location of the Bay on the Great Lakes and its abundant natural resources made it desirable not only for Native Americans, but also for early European settlers. French explorers traveling along the east coast of Lake Michigan found two large embayments along their way. During calm weather, they crossed the bays' mouths in their canoes to save time. The northernmost bay had a slightly narrower mouth and they called this *la petit travers* - the little traverse.

The abundance of natural resources, and ease of harvesting and transporting them, made the area's economy flourish. Lumbering and fur trading were extensive within the Watershed. The Bear River made it easy for transporting logs to the Bay where large ships waited to take them to points all along the Great Lakes. Fishermen harvested whitefish and lake trout from the Bay. Limestone and shale along the south shore of the Bay supported cement manufacturing. In addition to all of the industrial and extractive uses, the natural beauty of Little Traverse Bay also attracted visitors from across the country. By the 1880's, several resort communities were well established. By the time Michigan became a state, well over 100 years of fur trading, resource extraction and development had already taken its toll on the Watershed.

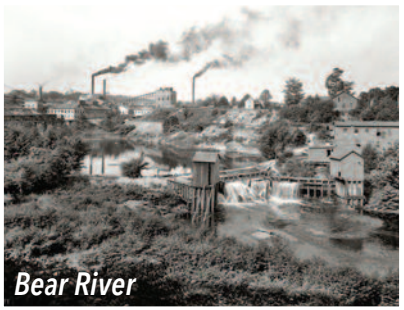
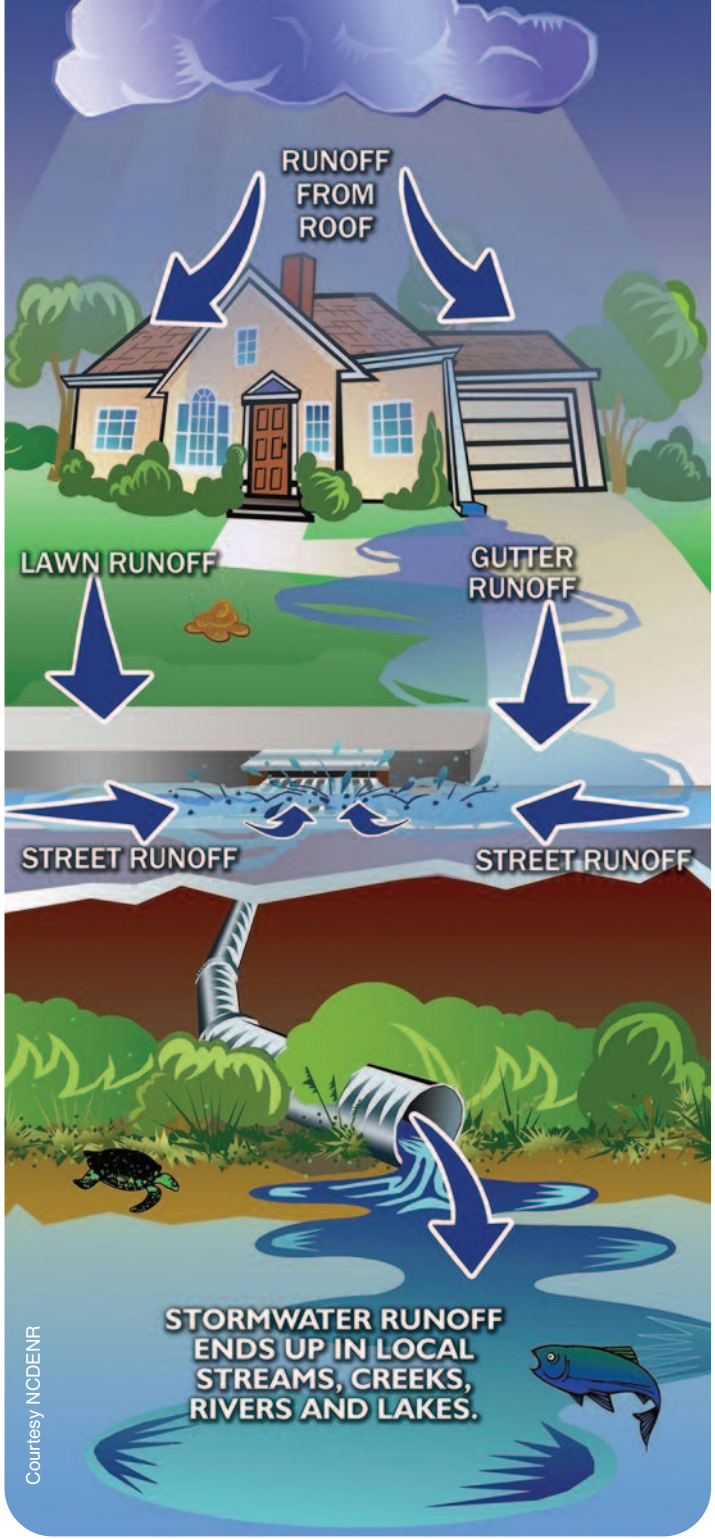


Image courtesy of Little Traverse Historical Society

Ironically, the water resources that continue to enrich the area are still threatened. Overdevelopment, invasive species, and pollution from stormwater runoff are just a few of the threats they face today. The balance of supporting the local economy while preventing resource degradation is an ongoing challenge.

DID YOU KNOW... ***Round Lake IS NOT part of the Little Traverse Bay Watershed. It's actually part of the Cheboygan River Watershed and drains into Lake Huron!***



Courtesy NCDENR

Watershed Protection

THREATS TO WATER QUALITY

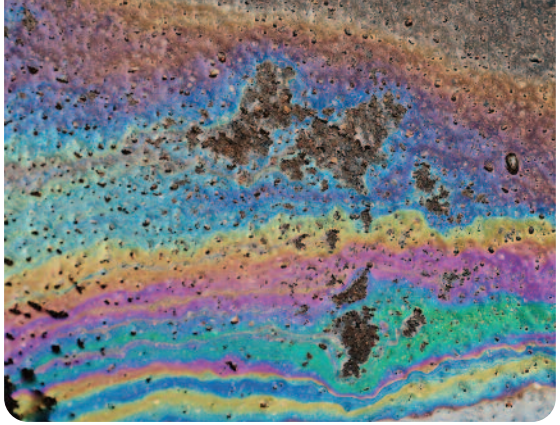
The water quality of Little Traverse Bay is a reflection of the activities in its watershed. Water quality is impacted by two major types of pollution -- point source and nonpoint source. Point source pollution comes from an easily identifiable source, such as a discharge pipe from a factory. Nonpoint source pollution, on the other hand, comes from more diverse and diffuse sources that are not usually so obvious. One cause of nonpoint source pollution is stormwater runoff.

What is Stormwater Runoff?

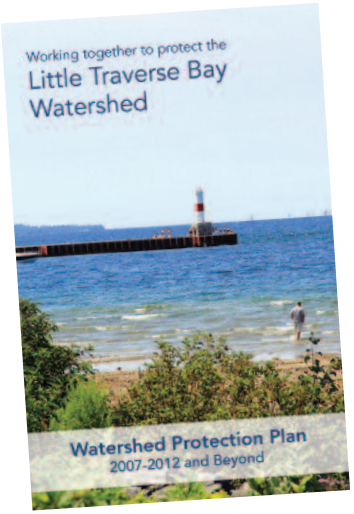
Stormwater runoff is generated when precipitation from rain and snowmelt flows over land or impervious surfaces (paved streets, parking lots, and building rooftops) and does not soak into the ground. Stormwater accumulates debris, chemicals, sediment, nutrients or other pollutants that adversely affect water quality of nearby lakes, streams and wetlands.

Don't Storm Sewers Treat Stormwater?

Yes and no. First of all, storm sewers are separate from waste water or sanitary sewers. In more developed areas, like cities and towns, residential and commercial wastewater is conveyed through sanitary sewers to waste water facilities where it is treated to meet water quality standards before it is discharged. On the other hand, stormwater is typically conveyed through an underground system of pipes and then discharged, without treatment, to a nearby lake or stream. In some cases, storm drains and inlets have integrated treatment devices, such as sumps, which allow for some settling of sediments, or oil/gas chambers, which separate out oils and gas from the rest of the stormwater. The vast majority of storm sewers, however, do not include these types of devices due to expense, required maintenance and difficulty with retrofitting existing structures.



Nonpoint source pollutants can have harmful effects on drinking water supplies, recreation, fisheries and wildlife. **The Little Traverse Bay Watershed Protection Plan (Plan)** identifies nutrients and sediments as the most serious nonpoint source pollutant threat to the Watershed's surface waters. Nutrients, especially phosphorous, can cause nuisance plant growth and harmful algal blooms. Common sources of nutrients include fertilizers used in agriculture and on lawns and gardens; animal wastes from both farming operations and pet sources; and failing septic systems. Sediments compromise aquatic habitat and increase water temperatures. Common sources of sediments include eroding soils from construction areas, lakeshores and streambanks, and agricultural fields. Other pollutants, such as metals, grease, oil, automotive fluids, and deicers, wash off roadways, sidewalks, and other impervious surfaces and directly into surface waters or into stormwater systems.



To help protect water quality of the Little Traverse Bay Watershed, the **Plan** addresses control of nonpoint source pollution with specific recommendations for action, including implementation of Low Impact Development (LID) strategies. LID comprises a set of site design approaches and best management practices (or BMPs) that are designed to address runoff and pollution at the source. LID practices remove sediments, nutrients, bacteria, metals and other pollutants while reducing the volume and intensity of stormwater flows, thereby proving to be one of the most effective techniques to protect water quality.

Across the Little Traverse Bay Watershed, there are 3,071 acres of land serviced by stormwater systems, with a total of 70 stormwater outfalls. Each year these outfalls discharge an estimated:

775,800 lbs. of Sediment
2,745 lbs. of Phosphorus
1,050 lbs. of Zinc
280 lbs. of Copper

This equals 547 50 lb. bags of 10-10-10 fertilizer!

This could stimulate the growth of over 2 million pounds of algae and equals almost 32 dump trucks of soil!

A Typical Residence

In Stormwater World

How much water could you collect from your roof?

During a typical moderate storm of 1" of rain during a 24 hour period, over 700 gallons of water will run off the average roof (about 1,200 square feet). In one rainy day, your roof runoff could fill up fourteen bathtubs!

Do you live at 123 Stormwater Way, Pollutedville, USA?

Take a look at your property. Where does your stormwater go? Observe these areas to see if you are contributing to polluted stormwater runoff:

1. **Gutters and Downspouts**
Roof runoff is directed onto the driveway.

2. **Driveway**
Expansive areas of impervious asphalt or concrete generate large volumes of stormwater that drains to the street.

3. **Turf Grass**
Although better than impervious surfaces, turf grass does not slow down or absorb stormwater as well as deeper-rooting native plants.

4. **Storm Drain**
The neighborhood's stormwater is directed into curb inlets where it then enters the storm sewer system before discharging to a lake or stream.

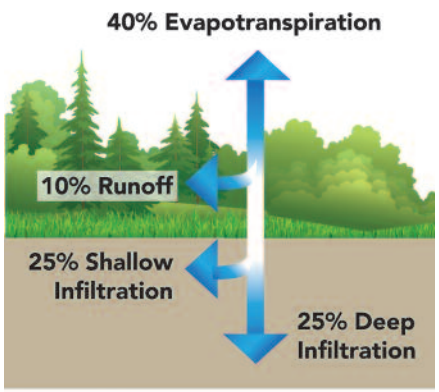
5. **Walkways, Patios, and Other Hardscapes**
Impervious surfaces used for walkways and other site elements further contribute to the stormwater footprint.

Imagine what happens when one typical "Stormwater Way" residence is multiplied by a subdivision, a city block, a community. Understanding your stormwater "footprint" will help you decide what measures you can take to help protect water quality.

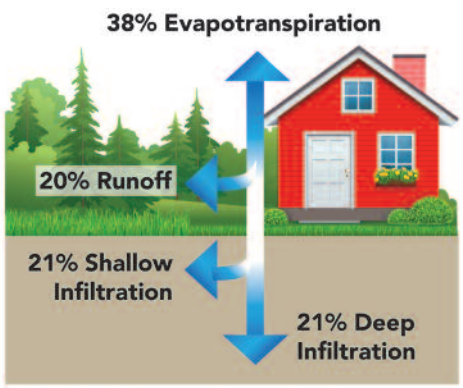
Understanding the Impacts of Impervious Surfaces

With natural groundcover, 25% of rain infiltrates into the ground and only 10% ends up as runoff. As imperviousness increases, less water infiltrates and more and more runs off. In highly urbanized areas, over one-half of all rain becomes surface runoff, and deep infiltration is only a fraction of what it was naturally.

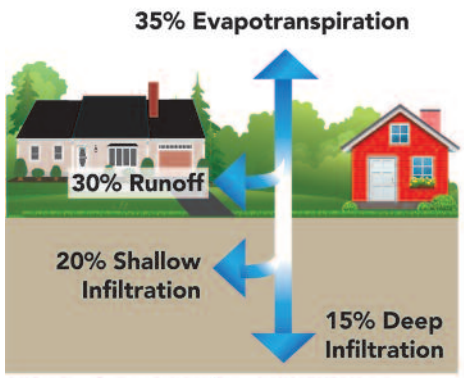
Furthermore, increased surface runoff requires more infrastructure to minimize flooding. Natural waterways end up being used as drainage channels, and are frequently lined with rocks or concrete to move water more quickly and prevent erosion. In addition, as deep infiltration decreases, the water table drops, reducing groundwater for wetlands, riparian vegetation, wells, and other uses.



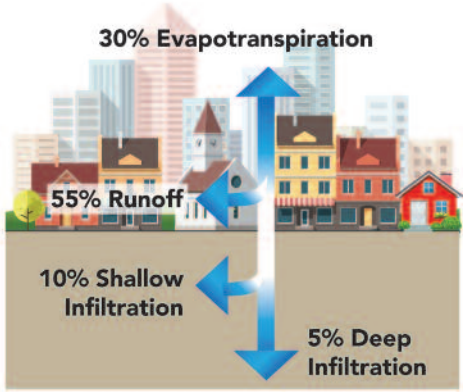
Natural Ground Cover



10-20 % Impervious Surface



35-50% Impervious Surface



75-100% Impervious Surface

Controlling Stormwater Matters!

Controlling stormwater isn't complicated. **You can start with these simple steps** to keep polluted stormwater runoff from entering our beloved Little Traverse Bay.

Chitty, Chitty, Bang, Bang!

The next time it rains, look down at the pavement on your driveway or the nearest parking lot. See any colorful oil rainbows? These rainbows may look pretty, but they are composed of toxic materials, such as antifreeze, motor oil, brake fluid, and transmission fluid. When these materials wash down storm drains into lakes and streams they can be harmful to aquatic life.

If your car is leaking, repair the leaks right away or use a drip pan to catch leaks if repairs are delayed.

Size does matter

When you cut your grass too short, the roots die back. Allowing your grass to grow taller (at least 3 inches) will result in deeper roots and a better lawn. Taller grass absorbs more rainwater so that less runs off during storms. Less runoff is good for keeping Little Traverse Bay clean.

Diamonds, Platinum, BLACK GOLD!

You can make your own riches by composting your yard waste. Leaves, grass, and other yard debris make excellent compost. Compost helps keep organic materials from washing into storm drains and nearby lakes and streams. Compost also saves you money and is great for your lawn and garden.

Cover your bald spot

When it rains, soil and sediment can wash into our lakes and streams. Sediment pollution clouds the water, making it difficult for aquatic plants to grow and can destroy aquatic habitats.

Plant grass seed, native plants, shrubs, or trees. For more information on native plants, visit www.mnppa.org.

Spreading it on too thick?

Over application of fertilizers is a significant source of pollution to water. Use the proper amount of fertilizer to keep your lawn green and prevent algae blooms in our lakes and streams.

The only way to know how much fertilizer your lawn needs is to have your soil tested. Contact your local MSU Extension Office for an inexpensive soil test that will help you determine which, if any, nutrients your soil needs.

You can be a multi-tasking hero

By washing your car or boat on the grass you will...

- Have a clean car/boat.
- Water your grass.
- Fertilize your lawn (grass will use nutrients from the soapy water).
- Protect water quality by keeping soapy water out of storm drains and ditches.

No lawn? You can still be a hero. Take your car to a car wash where the wastewater is managed before it goes to the Bay.

Trees please

Trees can provide:

- Shade in the summer
- Clean air
- Energy cost savings
- Traffic noise reduction
- Songbird nesting spots
- Wind protection

Trees can also help when there is too much rainwater. Trees can help slow rainwater down and allow it to soak into the ground before reaching water bodies.

Scoop that poop!

Pet waste can be a source of bacteria and excess nutrients in our local waters.

Leaving pet waste on the ground increases public health risks by allowing harmful bacteria and nutrients to wash into the storm drain and eventually into nearby waters.

Unlike other "thankless" jobs, this one will put you in good favor with your family and neighbors.

Is your yard to DIE for?

Pesticides and herbicides can do serious damage to the things we love most, our family and pets. These chemicals can wash into nearby waters and harm other things we love - fish and fish food (aquatic bugs).

Try these proven safe remedies to protect plants from pests:

- Stop aphids by applying soapy water to plants.
- Drown slugs in saucers of beer.
- Discourage mosquitos by removing standing water.

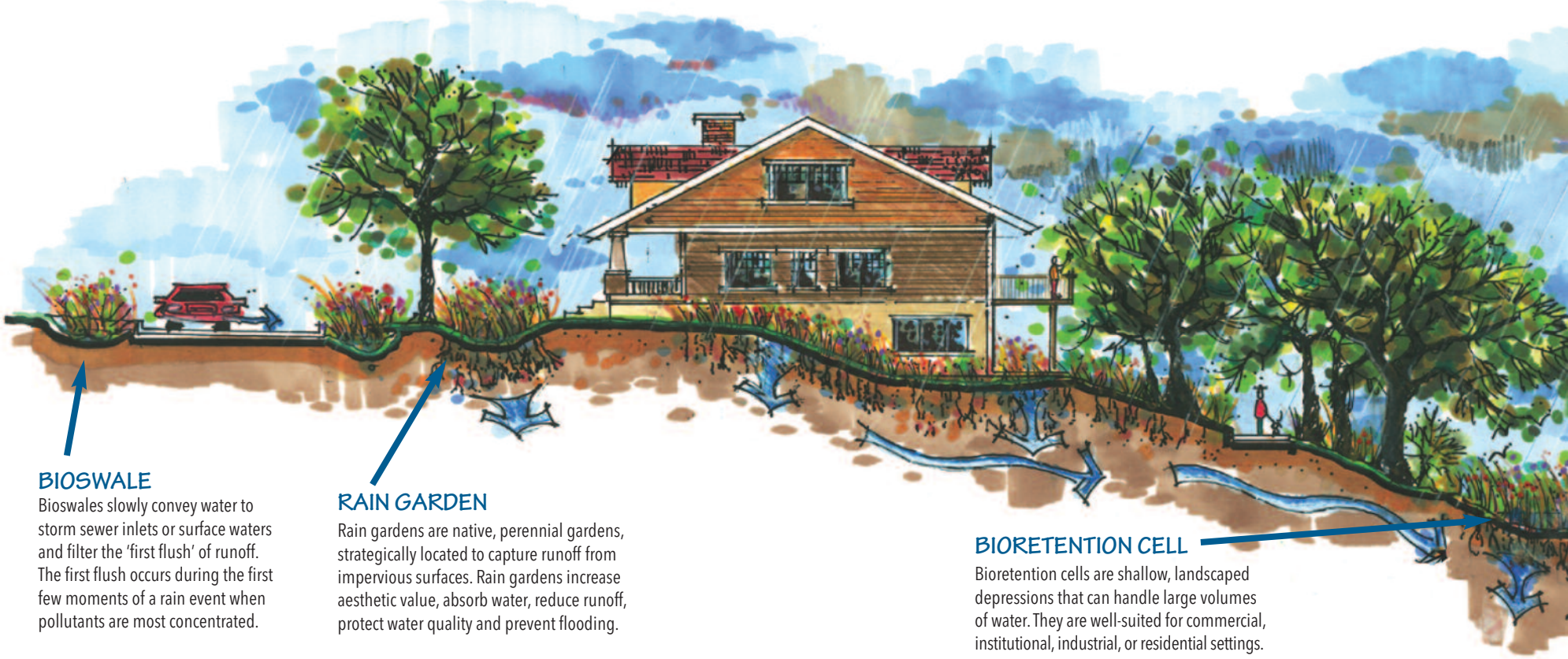
Don't get hosed

Hosing off the sidewalk and driveway may seem like the easiest way to clean it, but it is also the easiest way to wash pollutants into the lake.

Break out the broom and give it a sweep. Dirt and leaves can be swept back onto the yard. Sweeping saves money on your water bill and is less wear on your well pump. Make a clean sweep for you and for the waters you love.

Is your drain a toxic waste dump?

It is if you pour hazardous wastes into it, such as motor oil or cleaners. Chances are they are going directly from your storm drain to nearby waters without being filtered or treated. Clean water for drinking and swimming depends on your careful disposal of hazardous waste.



Low Impact Development (LID)

Also known as:

- **Green Infrastructure**
- **Conservation Site Design**
- **Sustainable Stormwater Management**

LID is one of many strategies and techniques used to counteract the impact of development. Many of the strategies have things in common and a few of the terms have been used interchangeably, but each may have a different frame that sets it apart from the others.

What is Low Impact Development (LID)?

LID is an approach to land development (or redevelopment) that works with nature to manage stormwater as close to its source as possible.

The goal of LID is to reduce runoff and to mimic a site's predevelopment hydrology by infiltrating, filtering, storing, evaporating, and detaining stormwater runoff. LID employs principles such as preserving and recreating natural landscape features and minimizing imperviousness to create functional and appealing site drainage that treats stormwater as a resource, rather than a waste product. There are many practices that have been used to adhere to these principles such as rain gardens, green roofs (i.e. vegetated rooftops), rain barrels, and porous pavements.

By implementing LID principles and practices, water can be managed in a way that reduces the effects of developed areas and promotes the natural movement of water in an ecosystem or watershed. Applied on a broad scale, LID can maintain or restore a watershed's hydrologic and ecological functions and provide numerous other environmental, economic, and social benefits.

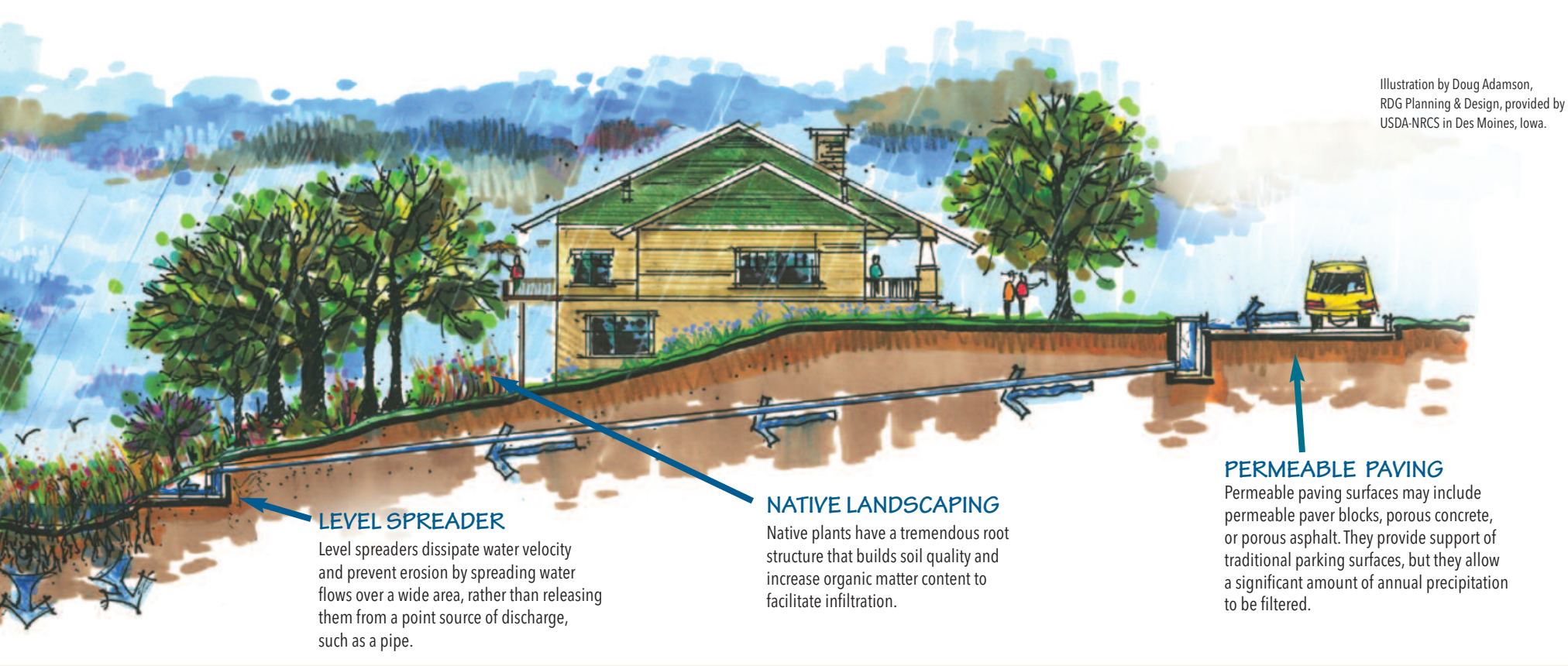


Illustration by Doug Adamson, RDG Planning & Design, provided by USDA-NRCS in Des Moines, Iowa.

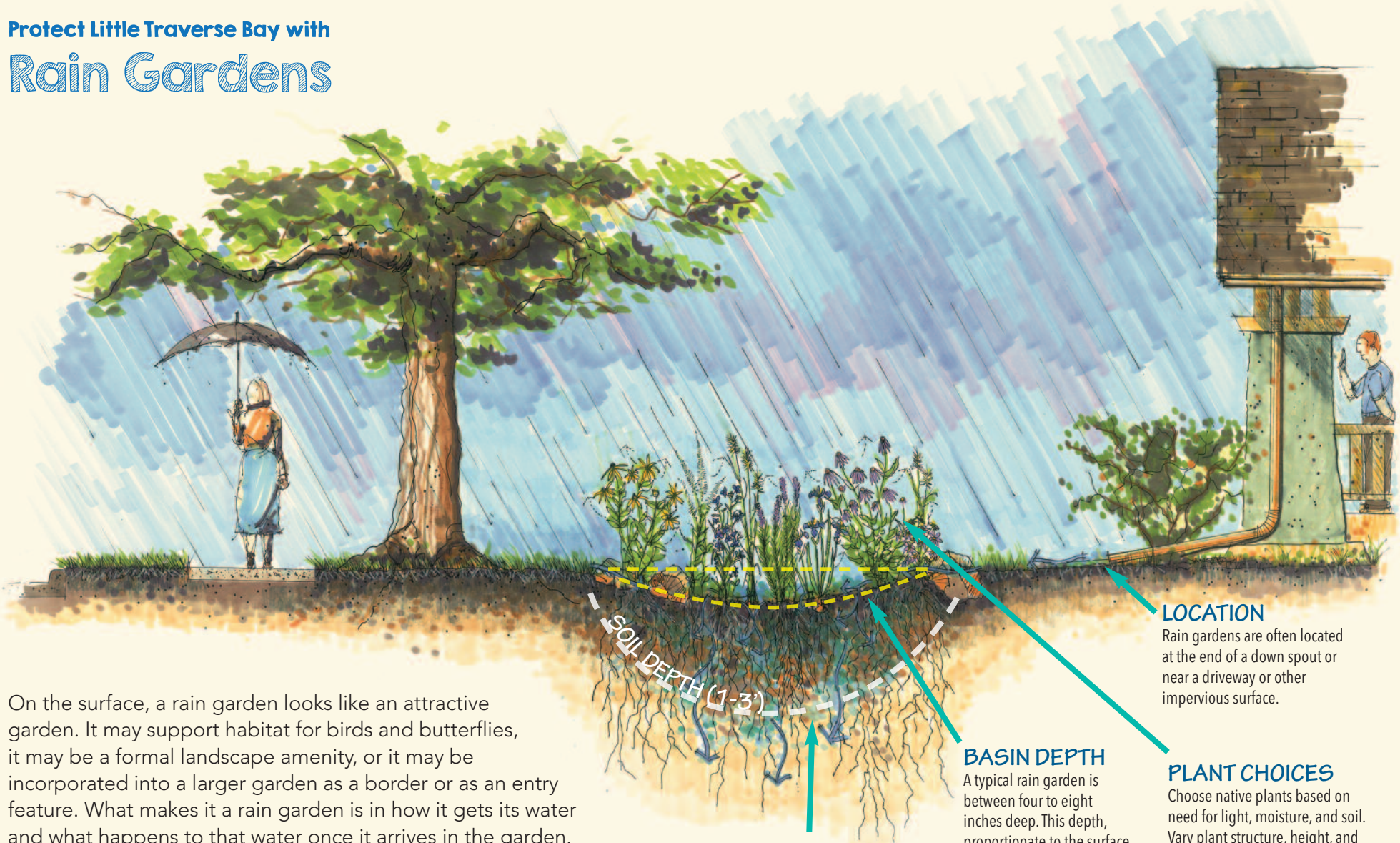
LID Benefits

LID offers a number of advantages over traditional, engineered stormwater drainage approaches, including:

- **Addresses stormwater at its source**
  LID practices seek to manage rainfall where it falls, thereby reducing or eliminating the need for detention ponds and flood controls.
- **Promotes groundwater recharge**
  Many LID techniques allow stormwater to infiltrate the earth, thereby recharging groundwater aquifers and providing baseflow to streams during dry weather. The stormwater, cooled as it flows underground, helps keep stream temperatures low.
- **Allows for more flexible site layouts**
  Whereas traditional stormwater management required large stormwater ponds that consume valuable real estate, the small-scale, dispersed nature of LID practices means that designers can include stormwater management in a variety of open spaces and smaller landscaped areas.
- **Preserves streams and watersheds**
  Because LID practices infiltrate rainfall and prevent runoff, they reduce both pollutant loads and streambank erosion associated with peak flows.
- **Enhances aesthetics and public access/use**
  Well-designed vegetated practices, such as rain gardens, can provide a visual amenity, particularly when compared to hardened drainage infrastructure such as pipes, curbs, gutters, and concrete-lined channels. Some practices can double as park space, offering recreational amenities.
- **Reduces costs**
  A common myth is that LID costs more than traditional stormwater management, but case studies have shown the opposite to be true. Savings can arise from the reduced amount of pipes, asphalt, detention basins or other infrastructure needed to handle runoff, reduced energy costs, and increases in developable land area, which otherwise would not have been available had traditional stormwater management approaches been employed.

Protect Little Traverse Bay with

Rain Gardens



LOCATION
Rain gardens are often located at the end of a down spout or near a driveway or other impervious surface.

PLANT CHOICES
Choose native plants based on need for light, moisture, and soil. Vary plant structure, height, and flower color for seasonal appeal.

BASIN DEPTH
A typical rain garden is between four to eight inches deep. This depth, proportionate to the surface area, helps assure water will infiltrate quickly and not pond.

SOIL AMENDMENTS
Soil amendment recommendations vary based on site conditions. In general, a good soil mix for rain gardens is 60% sand, 15% topsoil, and 25% compost.

SIZE
A rain garden is typically 10-30% the size of the impervious surface that generates runoff.

On the surface, a rain garden looks like an attractive garden. It may support habitat for birds and butterflies, it may be a formal landscape amenity, or it may be incorporated into a larger garden as a border or as an entry feature. What makes it a rain garden is in how it gets its water and what happens to that water once it arrives in the garden.

Rain gardens, also known as bioretention ("bio" meaning the use of plants and "retention" referring to the stormwater that is temporarily stored before it soaks into the ground) basins, allow stormwater to be both cleaned and reduced in volume, putting into practice the stormwater strategy:

"Slow it Down, Spread it Out, and Soak It In."

Illustration by Doug Adamson, RDG Planning & Design, provided by USDA-NRCS in Des Moines, Iowa.

What's the Best Location for a Rain Garden?

Rain gardens can be planted in either sun or shade, or somewhere in between. Locate them at least 10 feet away from any building to protect the foundation and never on top of a septic system. You will want to make sure the site has good drainage, too. Don't be tempted to put the rain garden in a part of the yard where water already ponds because the goal of a rain garden is to encourage infiltration, and soggy areas indicate where infiltration is slow.

- Locate the rain garden outside of a tree's drip line to avoid cutting roots.
- Keep the rain garden away from utility lines and any easements.
- Do not build a rain garden in soil that has a high water table.
- Since a rain garden surface must be flat, the amount of grading required during construction increases with slope. Rain gardens should not be built on land with a slope greater than 12%.

A critical step in designing a properly functioning rain garden is determining your local infiltration rate, or, in other words, how fast the water will seep into the ground. Once you have decided where to locate your rain garden, the infiltration rate can be approximated with a simple test:

1) Dig a hole 18 inches deep and 6 inches in diameter (a post hole digger will suffice).

2) Fill the hole to the top with water and let it drain (this will saturate the surrounding soil).

3) Re-fill the hole with water and measure how quickly it drains using a yard stick. If the hole drains 3 inches in a 6-hour period, your local infiltration rate is 0.5 inches per hour.

4) If the hole doesn't drain completely in 48 hours, then this location doesn't have good drainage. It may not be suitable for a rain garden unless the soil is amended or infiltration improved through mechanical means, such as placing an underdrain or tilling the native soils beneath the garden to improve infiltration. Conversely, if the site has soils that are potentially too well-drained, you may need to amend the soils with compost to enhance water retention and give the plants a boost.

How Much Does A Rain Garden Cost?

An average cost of a rain garden is about $8 per square foot, but depends on several factors including area, site preparation, plants (types, sizes, and quantity), and any additional accents or features.

How Do I Maintain A Rain Garden?

Maintenance of your rain garden is critical during the first couple years after installation. The plants will need to receive plenty of water until they are well established. Mulching, weeding, and replacing plants that fail to thrive in the rain garden are all important maintenance tasks necessary for both the maximum success of the rain garden and to control invasive species that might infest the garden from nearby sources.

How Big Should My Rain Garden Be?

You may want to consult a professional or other rain garden resource to determine the space requirements, but a general rule of thumb is a rain garden should cover the area equal to about 10-30% of its contributing drainage area. The depth of the rain garden also depends on a number of site factors, but a typical rain garden basin depth is about 4-8".

SIZING EXAMPLE

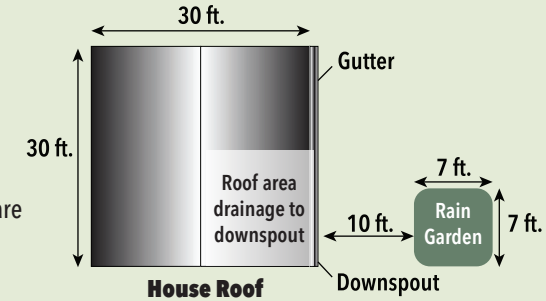
If the area of the house is 30 ft. x 30 ft. and 1/4 of this area drains to one downspout:

15 ft. x 15 ft. = 225 ft.^{2}

20% of 225 ft.^{2} = 45 ft.^{2}

30% of 225 ft.^{2} = 67.5 ft.^{2}

The rain garden area should be between 45 and 67.5 square feet, depending on soil type (use 20% for sandier soils.)



While rain gardens are very effective at helping to protect water quality, they should also be an attractive part of your yard and neighborhood. Whether you hire a professional, or do it yourself, keep in mind there are endless possibilities when it comes to designing a rain garden.

- The basin can vary in shape: from oval to kidney-shaped, from crescent to square and everything in between.
- For added interest, be sure to incorporate plants that range in color, texture, height, and bloom period.
- Consider adding other landscape elements, such as a bird bath, trellis, edging, or small decorative fence to enhance the rain gardens overall aesthetic.
- Choose plant species that also provide habitat for wildlife, including pollinators and songbirds.

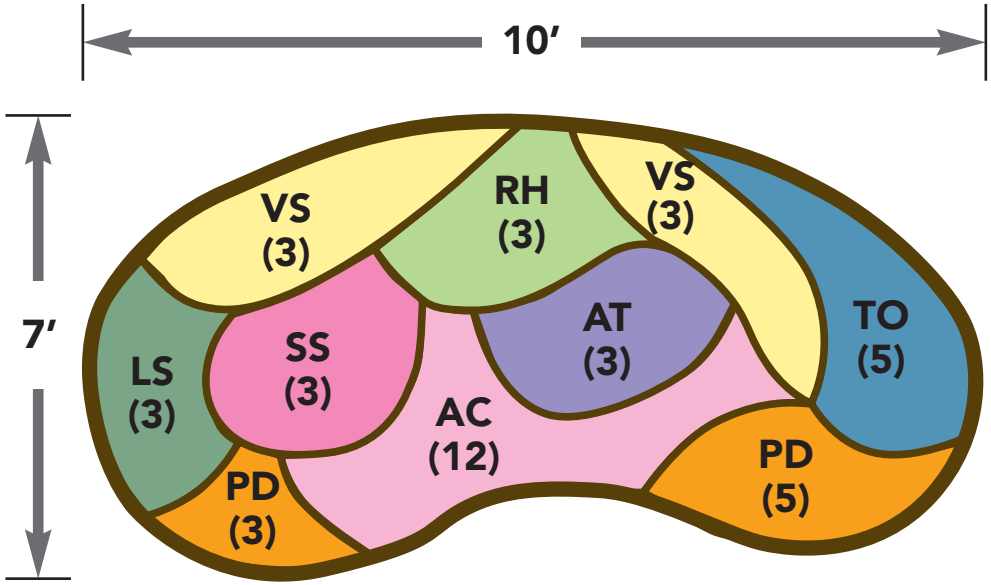
DON'T START DIGGING until you've checked for underground utility lines! If you're not sure, call MISS DIG a statewide, one-call notification system at **800-482-7171** in Michigan, or the national one call number 811. Visit **www.missdig.net** for more information and remember to please allow for 3 full working days before you dig. MISS DIG will send your work request to member facility owners who will mark the approximate location of their underground utility lines at no charge.

These templates are just two possible rain garden layouts. Refer to other rain garden resources to be sure your design works with site conditions and will result in the look you want.

Rain Garden Design Template (70 square feet)

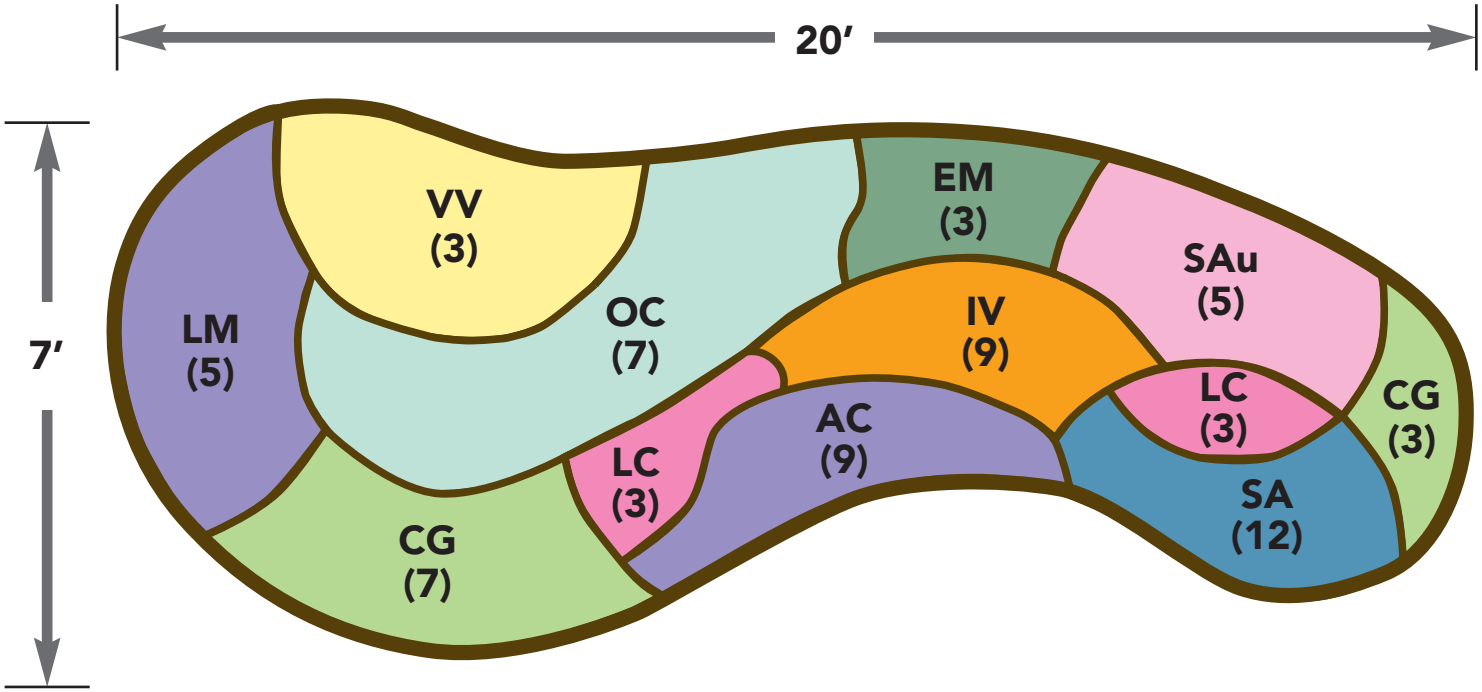
Site Conditions:

- Soils are dry-mesic (medium moisture) to dry
- Full sun
- Maximum plant height= 36 in.
- Plants will tolerate periodic water infiltrations as well as dry periods



Symbol	Species Name	Common Name	No. of Plants
AT	*Asclepias tuberosa*	Butterfly Weed	3
PD	*Penstemon digitalis*	Beardtongue	8
VS	*Verbena stricta*	Hoary Vervain	6
AC	*Allium cernuum*	Nodding Wild Onion	12
TO	*Tradescantia ohiensis*	Spiderwort	5
SS	*Schizachyrium scoparium*	Little Bluestem	3
LS	*Liatris scariosa*	Northern Blazing Star	3
RH	*Rudbeckia hirta*	Black-eyed Susan	3

Rain Garden Design Template (140 square feet)



Symbol	Species Name	Common Name	No. of Plants
LM	*Lilium michiganese*	Michigan Lily	5
IV	*Iris versicolor*	Blueflag Iris	9
AC	*Allium cernuum*	Nodding Wild Onion	9
LC	*Lobelia cardinalis*	Cardinal Flower	6
SA	*Sisyrinchium angustifolium*	Blue-eyed Grass	12
CG	*Chelone glabra*	Turtlehead	10
VV	*Veronicastrum virginicum*	Culver's Root	3
SAu	*Senecio aureus*	Golden Ragwort	5
EM	*Eupatorium maculatum*	Joe-Pye Weed	3
OC	*Osmunda cinnamomea*	Cinnamon Fern	7

Site Conditions:

- Soils are wet mesic (moist but can dry up) to mesic
- Full sun to partial shade
- Maximum plant height= 6 ft.
- Plants will appreciate moist, but not soggy, soils.

Rain Garden App

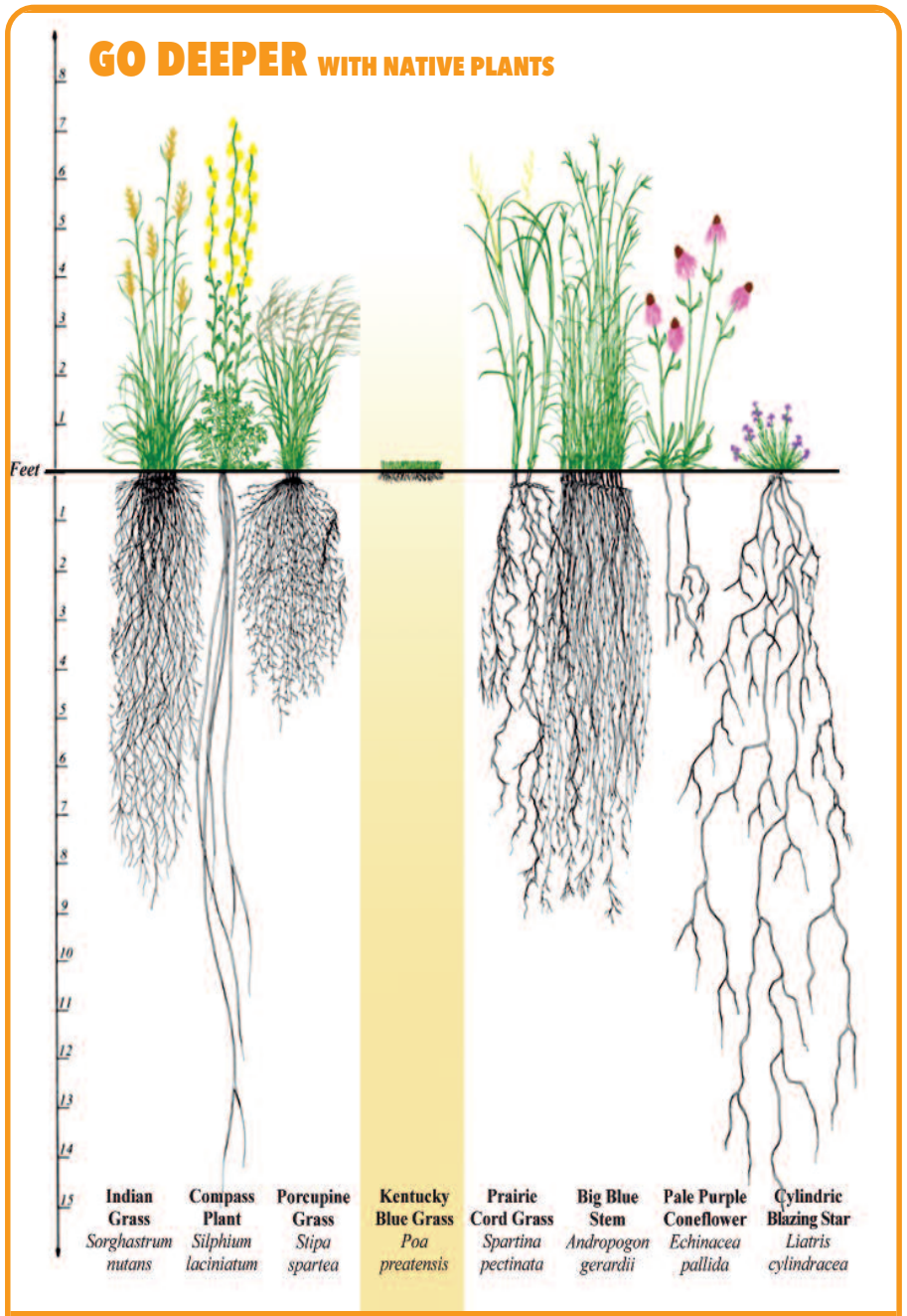
A Mobile App for designing, installing, and maintaining a Rain Garden

UCONN

http://nemo.uconn.edu/tools/app/raingarden.htm

Rain gardens are depressions in the ground that collect rainwater from roofs, driveways, parking areas, or other hard surfaces, reducing the amount of polluted runoff entering local waterways. The University of Connecticut Center for Land Use Education and Research developed this App as a resource for homeowners, landscapers, contractors, and others.

The App will guide you through the process of designing, installing, and maintaining a rain garden. The App includes basic information about what rain gardens are and how they work; guidance on how to design and install them properly; and tips on maintaining your garden. The app includes several short video tutorials to help users with each step of the process.



Native plants have deeper root systems that substantially increase the ability of soil to absorb and retain water. As natural vegetation is replaced with popular turf grasses, less stormwater is absorbed into the ground, leading to more stormwater runoff and water pollution.

Protect Little Traverse Bay with

Native Plants

Many plant species are suitable for rain gardens; however, native plants are best. Here in Northern Michigan, native plants are considered those species that occurred prior to European settlement.

Native plants have several characteristics that make them appealing as garden and landscaping plants:

- They are naturally adapted to the soils and weather conditions of the area, so they need little care once they've become established.
- They provide food and cover for wildlife.
- They improve the quality of the environment by slowing stormwater runoff, preventing erosion, and enriching the soil.

Native plants can be used for every type of environment, from dry and sunny to soggy and shady. With their variety of colors, heights, foliage, and bloom times, they can add beauty and interest to any landscape.

The recommended species on the right are only a sampling of possible plants you can use in a rain garden. Please note that other site factors, such as sunlight, should be considered when selecting plants.

CHOOSE WISELY!

Choosing native over non-native plants also means you are helping prevent the spread of invasive species, such as baby's breath, dame's rocket, and Japanese barberry. Many invasive species are still available for sale at nurseries, so be sure to learn what to avoid when purchasing plants for your rain garden. ***The Michigan Natural Features Inventory website has a listing of invasive plants to watch for at http://mnfi.anr.msu.edu/invasive-species/index.cfm.***

Best for Average

Cinnamon Fern
Osmunda cinnamomea

Meadowsweet
Spiraea alba

Joe-pye Weed
Eupatorium maculatum

Blazing Star
Liatris spicata

to Wet Conditions

Blue Flag Iris
Iris versicolor

Green-Headed Coneflower
Rudbeckia laciniata

Monkey Flower
Mimulus ringens

Swamp Milkweed
Asclepias incarnata

False Sunflower
Heliopsis helianthoides

Golden Ragwort
Senecio aureus

Cardinal Flower
Lobelia cardinalis

Sneezeweed
Helenium autumnale

Best for Average to Dry Conditions

*For information on where to buy Michigan native plants, refer to the **Michigan Native Plant Producers Association (www.mnppa.org)***

Little Blue Stem
Schizachyrium scoparium

Butterfly Weed
Asclepias tuberosa

Sand Coreopsis
Coreopsis lanceolata

Hoary Vervain
Verbena stricta

Western Sunflower
Helianthus occidentalis

Wild Lupine
Lupinus perennis

Horsemint
Monarda punctata

Switchgrass
Panicum virgatum

Beardtongue
Penstemon digitalis

Black-Eyed Susan
Rudbeckia hirta

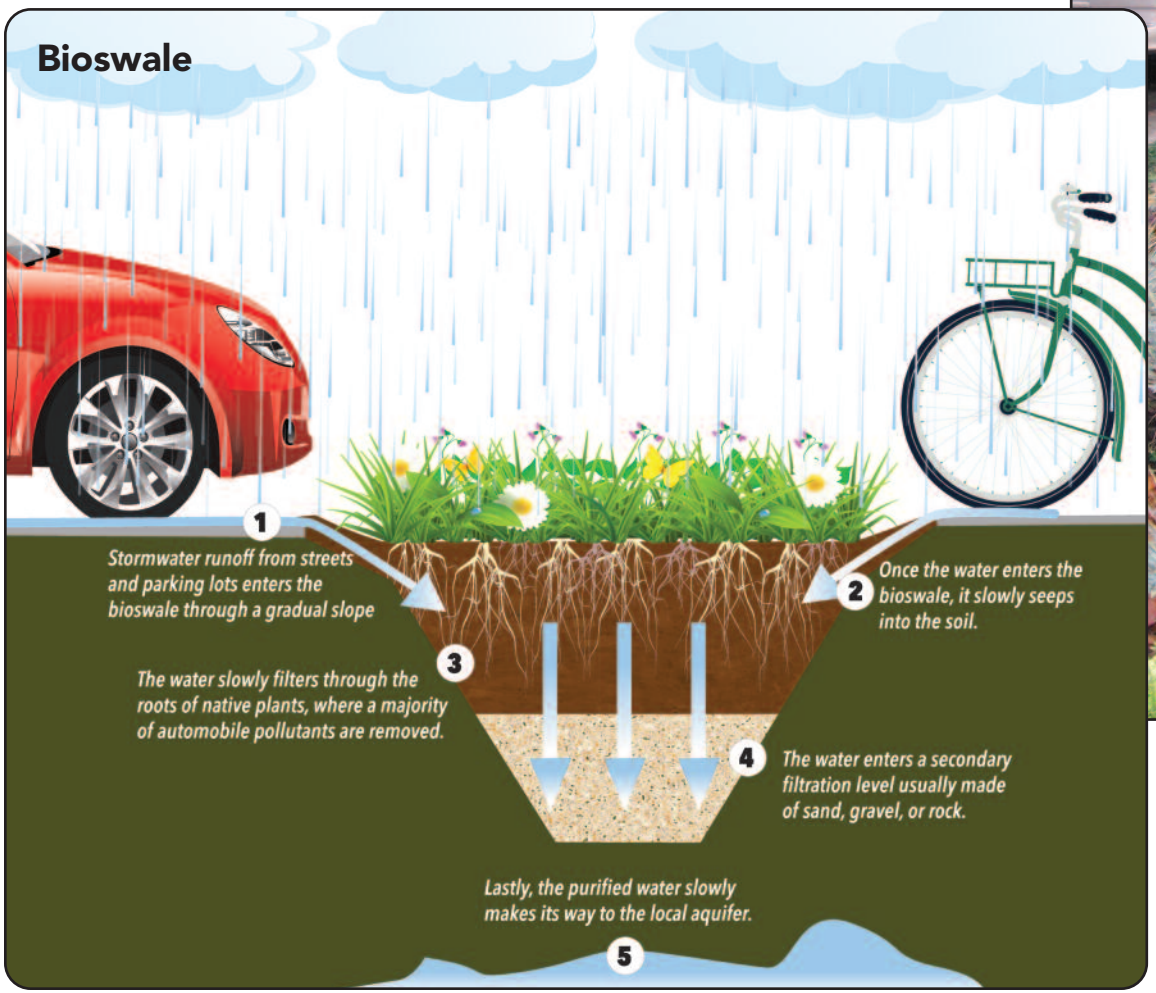
Spiderwort
Tradescantia ohiensis

Pennsylvania Sedge
Carex pensylvanica

Protect Little Traverse Bay with

Bioswales

Bioswales are linear, shallow, vegetated channels that convey stormwater from one point to another. Oftentimes, they are used to guide runoff from its entry point on the property (downspouts, uphill properties, etc.) towards a nearby rain garden, dry well or other structure. Bioswales are not just ditches under another name, however, they must be carefully designed and maintained to function properly. The vegetation in swales helps to trap pollutants (suspended solids and trace metals), reduce the velocity of stormwater runoff, and encourage infiltration. In some cases, street-side bioswales can replace curb and gutter systems, as well as storm sewers.



Protect Little Traverse Bay with

Rain Barrels

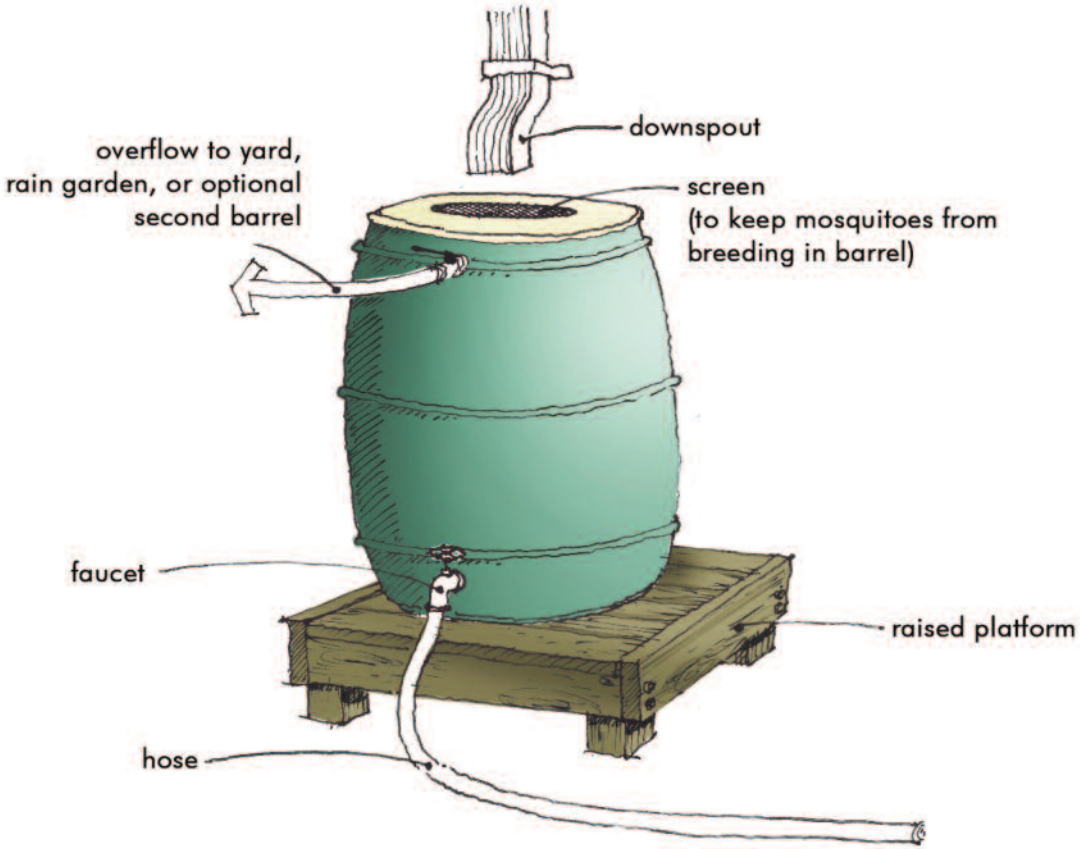
If you want to capture water naturally from your roof top for use at a later, dryer date, use a rain barrel. Rain barrels capture rain that might otherwise be lost to the storm drain.

By capturing this water you will reduce runoff volume, promote infiltration, and slow and filter runoff from the roof. As long as the water is transported well away from foundations, concerns of structural damage and basement flooding can be alleviated.

There are many styles of rain barrels. They can be found on the Internet or at your local home goods or landscaping store. They range from $20 for a do-it-yourself kit to upwards of $200. Most are in the 45 to 55 gallon capacity size, but for greater storage multiple barrels may be installed in a series.

To install your rain barrel:

- Decide the location of your rain barrel. Often they are placed near downspouts, but you can place the barrel under any surface that has a concentrated flow of water coming off of it. Locate the barrel so it is convenient to water your flower beds and gardens.
- The barrel must be placed on a flat, level surface, and should be raised off the ground to increase gravity flow and allow you to place a bucket under its spigot. Concrete blocks, pavers, or a sturdy wooden structure all provide a good base. Be aware, a full barrel can weigh 400 pounds or more.
- The barrel's overflow hose should be directed into a rain garden or other planted area, or optional second barrel at least 10 feet from a building's foundation.
- If you want to capture water from a downspout, you will need to modify the downspout so that it directs the flow of water into the screen-covered opening of your rain barrel. There are several styles of diverters you may purchase or you can cut the down spout at a height above the barrel and use an elbow to direct it.
- Keep in mind that rain barrels fill up fast! For every inch of rain that falls on one square foot of your roof, you can collect just over a half gallon of rainwater (0.6 gallons). For example, a 10' x 10' shed (100 square feet) will yield 60 gallons of rainwater during a one inch rain event. If you were to harness the water off a 2,000 square foot home, you would have 1,200 gallons from one inch of rain.



Disconnect Downspouts

If the gutters and downspouts on your home drain across paved surfaces or below ground, consider disconnecting or redirecting them to make a positive impact for stormwater management. Disconnecting downspouts from the storm sewer system and redirecting them to lawns, gardens, or rain barrels will reduce the amount of water that enters a storm drain and ultimately flows into nearby lakes, streams and rivers.

Disconnecting your downspout can also save you money on your water bill if you direct the water into a garden or a rain barrel for later use.

Protect Little Traverse Bay with

Porous Pavements

Porous or permeable pavement surfaces are suited for parking lots, low traffic residential streets, driveways, and sidewalks. The porous or permeable surfaces allow stormwater to infiltrate into underlying soils, thereby promoting pollutant treatment and groundwater recharge.

Permeable paving options include porous asphalt and concrete, block pavers, and vegetated grid systems.

Permeable pavers and porous asphalt and concrete are generally used in higher traffic parking and roadway applications; while vegetated grid systems are more commonly used in auxiliary parking areas and roadways.

Permeable pavers are comprised of interlocking concrete bricks, separated by joints, or gaps, filled with small stones or sand, which are laid over a bed of aggregate stones. Water is able to infiltrate through the joints in the pavers, and is stored in void space in the stonebed underneath the paver surface, where it is then filtered back into the soil.

Porous asphalt is the same as regular asphalt except it is manufactured with the fine materials omitted, leaving open spaces that allows water to filter through to a "recharge" or drainage bed.

Porous concrete is composed of materials that result in voids when it is dry, allowing water to drain through a bed of stone.

Vegetated grid systems are plastic or concrete grids over a bed of drainage material and soil. The voids are then seeded with low maintenance grass varieties.

Depending on design, paving material, soil type and rainfall, permeable pavements can infiltrate as much as 70% to 80% of annual rainfall. In addition, when properly selected, designed, constructed, and maintained, porous pavements function as intended in cold-weather climates. Porous pavement projects should be designed and constructed by an experienced professional. It is critical that all types of porous pavement projects are maintained according to manufacturer specifications. Maintenance oftentimes includes sweeping or vacuuming sediments from permeable pavers, asphalt, and concrete, replacement of drainage gravel in the voids of permeable paver systems, and tending to grass in vegetated grid systems.

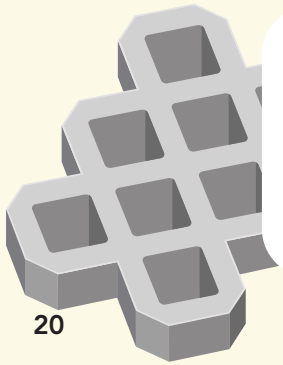
While initial costs for porous pavements are typically higher than costs for conventional pavements, they areoffset by eliminating the need for other stormwater infrastructure.

Examples of Porous Pavements

Permeable Pavers

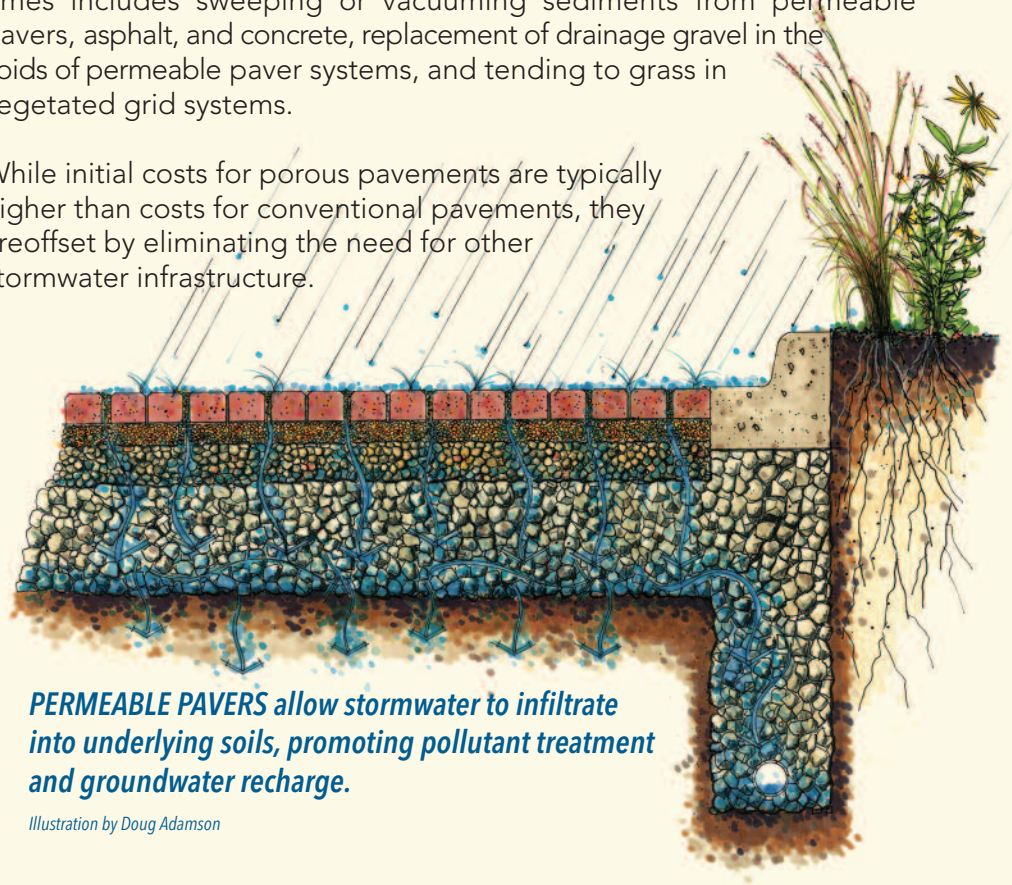
Permeable Concrete

Grass Pavers



AVERAGE COST OF POROUS PAVEMENTS

Permeable Pavers:	$5.00 - $10.00/sq. ft.
Porous Concrete:	$2.00 - $6.50/sq. ft.
Porous Asphalt:	$0.50 - $1.00/sq. ft.
Vegetated Grid System:	$1.50 - $5.75/sq. ft.



PERMEABLE PAVERS allow stormwater to infiltrate into underlying soils, promoting pollutant treatment and groundwater recharge.

Illustration by Doug Adamson

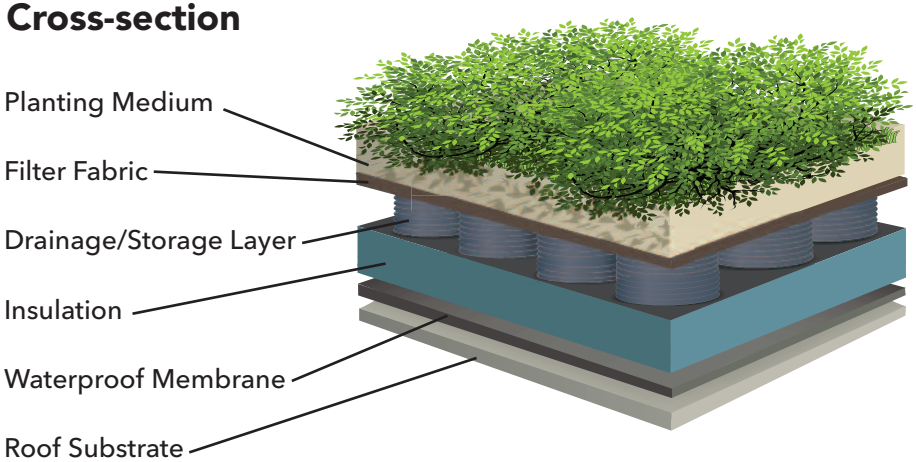
Protect Little Traverse Bay with

Green Roofs

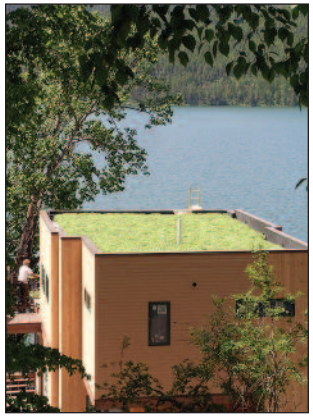
A green roof is a low-maintenance vegetated roof system that reduces stormwater runoff by absorbing and retaining the water in the soil medium for plant growth. As a result, much less water runs off the roof, as compared to conventional rooftops. They are easy to incorporate into new construction, and can be used on many existing buildings as well. Green roofs are constructed on top of existing roofs and include four basic components: a waterproofing layer, a drainage layer, a growing medium, and vegetation.These low-growing plants work well as they don't need supplemental watering after establishment, except in extreme conditions, and they usually only require weeding once or twice a year. In addition to reducing the amount of roof runoff, the plants filter pollutants and carbon dioxide from the air and rain water.

Another added benefit of green roofs include reduced heating and cooling needs and associated costs. Green roofs are likely to last much longer-up to twice as long-than conventional roofs, since the roofing material itself is shielded from ultraviolet light and thermal stress. Bonus: green roofs can reduce noise pollution and also serve as living habitats for birds and other wildlife!

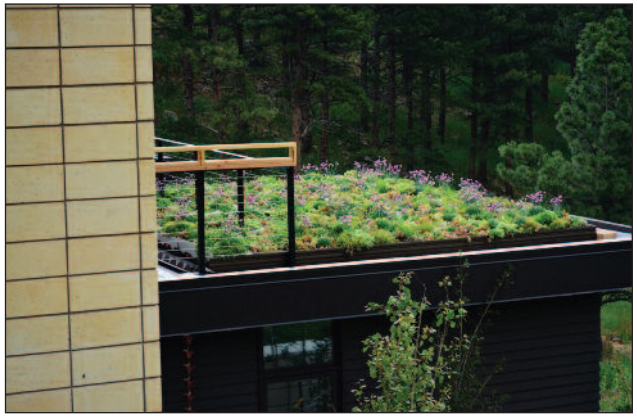
Green Roof Cross-section



Assisted Living Facility



Private Residence



Private Residence

Project photos by LiveRoof.com

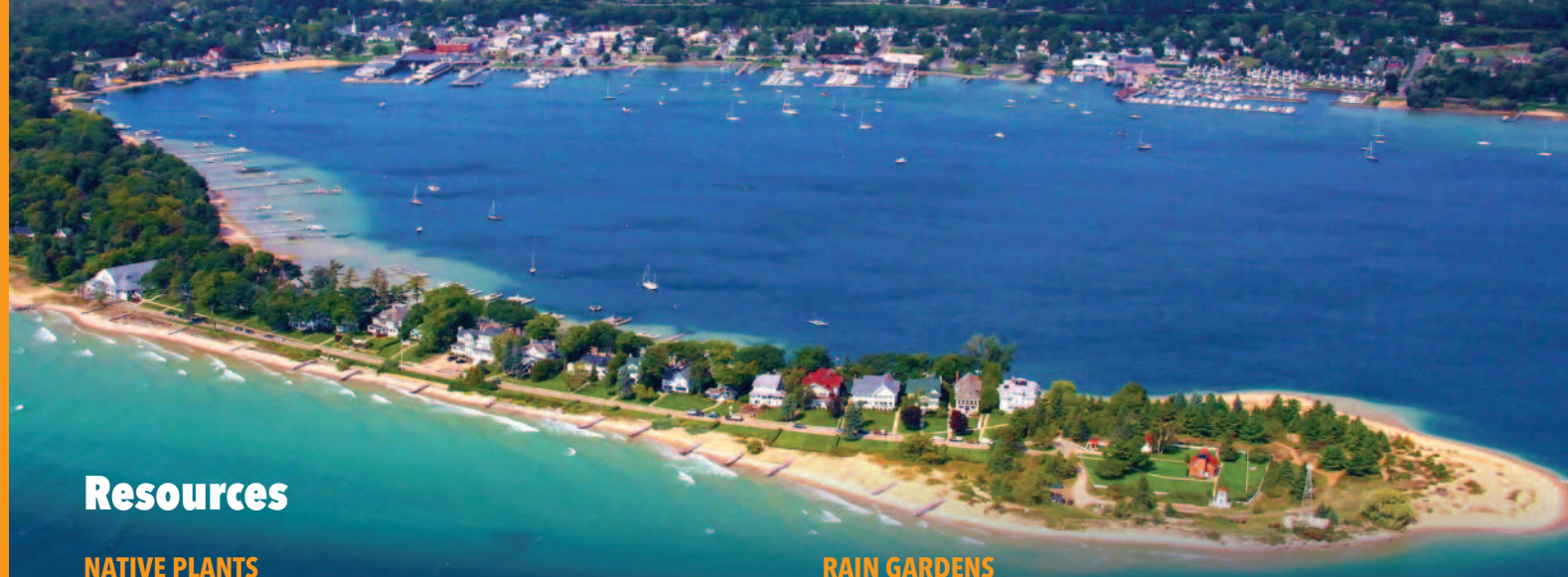
Private Residence

Little Traverse Bay Watershed Advisory Committee

Production and distribution of this publication is just one of many watershed protection recommendations of the Little Traverse Bay Watershed Protection Plan (Plan). The goal of the Plan is to protect and enhance the water quality and ecosystem integrity of Little Traverse Bay and its tributaries, to ensure all designated uses are restored and protected.

The Little Traverse Bay Watershed Advisory Committee leads implementation efforts of the Plan. The committee consists of many organizations and local governments that work to address non-point source pollution and other threats to the Little Traverse Bay Watershed. Advisory Committee members include:

Bear Creek Township
Charlevoix Conservation District
Charlevoix County
Charlevoix County Drain Commission
Charlevoix County Road Commission
City of Harbor Springs
City of Petoskey
Conservation Resource Alliance
Emmet County
Emmet Conservation District
Emmet County Lakeshore Association
Emmet County Road Commission
Friendship Township
Harbor Area Regional Board of Resources, Inc. (H.A.R.B.O.R., Inc.)
Harbor Point Association
Harbor Springs Chamber of Commerce
Harbor Springs Commission
Irish Boat Shop
L'Arbre Croche Club
Little Traverse Bay Bands of Odawa Indians
Little Traverse Conservancy
Little Traverse Township
Melrose Township
Menonaqua Beach Cottage Owners Association
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Natural Resources Conservation Service
North Central Michigan College
Northwest Michigan Community Health Agency
Northwest Michigan Council of Governments
Petoskey Chamber of Commerce
Petoskey-Harbor Springs Area Community Foundation
Resort Township
Tip of the Mitt Watershed Council
Walloon Lake Association
Walloon Lake Trust and Conservancy
Wequetonsing Association
West Traverse Township



Resources

NATIVE PLANTS

University of Michigan Herbarium
The goals of this Michigan Flora Website are to present, in a searchable and browsable form, the basic information about all vascular plants known to occur outside of cultivation in the state. Searchable by common name, scientific name, genus, species and a whole host of other categories, it includes lots of information and a wealth of photos of native plants.
www.michiganflora.net

Wild Ones
A national nonprofit organization that promotes the use of native plants in private and public landscaping.
www.wildones.org

Michigan Native Plant Producers Association
The Michigan Native Plant Producers Association comprises seven independently owned nurseries located throughout the state of Michigan. As responsible propagators of Michigan native plants, they are committed to enhancing the diversity and health of Michigan's unique natural heritage. They grow and sell over 400 species of native plants and seeds, including, trees, shrubs, wildflowers, grasses, and ferns.
www.mnppa.org

BIOSWALES

SEMCOG's Low Impact Development Manual for Michigan: A Design Guide for Implementers and Reviewers
http://www.swmpc.org/downloads/lidmanual.pdf
p. 315 – 326

RAIN GARDENS

Rain Gardens: A How-To Manual for Homeowners
(Wisconsin Department of Natural Resources Publication PUB-WT-776 2003/University of Wisconsin-Extension Publication GWQ037)
www.dnr.wi.gov/topic/Stormwater/documents/RgManual.pdf

Tip of the Mitt Watershed Council
www.watershedcouncil.org/learn/rain-gardens/

Blue Thumb: Planting for Clean Water
http://www.bluethumb.org

Low Impact Development Center
www.lowimpactdevelopment.org

POROUS PAVEMENTS

SEMCOG's Low Impact Development Manual for Michigan: A Design Guide for Implementers and Reviewers
http://www.swmpc.org/downloads/lidmanual.pdf
p. 241 – 255

GREEN ROOFS

SEMCOG's Low Impact Development Manual for Michigan: A Design Guide for Implementers and Reviewers
http://www.swmpc.org/downloads/lidmanual.pdf
p. 301 – 314

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FREY FOUNDATION