Land Use for a Healthy Watershed

Protecting water resources through intentional land use planning and citizen involvement

Huron River Watershed Council

1100 North Main Street, Ann Arbor, MI 48104, (734) 769-5123, www.hrwc.org

HRWC's mission is to protect and restore the river for healthy and vibrant communities.

We envision a future of clean and plentiful water for people and nature, where citizens and government are effective and courageous champions for the Huron River and its watershed.

This document has been made possible by generous funding from the Americana Foundation.

Original publication 1999; reprinted in 2001; revised, second edition 2018

Dear Citizen,

In Michigan, due to state regulatory practices, the most important land use decisions occur at the local level. This document is an introduction to basic hydrology, water resources, and local land use planning, including hands-on tools for working with local governments to protect water resources by positively affecting land use decisions. Since 1999, local citizens and government officials have used the enclosed information to effectively participate in local land use decisions.

Chapter 1 gives an overview of the water cycle and explains how different land uses and development patterns can impact it. Chapter 2 explains how land use decision-making works at the local level, presents ways to get involved in the planning process, and explains how to use local planning rules and policies to protect water resources. A resources section is provided at the back of this guidebook for further study.

Across the country and around the world, freshwater resources are in jeopardy. Thanks to hard work by municipalities, the Huron River Watershed Council, and citizens like you, the Huron River and its tributaries are in relatively good health. Careful, deliberate land use planning is key to continuing the protection and preservation of this invaluable resource.

We strongly encourage you to become a part of this positive and proven method of ensuring clean water now and in to the future.

Sincerely,

The Board and Staff

Huron River Watershed Council

Land Use for a Healthy Watershed

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Welcome to the Huron River Watershed

A watershed consists of all the land that drains to any body of water. Watersheds can vary in size from several square miles to thousands of square miles. The boundary separating one watershed from another follows the high points and ridges on the landscape. Rain that falls on the ridge between two watersheds can contribute to either watershed, depending on which side of the ridge it flows down. In Michigan, the difference in elevation between the high and low points on the landscape is relatively modest, and the edges of a watershed may be hard to discern.

The Huron River watershed (Figure 1) is 908 square miles and includes all the land that drains into the 128-mile long Huron River. Twenty four tributaries (small creeks) drain into the Huron. Each of these tributaries has its own sub-watershed comprised of any surface that drains into that creek. These creeksheds are part of a larger watershed that drains into the Huron River. In turn, the Huron River drains into Lake Erie and is part of the Great Lakes watershed.

Figure 1 - *The Huron River watershed covers 908 square miles of land. This land drains into the Huron River, which in turn drains into Lake Erie.*

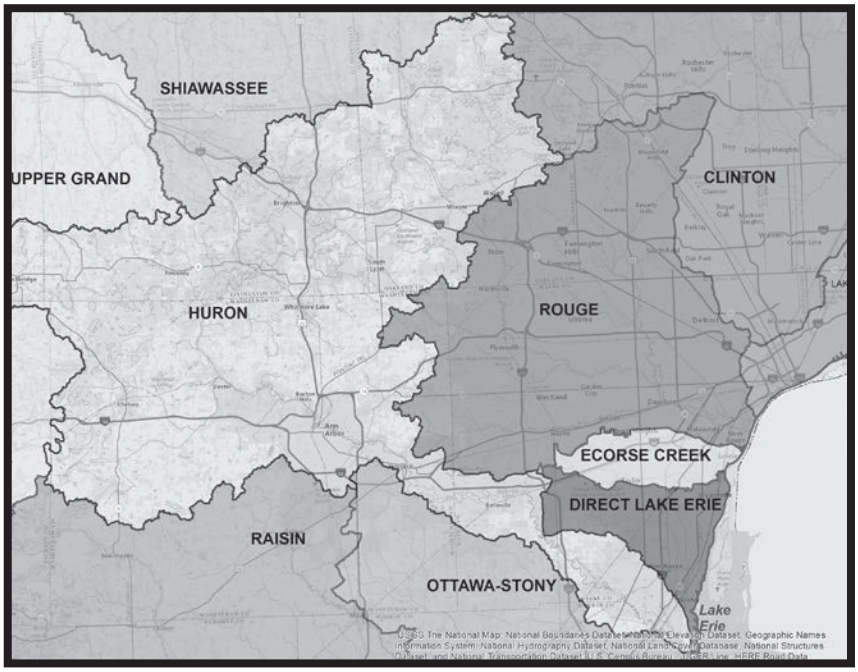

Figure 2 - *The Huron and its surrounding watersheds.*

Figure 3 - *Much of the precipitation that falls within a watershed eventually flows to a major river or lake. All of the land that drains into this common waterbody makes up the watershed. For example, the Huron River watershed, or the Great Lakes watershed.*

The highest elevation in the Huron River watershed is 1,200 feet above sea level, located in Oakland County. The lowest point is at the mouth of Lake Erie, where the elevation is 572 feet above sea level. As of 2017, 650,000 people live in the watershed. Municipalities partially or completely within in the watershed include 7 counties (Ingham, Jackson, Livingston, Monroe, Oakland, Washtenaw, and Wayne), 39 townships, and 21 cities and villages.

The watershed is surrounded by five other watersheds: the Raisin River watershed to the south, the Grand River watershed to the west, the Shiawassee and Clinton River watersheds to the north, and the Rouge River watershed to the east (Figure 2).

GET ORIENTED

For a closer look at the watershed and to find where you live in the watershed, check out :

www.hrwc.org/our-watershed/maps/

Here you will find maps of the Huron's tributaries, as well as land use, natural areas, parks, water quality results, and other features of the watershed.

Chapter

1

The Connection Between Land Use and Water Quality

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The Role of Land in the Water Cycle

The water cycle refers to how water moves or "cycles" from the atmosphere, to the ground, through the landscape, and back to the atmosphere.

As Figure 4 shows, land receives water from precipitation. Some of the water is sent back to the atmosphere through evaporation and plant transpiration (or "breathing"), some is stored in depressions on the surface of the land, some soaks into the ground and is stored in soil, and some runs across the surface of the land. The water cycle is "closed," meaning that the same water continuously cycles through the system. It is fascinating to realize that the water we use today is the same water the dinosaurs used. There is no "new" water to replace any that has been made undrinkable by pesticides, toxic chemicals, or other pollution.

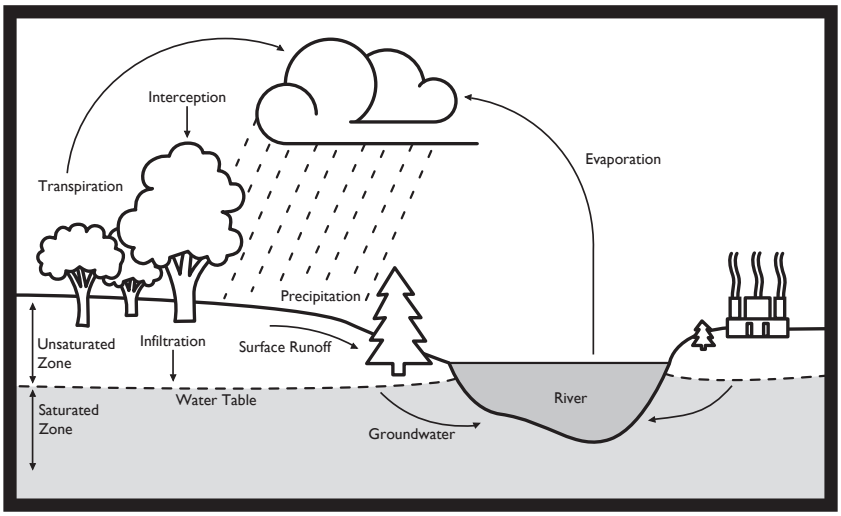


Figure 4 - *The water cycle*

Characteristics of the land such as soil type, vegetation, surface waters, and topography help to determine what will happen to water. These natural features make up a "Green Infrastructure." Much like human-built infrastructure such as utilities, roads, and bridges, green infrastructure provides vital services to people and communities. While built infrastructure provides services that help our economy and quality of life, green infrastructure does this and more by providing essential ecological services necessary for survival, including: clean air, clean water, productive habitats, crop pollination, game and other wildlife, pest control, climate regulation, and biodiversity.

Economists have begun to put a price on these services. In the Huron River watershed, a study done for HRWC by Grand Valley State University found that the ecological services provided by the wetlands, forests, and floodplains along the main branch of the river (not including tributaries or upland areas) are worth $150 million annually.

GREEN INFRASTRUCTURE

Green infrastructure is a broad term that watershed planners use to refer to a spectrum of features. Originally defined as the interconnected network of large, intact natural areas that support native species, maintain ecological services, and sustain air and water quality, the term broadened to include natural features of any size in more urban areas and on specific development sites. Planners began urging that developers preserve these natural features – woodlands, wetlands, streams, lakes, and other naturally vegetated areas – for their ability to infiltrate, intercept, store, and transport water. Stormwater managers later adopted the term to refer to constructed features such as rain gardens, green roofs, porous pavements, and parks in more urban areas and on specific development sites. Constructed (or "built") green infrastructure can recover some of the ecological services lost by the clearing and paving over of natural areas and features caused by the development.

In general and throughout this guidebook, the term Green Infrastructure encompasses everything from larger natural areas, to smaller natural features, to constructed features that mimic those natural features.

Ecological Services Provided by Green Infrastructure

The benefits of Green Infrastructure are detailed under four general categories:

1. **INFILTRATION:** water moving through soils
2. **INTERCEPTION:** water taken up by vegetation
3. **STORAGE:** water held in and on the land
4. **TRANSPORT:** water moving across and below the landscape

1. Infiltration: rain that soaks into the ground filters through layers of soil, sediment, and rock in a process called infiltration.

Why is infiltration important for water quality?

- Infiltration filters out some pollutants as water moves through soil. The degree of purification depends on the size and type of pollutant in the water and the type of soil it is traveling through. For example, soil can filter out many kinds of bacteria and prevent them from reaching groundwater.
- Infiltration directs water to groundwater supplies, allowing for water storage that provides a stable, cool flow of groundwater to streams and rivers, as well as to drinking water wells.
- Infiltration reduces stream bank erosion by reducing sudden, overwhelming surges of water into the system.

The following situations impede infiltration:

- Roads, pavement, rooftops, and other hard surfaces – and even some landscapes made up of tightly packed soils like lawns
- Soil saturated with water
- Frozen ground

WHERE DID the WATER GO?

For each inch of rainfall...

A one acre parking lot generates 24,806 gallons of water runoff, much of it destined to flow into the storm drains for discharge.

Compare that to a one acre meadow or forest, which generates just 1,630 gallons.

2. **Interception**: vegetation absorbs precipitation (rain, snow, sleet, etc.) through leaves and roots.

In an undeveloped watershed, native vegetation in forests, prairies, and wetlands provides interception. These deep-rooted plants take up an impressive amount of precipitation.

Why is interception important for water quality?

- Interception by vegetation reduces the force of water entering the system, thus reducing soil erosion.
- In addition, native vegetation has extensive root systems that hold soils in place, helping to prevent erosion while simultaneously drawing up certain harmful pollutants such as arsenic and other heavy metals.

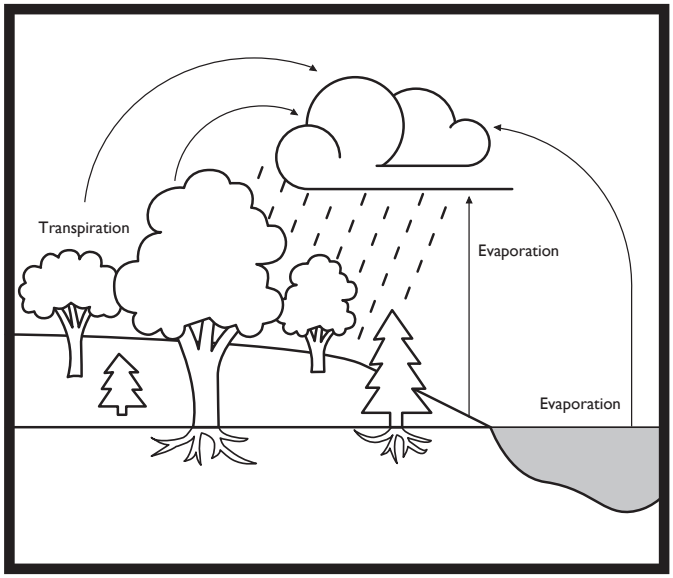


Figure 5 - *Vegetation intercepts rain and reduces soil erosion.*

Rain falling on a landscape bare of vegetation wears away precious soils, transforming it from vital food and structure for plants to one of the most troublesome forms of pollution in lakes and streams: sediment. This "dirt" becomes a problem for what it does to – and carries along with it into – waterways. When sediment reaches water it:

- Increases drinking water treatment costs
- Clogs the gills of fish, insects, and other aquatic animals, making it harder for them to breathe
- Covers food supplies on the bottom of waterbodies
- Covers eggs laid by fish and other creatures, preventing them from hatching
- Carries other pollution such as phosphorous with it
- Blocks light from reaching aquatic plants
- Absorbs the sun's heat, thereby warming up the water to the point where sensitive species can no longer survive

3. Storage: the landscape has a tremendous capacity for storing water in a variety of ways. Water can be stored in different states – as ice, snow, or liquid – and it can be stored for varying lengths of time – from days to years to decades.

Surface water storage occurs in any depressions on the surface of the landscape, from areas as small as a puddle or as large as the Great Lakes. Lakes, ponds, puddles, bogs, swamps, retention basins, and marshes are all surface storage areas (Figure 6). Surface storage areas can last any length of time ranging from temporary, to seasonal, to nearly permanent. A puddle may hold rainwater for a day or two until it evaporates, some wetlands may hold water only in the wet season, and a lake or reservoir may hold water for years.

Surface storage areas are often interconnected to the groundwater beneath them (Figures 8 and 9 on the next page). For example, water can travel from a lake into the ground, or water can travel into a lake from the ground, as in a spring-fed lake.

Why is surface storage important to water quality?

- During and after a heavy rainstorm, surface storage areas can hold excess water and prevent flooding.
- Many surface storage areas hold water for long periods of time, which allows sediments to settle out.
- Some surface storage areas contribute to groundwater systems.
- Many surface storage areas provide sources of drinking water.

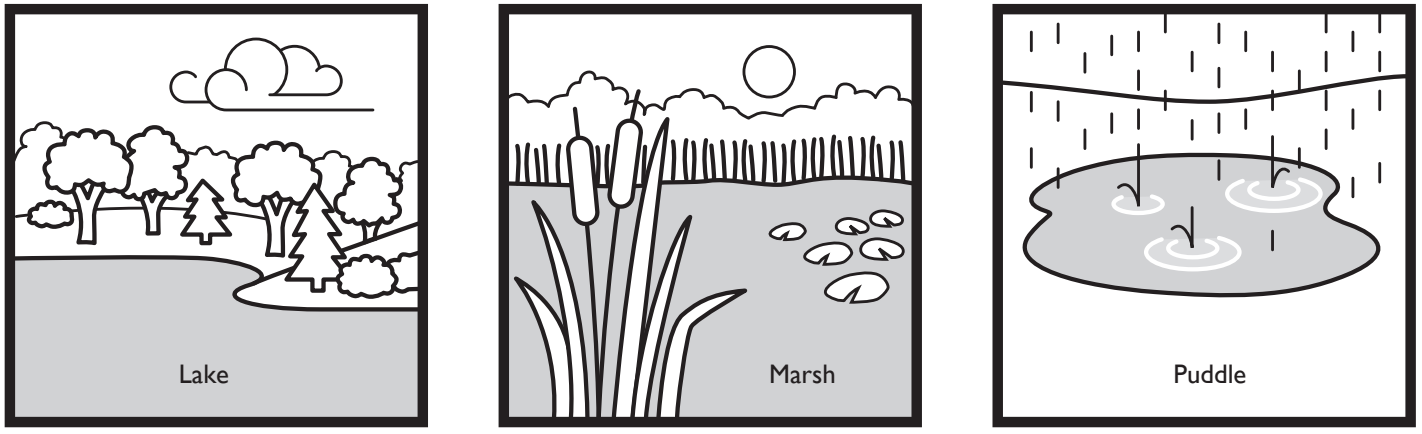


Figure 6 - *There are many different forms of surface storage areas. Some hold water for a day, others for a season, and still others hold water for many, many years. The largest natural surface storage area in the Huron River watershed is Portage Lake, in Dexter and Putnam townships. Collectively, the Great Lakes basin is the largest freshwater surface storage area in the world. It holds 20% of the world's fresh surface water.*

Groundwater storage occurs under the ground. While some water is stored on the surface of the land, most of the precipitation that falls on the landscape soaks into the ground and becomes groundwater. Groundwater is the water found underground in the cracks and spaces in soil, sand, and rock. It is stored in, and moves slowly through, geologic formations of sand, clay, and rocks called aquifers.

Why is groundwater important to water quality?

- Groundwater provides a stable, cool, clean flow of water to streams, rivers, lakes and wetlands.
- During dry summer months, groundwater often provides the only source of water to these surface waterbodies. Water that has infiltrated through soils and reached groundwater is cleaner and cooler than water that runs directly off of the surface and into streams.
- Many aquatic flora and fauna, such as brook trout, require cool-water streams to survive; Michigan's world-famous trout streams are sustained by a plentiful supply of groundwater.

About half of Huron River watershed residents use groundwater as their drinking water. The City of Ann Arbor draws about a fifth of its drinking water from groundwater. Maintaining the quality and quantity of our groundwater is very important.

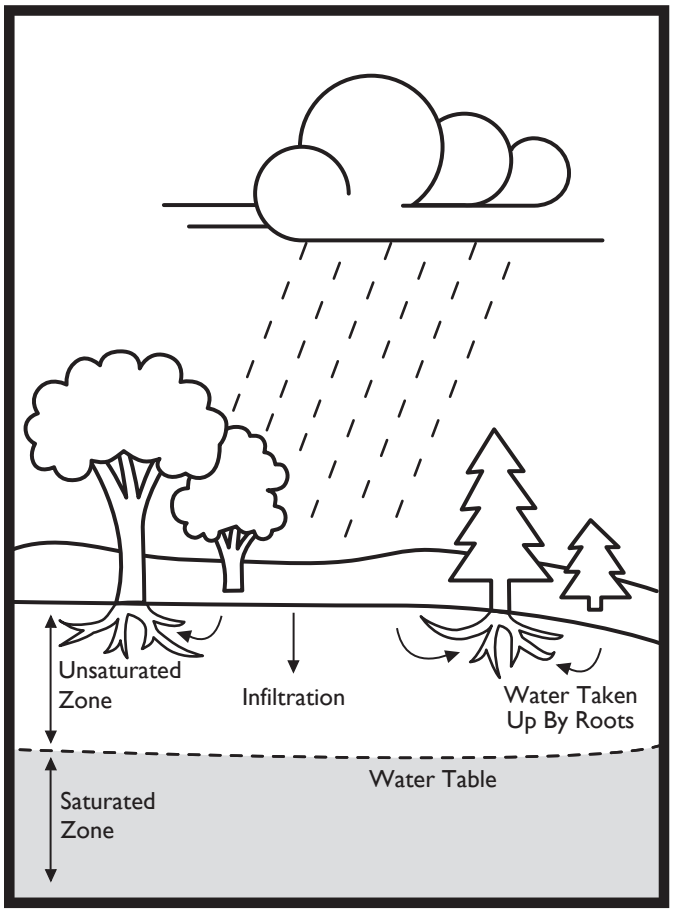


Figure 7 - *When water enters the soil it is either taken up by the roots of plants or infiltrates down to groundwater.*

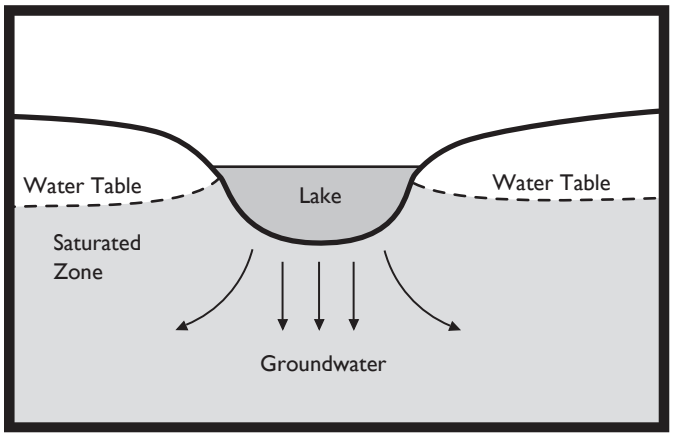


Figure 8 - *Surface waters can recharge groundwater...*

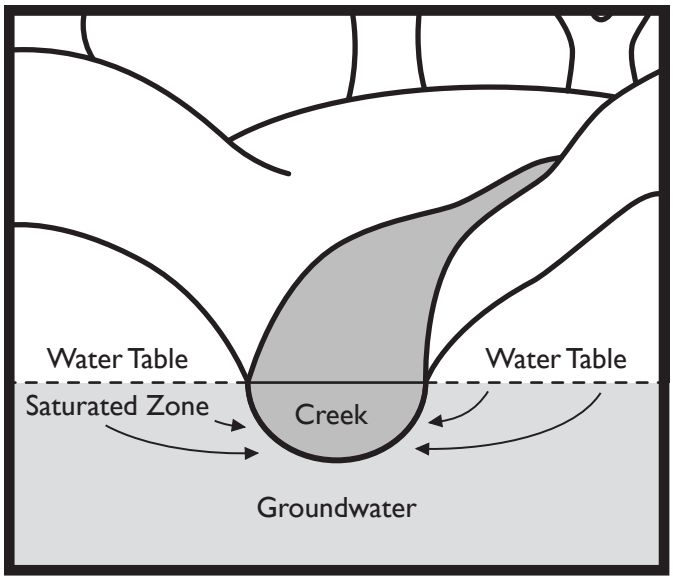


Figure 9 - *...or groundwater can recharge surface waters, supplying them with cool water at a steady flow rate.*

4. Transport: includes all the ways that water moves over and through the land and how it returns to the atmosphere.

There are four major types of transport:

- Runoff
- Rivers and streams
- Transpiration and evaporation
- Groundwater

Runoff is water that flows across the surface of the land and into rivers, lakes, streams, and other waterbodies. Runoff occurs when the land can't store all the water in soil and/or surface storage areas. In an undeveloped watershed, runoff is rare. It must rain long and hard before all the storage capacity of the land is filled. Runoff is more of a problem in a developed watershed due to the changes people make on the landscape that reduce infiltration and storage capacity.

Rivers and streams, as well as creeks, drains, and any other waterways, form major transportation networks for water.

The CONNECTION BETWEEN HEAT and EVAPORATION

Evaporation is the process by which a liquid (water) becomes a gas (water vapor or humidity). Heat accelerates the process of evaporation. A tea kettle provides a clear example as the heated water produces steam out of the spout.

In the environment, this becomes evident after a rainstorm on a hot summer day. The asphalt is rapidly cooled by the rain, and steam rises off the hot surfaces. Warmer temperatures caused by climate change mean an acceleration in evaporation, which in part explains the increased intensity and volumes of rainstorms experienced in the Huron River watershed in recent years.

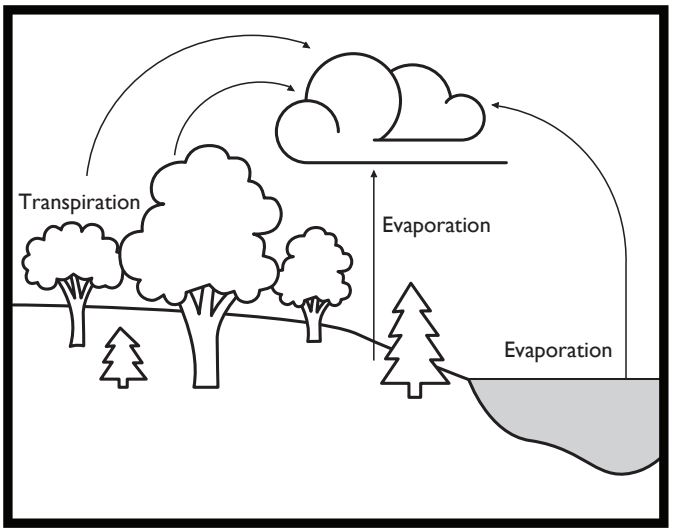


Figure 10 - *Transpiration and evaporation*

Transpiration is the process by which water exits a plant. Trees and other plants take up some of the water that is stored in soil. More than 90% of the water they take up is ultimately transpired into the atmosphere; most of this occurs when water transpires from the surface of leaves.

Evaporation is the process by which water exits surfaces other than plants, such as the ground or waterbodies, and returns to the atmosphere.

The general process of water leaving natural areas and returning to the atmosphere is **evapotranspiration**. This is the combination of evaporation and transpiration.

Groundwater is considered storage, but it also moves through aquifers, albeit very slowly. Groundwater can be recharged from surface water supplies and, in turn, can be discharged into springs and surface water.

Understanding Groundwater Resources

As more communities move toward municipal water and sewer services, fewer people are aware of the role groundwater plays in ecological systems.

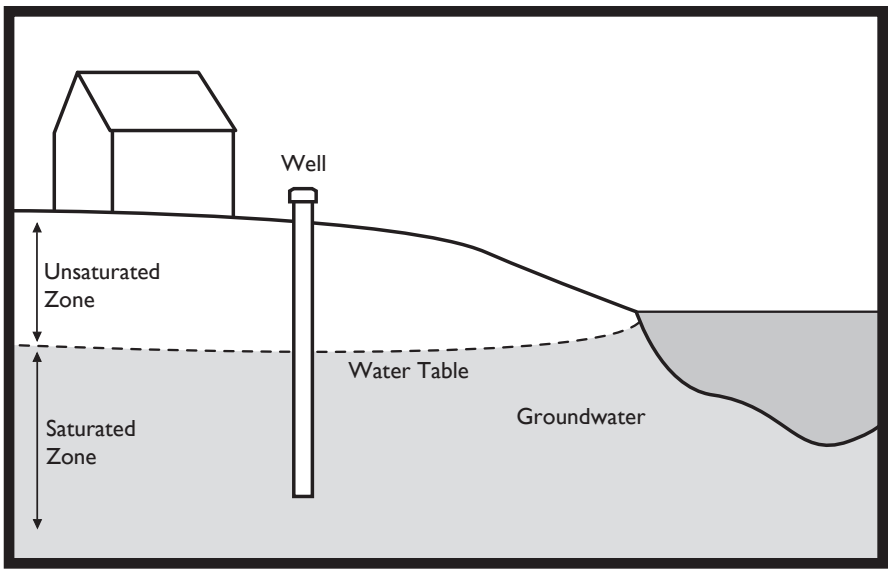


Figure 11 - *When people drill wells they need to drill down until they find the water table, and then drill even further because the depth of the water table can vary with the seasons.*

GROUNDWATER AQUIFER

Aquifer is from the Latin aqua (meaning "water") and ferre (meaning "to bear"). An aquifer is layer of rock, sand, or earth that contains water or allows water to pass through it.

GROUNDWATER DEPTH

The water table measures the distance from the ground to the top of the groundwater storage aquifer. Just as lake levels go up and down with the seasons and periods of dry and wet weather, so does the water table and hence groundwater availability. The height of the water table also varies from place to place. In Michigan, the water table can be at the surface (some lakes are just surface expressions of the groundwater) or hundreds of feet below the surface, depending on the season and location.

GROUNDWATER MOVEMENT

Groundwater moves very slowly between layers of earth. The rate of groundwater flow can range from a foot-a-day to a foot-a-decade. Groundwater flows from areas of recharge to areas of discharge. A recharge area contributes water to underground water supplies, including from surface water to groundwater as well as moving from one aquifer to another. Groundwater discharge refers to springs and seeps, where water leaves the underground aquifer layers to discharge onto the land and/or into surface water. Whether an area provides recharge or discharge depends on a variety of factors, including topography, geographic location, soil type, precipitation, and time of year.

WELLHEAD PROTECTION

Local governments supplying drinking water to residents from municipal wells must have a Wellhead Protection Program. These programs identify the sources of the groundwater that provide drinking water, the potential sources of contamination of the local water supply, strategies for managing these sources in order to protect drinking water, plans for drinking water emergencies, and plans to educate the public about their drinking water and what they can do to protect it.

How Natural Features Infiltrate, Intercept, Store, and Transport Water

"**Natural features**" are a part of the landscape independent of human activity. They include forests, meadows, wetlands, rivers, streams, lakes, floodplains, groundwater recharge areas, and steep slopes.

Figure 12 - *Forests*

Forests are dominated by trees with smaller shrubs, wildflowers, grasses, and other plants in the understory (Figure 12).

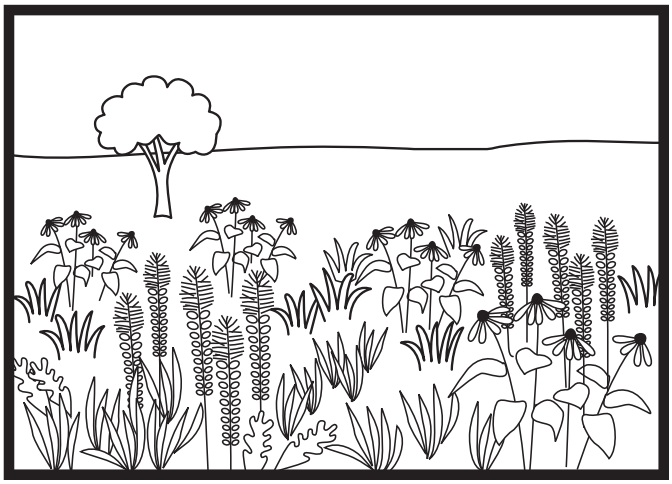


Figure 13 - *Prairies and meadows*

Prairie remnants, or meadows, are open sites dominated by grasses, and wildflowers, with few shrubs or trees (Figure 13).

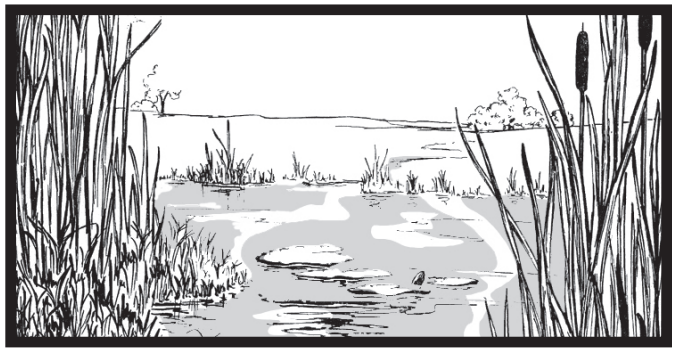


Figure 14 - *Wetlands*

Wetlands have both land and water characteristics. Although many wetlands are under water or have saturated soils, some are wet only during certain times of the year. Swamps, marshes, bogs, and fens are types of wetlands commonly found in Michigan (Figure 14).

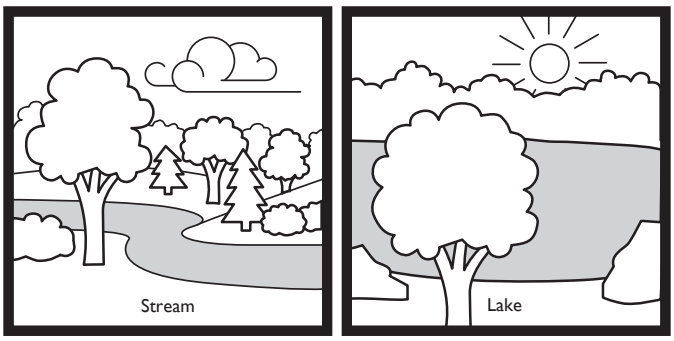


Figure 15 - *Waterbodies*

Waterbodies include lakes, ponds, rivers, creeks, and streams (Figure 15).

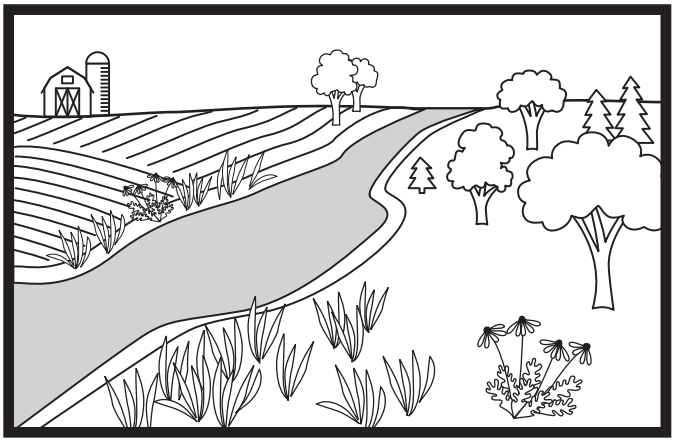


Figure 16 - *Floodplains*

Floodplains are areas adjacent to steams or rivers that flood during high river flows (Figure 16).

Groundwater recharge areas are often high in elevation and made up of large layers of permeable soils that can soak up and store large amounts of groundwater. These recharge areas replenish surface waters and underground wells (see page 8, Figures 8 and 9).

Steep slopes are features of the landscape that are sensitive to erosion.

Vegetation – like forests, prairie remnants, meadows, and wetlands – reduce erosion, filter water, and return water to the groundwater and atmosphere. Vegetation can return water to the atmosphere by transpiration or evaporation.

Vegetation helps to reduce erosion by:

- Intercepting precipitation, breaking its fall and thereby reducing its power to erode
- Holding soil in place through its network of roots
- Slowing the flow of water across the land, which helps to reduce the power of the water to cause erosion

Vegetation can filter runoff and clean it by:

- Slowing down the flow of runoff, allowing some sediments to settle out or become trapped in the vegetation
- Taking up nutrients and pollutants in the runoff and preventing them from contaminating waterways

Waterbodies, wetlands, and floodplains not only store water, they also move it across the landscape. They provide valuable services by:

- Providing a drainage system for the land
- Moving water and sediments across land from higher to lower elevations
- Storing flood waters in times of excess precipitation
- Trapping sediments and allowing them to settle out
- Containing sediment deposits

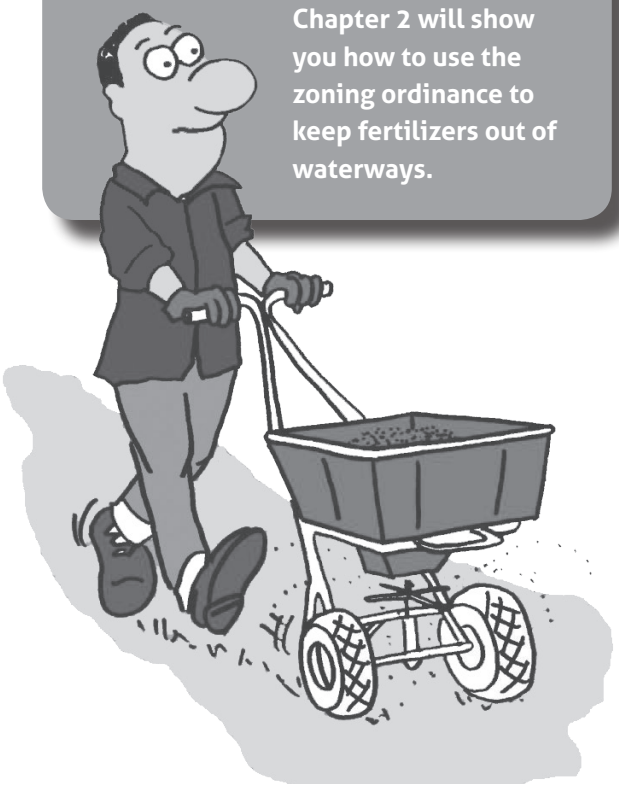
NUTRIENTS and WATER QUALITY

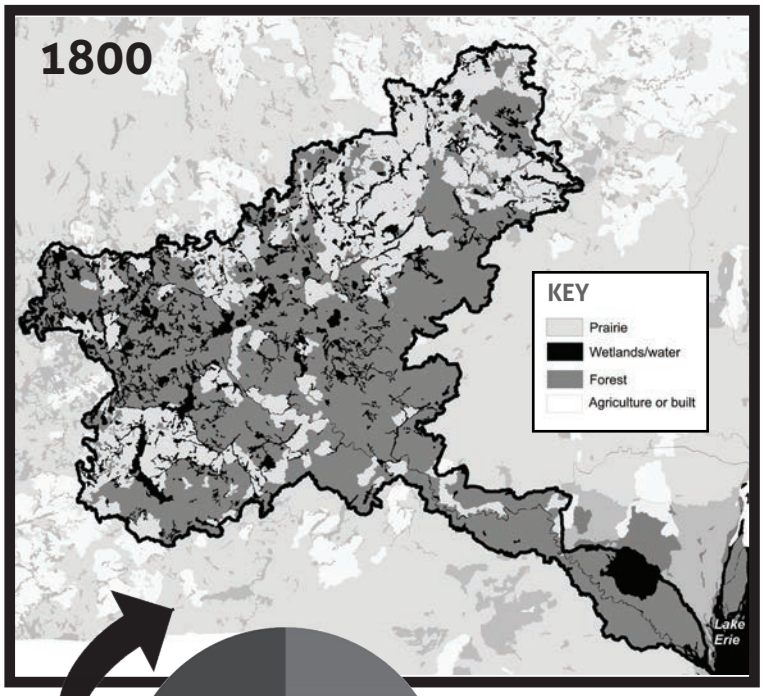
Phosphorus and nitrogen are vital plant nutrients, but, as with soil, too much causes problems. Oxygen depletion and eutrophication – the infill of natural lakes due to excess plant growth – can occur when farmers, businesses, and homeowners overuse fertilizers.

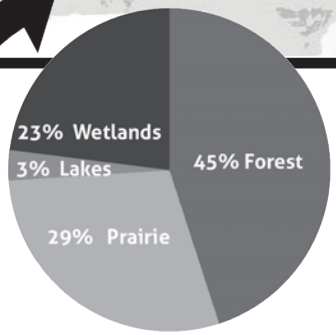
Excess nutrients flowing into a waterbody result in increased plant growth. With this excess growth comes a corresponding increase in plant die-off and decomposition. The decomposition process takes more oxygen than the plants produce (plants take in carbon dioxide and release oxygen; decomposition uses oxygen), and this results in oxygen-depleted water. Aquatic life suffers due to a lack of oxygen reserves; massive fish die-offs are a visible effect of this dynamic.

The excess plant growth can also lead to excess algae growth. Toxic algae blooms plaguing Lake Erie in recent years are a result of too many nutrients washing into the lake from fertilized farm fields in southern Michigan and northeast Ohio.

Chapter 2 will show you how to use the zoning ordinance to keep fertilizers out of waterways.







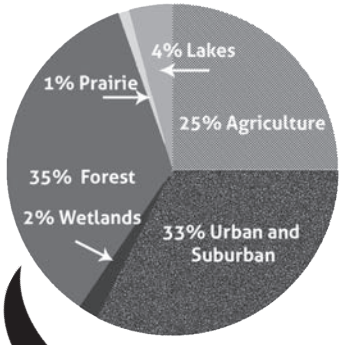
DEVELOPMENT IN THE WATERSHED: MOVING FROM NATURAL TO HUMAN FEATURES

Figure 17 - *(at left) Illustrates the natural features that covered the land around 1800, before European settlers moved into the area.*

Figure 18 - *(below) Illustrates the natural features as of 2011.*

In the corresponding pie charts, the urban and suburban land use category includes residential, commercial, and industrial lands.

Note the loss of the natural features (and therefore ecological services) in comparing the pre- and post-settlement maps.



LAND USE LAWS

Local land use laws decide where different land uses will be located.

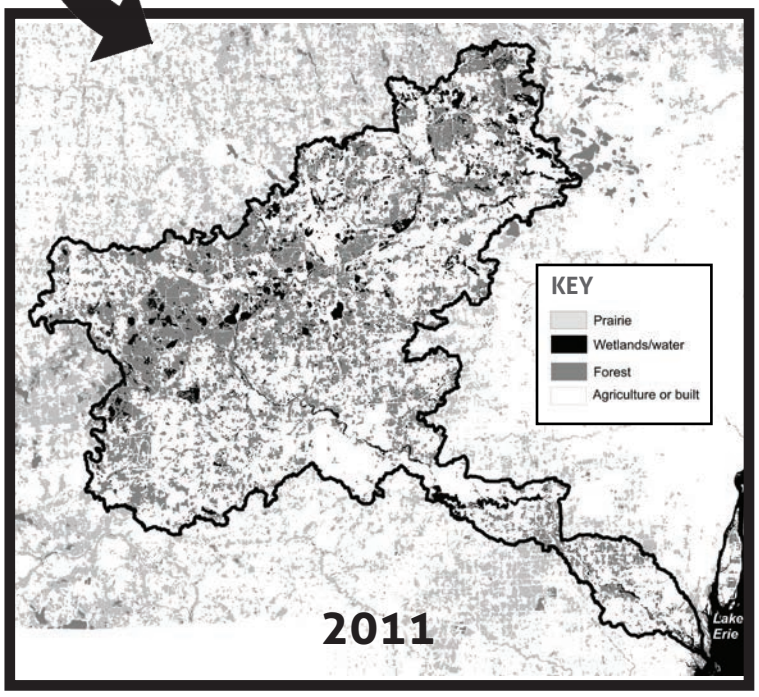
Chapter 2 looks closely at these land use laws.

Human Impacts on the Water Cycle

The landscape description presented on the previous pages does not take into account the actions of people on the land. People interact with the landscape and change it in many ways. Development in particular – of neighborhoods, shopping areas, factories, schools, roads, parking lots, etc. – has many impacts on the way the landscape performs its ecological services.

THE HISTORY OF LAND USE CHANGE IN THE HURON RIVER WATERSHED

The settlement of Michigan by Europeans has rendered dramatic changes to the land. Waterways have been dammed for power, wetlands have been drained to grow crops, and large areas of land have been repurposed to build houses, roads, and businesses. Southeast Michigan has experienced major growth and development – and these pressures on land and water continue.



DEVELOPMENT TRENDS IMPACTING THE WATERSHED

The two major ways development has been impacting the watershed are the loss of natural areas and the increase in hard, impervious surfaces like roads, roofs, and parking lots.

Development Trend: Losing Natural Areas

Residential, commercial, industrial, and agricultural land uses have two major impacts on natural areas: the clearing of natural vegetation and the draining of wetlands.

Development Trend: Clearing Natural Vegetation

Whether the proposed land use is a residential subdivision, industrial park, retail area, or cornfield, the first step of development is almost always the same. Most or all of the land area is cleared of forests, meadows, and other vegetated areas.

Development Trend: Building to the Water's Edge

Building and landscaping right to the edge of waterbodies destroys natural buffers for the water, allowing runoff to carry pollutants and sediments straight into rivers, lakes, and streams. The land immediately adjacent to a waterbody is called the "riparian corridor" or the "riparian zone."

Development Trend: Draining and/or Filling Wetlands and Floodplains

During development, wetlands and floodplains are often drained or filled. In order to make Michigan more hospitable to farming, the Michigan Drain Code was enacted in 1956 and provided a means for wetlands and other areas to be drained so they could be developed and farmed. Development has also often resulted in filling wetlands to provide suitable conditions for building.

With these actions many ecological services are lost. Draining and filling wetlands and floodplains reduce the land's capacity to infiltrate and store water. Water that would have been held will now become runoff.

The State of Michigan Wetlands Protection Program requires a permit to drain, fill, or otherwise impact wetlands of over five acres or contiguous to streams and lakes. This leaves many wetlands unprotected, however, which is unfortunate, as the loss of a wetland represents a "double whammy" to the system. Wetlands provide water storage, allowing for groundwater recharge and the slow release of cool water into surface streams, rivers, and lakes. In addition, wetland vegetation filters out a wide range of harmful nutrients and pollutants.

The TROUBLE with TURF GRASS

Clearing vegetation disrupts the functions that vegetated areas provide, including erosion control, water filtration, evapotranspiration, and water storage.

Are lawns a beneficial substitute for natural areas? Technically, lawns are vegetation; so, logically, lawns should be ecologically beneficial. Unfortunately, lawns are poor substitutes for natural areas for the following reasons.

- ***Soils are often highly compacted underneath lawns. As a result, lawns have minimal infiltration capacity – meaning runoff from lawns can reach nearly the levels of runoff from paved areas.***
- ***Most homeowners and businesses use fertilizers and herbicides to maintain lawns. These products can wash into waterways, contributing to excess algae growth, contamination, and overall poor water quality.***
- ***Lawns have very shallow root systems, and therefore are less able to clean and store runoff water than native plants.***

Development Trend: Increasing Impervious Surfaces

An impervious surface is any surface that stops rainfall from soaking into the ground. Roads, parking lots, sidewalks, and rooftops are impervious surfaces. Even highly compacted soils can become impervious. General trends indicate that as populations increase so do impervious surfaces because of additional roads, houses, and parking lots.

Figure 19 maps the impervious surfaces in the Huron River watershed as of 2010, illustrating the trend just described. The dark areas are the most populated areas in the watershed, and they have the greatest amount of impervious surfaces.

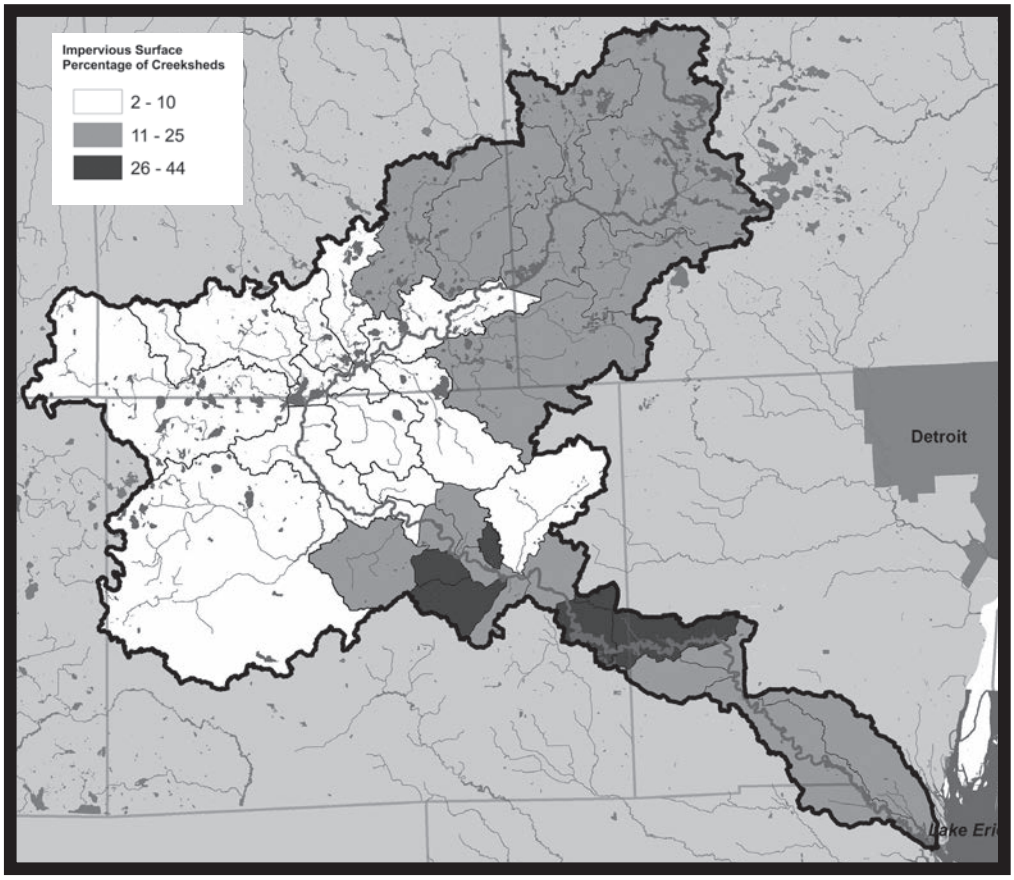


***Figure 19** - Imperviousness in the Huron River watershed*

Figure 20 illustrates that as watersheds develop, the amount of infiltration decreases. Reduced infiltration leads to less storage. Water that falls on the land flows over impervious surfaces instead of seeping into the ground. Every time it rains, less water is stored and more pollutants enter the system, resulting in water quality degradation.

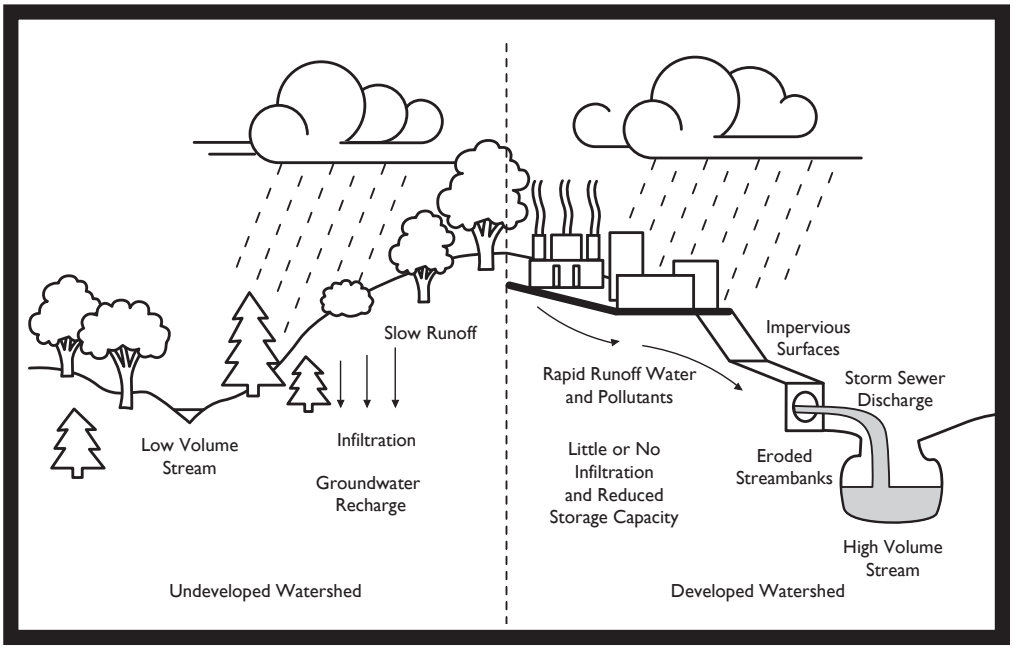


***Figure 20** - Less infiltration results in less storage in the soil and more runoff.*

WHAT DO THESE CHANGES MEAN FOR WATER RESOURCES?

In a developed watershed the natural landscape is significantly altered. There are several major consequences for water resources.

More floods

Much of the country, including Southeast Michigan, is experiencing a startling increase in flooding frequency and intensity; areas that in the past experienced one flood every five years are now facing five floods in one year. Many urban and suburban areas are also experiencing higher and more intense flows each time it rains.

What is causing these changes? Climate change and impervious surfaces. One of the impacts of climate change in the Great Lakes is more frequent and more intense storms. Storms that were once considered "100-year" events now occur closer to every 10 years and dump 37% more rain. There have been seven 1,000-year flood events in the United States since May 2010.

COMMUNICATING "RUNOFF"

It is important to communicate the issue of runoff and nonpoint source pollution to local officials and citizens.

The storm drain system is designed to prevent flooding by moving water quickly off streets. Most people believe – incorrectly – that the water passing through storm drains is diverted through waste water treatment plants before it is discharged into waterways. However, diverting and cleaning large volumes of runoff in this way is not feasible. Instead, pollutants that are transported with the runoff enter directly into waterways.

A good test to apply is "If you wouldn't drink it, then don't let it wash into the storm drain system."

The COSTS of INCREASED FLOODING

- ***Loss of life***
- ***Expensive flood damage to property, including loss of property and loss of water frontage***
- ***Damage to stream banks, bridges, and road crossings***
- ***Stream channels scoured by powerful floodwaters, increasing erosion and destroying habitat for aquatic animals***
- ***Loss of valuable topsoil, often feeding into a cycle of increased fertilizer use***

In developed watersheds with greater impervious surfaces, flows are higher. Instead of soaking into the ground and reaching waterbodies slowly, most stormwater now rushes into waterbodies as runoff. Runoff travels across the land rapidly and enters waterbodies shortly after a storm event. Stream channels aren't shaped to hold the new larger amounts, and so banks flood. Runoff water also has greater velocity because it is not slowed by vegetation, and therefore has more power to scour and erode as it moves.

Runoff

Water that cannot soak into the ground is called "runoff." Saturated soils, heavy storms, and impervious surfaces like roads, driveways, roofs, and patios prevent water from soaking into the ground and cause the water to rush over land into ditches and storm drains. Once the water enters the drain system it travels directly to rivers and streams, unfiltered.

In developed areas runoff can be a serious source of pollution. If a pollutant is on the ground – especially on impervious surfaces – it will be carried along with the runoff and directly into surface water resources.

When land use patterns increase impervious surfaces and polluted runoff, water quality is severely compromised.

This type of pollution is called nonpoint source pollution because – unlike a factory with a discharge pipe – it is impossible to tell exactly where the pollutants first entered the system.

Common pollutants transported in runoff include:

- Litter – plastics, cigarette butts, etc.
- Fertilizer, pesticides, and herbicides – compacted soils and shallow roots mean that lawns absorb very little water in a rainstorm
- Sediment (dirt)
- Automotive fluids, heavy metals, and rubber particles
- Animal waste – from large agriculture facilities and pet waste
- Heat – as water runs over hot pavement during summer storms, heat is transferred into waterways, resulting in warmer water temperatures and reduced oxygen carrying capacity, making it impossible for many aquatic species to survive

Flashiness is a term used to describe unstable flow rates in streams and rivers. During large storms, runoff enters waterways rapidly, with a lot of force. High volumes rush along streams and rivers, undercutting banks, increasing sedimentation, and destroying aquatic habitats. Water can surge over the banks and cause flooding. Once the storm has passed, water levels drop rapidly, with many urban streams dropping to flow levels that are too low to support aquatic species.

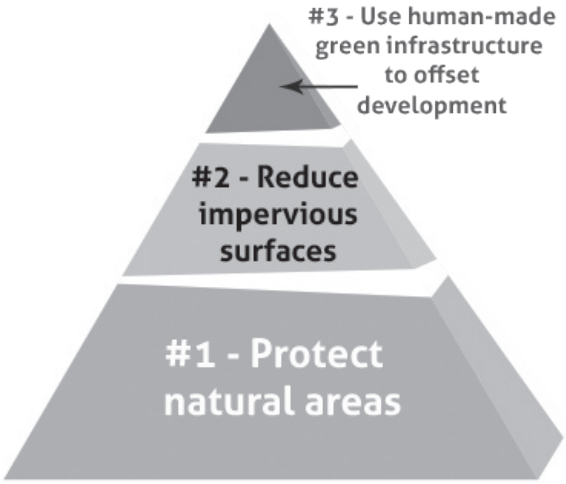
The COSTS of POOR WATER QUALITY

- ***Increased costs to treat municipal drinking water***
- ***Increased risk of contaminated drinking water wells***
- ***Public health concerns***
- ***Lost recreational potential***
- ***Lost fisheries***
- ***Increased levels of contaminants that harm aquatic life***
- ***Nuisance and toxic algae blooms***

What Can We Do to Reduce Our Impact on the Water Cycle?

One of the most important tools we have to change development's impact on water is **LAND USE PLANNING.** The rest of this workbook will present ways for local governments and individuals to relieve these impacts using land use planning that considers watersheds and the importance of maintaining natural areas for their ecological services.

This type of land use planning requires a three-tiered approach to water quality and green infrastructure protection.



PROTECT NATURAL AREAS

Identify natural features as defined on page 11 and protect them by guiding development elsewhere. Group neighborhoods and commercial areas together to minimize the conversion of green infrastructure to human-built infrastructure, so that we can keep those ecological services.

REDUCE IMPERVIOUS SURFACES

Where development does occur, reduce impervious surfaces that don't allow water to soak into the ground. Development designs that minimize impervious surfaces include:

- Grouping buildings close together
- Minimizing street widths and driveway length
- Minimizing parking lot sizes

USE HUMAN-MADE GREEN INFRASTRUCTURE TO OFFSET DEVELOPMENT

Best management practices, low impact design, and green infrastructure are all terms that refer to practices that can help minimize development's impact on natural features. Examples of green infrastructure built into a development project could include:

- Rain gardens and swales to trap runoff and filter pollution
- Vegetated buffers (also called "filter strips") to protect stream and river corridors
- Green roofs that absorb rain
- Permeable pavement that allows runoff to infiltrate into the ground
- Landscaping with deep-rooted, native plants that intercept and slow runoff and take up nutrients; native plants can also serve as habitat for pollinators, migrating birds, and other wildlife

CAN I DO ANYTHING ABOUT IT?

At this point you may be wondering whether you have any control over the loss of natural features and the increasing amounts of impervious surface in your community.

These trends are not inevitable. You can help to change them.

THE ANSWER IS YES, YOU CAN!

Chapter 2 will show you how!

Chapter 1 Worksheet

Use the prompts below to consider the priority concerns for your community based on the concepts presented in this chapter.

GREEN INFRASTRUCTURE

What examples of Green Infrastructure (GI) exist in your community?

Are they human-made or natural GI?

If you can't think of any GI, who can you ask to identify some GI in your community?

If no GI exists, where could some be built?

Are you aware of any policies to protect and/or incentivize GI?

IMPERVIOUS SURFACE

Name steps in the process to reduce impervious surfaces and their impacts. Which are in place in your community?

RUNOFF

Streets, ditches, and stormdrains are designed to remove runoff rapidly during storm events. Pages 15-16 explain why these stormwater systems, which were originally designed to prevent flooding, have become transportation routes for nonpoint source pollution. What are feasible solutions to this problem for your community?

DRINKING WATER

What are the sources of drinking water for your community? There may be more than one source – surface water, private wells, municipal wells, etc.

Chapter

2

Local Government

Huron River Watershed Council

1100 North Main Street, Ann Arbor, MI 48104, (734) 769-5123, www.hrwc.org

Citizen Involvement in Land Use Planning at the Local Level

Land use decisions are influenced by federal, state, and local laws, and public comment. Local elected and appointed officials play a very important role. Michigan is guided by the home rule principle, which means that state planning laws give substantial decision-making power to local governments. Because of home rule, many important land use decisions are made at the local level. The good news about this is that everyone can participate in local government, and it works best when all are involved.

MUNICIPAL BOUNDARIES

Boundaries have a huge effect on water because many land use decisions that affect water quality are based on municipal boundaries. Different local governments within the same watershed often make very different land use decisions. Yet, as discussed in Chapter 1, water ignores municipal boundaries and instead moves within watershed boundaries. The water draining through the Huron River watershed crosses 67 distinct municipal boundaries.

Figure 21 illustrates local government structure. Michigan has four units of local government: counties, cities, villages, and townships. Counties are the largest unit, generally covering many hundreds of square miles. Cities vary in size but are larger in population than villages. Townships are almost always 36 square miles. Villages and cities fall within or cross the bounds of townships and have separate land use laws and local government officials.

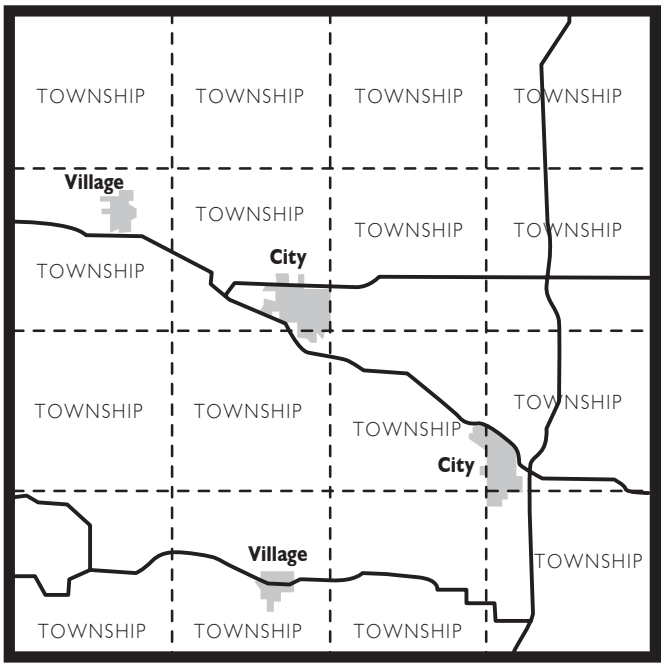


Figure 21 - *The four levels of local government: county (entire area shown), township, village, and city.*

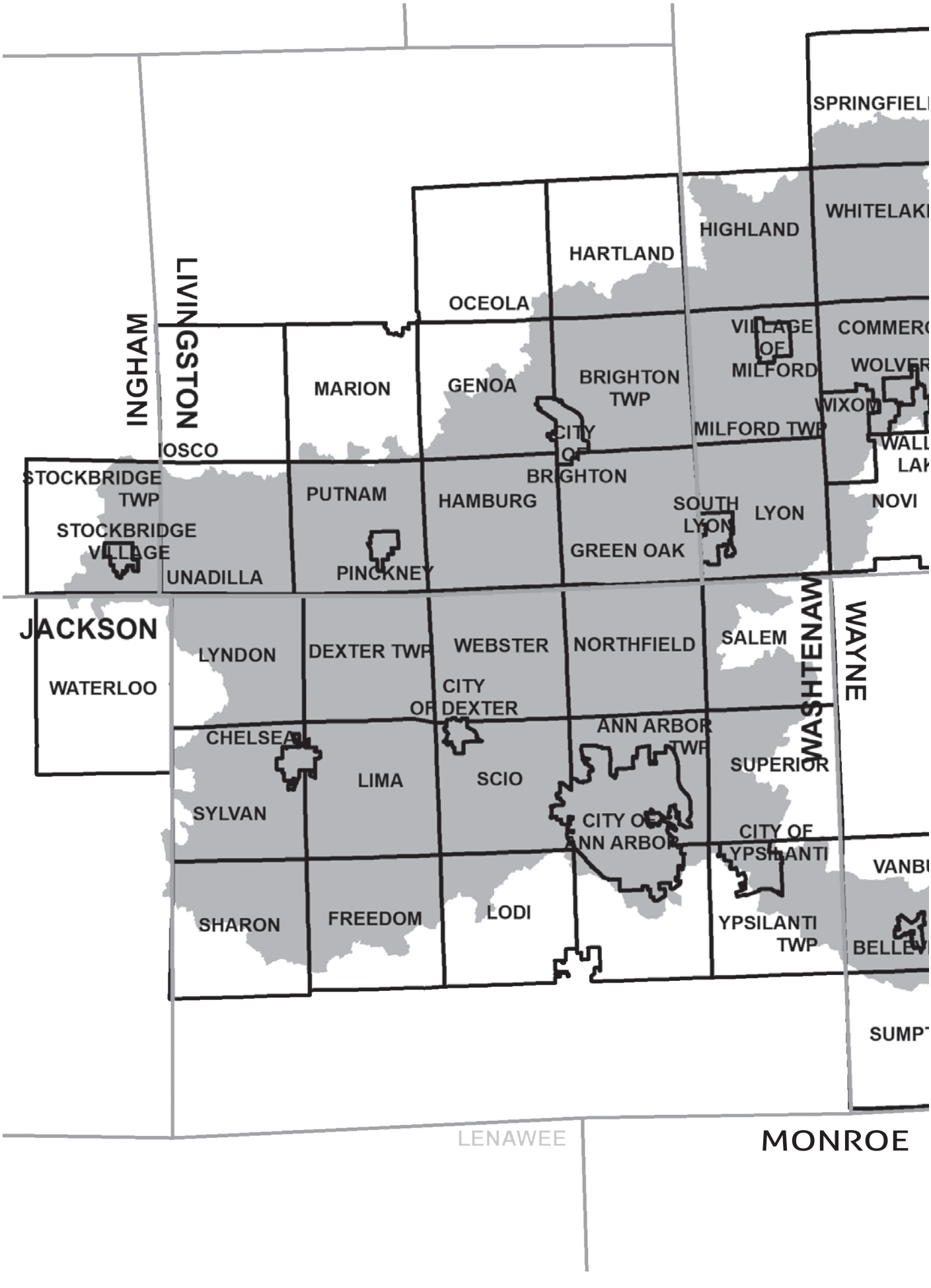
There are 16 cities, 5 villages, and 39 townships within the boundaries of the Huron River watershed. All of these local governments are making separate land use decisions that will affect the water quality in the watershed. Each city, village, and township has its own planning documents and land use decision makers.

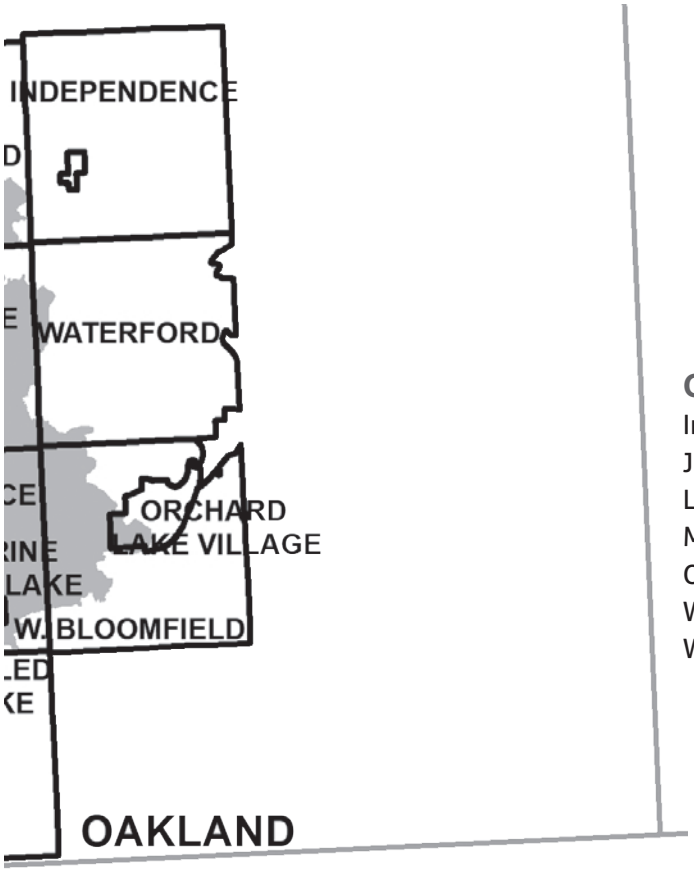
Seven counties within the watershed also participate in land use decisions that affect water quality, such as permits for drinking water wells, septic systems, and construction activities that can cause soil erosion. This guidebook does not address county actions and structure, but additional information can be found in the Resources section, page 53, *Guide to Michigan County Government*. At a minimum, citizens interested in land use and water resources protection should become familiar with the office of their county Water Resources Commissioner or Drain Commissioner.

HOME RULE STATES

In home rule states, an article or amendment to the state constitution grants cities, municipalities, and/or counties the ability to pass laws to govern themselves as they see fit (so long as they obey the state and federal constitutions).

In Michigan, following adoption of the 1908 constitution, the Legislature moved forward with statutory provisions and enacted the Home Rule City Act, Public Act 279 of 1909. In 1963, Michigan citizens approved a new constitution which included many of the home rule provisions of the 1908 constitution. source: www.mml.org/advocacy/resources/homerule-paper.pdf


SPRINGFIEL
WHITELAK
HIGHLAND
HARTLAND
OCEOLA
LIVINGSTON
INGHAM
VILLAGE OF MILFORD
COMMERC
WOLVER
MARION
GENOA
BRIGHTON TWP
WIXOM
CITY OF BRIGHTON
MILFORD TWP
WALL LAK
OSCO
STOCKBRIDGE TWP
PUTNAM
HAMBURG
SOUTH LYON
LYON
NOVI
STOCKBRIDGE VILLAGE
GREEN OAK
UNADILLA
PINCKNEY
JACKSON
LYNDON
DEXTER TWP
WEBSTER
NORTHFIELD
SALEM
WASHTENAW
WAYNE
WATERLOO
CITY OF DEXTER
CHELSEA
ANN ARBOR TWP
SUPERIOR
LIMA
SCIO
SYLVAN
CITY OF ANN ARBOR
CITY OF YPSILANTI
VANBU
SHARON
FREEDOM
LODI
YPSILANTI TWP
BELLEV
SUMPT
LENAWEE
MONROE



MUNICIPAL BOUNDARIES IN THE HURON RIVER WATERSHED

COUNTIES
Ingham
Jackson
Livingston
Monroe
Oakland
Washtenaw
Wayne

TOWNSHIPS
Ann Arbor
Ash
Berlin
Brighton
Brownstown
Commerce
Dexter
Freedom
Genoa
Green Oak
Hamburg
Hartland
Highland
Huron
Lima
Lodi
Lyndon
Lyon
Milford
Northfield
Novi
Pittsfield
Putnam
Salem
Scio
Sharon
Springfield
Stockbridge
Sumpter
Superior
Sylvan
Unadilla
Van Buren
Waterford
Webster
West Bloomfield
White Lake
Ypsilanti

CITIES
Ann Arbor
Belleville
Brighton
Chelsea
Dexter
Flat Rock
Gibraltar
Orchard Lake Village
Rockwood
South Lyon
South Rockwood
Walled Lake
Wixom
Ypsilanti

VILLAGES
Barton Hills
Milford
Pinckney
Stockbridge
Wolverine Lake

LAND USE PLANNING – DIRECTIONS AND DECISIONS

The two critical documents that local governments use to control and plan land use are the master plan and the zoning ordinance. Officials that use these documents are: the board of trustees (in townships); the council (in a village or city); the planning commission; and the zoning board of appeals. Fortunately, the structure and purposes of these documents and government bodies are fairly consistent across local governments in Michigan.

BE INFORMED

Most local governments provide access to master plans and zoning ordinances on their web sites. Download a copy of both documents for review and evaluation in conjunction with this guidebook. Later in this chapter, assessment worksheets will help you understand how well your community protects water quality and natural areas.

Master Plans

A master plan is the best way to get an overall sense of what your community will look like in ten to twenty years.

A master plan commonly serves three purposes.

1. It is a general statement of a local government's goals and provides a single, comprehensive view of what a local government desires for the future.

2. It serves as an aid in day-to-day decision making. The goals, objectives, and strategies outlined in the plan guide local government officials in their decisions. In effect, it forms an agenda for the achievement of goals and objectives.

3. It provides a basis upon which zoning decisions are made.

DID YOU KNOW?

Master plans help reinforce zoning ordinances. Michigan law states that a zoning ordinance should be consistent with "a plan." Zoning ordinances are legal documents, and master plans supply the context, intent, and overall goals that support these laws.

UNDERSTANDING A MASTER PLAN

Master plans vary in makeup from one local government to another. However, most master plans follow a standard format that includes Current Conditions, Goals, Objectives, Policies, and Strategies and implementations. In the box on the next page, at far right, is an overview of the subject matter covered in a typical master plan.

Overview of a master plan

Current conditions – a description of the community's population, natural landscape, utilities, and history.

Goals – long-range statements that reflect the local government's underlying values and desires for the future; each subject area starts with a goal statement that is relatively general in nature.

Objectives – shorter term, more specific statements, often comprised of specific steps towards meeting a goal.

Policies – approaches the planning commission will take when resolving a planning issue.

Strategies and implementations – specific actions the planning commission and board will take to achieve each objective, including identification of who will perform a task and by what date.

Land Use Maps

A master plan should include current and future land use maps illustrating the basic patterns for land use. These land use maps reveal the basic pattern for land use and show what types of land uses are situated

relative to each other, as well as which parcels the local government wants to protect (Figure 22). Descriptions are provided for all current and planned land use categories. Although these descriptions are not as technical as zoning districts, the intent of the land use categories should be clear.

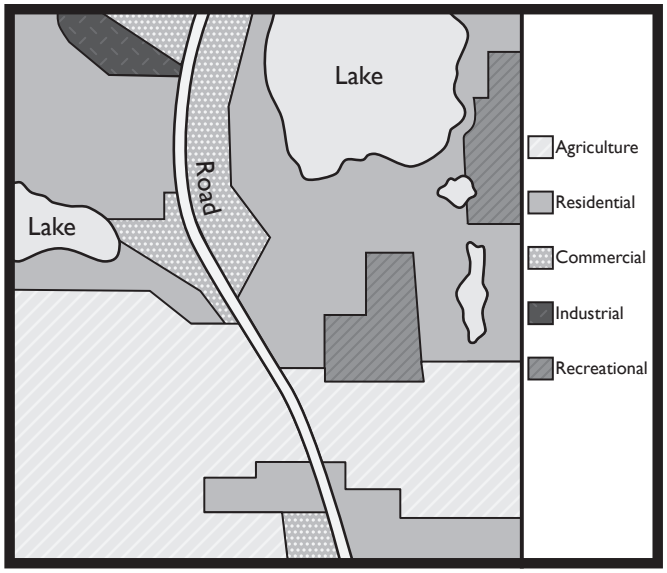


Figure 22 - *An example of a Future Land Use map*

Other maps typically found in a master plan include:

- Soils
- Topography
- Wellhead protection areas
- Forests
- Wetlands
- Groundwater recharge areas
- Watersheds
- Zoning

TYPICAL TOPICS COVERED IN A MASTER PLAN

Introduction
Commonly includes a statement of purpose along with a description of how the plan was created and how it should be used. If the local government conducted surveys of their residents, the results may be summarized here.

History
Current landscape and demographics

The Land Use Plan
A detailed description of how the government intends to use various lands now and into the future.

The Local Government Facilities Plan
Indicates approximate areas where public and private local government facilities will be needed, and where commercial or industrial complexes are contemplated. The facilities plan could include:

- Reservation of land for school sites
- Plans for additional recreational areas
- Provisions for fire and police protection

Transportation
Outlines areas for transportation development such as:

- Potential locations of bike and pedestrian paths
- Locations of proposed roads
- Modification of existing road networks to improve circulation patterns

Utilities
Outlines areas for utilities development, such as expansion of sewer and water services.

Design
Examines factors that affect the community's appearance, such as:

- Building design and location
- Open space
- Signs
- Historic preservation

Maps
Current and projected maps covering a variety of land use issues

UPDATING THE MASTER PLAN

State law requires local governments to revise their master plan every five years. During the revision process, a local government gathers information to determine historical trends and present conditions in order to project future needs. Local governments undertake the revision process in a variety of ways. Some communities undertake the process on their own, while others choose to hire a professional planning consultant to revise and update their master plan. A local government or its consultant may ask residents to fill out surveys or participate in vision sessions where they describe in detail what they would like their community to look like in twenty years.

The master plan revision process provides an invaluable opportunity to document what the community has, what its residents value, and to construct a plan of action to protect those things. A local government can then use the zoning ordinance and other tools to implement the plan.

Protecting water quality and Green Infrastructure

The previous chapter covered the importance of natural features and Green Infrastructure (see definition on page 5) in providing ecological services that keep water clean. Master plans can protect Green Infrastructure in a variety of ways.

Smart Growth

Smart Growth is a term adopted by planners to cover a range of policies that "help protect our health and natural environment and make our communities more attractive, economically stronger, and more socially diverse." (source: http://smartgrowth.org/what-is-smart-growth/). Much of what makes a community attractive and livable is driven by clean air and water, plentiful recreation opportunities, and beautiful scenery – all part of the ecological services provided by natural areas and Green Infrastructure.

TEN PRINCIPLES NECESSARY to ATTAIN SMART GROWTH

- ***Mixed land uses, allowing people to work, go to school, enjoy recreation, and live within a short commute.***
- ***Compact building design, increasing land use efficiency and reducing the destruction of natural areas and farmland.***
- ***A range of housing opportunities and choices, making it possible for senior citizens to stay in their neighborhood as they age, families to raise children in a lively, affordable neighborhood, and younger people to find a first home close to where they work.***
- ***Walkable neighborhoods that reduce the need for hard-surfaced roads and long, gas-consuming commutes.***
- ***Distinctive, attractive communities with a strong sense of place, fostering neighborhoods that value compact, walkable development with mixed land uses.***
- ***Open space, farmland, natural beauty, and critical environmental areas preservation.***
- ***New development placed within existing communities to reduce the need for new infrastructure (roads, sewer and water lines, etc.), and to reduce development in rural areas.***
- ***A variety of transportation choices so people can commute by foot, bicycle, bus, or train.***
- ***Predictable, fair, transparent, and cost-effective development decisions to increase trust and confidence in local government.***
- ***Community and stakeholder collaboration in development decisions to foster confidence and buy-in for new approaches to land use.***

Green Infrastructure Preservation

Many local governments have a Green Infrastructure visioning session to discuss and map out a network of natural areas and features, including large "hubs" of contiguous natural areas, smaller sites of forests and wetlands, and stream corridors, tree lines, hedgerows, and old fields that link them all together. Regardless of whether or not a visioning session is completed, a master plan should include:

- The location of natural areas and Green Infrastructure, as well as goals and policies for preservation of these green spaces
- Stated goals for preserving natural areas in general and specific natural features such as stream corridors, woodlands, wetlands, and wildlife habitats
- Policy and implementation sections that lay out strategies for protection

Master plans should include maps with these elements:

- Green infrastructure network
- Wetlands

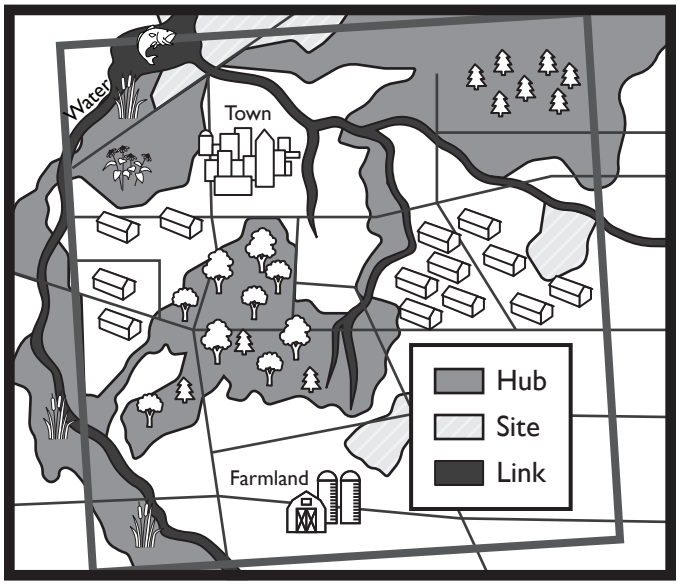


Figure 23 - *An example of a Green Infrastructure map*

- Prairie remnants
- Prime agricultural lands
- Woodlands
- Steep slopes (greater than 12%)
- Important habitats or breeding areas identified by naturalists
- Groundwater recharge areas

Reduce Imperviousness

A master plan can address imperviousness by including a goal that sets a limit for the total amount of impervious surface in the community. Studies have shown that water quality begins to decline in creeks and rivers when the impervious cover in a watershed reaches just 10% of the total area. While it is hard to have a community with a downtown area with less than 10% impervious cover, having planning strategies in place can reduce the overall impact. For example, impervious cover in one area may be high but it could be low in another to attempt to achieve an overall impervious cover below 10%. Communities can also group development together in appealing, livable neighborhoods and leave more of the site in open space. This allows for development and population growth, but results in lower overall imperviousness. Also, built green infrastructure such as green roofs (rooftops covered with plants rather than shingles or sheet metal), rain gardens, and permeable paving can reduce imperviousness.

Land Use Patterns

The best way to maintain water quality in a watershed is to convert the least amount of natural area into buildings, parking lots, roads, and lawns. The more of these natural areas that are left undeveloped, the easier it is to ensure clean air, water, and soil. Master plans lay the groundwork for this by describing the pattern of future land use. Compact development in areas with existing infrastructure, like water and sewer, allows for the most efficient use of land and the preservation of more natural areas and agricultural lands in surrounding rural areas, thus keeping imperviousness low throughout the watershed.

Agricultural Preservation

Agriculture is a vital part of our economy, culture, and wellbeing. Farmland also retains many of the ecological services provided by natural areas, such as water infiltration, soil retention, pollination, and wildlife habitat. In fact, one study in Pennsylvania found that such services amounted to a half a billion dollars in economic benefits (see Resources, page 53, *Beyond Food...* Earth Economics 2014). Master plans can include information, goals, and policies to preserve farmland as well as policies ensuring that farming practices do not degrade local water resources.

Water Management

Stormwater runoff is the number one cause of pollution to the Huron River. A master plan can address stormwater by including goals, objectives, and policies that to require site plans that minimize polluted runoff and maintain predevelopment runoff conditions. Refer back to pages 16-17 in Chapter 1 for more information about runoff and its impacts on the system.

STRENGTHENING YOUR MASTER PLAN

The following worksheet provides guidance on how a community's master plan measures up to and provides for water quality protection. Note the provisions in your local government's master plan that address these elements, as well as any potential improvements to the plan.

Master Plan Worksheet

Use this worksheet as a guide for evaluating your community's master plan. Your master plan may list items in a different order, but the fundamental elements should be the same.

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Conditions Section			
Natural areas and Green Infrastructure	Include language describing the municipality's Green Infrastructure, including details about specific ecological services provided by these areas. Include a map.		
Natural features listed and mapped	Describe the presence and importance of the following natural features: waterways, wetlands, forests, steep slopes, groundwater recharge areas, endangered and threatened species.		
Impervious capacities	Inventory of existing impervious surfaces in the municipality, describe future/anticipated impervious surface increases or decreases, with specifics and maps.		
Current conditions of agriculture (for rural governments)	Include language about the current state of agriculture in the municipality.		
Transportation	Describe existing bicycle, pedestrian, and mass transit transportation networks, as well as future opportunities.		
Smart Growth Principles			
Create compact communities	Direct development toward compact areas with preexisting infrastructure; in very rural communities these compact areas may be in nearby villages or cities. This information should be reflected in the future land use map.		
Mix land uses	In compact areas mentioned above, designate a mixture of land uses to allow shorter distances between home, work, school, and shopping, etc.		
Create varied types of housing	Include variety of housing costs and densities in the future land use map to accommodate different living scenarios and encourage socio-economically diverse communities.		

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Promote attractive communities with a strong sense of place	Conduct capital improvement plans or other planning and studies to create a strong community.		
Create walkable neighborhoods	Include pedestrian needs in development design along with specific plans to ensure these needs are realized.		
Preserve open space, farmland, and critical natural areas	Include goals and policies to protect natural areas and farmland. Identify critical areas with parcel descriptions and maps, if available.		
Prioritize and incentivize development in existing built areas	Designate higher intensity land uses within sewer service areas, mass transit services areas, etc. Provide incentives for developers to build in already-built areas of the community.		
Promote multiple types of transportation	Ensure developments provide safe areas for bicycles and pedestrians; direct development towards areas close to bus routes.		
Promote fair, transparent, and predictable development decisions	Make sure zoning ordinances follow the master plan's goals and policies with a development review process that is transparent and consistent, and that public input is provided. This will not be easy to evaluate until you have become more familiar with your local government's meetings and decision-making process.		
Promote community and stakeholder collaboration in development decisions	Hold visioning and planning sessions, and conduct surveys to include stakeholders in decision making.		
Goals/Objectives Sections			
Compact development	Include a statement supporting land use patterns that provide compact development in areas with existing infrastructure.		
Agricultural preservation	Include a statement supporting agricultural preservation.		
Natural features preservation	Include statements supporting protection of wetlands, slopes, groundwater recharge areas, woodlands, and waterbodies.		

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Open space/natural areas	Include statements supporting preservation of natural areas and open space.		
Policies/Implementation Sections			
Future land use map	Include mixed land uses, varied housing types, and walkable communities within compact communities designated for development. Designate surrounding areas as Green Infrastructure, farmland preservation, and other low intensity, rural uses.		
Natural features policies	Include policies the government intends to enact to preserve natural features.		
Stream corridor policies	Include policies the government intends to enact to preserve stream buffers.		
Green Infrastructure policies	Include policies the government intends to enact to preserve natural areas and other elements of Green Infrastructure.		
Urban services district	Include policies the government intends to enact to create or maintain an urban services district that directs development towards areas of existing built infrastructure.		
Stormwater policies	Include policies the government intends to enact to properly manage stormwater runoff.		
Agriculture preservation policies	Include policies the government intends to enact to preserve agriculture.		
Purchase/Transfer of Development Rights (P/TDR)	Include policies that incentivize compact patterns of development. (see page 41 for details)		
Other innovative land use planning policies	Include other policies the government intends to explore to encourage compact patterns of development and the protection of green spaces.		

Zoning and the Zoning Ordinance

Zoning is a powerful legal tool that local governments use to control where and how land is developed. Using zoning, local governments designate the land uses that can take place on a piece of property. The master plan specifies how a community wants to look in the future. The zoning ordinance is the legal implementation of this vision, as described in the master plan.

Prior to zoning, landowners could build anything they wanted anywhere they wanted, and this often resulted in conflicts such as a noisy factory being built next to a residential neighborhood. Zoning was initially established as a means to avoid such conflicts between land uses. Traditionally, local governments largely use zoning to keep conflicting land uses apart from each other.

Zoning ordinances are legal documents that determine the patterns of development and land use in a community. Zoning specifies:

- Allowable land uses, as indicated in the list of zoning districts
- Permitted designations for different types of development, as shown on the official zoning map
- Guidelines for how individual sites will be developed, as specified in site plan review or in the provisions described under each zoning district

Historically, most local governments wrote their zoning ordinance with little or no consideration of the impacts on water quality or the land's ability to perform ecological services. Even today, a zoning ordinance does not automatically include protection for water resources. In most cases, a local government must build protection measures into their zoning ordinance. Many local governments realize this and are amending their zoning ordinances to provide more protection for water. Some local governments are requiring that buffers of vegetation be left along stream and river banks to protect the ecological services these buffers provide. Others are requiring wetlands protection, and still others are working to reduce impervious surfaces. These local governments are enacting local ordinances that protect natural features and green infrastructure.

HISTORY of ZONING

In the famous case* Village of Euclid vs Ambler Realty Co. *(1926), the U.S. Supreme Court ruled that zoning was a valid use of local government power. The decision signaled to state legislatures that they could give local governments the power to regulate private use of land, i.e. zoning.

GETTING TO KNOW YOUR ZONING ORDINANCE

The most common goal stated in Michigan zoning ordinances is "to promote and protect the health, safety, and general welfare of a community." In addition, the following purposes are cited as reasons for having zoning:

- Promoting and regulating growth to attain orderly and beneficial development
- Conserving life, property, and natural resources
- Lessening and avoiding congestion on highways and streets
- Conserving funds for public services
- Providing each property with adequate light, air, and privacy

A local government strives to achieve these goals by establishing a set of standards for development.

A zoning ordinance may seem intimidating, but, because it is a legal document, the format is standardized. Each subject area is referred to as an article. The articles are further broken down into sections. The text of zoning ordinances varies between local governments, but the format is always similar. Each township will also have a zoning map that shows the location of each zoning district.

OVERVIEW OF A ZONING ORDINANCE

Following is a list of articles typically found in a zoning ordinance.

Articles or Chapters in a Zoning Ordinance Related to Water Quality

Article 3: General provisions, zoning districts

Includes a list of all the zoning districts and introduces a zoning map as an official map and legal document.

Article 4: Schedule of district regulations

A table that describes the density, building dimensions, and restrictions of each zone.

Article 5: Site plan review

Describes the procedure that must be followed by anyone proposing to develop a piece of land; not every zoning ordinance has this article.

Article 6: Planned Unit Development (PUD)

A type of development that typically provides greater flexibility for development specifications, like density and setbacks, in exchange for other local government amenities, such as open space and protection of sensitive environments.

Article 7: General Use Regulations

Design standards for exterior lots – i.e. soil erosion, landscaping, and impervious surfaces.

Article 8: Off-street parking and loading requirements

Article 9: Administration and enforcement of the ordinance

Article 10: Nonconforming uses

Structures that do not fit the requirements for the zoning district are sometimes given special exceptions, i.e. "grandfathered in."

Article 11: Zoning Board of Appeals

Describes the makeup and responsibilities of this group.

Article 12: Amendments

A place for additions to the original text.

Article 13: Effective date

The date when the document became official.

DETAILS FOR EACH ARTICLE

Below are details for each article. Note that your zoning ordinance may have the articles in a different order, but the basic intent should be similar.

Zoning Districts (***Article 3***)

A zoning district (Figure 24 on page 39) is a land use category defined by a particular set of restrictions. For example, one district may allow factories while another permits only residential dwellings. The major types of zoning districts are:

- Residential
- Commercial
- Industrial
- Agricultural
- Public

Zoning restrictions specify what is and what is not allowed, such as the type and size of structures, setback distances from roads, and what types of businesses are permitted.

STATE ENABLING ACTS

The State of Michigan gives local governments the power to zone through The Michigan Zoning Enabling Act (2006), which specifies that a local government must have a zoning ordinance in order to enact and enforce zoning regulations. In Michigan, local governments are not required to have zoning ordinances, but most see the value in these regulations.

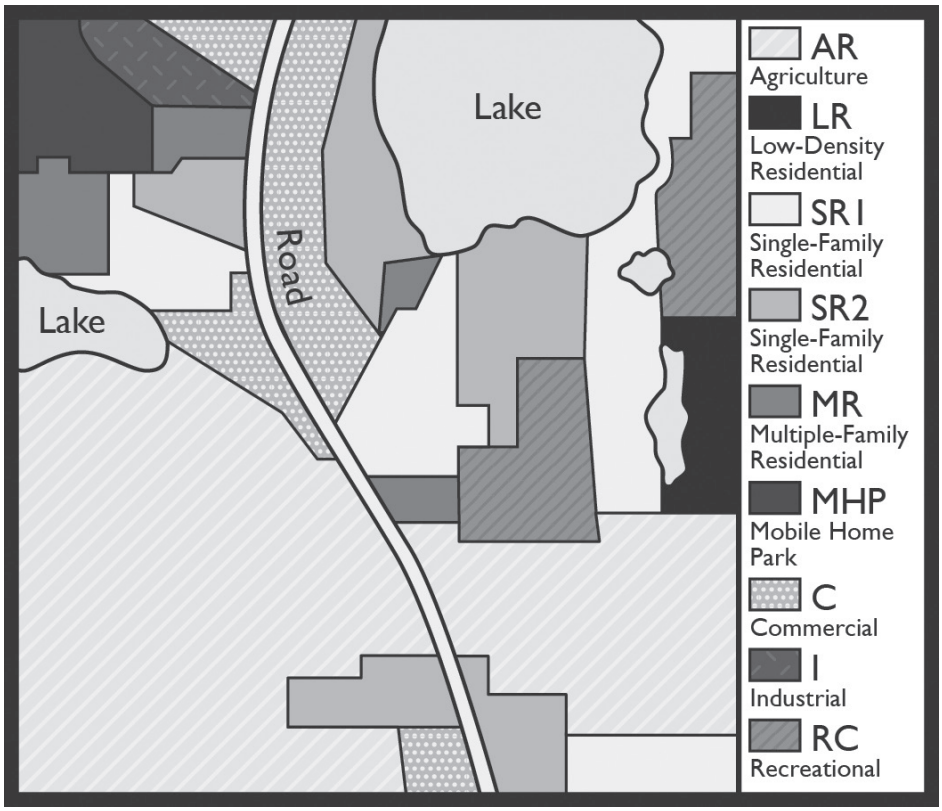


***Figure 24** - An example of zoning districts*

Density Restrictions (*Article 4*)

In a zoning ordinance, "density" refers to the number of dwelling units (homes) allowed on a piece of land. High density means the zone allows many houses while low density allows fewer homes on the same amount of land.

Figure 24 is an example from a Michigan township that shows how the residential district is broken down further by restrictions on density.

LOW DENSITY vs LARGE LOT

"Low density" development is sometimes referred to as "large lot zoning" because large lot sizes are inherent to lower density. Many people mistakenly believe that large lot zoning preserves natural space. However, due to changes that developers and homeowners make to the lots – reduced vegetation, increased impervious surfaces, increased built infrastructure – it is rarely the case that large lot zoning benefits natural space.

Sample Table of Density Standards

Zoning District	Density Restrictions
Rural residential (low density)	1 dwelling unit per acre
Suburban residential (medium density)	2-4 dwelling units per acre
Urban residential (medium density)	5-8 dwelling units per acre
Urban residential (high density)	8-10 dwelling units per acre

Local governments make different decisions about what constitutes low and high density. In the above table, a requirement of one acre per dwelling unit is considered low density. Some local governments require 10 or more acres to establish a low density categorization.

Site Plan Review (*Article 5*)

Most local governments require site plans for all development projects. A site plan is a set of drawings showing the physical layout of a project, including buildings, lot lines, roads, utilities, landscaping, etc. Site plans are reviewed and approved by the planning commission. The commissioners examine the plans to ensure that development is in accordance with the standards set forth in the zoning ordinance.

Many zoning ordinances have an entire article devoted to site plan review, specifying which types of developments need to submit site plans, what the plans should include, who will review the plans, and how the review process will be conducted.

DID YOU KNOW?

Zoning ordinances are legal documents, and certain procedures are required for making any revisions. First the planning commission, board, or concerned citizens make a proposal. If the planning commission decides to consider it, a public hearing is scheduled. After the hearing, members of the planning commission vote on the proposal. Then the planning commission makes a recommendation to the board, which has the ultimate power to change the zoning.

The Zoning Map

The zoning map is the official map that accompanies the zoning ordinance. The map shows the zoning districts for the entire land area of a municipality. Every parcel of land is assigned a zoning district (Figure 24 on page 39).

PROTECTING WATER QUALITY AND GREEN INFRASTRUCTURE WITH YOUR ZONING ORDINANCE

A zoning ordinance can include elements that protect water quality. Each element described below is a good step to take, but local governments can realize meaningful benefits only when applying all of the elements simultaneously. Also, while each of these elements is something local governments can implement right away, there are other long-term measures that need to considered that are beyond the scope of this guidebook, including regional planning efforts, economic financing programs to encourage downtown development, and transportation planning (see Resources on page 54 for more information).

Elements that impact WHERE development happens

As described in the master plan section, the best way to maintain water quality in a watershed is to convert the least amount of natural areas into buildings, roads, and lawns. The more of those areas that are left undeveloped, the more ecological services are preserved to clean the air, filter polluted runoff, and keep drinking water clean.

The zoning map can arrange land uses in a pattern that provides compact development in areas with built infrastructure such as water and sewer service. This will allow the most efficient use of land and leave more natural area and agricultural uses in surrounding rural areas, thus keeping imperviousness low throughout the watershed.

Providing areas in the zoning map for mixed uses – e.g. allowing commercial and residential areas within the same zone – allows for more efficient use of land and opportunities for living closer to school, shopping, and work. "Transit-oriented development" aims to overlap neighborhoods and workplaces with existing and planned mass transit to reduce the need for automotive transport.

The zoning ordinance can also encourage infill and redevelopment – development within existing neighborhoods and commercial areas – by offering incentives and relaxing specific regulations.

Another way to foster compact communities is to allow for "accessory dwelling units" – additional homes built on existing residential lots, often for aging parents or other family members.

Some local governments keep development from leapfrogging out into the countryside through an "urban services area" or "urban growth boundary." This prohibits the expansion of water, sewer, and other utilities beyond a designated area. Concentrating new development into designated areas allows for

cost-efficient maintenance and improvements to infrastructure.

Through Purchase of Development Rights (PDR), local governments raise funds for the purchase of conservation or farming easements from property owners of natural or agricultural lands, thus investing directly in the ecological services those lands provide. These funds can also be used to purchase lands outright for nature preserves and parkland.

Taking a step further, a Transfer of Development Rights (TDR) program uses a system of trades or credits to protect natural areas and farmland, while encouraging compact development.

Capital Improvement Plans (CIPs) fund and encourage development that supports vital downtowns and neighborhoods with a variety of types, sizes, and price ranges of housing with access to jobs, services, shopping, and schools. CIPs can also support the development of built green infrastructure, such as parks, rain gardens, green roofs, and similar features.

Elements that impact HOW development happens

Since all land drains to water, whatever happens on the land impacts water quality. Therefore, once a local government has determined where development will occur, it still must ensure that development is done with the least impact on natural areas and water quality.

In order for the planning commission to properly review a development for its water quality impacts, the site plan must include information about the existing natural features and how the development will impact them. The site plan must also show how the builder will manage the stormwater runoff and soil erosion created by both the construction of the development and by the new impervious surfaces built.

If the proposed development is required to obtain review by other agencies, the site plan should specify this as well. For instance, Michigan's wetland law requires developments to obtain permits for building in wetlands. County Drain Commissioners have the option to require a stormwater review as part of the permit application process.

Natural features protection

With the site plan in hand, the planning commission can now review the proposed development against the standards in its zoning ordinance. Elements such as requiring buildings to be set back from waterbodies and wetlands, prohibiting the wholesale clearance of woodlands from development sites, and protecting naturally vegetated buffers around wetlands or waterways can reduce the negative environmental impacts of development.

Elements that require the creation of the least amount of impervious surface will relieve the burden on those woodlands and buffers from dealing with so much

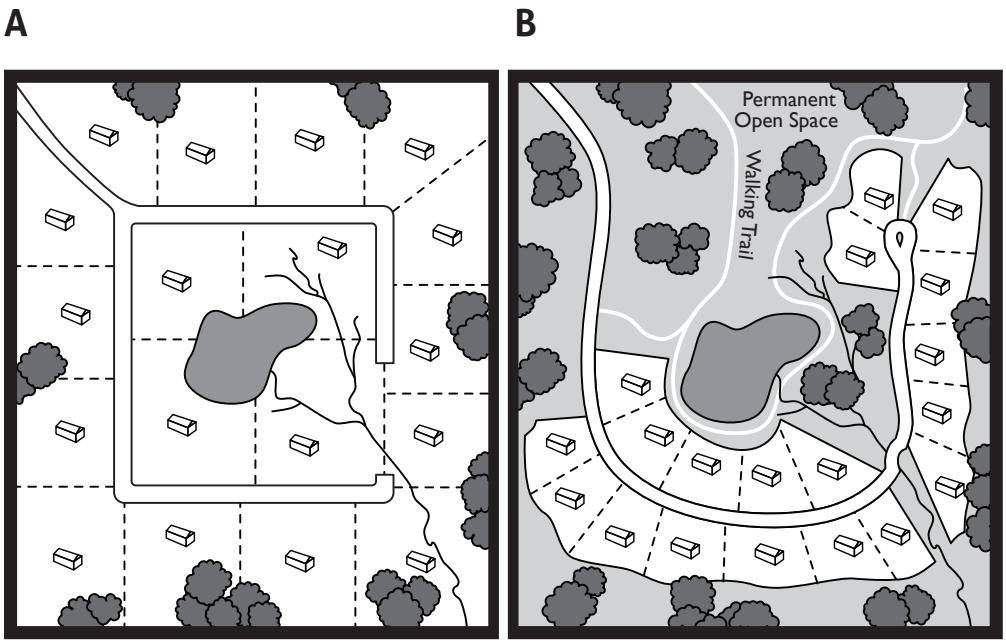


Figure 25 *- Diagram A (far left) illustrates traditional development. Note that the lots are large, with no shared natural areas.*

Diagram B (left) illustrates "open space development" or "clustered development." Note that homes are placed on smaller lots, allowing for the preservation of large natural areas that are accessible to the neighborhood and able to provide ecological services.

polluted runoff. Provisions may include flexible lot coverage, setback, and parking standards to allow designs that will limit pavement.

Managing the extra stormwater resulting from the development of a woodland or farm field is vital to protecting water quality. A zoning ordinance can include a stormwater ordinance that requires runoff to be limited through the use of built green infrastructure – human-made rain gardens, green roofs, trenches, and basins that mimic the ecological services that natural areas provide.

Open space development design

A zoning ordinance can design a whole township to have a compact land use pattern. Open space development design takes this broader concept and applies it to a particular site plan. Most planners call this an "open space development" or a "clustered development."

This design is illustrated in Figure 25 on the previous page. While traditional development (diagram A) typically clears land of all vegetation and spreads houses out evenly across a parcel, open space development (diagram B) guides construction to one portion of a site while leaving the remaining portions open.

Because development is limited to a small portion of the land, most of the land is left undisturbed and able to provide ecological services. In addition, less impervious surface is created than with a more traditional development.

Overlay zones

Overlay zoning (Figure 26) allows a separate zone to be applied "on top of" an area of pre-existing districts, thereby imposing an additional set of requirements without altering the requirements imposed by the underlying zoning district. For example, a local government can create an overlay zone that extends 100 feet from the edge of any body of water that requires restrictions on the use of certain lawn care chemicals that may be harmful to fish, frogs, and other animals. This restriction would apply whether the underlying zoning is commercial, residential, public, agricultural, or other.

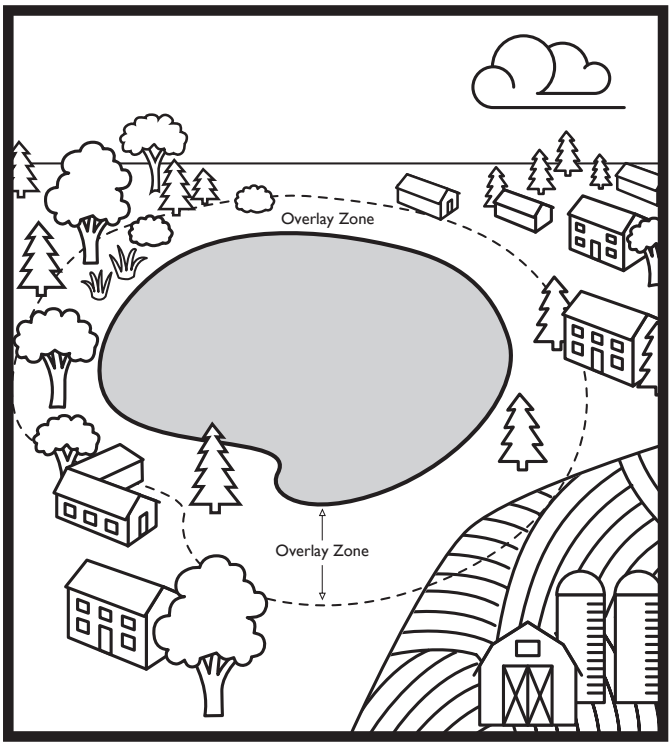


***Figure 26** - An overlay zone*

Overlay zones provide added protection to an area of concern. Some common areas where overlay zones have been used to protect water resources include:

- Buffers along bodies of water
- Important aquifers and drinking water resources
- Large, intact natural areas

IS YOUR ZONING ORDINANCE DOING ALL IT CAN?

Use the worksheet on the following pages to become familiar with the zoning ordinance document and to determine how well it provides for water quality protection.

Zoning Ordinance Worksheet

Use this worksheet as a guide for evaluating your community's zoning ordinance.

ELEMENT	MY ZONING ORDINANCE	OBSERVATIONS and SUGGESTIONS
Compact Land Use Pattern/Natural Area and Farmland Conservation Provisions		
Zoning map groups neighborhoods, workplaces, and commercial areas together in areas of existing or planned built infrastructure		
Key natural areas identified for protection (e.g. parks or open space plan, or Green Infrastructure plan)		
Zoning map includes large blocks of very low density areas of at least 20 acres		
Natural area and farmland preservation program in place (e.g. PDR)		
Transfer of development rights (TDR) program in place		
Policies that encourage infill development		
Policies that limit development to where infrastructure exists (e.g. urban service area)		
Mixed use/transit oriented development		
Capital improvement plan for urban areas		
Development standards encourage and incentivize density and infill		
Accessory dwelling units allowed independent of current density zoning		
Site Plan Review Requirements		
Description of all existing natural features and endangered and threatened species		
Review by other agencies required where applicable		
Stormwater management plan required as part of the permitting process		
Soil erosion and sedimentation control plan required as part of the permitting process		
Natural Features Requirements		
Incentives provided for open space site design that preserves natural areas		
Open space development design is as easy to pursue through the permitting process as conventional design		
Allowable uses in open space restricted to agriculture or low impact uses		

ELEMENT	MY ZONING ORDINANCE	OBSERVATIONS and SUGGESTIONS
Setbacks from waterways and floodplains are at least 100 feet		
Setbacks from wetlands are at least 25 feet		
Wetland protection ordinance in place		
Vegetated buffers along waterways are at least 25 feet wide		
Groundwater recharge areas protected		
Direct and indirect discharge of hazardous substance to groundwater prohibited		
Steep slope protections		
Woodland and landscape trees protection		
Natural environmental areas overlay		
Impervious Surface Reductions		
Flexible lot coverage standards allow creative approaches to limiting impervious surfaces		
Yard setbacks low to limit impervious surface (see page 47 - 1)		
Bioretention, rain gardens, swales, and filtration strips allowed in setbacks and common areas		
Parking lot standards limit impervious surface (see page 47 - 2)		
Street standards limit impervious surface (see page 47 - 3)		
Stormwater		
Review by county drain or water resources commissioner required		
Township stormwater ordinance in place (see page 47- 4)		
Other Elements (not necessarily included in zoning ordinance)		
Soil Erosion and Sediment Control (SESC) program in place		
SESC permit required for developments within 500 feet of a waterway or storm drain system		
Septic system must be at least 100 feet from a wetland or waterways		
Point of sale septic inspection required		

Zoning Ordinance Worksheet: additional guidance

In the previous table, yard setbacks, parking lot standards, street surfacing standards, and stormwater ordinance standards can be compared to the following recommendations.

1. Yard setbacks (for example, how far back structures must be from the road) can affect the amount of impervious surface used for driveways and other access:

- front yard < 20 feet
- side yard < 8 feet
- rear yard < 25 feet
- frontage < 80 feet

2. Recommended parking lot standards:

- bioretention allowed in parking lots
- bike parking provided
- landscaping required in parking lots
- parking spot ratio for professional office < 3 per 1000 square feet
- parking spot ratio for single family homes < 2
- parking spot ratio for shopping centers < 4.5 per 1000 square feet
- shared parking promoted (e.g. a commercial day-use lot is accessible for evening events)
- parking reduced if mass transit nearby
- stall width < 9 feet
- stall length < 18 feet
- "compact car only" area provided
- pervious pavement encouraged
- structures promoted
- flexibility for shared and off-site parking

3. Recommended street standards:

- shared driveways, reduced driveway width, 2-track driveways; rear garages, etc., encouraged
- right-of-way widths < 45 feet
- utilities can be under pavement
- cul-du-sacs < 45 feet, landscaping required
- if curb and gutter required, perforated curbs required/encouraged
- road widths between 18 - 22 feet

4. Recommended stormwater requirements:

- Preservation of natural vegetation encouraged
- Site designs that limit impervious surfaces
- Infiltration of "first flush" of rainfall (this first inch of rainfall contains the highest concentrations of polluted runoff)
- Effective design criteria for green infrastructure in place the handle up to the 100-year storm, maintaining at or below 0.15 cubic feet per second discharge velocity
- Stormwater management facilities must be designed to prevent flooding and protect surface and groundwater
- Green infrastructure stormwater features encouraged (infiltration basins/beds, bioretention areas, rain gardens, pervious pavement, infiltration trenches, etc.)
- Rooftop runoff disconnection encouraged
- Pre-treatment required before stormwater discharges to wetlands
- Stormwater runoff must be controlled to a non-erosive velocity
- Regular evaluation and maintenance of all stormwater systems
- Off-site stormwater facilities allowed
- Stormwater requirements reduced for projects that decrease total imperviousness on redeveloped sites

Getting Engaged

Zoning ordinances and master plans shape current and future land use. You can put this understanding to use by working with local government officials to ensure that your zoning ordinance and master plan protect water.

The next step is to learn about the local government officials who administer the zoning ordinance and hold responsibility for the master plan. Three elected and appointed local government bodies have the most influence:

- The township board or the village/city council
- The planning commission
- The zoning board of appeals

All of their meetings are open to the public. Providing opportunities for public comment at these meetings is not just encouraged, it is required by state law. If you want to become involved in land use decision-making in your local government, begin by attending these meetings or tracking activities on social media.

SPEAK UP

Citizens like you elect the board/council. Share your concerns and ideas with them!

ELECTED LOCAL LAND USE DECISION MAKERS

Township boards and city councils

The township board is the chief governing body of the township, consisting of the supervisor, clerk, treasurer, and several trustees. Board members are elected by citizens from their local government for four-year terms. Village and city councils are the equivalent elected bodies in villages and cities. Their responsibilities regarding development and planning are similar to the planning commission, but the board makes final decisions.

The township board or the village/city council (the "board/council") appoints the planning commission and the zoning board of appeals.

Many of the board/council's decisions have a direct impact on land use and water quality in a local government.

Common duties of the board/council that affect water resources include:

- Appointing the planning commission and the zoning board of appeals
- Enacting or amending and approving the zoning ordinance
- Reviewing the recommendations of the planning commission and making the final decision on any revisions to the zoning ordinance
- Reviewing the recommendations of the planning commission and making the final decision on some development proposals
- Participating in appointment of planning commissioners and special committees
- Allocating funds for water quality studies and professional planning
- Approving some site plans and special land use requests, as well as rezoning requests, zoning text amendments, and subdivision plats

The board/council has the final decision-making power within a local government. They have legislative power, whereas the planning commission functions in an advisory capacity. Citizens can contribute to this process in meaningful ways.

- Attend board meetings – most local governments post schedules and agendas online; when agenda items related to water quality come up, provide comments during the public comment period.
- Comment on proposed zoning ordinance amendments during the time alloted for public participation and comment.
- Comment on specific development proposals.
- Run for election to become a member of the board/council.

APPOINTED LOCAL LAND USE DECISION MAKERS

The Planning Commission

The planning commission is a group of appointed citizens whose primary responsibilities are to administer the zoning ordinance and to create and update the master plan. Members of a planning commission are appointed by the board/council. Each township, city, and village has a planning commission. In general, the planning commission is composed of five to nine citizens who serve for three-year terms. Any citizen can serve on the planning commission as long as she or he is a resident of the community. (Note: cities, villages, and townships vary in the number of members, time served, and responsibilities of planning commissions.)

Many of the planning commission's decisions have a direct impact on land and water in a community. Common duties of the planning commission that affect water resources include:

- Developing and revising the master plan
- Developing and amending the zoning ordinance by reviewing and making recommendations to the township board or the city/village council on all zoning ordinances and zoning changes
- Proposing new ordinances
- Reviewing and approving site plans for development proposals, including assessing whether or not site plans meet the specifications in the zoning ordinance

Planning commission meetings are open to the public, as required by law. Comment opportunities are twofold, as detailed below.

- Written comments may be submitted prior to a meeting. Address written comments to the chairperson of the planning commission and submit them in advance of the meeting, ideally with enough lead time for review by the commission prior to the meeting.
- Comments may be made in person during the meeting. Planning commission meetings include a period for general comments on any local government business as well as a chance to respond to specific agenda items. Upon arrival, check in and inquire about procedures for public comment – e.g. signing up for an allotted time to speak. Be prepared, be concise, and be clear about any questions or actions you are proposing to the commission.

Consider ways to become involved in the planning commission process.

- Attend planning commission meetings. Most local governments post their schedules and agendas online. When agenda items related to water quality come up, provide comments during the public comment period.
- Submit comments in writing in advance of the meeting.
- Get involved in the master plan revision process. Master plans must be updated every five years, and local governments may ask for public participation and/or public comment. Many local governments hold visioning sessions prior to master plan revisions. This is an opportunity for citizens to describe what they would like the community to look like in the future. These sessions greatly influence the kinds of changes that are made to a master plan. Inquire about opportunities to respond to a draft of the master plan. Be proactive in your role as an advocate for clean water. Be respectful and concise in all communications.
- Comment on proposed zoning ordinance amendments. Ask the planning commission about designated times and procedures for public participation and comment.
- Comment on specific developments. Site plan review is the time when best management practices can be added to a proposed building or development. Become involved early in this process to be a voice for water resources.
- Call your local government to find out how to apply to become a member of the planning commission.

The Zoning Board of Appeals

Members are appointed to the zoning board of appeals (ZBA) by the board/council and serve three-year staggered terms. Each ZBA must include a representative from both the board/council and the planning commission.

The ZBA is an "interpretive committee" responsible for interpreting provisions of the zoning ordinance. A variance is a formal petition to the local government to officially exempt the petitioner from the designated zoning.

When requested, the ZBA determines whether variances should be granted. For example, if land was zoned low density residential with a height restriction of two stories, the construction of a three story building would require permission from the local government to proceed. If the planning commission/ local government denies the request, then an application could be submitted to the ZBA requesting a variance.

Common duties of the ZBA include:

- Hearing and deciding appeals from someone who is contesting the enforcement of the zoning ordinance
- Hearing and deciding requirements for special exceptions (variances) from the zoning requirements

Summary

When it comes to land use, citizen participation is key to preserving our clean water resources.

Land use decisions are made at the city, village, and township level by residents who are elected or appointed. Hundreds of citizens step forward to make these important decisions every year. Many of them have little background in planning or natural resource protection. The tools and strategies presented in this guidebook will help even a novice participant become an effective advocate for clean water protections.

Having completed this guidebook, we hope you are inspired and motivated to become involved in your local land use planning process. We encourage you to pick a simple place to get started – perhaps attending a planning commission or board meeting – and to become engaged in the overall process. Thank you in advance for your interest in and commitment to a legacy of clean water.

Change MAKERS Boot Camp

The Huron River Watershed Council offers companion workshops on land use planning.

Participants are given the opportunity to work hands-on with water resource specialists, ask questions specific to their community policies, and review existing land use case studies, master plans, and zoning ordinances.

Workshops also provide a forum for meeting like-minded citizens who are interested in water resource protection.

Contact Kris Olsson, Watershed Ecologist, at (734) 769-5123 x 607 or kolsson@hrwc.org to learn more.

Resources

The following two pages include resources used in writing this workbook, plus recommended reading and web resources.

DOCUMENTS CONSULTED

Better Site Design: A Handbook for Changing Development Rules in Your Community. Center for Watershed Protection. 1998 www.chesapeakestormwater.net

Charlevoix County Local Ordinance Gaps Analysis. Tip of the Mitt Watershed Council. 2011 www.watershedcouncil.org

From Policy to Reality: Model Ordinances for Sustainable Development. Minnesota Planning. September, 2000

Opportunities for Water Resource Protection in Local Plans, Ordinances, and Programs. SEMCOG 2002

Citizen's Guide to Land Use Planning. Huron River Watershed Council. 2001

Smart Growth Guideline for Sustainable Design and Development. U.S. Environmental Protection Agency. 2009

Beyond Food: The Environmental Benefits of Lancaster County. Earth Economics. 2014 www.eartheconomics.org/all-publications/2015/3/1/beyond-food-the-environmental-benefits-of-agriculture-in-lancaster-county-pennsylvania?rq=Aaron%20Schwartz:

Guide to Michigan County Government. Kenneth VerBurg. Michigan State University. 1987

Using Smart Growth Techniques as Stormwater Best Management Practices. U.S. EPA. EPA 231-B-05-002. www.epa.gov/smarthgrowth. December 2005

Creating Great Neighborhoods: Density in Your Community. Local Government Commission. www.lgc.org. September 2003

Protecting Water Resources with Higher-Density Development. U.S. EPA. EPA 231-R-06-001. www.epa.gov/smartgrowth. January 2006

Protecting Water Resources with Smart Growth. U.S. EPA. EPA 231-R-04-002. www.epa.gov/smartgrowth. May 2004

Smart Growth Guidelines for Sustainable Design and Development. U.S. EPA and the Connecticut Capitol Regional Council of Governments. November 2009

Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood, and Site Scales. U.S. EPA. EPA 231-B-09-001.www.epa.gov/smartgrowth. October 2009

Essential Smart Growth Fixes for Urban and Suburban Zoning Codes. U.S. EPA 231-K-09-003. www.epa.gov/smartgrowth. November 2009

Essential Smart Growth Fixes for Rural Planning, Zoning, and Development Codes. U.S. EPA 231-K-12-001. www.epa.gov/smartgrowth. March 2012

Protecting Water Quality with Smart Growth Strategies and Natural Stormwater Management in Sussex County, Delaware. EPA-NOAA Smart Growth Implementation Assistance for Coastal Communities For Sussex County, Delaware. January 2009

RECOMMENDED READING

How Much Development is Too Much? A Guidebook on Using Impervious Surface and Gravel Road Capacity Analysis to Manage Growth in Rural and Suburban Communities. Huron River Watershed Council and Planning and Zoning Center. August 2003 www.hrwc.org/resources/how-much-development-is-too-much/

LEED 2009 for Neighborhood Development Rating System. Congress for the New Urbanism, Natural Resources Defense Council

Preparing, Circulation and Filing Petitions for Public Office. Michigan Department of State, Bureau of Elections. www.michigan.gov/elections. March 2015

WEB SITES AND ORGANIZATIONS

Michigan Association of Planning. www.planningmi.org

American Planning Association. www.planning.org

Smart Growth Online. http://smartgrowth.org

Michigan State University Citizen Planner Program. http://msue.anr.msu.edu/program/info/michigan_citizen_planner

SAMPLE WORKSHEETS

The following pages provide samples of Master Plan and Zoning Ordinance worksheets that were completed for a local township.

Master Plan SAMPLE Worksheet

This example comes from an actual review of a township's master plan.

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Conditions Section			
Natural areas and Green Infrastructure	Include language describing the municipality's Green Infrastructure, including details about specific ecological services provided by these areas. Include a map, if available.	Yes	township has done a GI workshop with HRWC and has included information in its master plan
Natural features listed and mapped	Describe the presence and importance of the following natural features: waterways, wetlands, forests, steep slopes, groundwater recharge areas, endangered and threatened species.	Yes	except for endangered species
Impervious capacities	Inventory of existing impervious surfaces in the municipality, describe future/anticipated impervious surface increases or decreases, with specifics and maps if available.	Yes	township has done extensive study with HRWC
Current conditions of agriculture (for rural governments)	Include language about the current state of agriculture in the municipality.	Yes	
Transportation	Describe existing bicycle, pedestrian, and mass transit transportation networks, as well as future opportunities.	Yes	
Smart Growth Principles			
Create compact communities	Direct development toward compact areas with preexisting infrastructure; in very rural communities these compact areas may be in nearby villages or cities. This information should be reflected in the future land use map.	Yes with conditions	directs development more to areas within sewer district, although still allows low density residential in rural area states that it does not need to have commercial and industrial uses in the township, since City of Ann Arbor is adjacent.
Mix land uses	In compact areas mentioned above, designate a mixture of land uses to allow shorter distances between home, work, school, and shopping, etc.	No, not included	

Master Plan SAMPLE Worksheet: continued

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Create varied types housing	Include variety of housing costs and densities in the future land use map to accommodate different living scenarios and encourage socio-economically diverse communities.	No, not included	
Promote attractive communities with a strong sense of place	Conduct capital improvement plans or other planning and studies to create a strong community.	No, not included	
Create walkable neighborhoods	Include pedestrian needs in development design along with specific plans to ensure these needs are realized.	No, not included	
Preserve open space, farmland, and critical natural areas	Include goals and policies to protect natural areas and farmland. Identify critical areas with parcel descriptions and maps, if available.	Yes	includes strong farmland and natural areas protection language
Prioritize and incentivize development in existing built areas	Designate higher intensity land uses within sewer service areas, mass transit services areas, etc. Provide incentives for developers to build in already-built areas of the community.	Yes	higher density residential is in sewer services area does not have mass transit
Promote multiple types of transportation	Ensure developments provide safe areas for bicycles and pedestrians; direct development towards areas close to bus routes		has goal and policies to provide nonmotorized transportation options
Promote fair, transparent, and predictable development decisions	Make sure zoning ordinances follow the master plan's goals and policies with a development review process that is transparent and consistent, and that public input is provided. This will not be easy to evaluate until you have become more familiar with your local government's meetings and decision-making process.		township allows public participation, zoning ordinance follows master plan, and so far seems to make consistent decisions that follow their rules
Promote community and stakeholder collaboration in development decisions	Hold visioning and planning sessions, and conduct surveys to include stakeholders in decision making.		has done surveys on transportation planning, master planning, wetland ordinance, and held visioning sessions for transportation and for GI planning

Master Plan SAMPLE Worksheet: continued

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Goals/Objectives Sections			
Compact development	Include a statement supporting land use patterns that provide compact development in areas with existing infrastructure.	Yes	statement included
Agricultural preservation	Include a statement supporting agricultural preservation.	Yes	statement included
Natural features preservation	Include statements supporting protection of wetlands, slopes, groundwater recharge areas, woodlands, and waterbodies.	Yes	statement included
Open space/natural areas	Include statements supporting preservation of natural areas and open space.	Yes	statement included
Policies/Implementation Sections			
Future land use map	Include mixed land uses, varied housing types, and walkable communities within compact communities designated for development. Designate surrounding areas as Green Infrastructure, farmland preservation, and other low intensity, rural uses.	Yes and No	designates GI areas and farmland preservation areas, groups higher intensity uses like like office, research, and higher density residential in sewer service area does not provide mixed uses; housing types are not too variable
Natural features policies	Include policies the government intends to enact to preserve natural features.	Yes	strong policies
Stream corridor policies	Include policies the government intends to enact to preserve stream buffers.	Yes	strong policies
Green Infrastructure policies	Include policies the government intends to enact to preserve natural areas and other elements of Green Infrastructure.	Yes	strong policies
Urban services district	Include policies the government intends to enact to create or maintain an urban services district that directs development towards areas of existing built infrastructure.	Yes	strong policies

ELEMENT	DESCRIPTION	MY MASTER PLAN	OBSERVATIONS and SUGGESTIONS
Stormwater policies	Include policies the government intends to enact to properly manage stormwater runoff.	Yes	strong policies
Agriculture preservation policies	Include policies the government intends to enact to preserve agriculture.	Yes	strong policies
Purchase/Transfer of Development Rights (P/TDR)	Include policies that incentivize compact patterns of development. (see page 41 for description)	Yes PDR	has purchase but not transfer program
Other innovative land use planning policies	Include other policies the government intends to explore to encourage compact patterns of development and the protection of green spaces.	Some	has agricultural preservation program that encourage innovative ways to promote agric-business in the township, including a farming incubator farm and a food hub considers itself the rural "yin" to the City of Ann Arbor's "yang," so the thinking is the City provides mixed use, transit oriented development, etc. while the township is the rural and natural surroundings

Zoning Ordinance Sample Worksheet

This example comes from an actual review of a township's zoning ordinance.

ELEMENT	MY ZONING ORDINANCE	OBSERVATIONS and SUGGESTIONS
Compact Land Use Pattern/Natural Area and Farmland Conservation Provisions		
Zoning map groups neighborhoods, workplaces, and commercial areas together in areas of existing or planned built infrastructure	Yes	
Key natural areas identified for protection (e.g. parks or open space plan, or Green Infrastructure plan)	Yes	
Zoning map includes large blocks of very low density areas of at least 20 acres	No	
Natural area and farmland preservation program in place (e.g. PDR)	Yes	
Transfer of development rights (TDR) program in place	No	
Policies that encourage infill development	No	
Policies that limit development to where infrastructure exists (e.g. urban service area)	Yes	
Mixed use/transit oriented development	No	
Capital improvement plan for urban areas	No	
Development standards encourage and incentivize density and infill	No	
Accessory dwelling units allowed independent of current density zoning	No	
Site Plan Review Requirements		
Description of all existing natural features and endangered and threatened species	Yes	
Review by other agencies required where applicable	Yes	
Stormwater management plan required as part of the permitting process	Yes	
Soil erosion and sedimentation control plan required as part of the permitting process	Yes	
Natural Features Requirements		
Incentives provided for open space site design that preserves natural areas	Yes	
Open space development design is as easy to pursue through the permitting process as conventional design	Yes	
Allowable uses in open space restricted to agriculture or low impact uses	Yes	
Setbacks from waterways and floodplains are at least 100 feet	Yes	

Zoning Ordinance Sample Worksheet: continued

ELEMENT	MY ZONING ORDINANCE	OBSERVATIONS and SUGGESTIONS
Setbacks from wetlands are at least 25 feet	Yes	
Wetland protection ordinance	Yes	
Vegetated buffers along waterways are at least 25 feet wide	Yes	
Groundwater recharge areas protected	No	protection encouraged, not required
Direct and indirect discharge of hazardous substance to groundwater prohibited	Yes	
Steep slope protections	Yes	
Woodland and landscape trees protection	Yes	
Resource protection/Natural Environmental Areas Overlay	No	
Impervious Surface Reductions		
Flexible lot coverage standards allowing creative approaches to limiting impervious surfaces	Yes	
Yard setbacks low to limit impervious surface	No	
Bioretention, rain gardens, swales, and filtration strips allowed in setbacks and common areas	Yes	
Parking lot standards limit impervious surface	Yes	
Street standards limit impervious surface	Yes	but only for private roads
Stormwater		
In Washtenaw County, review by county drain or water resources commissioner required	Yes	
Township stormwater ordinance in place	Yes	
Other Elements (not necessarily included in zoning ordinance)		
Soil Erosion and Sediment Control (SESC) program	Yes	
SESC permit required for developments within 500 feet of a waterway or storm drain system	Yes	
Septic system must be at least 100 feet from a wetland or waterways	Yes	
Point of sale septic inspection required	Yes	this is a county program

Please Stay in Touch

We look forward to hearing more about your experiences working on land use planning in your community. Your questions and comments are always welcome.

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