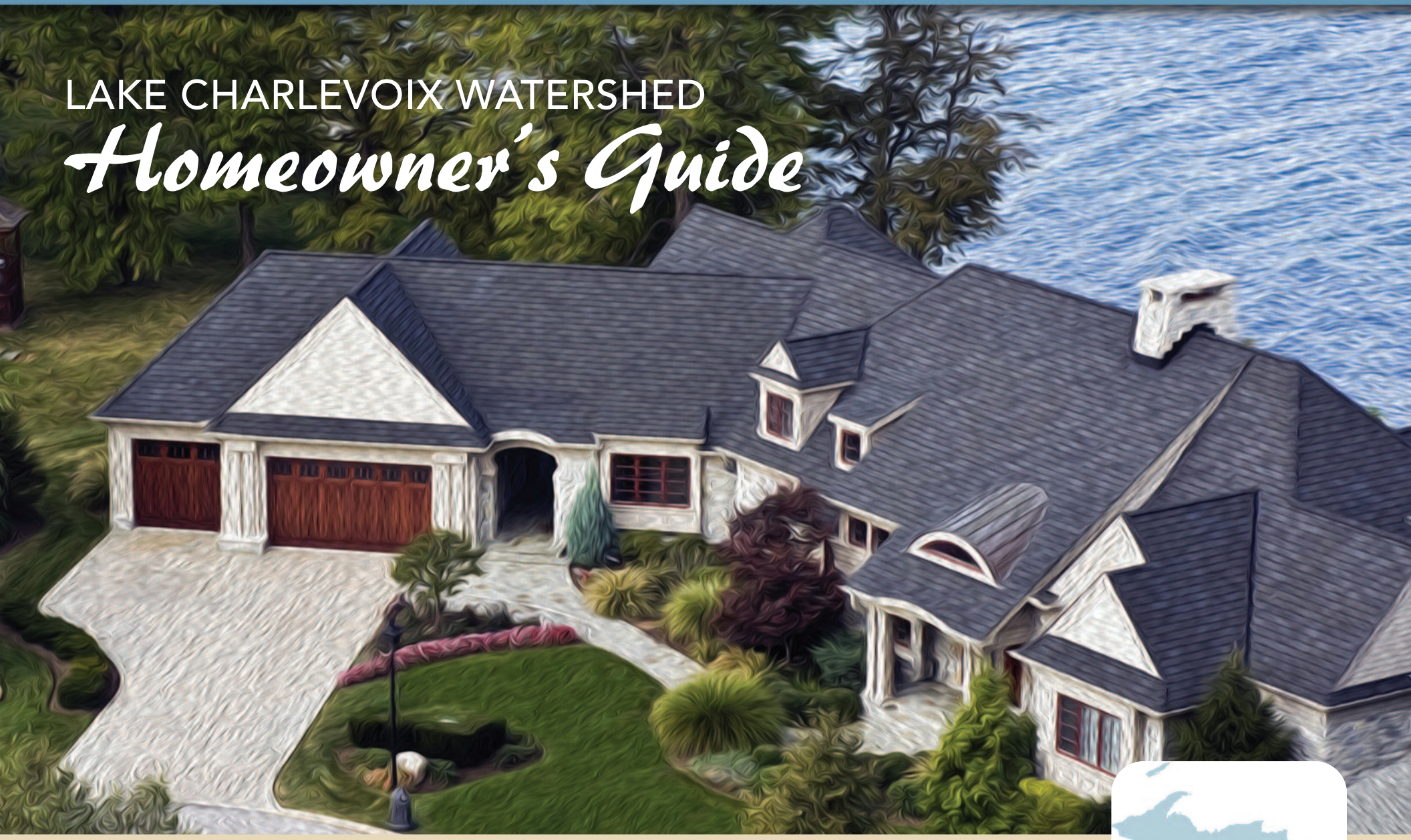
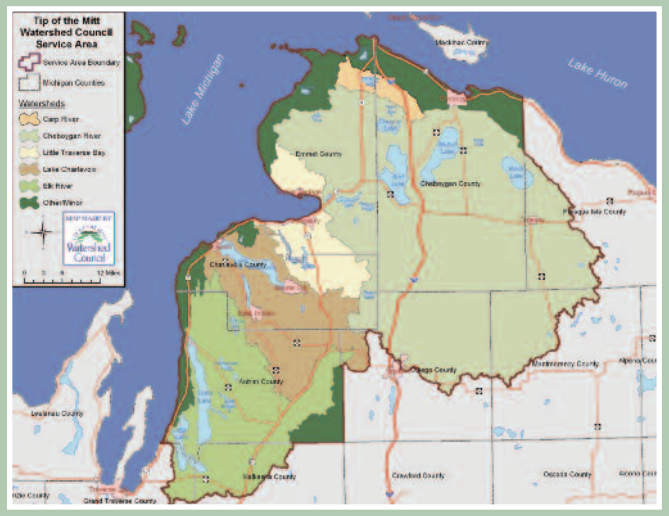
LAKE CHARLEVOIX WATERSHED

Homeowner's Guide



Simple, practical, and water-friendly ways to protect the Lake Charlevoix Watershed

Lake Charlevoix WATERSHED



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 resource 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
426 Bay Street, Petoskey, MI 49770
(231) 347-1181
www.watershedcouncil.org

Greetings Lake Charlevoix Watershed Resident!

As a resident of the Lake Charlevoix Watershed, you are aware of the area's wonderful water resources – the Boyne and Jordan Rivers and their tributaries; streams including Horton, Loeb, Monroe, Porter, and Stover Creeks; small lakes including Deer, Nowland, Adams, and Round Lakes; and Lake Charlevoix itself. We live, work, and play here. The Lake Charlevoix Watershed is home.

This publication serves as a resource to Lake Charlevoix 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 Lake Charlevoix Watershed.

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

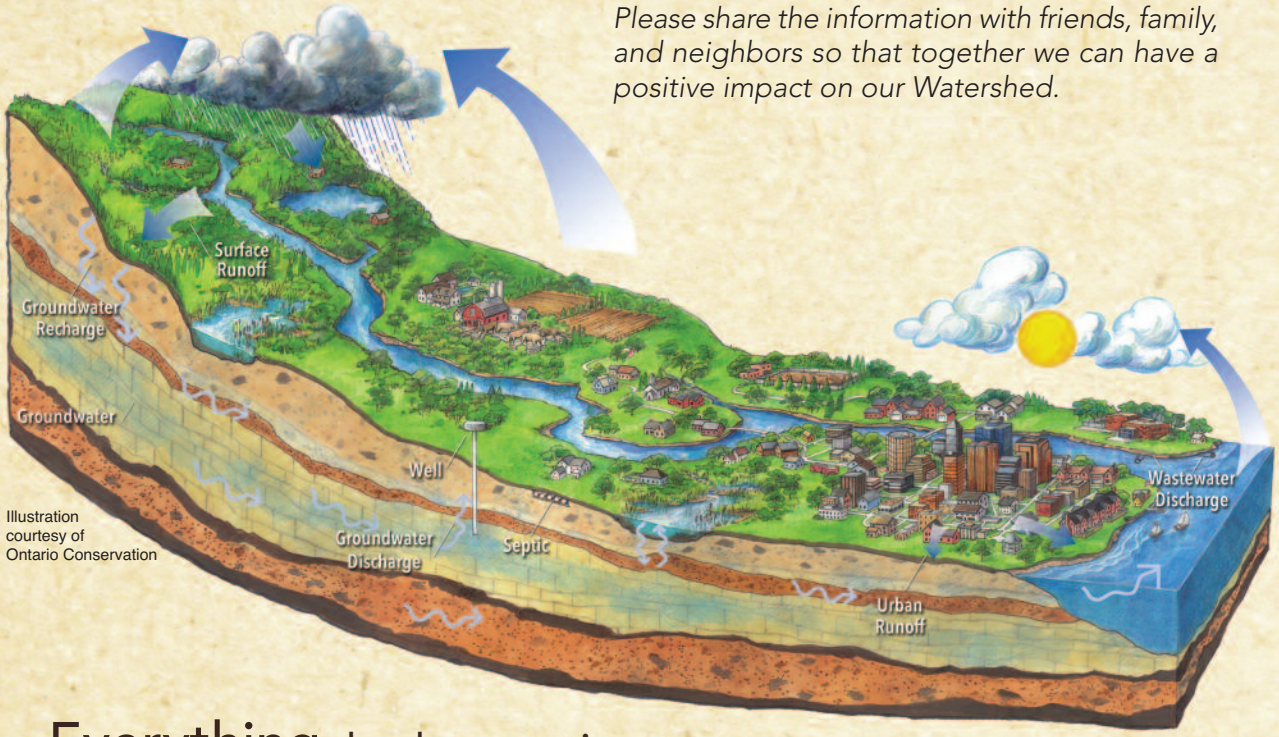


Illustration courtesy of Ontario Conservation

Everything that happens in a watershed affects its water quality.

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 county, 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.***

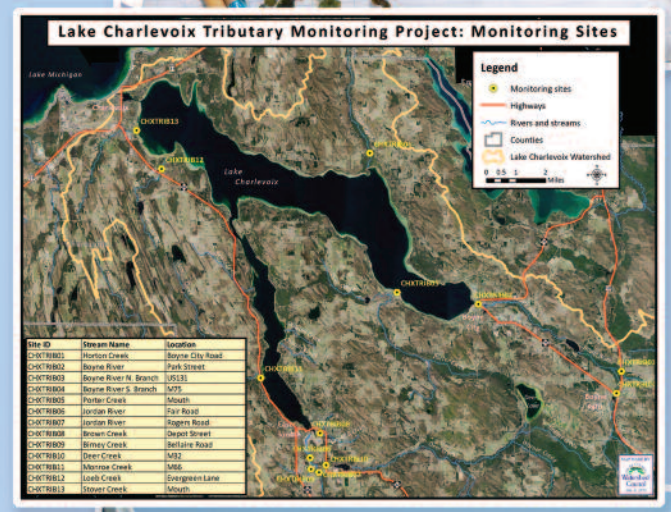
Water Quality of Lake Charlevoix

A considerable amount of water quality data have been collected from surface waters of the Lake Charlevoix Watershed for over 40 years and is available from the Michigan Department of Environmental Quality, United States Geological Survey, Tip of the Mitt Watershed Council, Little Traverse Bay Bands of Odawa Indians, and the Health Department of Northwest Michigan.

Over 40 physical and chemical parameters have been monitored in the lakes and streams of the Lake Charlevoix Watershed. Physical water quality data, such as water temperature, pH, conductivity, and dissolved oxygen have been collected at most sites on both lakes and streams. Chemical data, including many different forms of nutrients, a variety of metals, alkalinity, hardness, chloride, and more have been collected from lakes and streams in the Watershed. Biological and bacteriological monitoring has also been performed in lakes and streams throughout the Watershed. The majority of biological monitoring has occurred on streams and consisted of assessments of the aquatic macroinvertebrate communities.

Since monitoring efforts began, there have been some changes, but overall the data show that water quality has consistently been high. However, certain trends do suggest that development may be influencing water quality. For example, based on averaged yearly data collected by all agencies and organizations, conductivity and chloride levels have steadily increased since 1973, which correlate with localized population increases. Although both parameters do not exceed State of Michigan water quality standards, it is important to note that these increases may be indicative of more harmful pollutants that are not regularly monitored (e.g., automotive fluids and metals from roads, nutrients and bacteria from septic systems) but are associated with human activity.

For more information regarding water quality of the lakes and streams of the Lake Charlevoix Watershed, visit www.watershedcouncil.org.



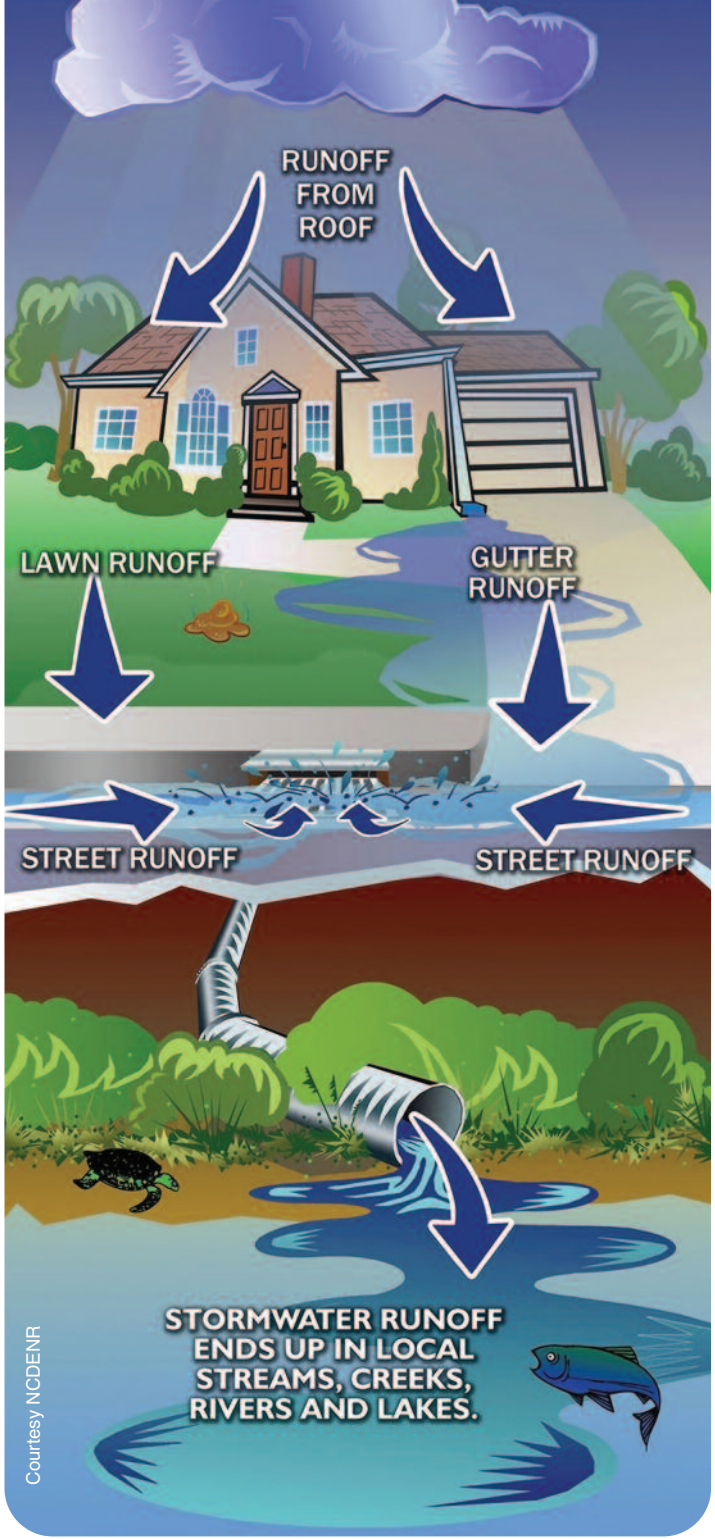
Lake Charlevoix is one of Michigan's premier inland lakes. With a surface area over 17,200 acres, it is the third largest lake in Michigan. The Lake's tributaries include the Boyne and Jordan Rivers and their tributaries, along with a multitude of small inlet streams including Horton, Loeb, Monroe, Porter, and Stover Creeks. The Watershed also consists of several smaller lakes including Deer, Nowland, Adams, and Round Lakes. The Pine River and Round Lake, located in the Watershed's northwest end, connects Lake Charlevoix before discharging into Lake Michigan.

Overall, the water quality of the Watershed's lakes and streams is excellent. Unfortunately, this has not always been the case. During the late 1800s, widespread lumbering and industrial development in Boyne City, Charlevoix, and East Jordan brought about devastating impacts to the Watershed. Lake Charlevoix in particular was primarily seen as a resource for water supply, navigation, and waste disposal.

Although the era of intense lumbering has passed and the remaining industries are no longer emitting pollutants into the air and water, water quality concerns still exist for Lake Charlevoix and its tributaries. The pollutants that threaten Lake Charlevoix's health today are not from tanneries and lumber companies, but from sources all around the Watershed. The two primary pollutants of concern, being nutrients and sediments, originate from a variety of everyday activities like shoreline development, lawn maintenance, streambank erosion, road/stream crossings, and agricultural activities. Fortunately, there are actions that everyone can take to be sure we lessen these impacts on water resources. Together we can keep the Lake Charlevoix Watershed an exceptional resource for all.

Lake Charlevoix Watershed

- The Lake Charlevoix Watershed is one of Northern Michigan's largest watersheds covering approximately 332 square miles, or 212,515 acres, in Antrim, Charlevoix, Emmet, and Otsego Counties.
- The Boyne and Jordan Rivers drain over 70% of the land in the Lake Charlevoix Watershed; 45,912 and 82,356 acres respectively.
- The Jordan River was the State's first designated Natural River.
- With a 60-mile perimeter, Lake Charlevoix has the longest shoreline of any inland lake in the State of Michigan.



Watershed Protection

THREATS TO WATER QUALITY

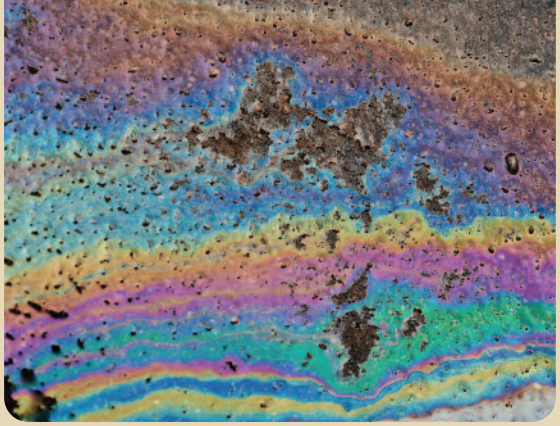
The water quality of Lake Charlevoix is a reflection of the activities in its Watershed. Water quality is impacted by two major types of pollution – point source and nonpoint source. Point source pollution comes from an easily identifiable source, such as a discharge pipe from a factory. Nonpoint source 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?

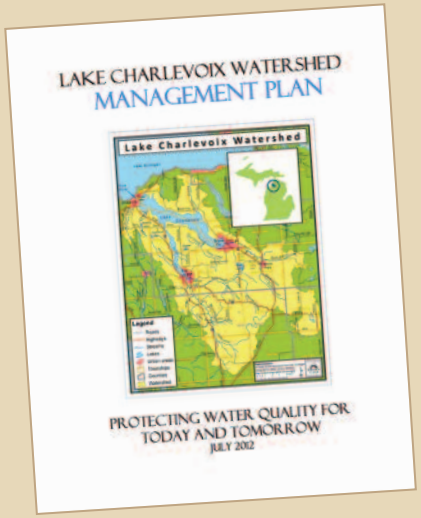
Stormwater runoff is generated when precipitation from rain and snowmelt flows over land or impervious surfaces (paved streets, parking lots, and building rooftops) and does not soak into the ground. Stormwater accumulates debris, chemicals, sediment, nutrients, or other pollutants that adversely affect 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 or oil/gas chambers, which allow for some settling of sediments and 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 Lake Charlevoix Watershed Management 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 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 Lake Charlevoix 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.

This storm drain may carry excess sediments, cigarette butts, grease, and other pollutants that have collected on the marina parking lot directly into Lake Charlevoix.

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 1,200 gallons of water will run off the average roof (about 2,000 square feet).

In one rainy day, your roof runoff could fill up 30 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.

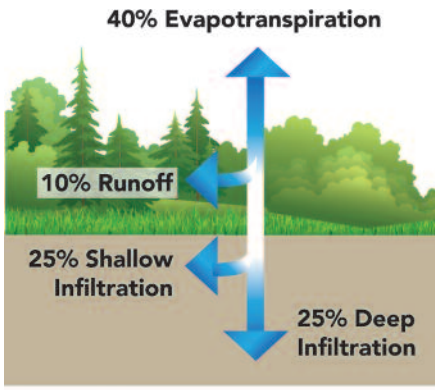
5. **Walkways, Patios, and Other Hardscapes**
Impervious surfaces used for walkways and other site elements further contribute to the stormwater footprint.

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.

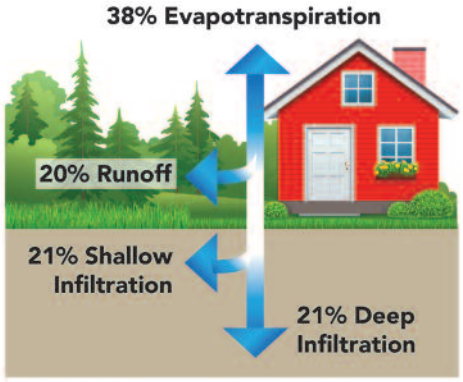
Understanding the Impacts of Impervious Surfaces

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.

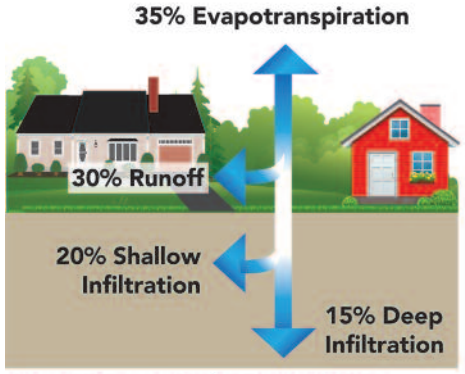
Furthermore, increased surface runoff requires more infrastructure to minimize flooding. Natural waterways end up being used as drainage channels and are frequently lined with rocks or concrete to move water more quickly and prevent erosion. In addition, as deep infiltration decreases, the water table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



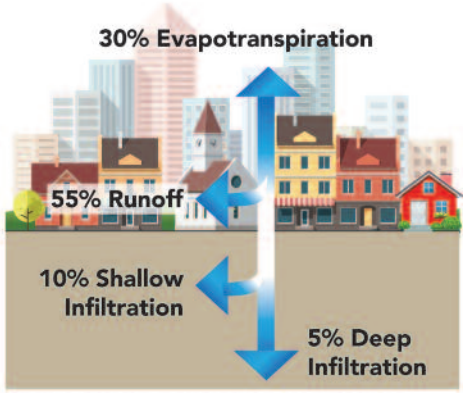
Natural Ground Cover



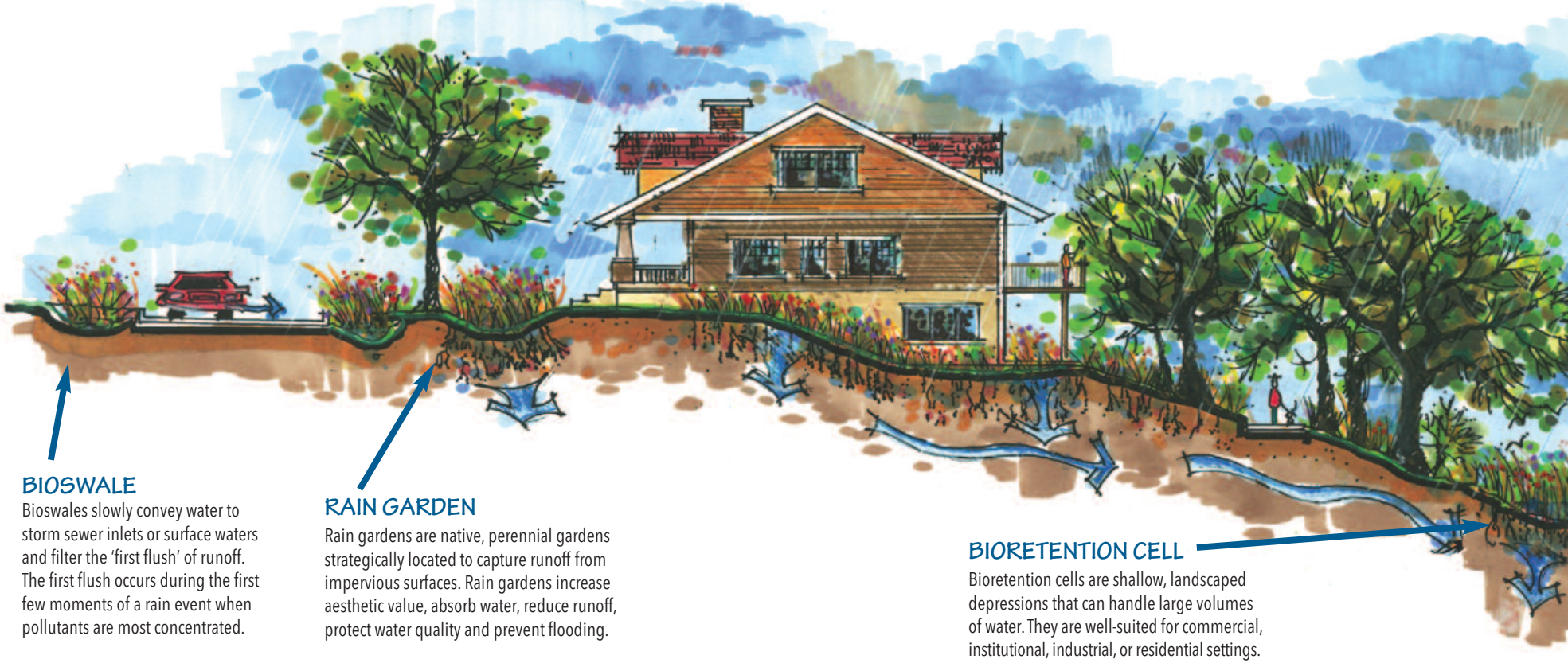
10-20 % Impervious Surface



35-50% Impervious Surface



75-100% Impervious Surface



BIOSWALE
Bioswales slowly convey water to storm sewer inlets or surface waters and filter the 'first flush' of runoff. The first flush occurs during the first few moments of a rain event when pollutants are most concentrated.

RAIN GARDEN
Rain gardens are native, perennial gardens strategically located to capture runoff from impervious surfaces. Rain gardens increase aesthetic value, absorb water, reduce runoff, protect water quality and prevent flooding.

BIORETENTION CELL
Bioretention cells are shallow, landscaped depressions that can handle large volumes of water. They are well-suited for commercial, institutional, industrial, or residential settings.

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 and redevelopment. 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 management that works with nature to manage stormwater.

The goal of LID is to reduce runoff, encourage infiltration, and treat 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 are 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.

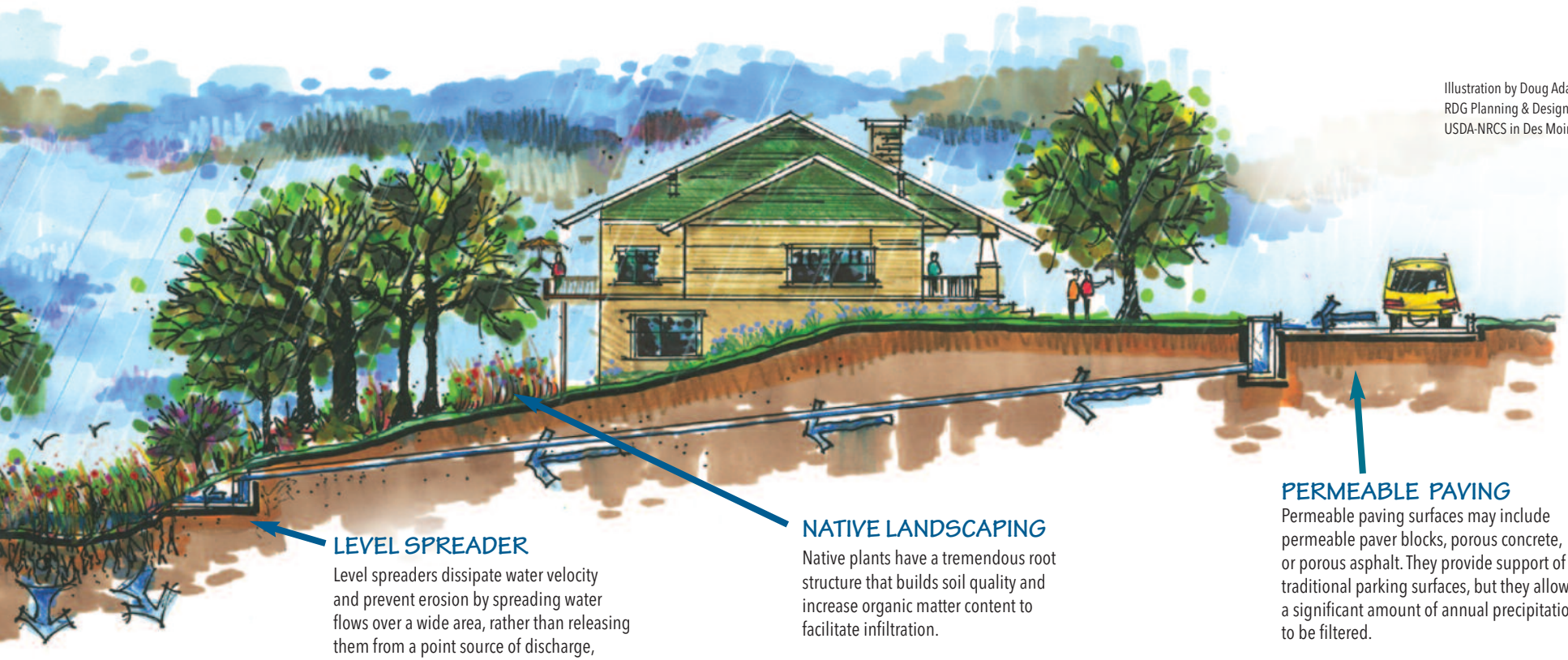


Illustration by Doug Adamson, RDG Planning & Design, provided by USDA-NRCS in Des Moines, Iowa.

LEVEL SPREADER

Level spreaders dissipate water velocity and prevent erosion by spreading water flows over a wide area, rather than releasing them from a point source of discharge, such as a pipe.

NATIVE LANDSCAPING

Native plants have a tremendous root structure that builds soil quality and increase organic matter content to facilitate infiltration.

PERMEABLE PAVING

Permeable paving surfaces may include permeable paver blocks, porous concrete, or porous asphalt. They provide support of traditional parking surfaces, but they allow a significant amount of annual precipitation to be filtered.

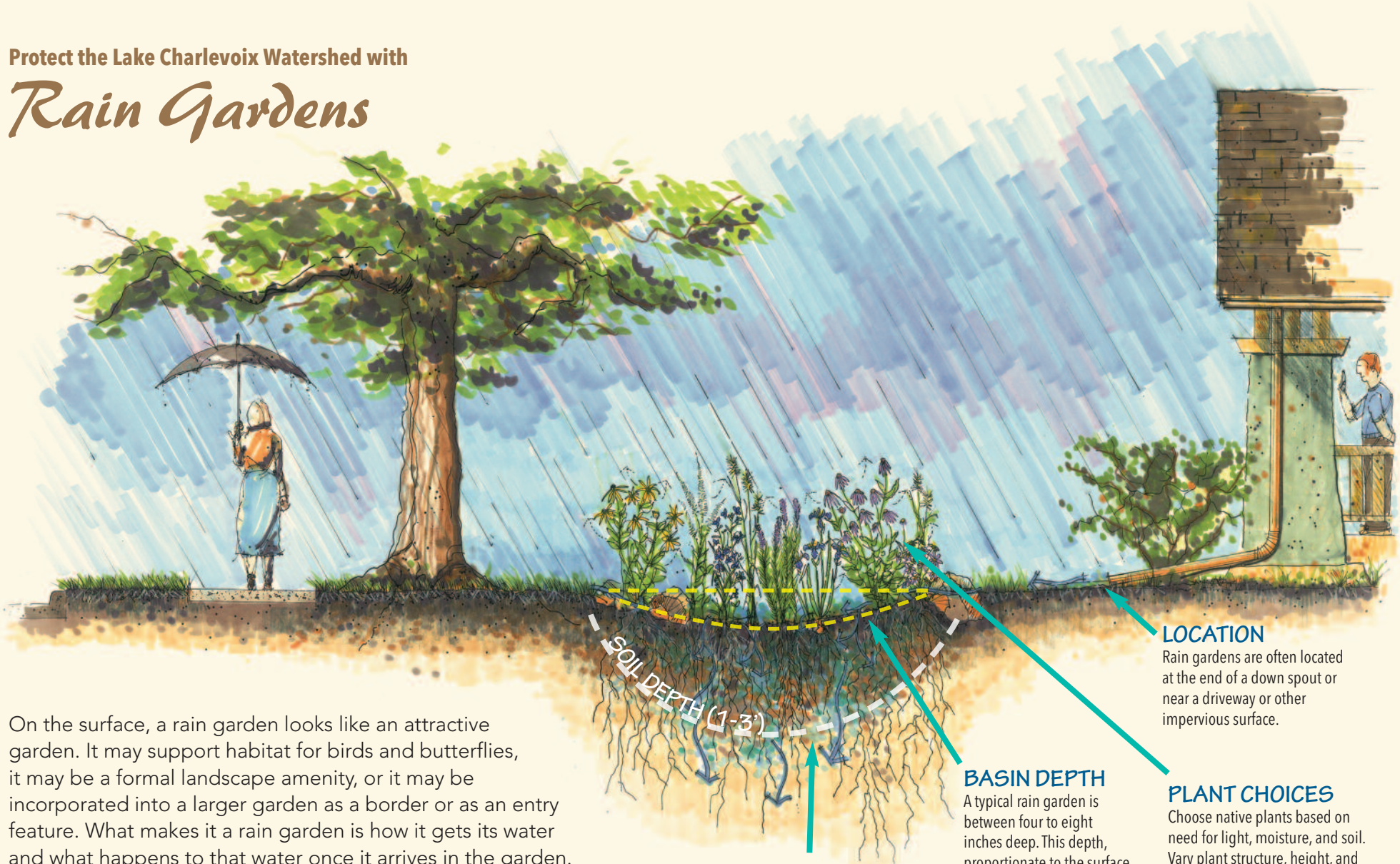
LID Benefits

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, reducing or eliminating the need for detention ponds and flood controls.
- **Promotes groundwater recharge**
  Many LID techniques allow stormwater to infiltrate the earth, 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 the Lake Charlevoix Watershed with

Rain Gardens



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 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 runoff 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, 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. 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 depending 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

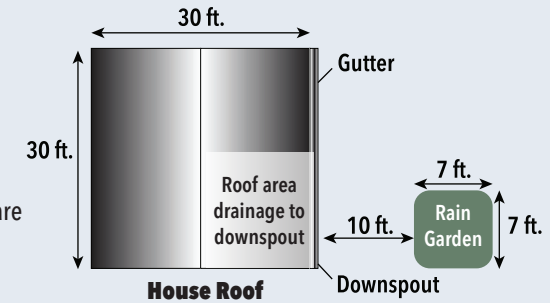
If the area of the house is 30 ft. x 30 ft. and 1/4 of this area drains to one downspout:

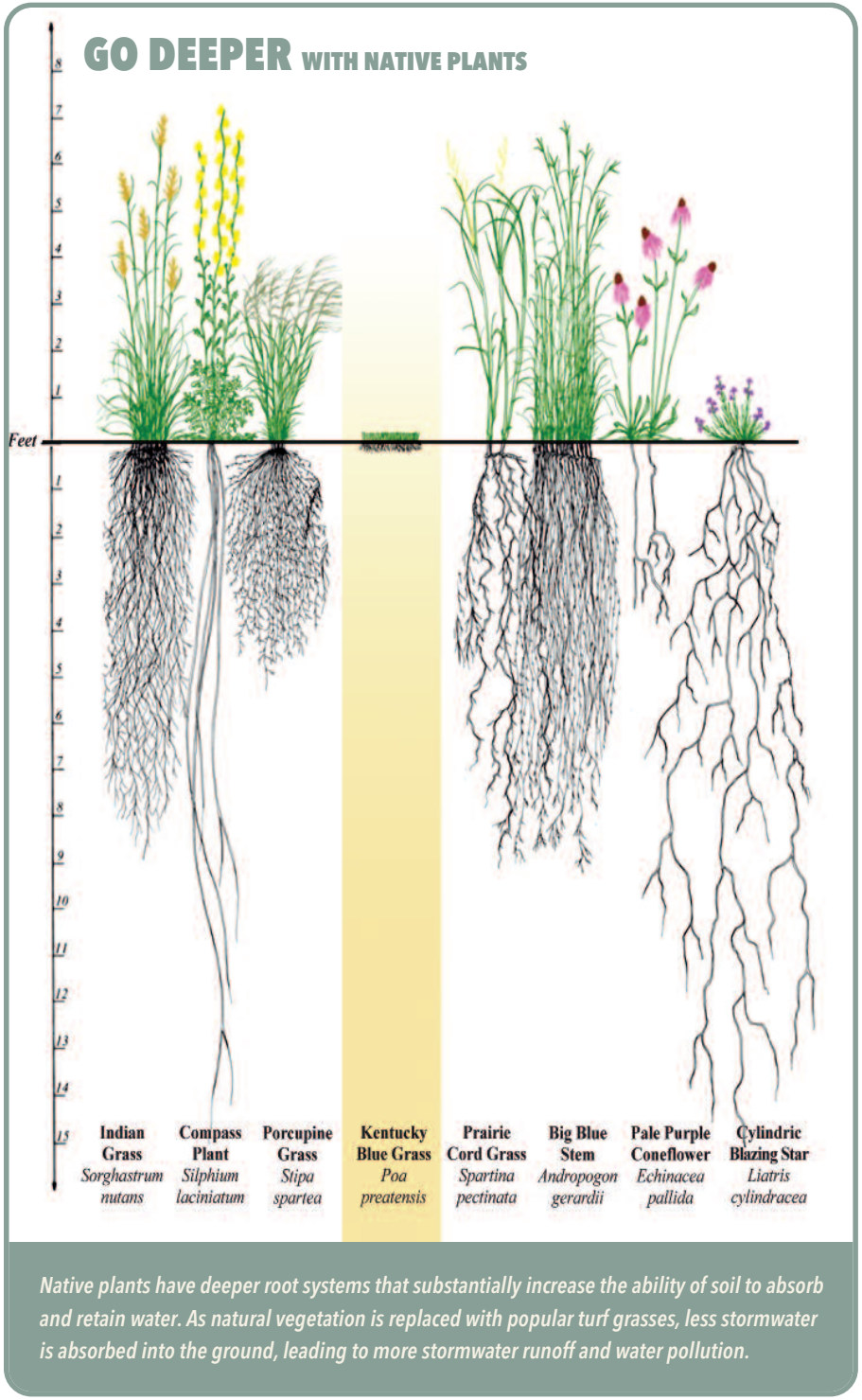
15 ft. x 15 ft. = 225 ft.^{2}

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).





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 the Lake Charlevoix Watershed 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 here 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 the Lake Charlevoix Watershed 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 promoting pollutant treatment and groundwater recharge.

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

Permeable pavers and porous asphalt or 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 and 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 allow water to filter through to a "recharge" or drainage bed.

Porous concrete is composed of materials that result in voids when it is dry by 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.

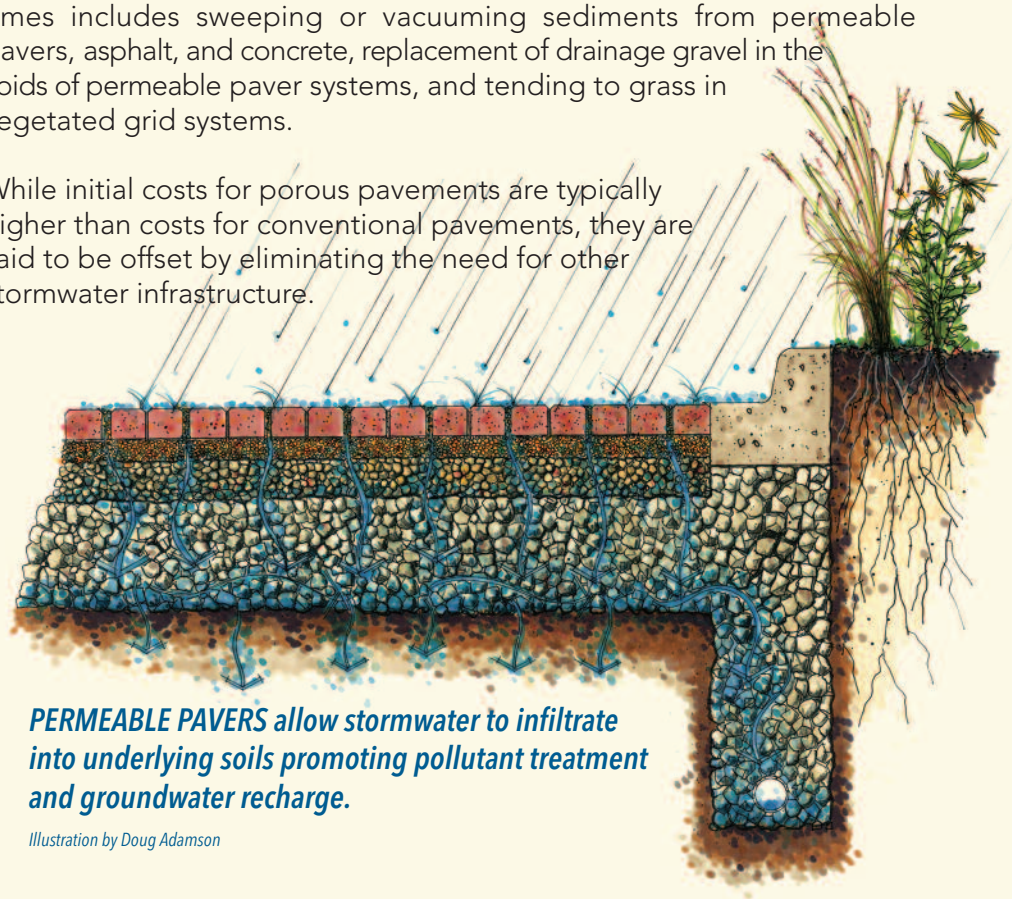
While initial costs for porous pavements are typically higher than costs for conventional pavements, they are said to be offset by eliminating the need for other stormwater infrastructure.

Examples of Porous Pavements

Permeable Pavers

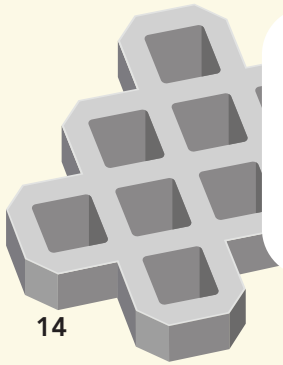
Permeable Concrete

Grass Pavers



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

Illustration by Doug Adamson



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.

Protect the Lake Charlevoix Watershed 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.

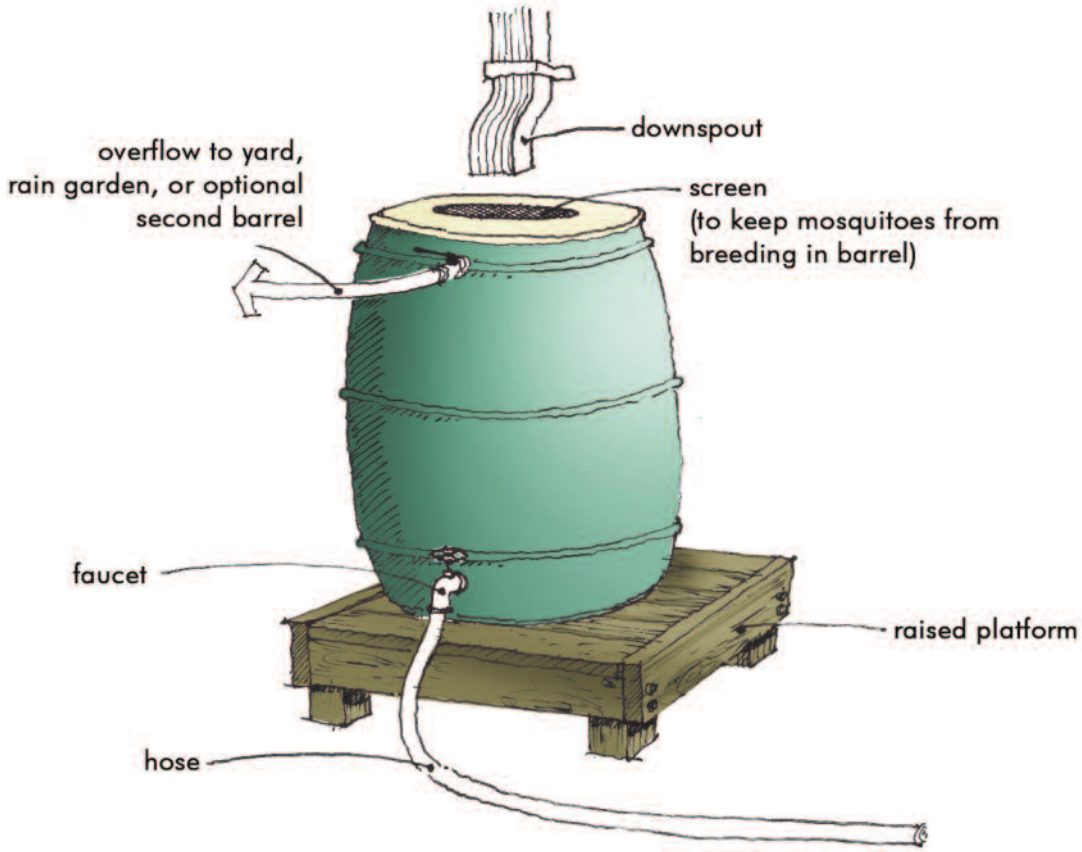
To install your rain barrel:

- 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 to an 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 downspout 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 the Lake Charlevoix Watershed with

Greenbelts

If you live on Lake Charlevoix or another inland lake within the Watershed, an additional way you can protect water quality and provide valuable shoreline habitat is to have a greenbelt. A greenbelt, also known as a riparian buffer, is the vegetated area along the shoreline. A healthy greenbelt consists of a mix of native trees, shrubs, and herbaceous plants. Greenbelts provide many benefits to the lake ecosystem, including shoreline stabilization and erosion control, habitat for shoreline-dependent species, infiltration of runoff, and filtration of pollutants such as sediments, nutrients, and chemicals. It is important to note turf grass does not provide the same benefits that a mix of native vegetation does, and therefore, is not considered an adequate greenbelt.

One quick and easy way to get a shoreline greenbelt started is to create a "no-mow" zone. Native grasses and wildflowers are some of the first plants to appear. You can also enhance your greenbelt by adding a variety of native shrubs, trees, grasses, and flowering perennials.

A greenbelt that will provide the most water quality benefits should cover 75% of the shoreline frontage and extend landward a minimum of 20 feet. For example, if your shoreline is 100 feet long, then 75 feet of it should be a greenbelt to be effective. It is important to note that your township may have a greenbelt ordinance. Please contact your township to be sure any greenbelt project you are considering complies with any applicable ordinances.

Since 1996, the entire 60+/- miles of Lake Charlevoix shoreline, which includes nearly 1,700 individual properties, has been surveyed and assessed for erosion, greenbelts, alterations (e.g., seawalls), and the presence of *Cladophora* algae (a biological nutrient pollution indicator). Results from the most recent survey (2012) include:

- Over a third of greenbelts (35%) along the Lake Charlevoix shoreline were found to be in good or excellent condition. However, nearly half of shoreline property greenbelts (46%) rated in the poor or very poor categories.
- Some form of shoreline alteration was noted at 1,354 shoreline properties (79%). The majority of alterations consisted of riprap (61%), while seawalls, including seawalls combined with riprap or other structures, accounted for 18% of shoreline alterations. Beach sand, whether from fill or vegetation and topsoil removal to expose underlying sand, was documented at nearly 20% of properties.
- Erosion was noted at 593 properties (~35%). Nearly half (44%) of shoreline properties with erosion were classified as minor in terms of severity, while only 13% of properties were experiencing severe erosion.
- Noticeable growths of *Cladophora* or other filamentous green algae were found along the shoreline at 370 properties, representing 22% of the total. At properties where *Cladophora* growth was observed, nearly 20% consisted of heavy or very heavy growth.

The Lake Charlevoix Association has a local recognition program, the Lake Guardian Program, designed to educate homeowners and contractors on "lake-friendly" approaches to lawn care and landscaping within the Lake Charlevoix Watershed and to encourage their use. Individual property owners, neighborhood associations, and businesses may become Lake Guardians by agreeing to support a set of principles regarding the care of their properties. Homeowners agree to limit or eliminate chemical usage, maintain septic areas, protect, maintain, or restore greenbelt buffer zones, and avoid actions which may create harmful water flow into the lake. Businesses, such as lawn care companies and home builders, may also become Lake Guardians if they pledge to adhere to best management practices for water quality protection. For more information, please visit www.lakecharlevoix.org/lake-guardian-program.

SHORELAND STEWARDS

The **MI Shoreland Stewards program** is a statewide program developed to recognize lakeshore property owners who protect their lake through good shoreland management practices.

What are Best Management Practices?

Best management practices (BMPs) are actions that you can take to reduce your impact on your shoreland property. Shoreland best management practices help to protect water quality and the lake ecosystem through restoring natural characteristics and improving problem areas.

To learn what shoreline protection standards may apply to your shoreline, visit **www.lakecharlevoixprotection.org.** Community links for the ten jurisdictions surrounding Lake Charlevoix, including the Cities of Charlevoix, Boyne City, and East Jordan, and Bay, Charlevoix, Eveline, Evangeline, Hayes, Marion, and South Arm Townships, provide property owners comprehensive information.

The biggest threat to Michigan's inland lakes is the loss of nearshore habitat. The National Lake Assessment results indicate that forty percent (40%) of Michigan's inland lakes were rated as poor with another 20% rated as fair for lakeshore habitat. As compared to only 2-4% having problems with nutrients. It is clear that high impact development such as removing native plants on the land and in the water, excessive impervious surfaces (buildings, driveways etc.), and seawalls are causing problems for inland lakes. Studies have shown that when habitat is lost both on the land and in the water this harms the birds, frogs, salamanders, turtles, insects, fish, and other wildlife that depend on certain plants for their survival.

The **MI Shoreland Stewards** program is a statewide recognition program developed by the Michigan Natural Shoreline Partnership to recognize lakeshore property owners who protect their lake through good shoreland management practices.

Become a MI Shoreland Steward!

1. **Take the online questionnaire** to determine if your lakefront property qualifies as a gold, silver, or bronze stewardship level.
2. **Learn important tips** on how you can protect your lake and improve your shoreland.
3. Once you complete the questionnaire, you can print a stewardship certificate. If you want to **let everyone know you're a MI Shoreland Steward**, purchase a sign to display in your shoreland.

Learn more about this program at:
www.mishorelandstewards.org

Protect the Lake Charlevoix Watershed with

Septic System Maintenance

Shoreline residents play a special role in protecting the Lake Charlevoix Watershed. Their actions on or around their property can affect not only their water quality, but also that of their neighbors and those in other parts of the watershed.

One important action that all shoreline property owners should observe is septic system maintenance. Septic systems that are failing or unmaintained can threaten both surface and ground waters. Studies have shown that some pollutants, carried by the groundwater beneath the septic system, often reach surface waters from septic systems located within 300 feet of the shoreline. Nutrients, such as nitrogen and phosphorus, are the primary pollutant of concern. Nutrients can encourage excessive aquatic plant and algae growth which can make swimming and boating undesirable. Septic system effluent can also contain disease-causing bacteria that can move to surface waters from septic systems, making it unsafe for swimming or other bodily contact. Contamination of groundwater from septic system effluent is a particular concern where the groundwater is used for drinking water.

Because shoreline areas typically have high water tables and septic systems are often very close to the water, the potential to negatively impact groundwater and/or surface water is significant.

To protect the health of the Lake Charlevoix Watershed and its residents, shoreline property owners should follow these best management practices:

1. **Have your septic tank inspected and pumped regularly by a licensed pumper.** The general recommendation of how often to get your tank pumped is once every 3-5 years. Of course, the right specific pumping schedule for you is based on the size of the septic tank, the number of individuals in your household, and the amount of wastewater generated. Heavy or year-round use will necessitate more frequent pumping than light or seasonal use.

2. **Consider improving or upgrading your system if the amount of wastewater you generate is more than your septic system can handle.** Since it is not easy to make such extensive changes, carefully consider all of the activities that generate wastewater in your home – cooking, bathing, flushing toilets, laundry, dishwasher, etc. This will help you come up with measures you can take to conserve as much water as possible.

3. **DO NOT use commercial products that claim to be a substituted for maintenance pumping.** Many of these products liquefy the sludge and cause it to enter the drainfield.

4. **Avoid using chemicals, such as drain cleaner and large amounts of bleach, because they kill the bacteria which break down solid wastes in the septic tank.**

5. **Install a vegetative buffer strip of deep-rooted plants between the end of your drain-field and the shoreline area.** These plants can help absorb nutrients before they reach water. Take care not to plant deep-rooted plants in the area directly over your drain-field, as roots might cause damage to your system which may result in wastewater that is not adequately treated.

6. **Direct rainwater from gutters and other surface runoff away from the drainfield.** Excessive moisture can saturate the soil and reduce the drainfield's filtering capacity.

7. **Construct the septic system as far away from the shoreline as possible if you are building a new home.** Never build or pave over a drainfield. Keep vehicles away from the drainfield and septic tank.

8. **DO NOT apply fertilizer around a drainfield because the nutrients saturate the soil and cause it to stop removing nutrients from the wastewater.**

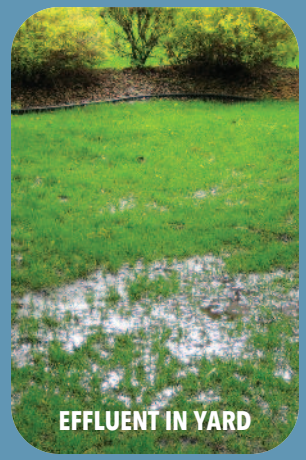
9. **Limit your use of kitchen garbage disposal units.** Heavy use adds large quantities of solids and will shorten the time between septic tank maintenance.

Signs of a Failed Septic System

- Slowly draining sinks and toilets.
- Gurgling sound in plumbing.
- Constant plumbing backups.
- Strong odor near septic drainfield.
- Vibrant green patches or areas where vegetation seems to be flourishing at a much more pronounced rate.
- Pooling of effluent on the surface of your lawn.
- Excess algae growth on lake bottom along shoreline.


PLUMBING ISSUES


ALGAE ON LAKE BOTTOM NEAR SHORELINE


EFFLUENT IN YARD

Lake CharlevoixWatershed Advisory Committee

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

The Lake Charlevoix Watershed Advisory Committee leads implementation efforts of the Plan. The Committee consists of many organizations and local governments that work to address nonpoint source pollution and other threats to the Lake Charlevoix Watershed. Advisory Committee members include:

Antrim Conservation District
Antrim County
Antrim County Road Commission
Charlevoix Conservation District
Charlevoix County Board of Commissioners
Charlevoix County Planning Commission
Charlevoix County Road Commission
City of Boyne City
City of Charlevoix
City of East Jordan
Conservation Resource Alliance
Friends of the Boyne River
Friends of the Jordan River Watershed
Grand Traverse Band of Ottawa and Chippewa Indians
Grand Traverse Regional Land Conservancy
Keep Charlevoix Beautiful
Lake Charlevoix Association
Little Traverse Bay Bands of Odawa Indians
Little Traverse Conservancy
Michigan Department of Environmental Quality
Michigan Department of Natural Resources
Michigan State University Extension
Natural Resources Conservation Service
Northwest Michigan Community Health Agency
Northwest Michigan Council of Governments
Tip of the Mitt Watershed Council
Water and Air Team Charlevoix, Inc.
(WATCH) & CARE Committee

Financial assistance for this project was provided by:
CHARLEVOIX COUNTY COMMUNITY FOUNDATION
Giving Back. Moving Forward.

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 a lot 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 7 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

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

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

NATURAL SHORELINES

Michigan Natural Shoreline Partnership
www.mishorelinepartnership.org

Michigan Shoreland Stewards
www.mishorelandstewards.org

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426 Bay Street, Petoskey, MI 49770
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