

Section **2.0**

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# PHYSICAL FEATURES

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## INTRODUCTION

The purpose of this study is to discuss the inventory of physical features in Riley Township that have the potential of influencing the location and character of development. Specific topics covered in this inventory include geology, topography, flood hazards, soils, water, woodlands and wetlands.

Existing physical features exert important influences in shaping the development of any specific area. They are nature's contribution to the Township's environment. Collectively, these features can determine the overall physical character of the community.

When integrated thoughtfully into development proposals, physical features serve to enhance the character and appearance of the constructed environment. Conversely, ignoring physical features, or misusing them, can have significant, long-term negative consequences. Some well-defined physical features serve as a barrier to development and may be difficult to overcome, except at considerable expense. It is usually better to design with nature than to attempt to substantially change an area's physical environment.

## GEOLOGY

Michigan's physical setting, as we know it today, including the Great Lakes that surround the State, is the result of the interaction of glacial action on the bedrock formation that underlay the State. These bedrock formations consist largely of sandstone, limestone and shale, which were particularly vulnerable to the weight and movement of the glaciers. The movement and weight of the glaciers depressed the land mass surrounding Michigan, forming basins that eventually became the Great Lakes.

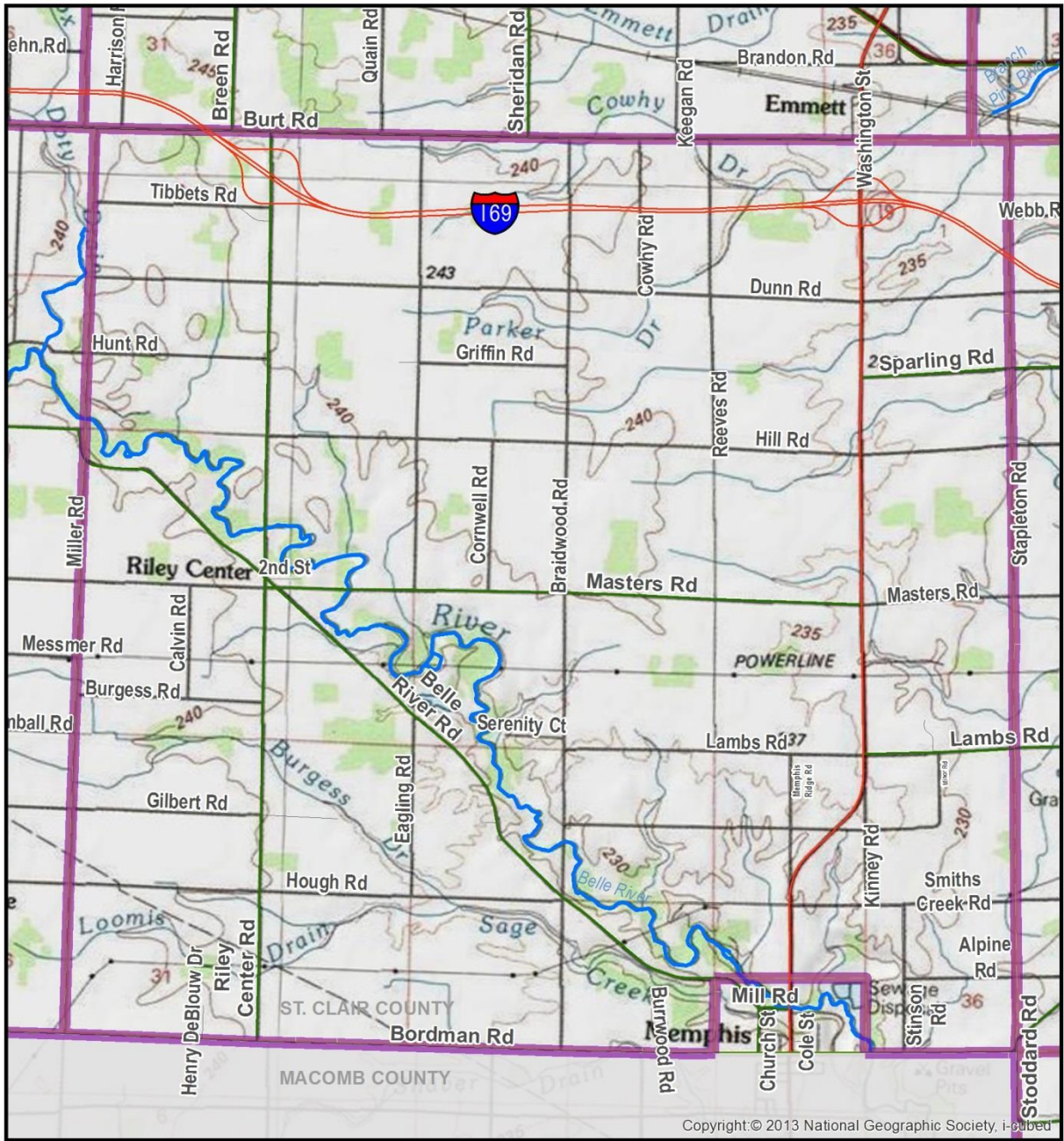
Riley Township lies in an ancient lake bed covered by glacial material. As a result, the topography is primarily that of a level plain which was formed by sediments settling to the bottom of the ancient lake.

The last period of glaciers that covered Michigan was directly responsible for the Township's basic land forms. As these glaciers moved South, they accumulated large quantities of soil that were eventually deposited across southern Michigan and neighboring States. This fertile soil accounts for much of Michigan's productive agricultural land.

The Township's glacial features help explain some of Riley's other important physical characteristics, including its topography and flood hazard areas.


# MAP 5

## Riley Township Master Plan



# United States Geological Survey (USGS) Topography

USA Topo Maps

 Community Boundary

Contour Lines are labeled in Meters above sea level (elevation)



## TOPOGRAPHY

Topographic conditions can have a significant influence on land development patterns. Topography, for example, can impact the site location, orientation and design of buildings, roads and utilities. Where topography is extreme, slopes become an important consideration due to concerns relating to the ability of the land to bear the weight of buildings and the danger of erosion. Sometimes, topographic variations offer opportunities to appreciate the scenic environment. The absence of significant changes in topography can result in the need for man-made drainage improvements. Map #5 highlights topography in the Township.

Riley Township's topography is a direct consequence of the glacial actions described earlier. The Township is relatively flat. The land surface of Riley Township dips gently from its highest elevations in the West portion of the Township to lower elevations in the East. The highest point in the Township, which exceeds 800 feet above National Geodetic Vertical Datum, occurs near Riley Center Road and Burt Road. A low point of 720 feet occurs at two locations along the Belle River just north of Memphis.

## WATER

Surface water exists in many forms, such as man-made lakes, rivers, creeks and county drains. Riley Township contains a high proportion of these features. Most notable is the Belle River, traveling through the Township in a Northwest to Southeast direction.

## FLOOD HAZARDS

Because of Riley's nearly level terrain and shallow river valley, it is subject to periodic flooding hazards. A floodplain is an area of land along a lake, river or other water feature that is susceptible to being inundated by water as a result of heavy rains, snow melt, or other factors. Floodplains are naturally occurring physical features that provide for the temporary holding of this excessive water until such time as the receiving channel is capable of accepting the water.

## SOILS

Soil characteristics have an important influence on the ability of land to support various types of land uses, including roads, buildings, utilities and agriculture. Four specific soil characteristics influence their ability to be used for various purposes. These include the following:

- **Bearing Capacity:** the ability to support the weight of roads, buildings or vehicles.
- **Erodibility/Stability:** the susceptibility of the soils to erosion hazards and the ability to accept weight, without causing mass movements such as mud flows and slides.

- **Drainage:** the capacity of soils to transmit and receive water. This characteristic is especially important for determining the ability of soils to absorb stormwater. Soil drainage characteristics are influenced by particle composition and water content.
- **Resource Value:** the economic worth of the soil for agricultural purposes, or as a fill or mined material.

Riley Township's soil characteristics were identified as part of the larger St. Clair County Soil Survey conducted in 1967 by the United States Department of Agriculture Soil Conservation Service. Categories of soils with different characteristics and physical properties were identified as part of the survey. This process resulted in a patchwork or jigsaw-like pieces that fit together to portray a larger overall picture of existing soil characteristics. A large number of individual soils types are present in the Township. These individual categories are grouped together into several generalized classifications of soils that share similar characteristics.

There are twelve major soil associations found in St. Clair County. These soil associations are areas with a distinctive or proportional pattern of soils.

The drainage of most soils in the Township is relatively poor due to the level topography. The predominant soil association, Blount-Parkhill, is characterized by a surface layer of dark grayish loam that is nine inches thick. Surface runoff is generally slow, available water capacity is high, and wetness limits many non-farm uses. This type of soil is generally found along waterways and floodplains.

The patterns of soils found in an area can generally be explained by the type of surface geology found in Southeastern Michigan and can be divided into two broad zones: a lowland zone, and a hill zone. These two zones parallel each other in a Northeast/Southwest direction, following the shoreline of Lake St. Clair. The lowland zone, consisting of St. Clair, Macomb, Wayne, and Monroe counties was most likely covered by an ancient glacial lake as the last ice age came to a close. The geology in Riley Township consists primarily of lacustrine clay and silt areas, a water-laid end moraine of fine- textured till (an accumulation of earth and stones) which runs parallel to the Belle River, and fine- textured glacial till in the Northeast part of the Township.

## SOIL SUITABILITY FOR AGRICULTURE

The U.S. Department of Agriculture has classified virtually all of Riley Township as prime farmland on Soils: Prime Farmland Map (Map 6). Only the narrow Belle River corridor and some small scattered areas are not considered suitable for agricultural use. Prime Farmland has the following characteristics:

- Soils capable of providing yields of crops common to the area that are equal to or greater than yields from well- managed, deep, well-drained sandy loams.
- Soil quality, a growing season, and moisture conditions necessary to produce a high yield of crops economically if managed in accordance with modern farming methods.

- Slopes of less than six percent.
- Active rooting depth of at least twenty (20) inches.
- Soils that are not waterlogged.
- Soils that do not flood more than once every two years.
- Soils that present no particular difficulty in cultivating with large equipment.
- Soils with the potential for being prime agricultural lands through economically justifiable investments and practices, including drainage, clearing, irrigation, etc.

Although designated as prime farmland, wetness presents major limitations for the cultivation of crops. Drainage measures are necessary to improve the use of these soils for more widespread agricultural uses.

## **SOIL SUITABILITY FOR SEPTIC FIELDS**

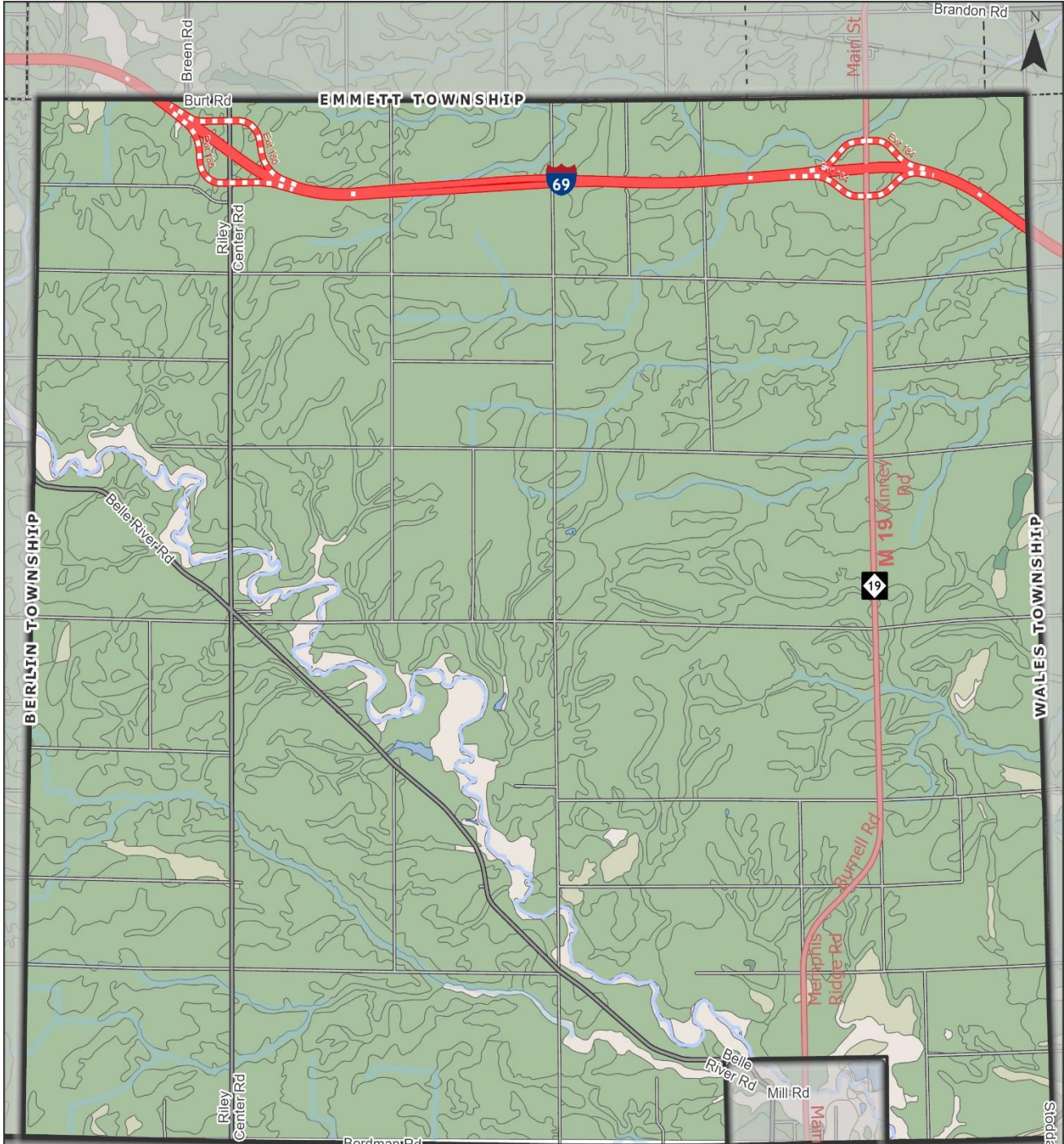
The soil associations are also classified based on soil limitations for septic drainage field suitability. The classifications for soil suitability are slight, moderate, and severe. The basic classifications are defined as follows:

- Slight: Relatively free of limitations or limitations are easily overcome.
- Moderate: Limitations need to be recognized, but can be overcome with good management and careful design.
- Severe: Limitations are severe enough to make use questionable.

The classifications are basically concerned with such limitations as shallow well pollution due to high permeability, high water table, slow permeability, and unstable organic matter. Map 7 shows the dominant drainage class for soils in the Township.

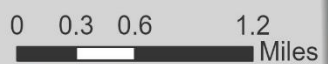
Riley Township has very little of its soils in the slight, slight to moderate, and moderate limitation classes. Moderate to severe and severe limitation soils make up most of the soils of the Township.

# MAP 6



Freeway	St. Clair County
Ramps and Facilities	Wales Township Boundary
Local Highways	Surrounding Political Boundaries
Main Roads	<b>Farmland Classification</b>
Active Rail	All areas are prime farmland
Major Watercourses	Prime farmland if drained
Designated County Drain	Farmland of local importance
Lakes, Ponds, and Reservoirs	Not prime farmland

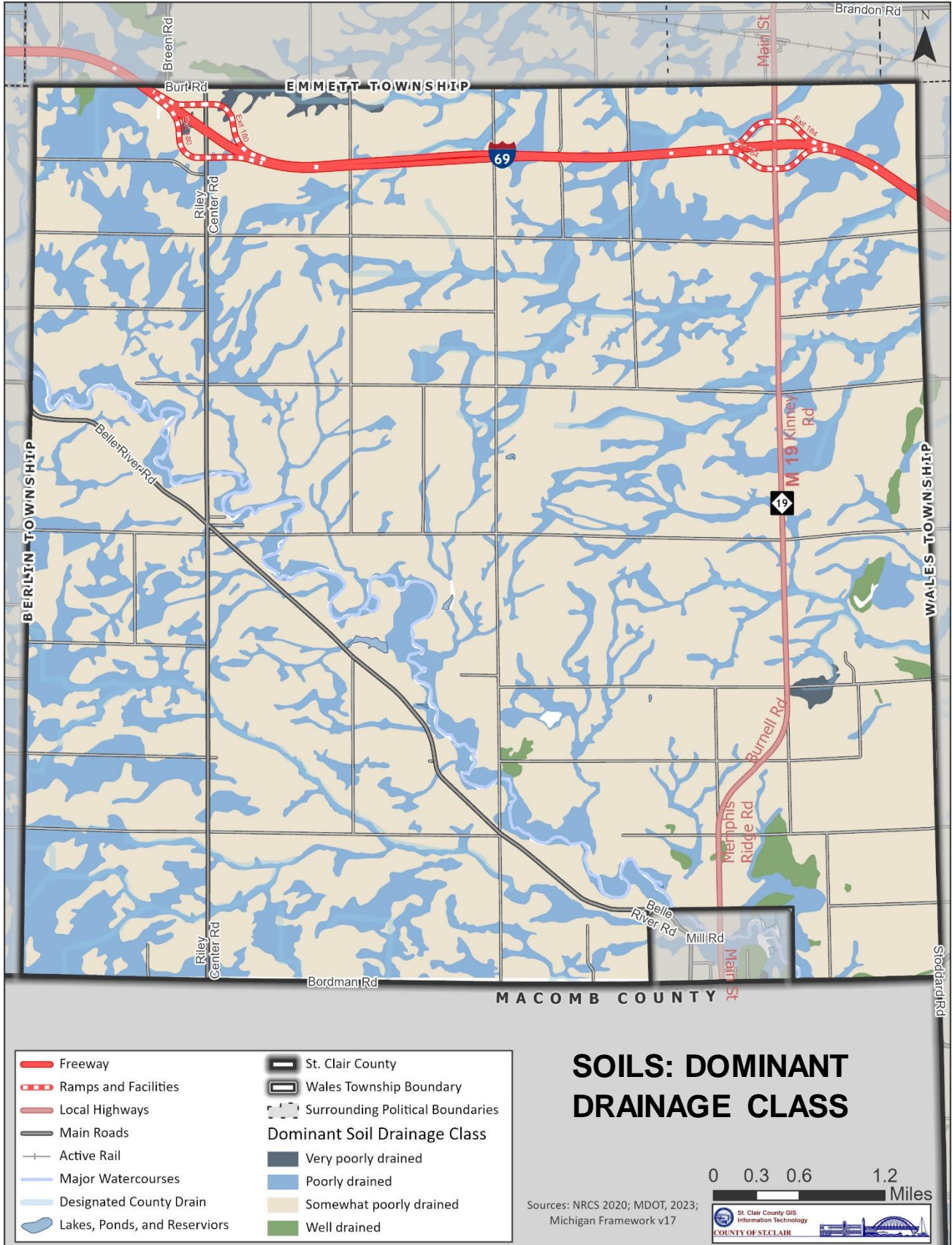
## SOILS: PRIME FARMLAND



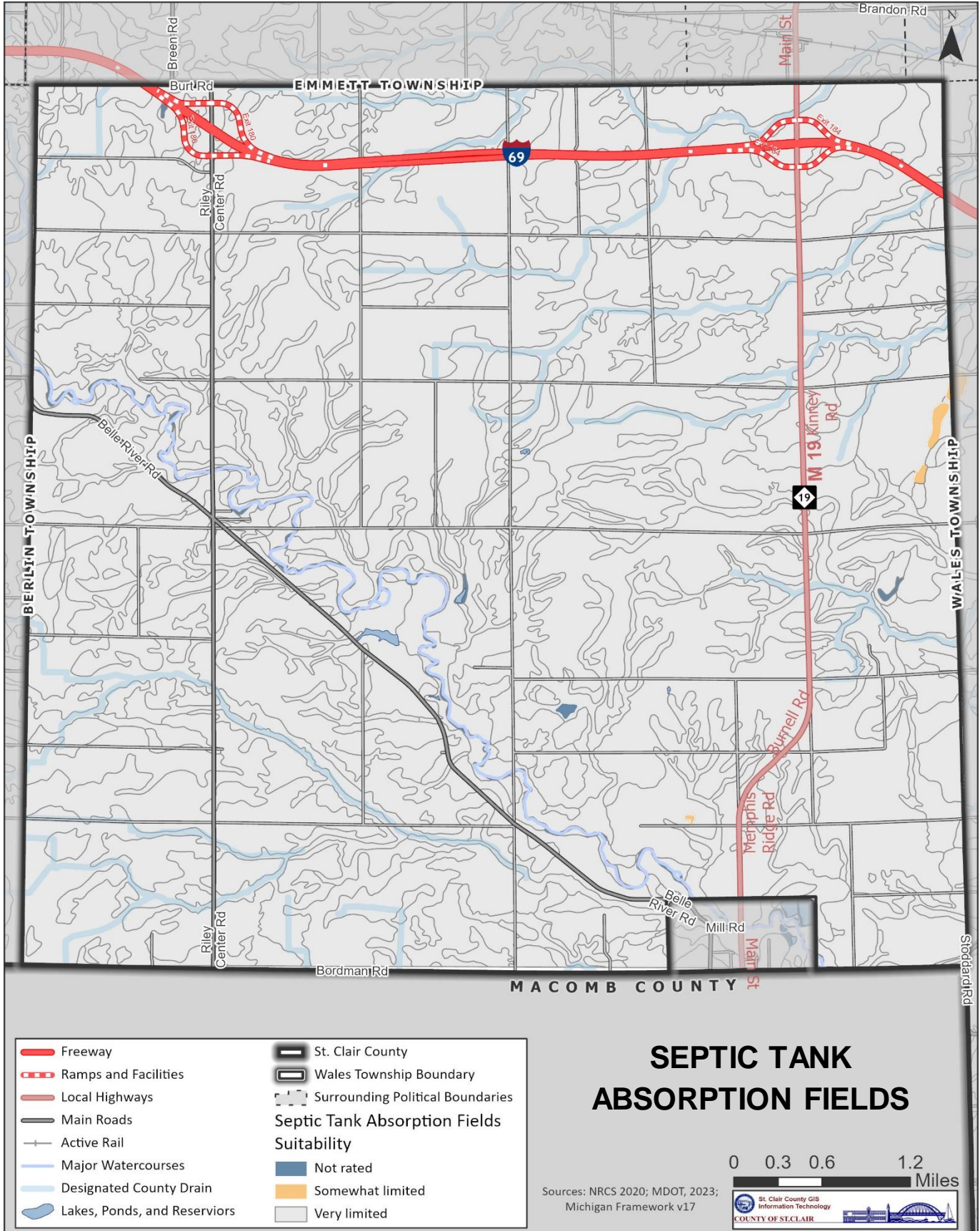
Sources: NRCS 2020; MDOT, 2023; Michigan Framework v17



# MAP 7



# MAP 8



## WOODLANDS

At the time Southeast Michigan was originally settled, the area was covered with dense hardwood forests. As the number of inhabitants increased, these forests were cleared for lumbering and farming purposes. Today, the quantity of land still occupied by mature vegetation has diminished. Where large contiguous woodlands remain, however, they provide benefits that need to be considered in the planning process.

Woodlands are frequently only considered valuable as a visual amenity enhancing the natural or constructed environment. Trees serve many other useful environmental purposes that should be recognized for planning purposes. These include the following:

- Slope stabilization and erosion control
- Conserving water quality
- Maintaining a micro-climate
- Filtering pollution from the atmosphere
- Decreasing noise
- Providing a habitat for wildlife

Recognizing these important physical properties and integrating woodlands into future development can improve the community's overall environmental quality and enhance the visual character of the constructed environment.

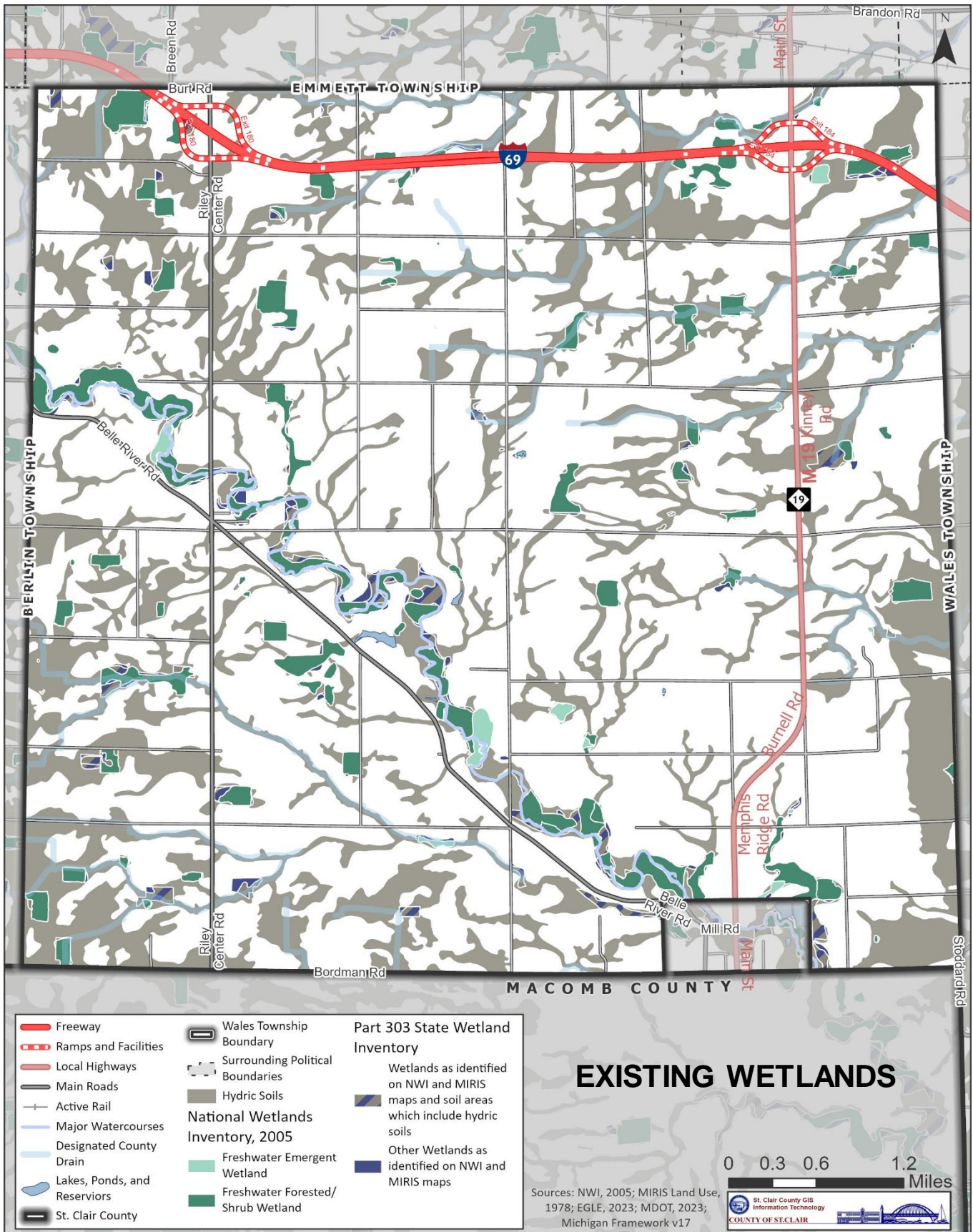
Few large, undisturbed wooded areas remain in Riley Township as a result of farming activities. Several areas of large wood lots exist along the Belle River. Wherever they occur, mature vegetation should be sensitively incorporated into future development proposals as a visual amenity and for its environmental values.

## WETLANDS

Wetlands are an important element of Michigan's landscape. Before experiencing settlement in the late 18th and early 19th centuries, Michigan was thought to contain over 11 million acres of wetlands. Like the extensive forests that once covered the State, the unique physical characteristics of many of these wetlands were permanently altered as a consequence of the settlement of the State. This change occurred as forests were logged and swamps drained for farming purposes. Between 25 and 50 percent of these original wetlands remain in Michigan today, Map 9 shows existing wetlands in Riley Township.

Wetlands are areas characterized by the presence of water that either saturate the soil or cover the land most or all of the year. Because of this characteristic, wetlands have the ability to support unique varieties of plants and animals. Not all wetlands are similar, however. Several categories of wetlands are found in Michigan. These varieties are the result of differences in climate, bedrock geology, soil characteristics and landforms that are unique to different portions of Michigan. The characteristics of wetland vegetation provide the basis for making a distinction between different types of wetlands. The two

# MAP 9



basic types of wetlands are forested and unforested. The largest share of remaining State wetlands is of the former variety. Many of these forested wetlands have soils that are seasonally saturated with water during seasonal periods. These wetlands are commonly referred to as swamps. Swamps differ from unforested wetlands more commonly known as marshes, wet prairies, wet meadows, fens and bogs.

Marshes are those areas that normally occur along the edges of lakes and streams. These areas are flooded for much of the year with average depths of fewer than five feet. Commonly occurring vegetation in marshes include emergent plants such as bulrushes, cattails, sedges, grasses and floating or underwater plants.

Wet prairies consist of land located between marshes and abutting farm land. Their existence is a result of fluctuating water levels and Indian fires, which prevented the establishment of more permanent vegetation, including trees and shrubs. Few of these unique wetlands exist today. Many of these areas have been absorbed into the adjoining agricultural acreage. Wet prairies are recognizable by the striking vegetation that inhabit these areas, such as asters, goldenrods, mints, rare milkweed, Indian plantain and assorted prairie grasses.

Fens are a common herbaceous wetland located in areas characterized by saturated, lime- rich soils. Fens are commonly found at the bottom of ridges where poor drainage conditions exist resulting in mulch soils. Like wet prairies, farming has absorbed many of these wetlands.

The remaining category of non-forested wetlands is known as bogs. The most striking feature of a bog is the thick acidic peat mats that cover these areas. These are formed as a result of the decomposition of sphagnum mosses and sedges. Many bogs have been permanently changed as a consequence of peat mining activities, especially those located in the more populated portions of southeast Michigan.

In spite of these differing characteristics, wetlands share some common physical properties that have important consequences for planning purposes. Wetlands serve a number of necessary environmental functions. These include the following:

- Protecting downstream water supplies by providing clean ground water as a result of the nutrient retention and sediment removal. Wetland vegetation traps these sediments and pollutants, thereby preventing them from being deposited in surface water bodies.
- Functioning as effective natural storage basins for floodwater. Wetlands may be considered large sponges that absorb large quantities of seasonal precipitation, gradually releasing it when the receiving channels are able to accept it.
- Protecting the shoreline from erosion caused by wind and wave action and effectively serving as environmental shock absorbers.
- Providing a habitat for many types of plants and animals that thrive in the type of physical environment created by wetlands. These plants and animals provide an

economic and recreational benefit as a result of hunting, fishing and other leisure activities.

Development in or around wetlands are regulated by several State statutes. Permits are required by this legislation for the following activities: 1) depositing or placing fill material in a wetland; 2) dredging or removing soil from a wetland; 3) constructing, operating or maintaining any use or development in a wetland; and 4) draining surface water from a wetland. Specific categories of activities are exempt from the requirements of the Wetland Protection Act.

Other State statutes that have the effect of regulating wetland development include the Inland Lakes and Streams Act, the Floodplains Regulatory Act, the Great Lakes Submerged Lands Act, and the Shoreline Protection and Management Act.

Office of Biological Services for the National Wetlands Inventory has mapped existing wetlands for Riley Township. The most significant wetland concentrations are found adjacent to the Belle River. Smaller wetland formations can be found throughout the Township. No wetland information can be considered to offer conclusive evidence on the boundaries or extent of identified wetlands. On-site field investigations are necessary to verify this information.

The preservation of the Township's natural wetlands is a legitimate concern of local planning. This may be accomplished through cooperation with the Michigan Department of Environmental Quality (MDEQ) regulations that prevent development of these poorly drained geological areas.

## **FARMLAND**

Important agricultural lands were identified in Riley Township by the U.S. Department of Agriculture. Soil characteristics and the ability of different classes of soils to support farming is the principal factor in this identification process. The major portion of Riley Township is identified as important farmland area as shown on Map 6 on page 23.

Farmland is often viewed as an inexhaustible resource, when in fact it is a finite one. Once an acre of land is converted to a non-farm use, its ability to be used once more for farming is severely diminished. The quantity of farmland in the United States is gradually being eroded by competition for other land uses. Other acreage is often idled prematurely because of unrealistic expectations regarding future development. The 2022 State of Michigan Agriculture Census conducted by USDA found that farmland within the State of Michigan decreased by almost 300,000 acres from 2017 to 2022. The total number of agricultural operations decreased by 2,060 from 2017 to 2022. Lastly, the average age of principal farm operators in the State of Michigan and the United States generally continues to rise, however, in the State of Michigan from 2017 to 2022, the average age of principal farm operators remained 56.5 years of age.

Major demographic shifts occurring in this Country explain this steady loss of farmland. The most significant aspect of this change was the immigration of the population from the central cities to suburban areas. Evidence of this trend is found in the population, housing unit and employment increases which have occurred in converted rural areas in recent years.

As a result of these trends, farming within St. Clair County in the past two decades has been typified by a decreasing number of farms. Generally, over the past few years, the farmer has increasingly rented more land for production and has hired specialized teams to fertilize or cultivate specific crops. Farm equipment has become such a major capital expenditure that the only way it can provide an economic return is to keep it in service each day as long as possible.

## **CONCLUSION**

As this chapter points out, the physical features of the community are nature's contribution to the Township's environment. For a variety of reasons, different communities have different endowments. Physical features appear to either enhance or limit development. Until recent times, development limitations were considered an adverse circumstance and engineered solutions were often employed to overcome natural limitations. Experience has proven that cooperation with nature, using imagination and creativity, is preferable to removing and/or paving over natural features. The Township should carefully examine each opportunity to complete its design in a manner that enhances the community's livability. Planning can best assist in accomplishing this by encouraging designs that respect and work with nature.