

Appendix D

ENVIRONMENTAL FEATURES

Introduction

The environmental features of an area can have an important impact on shaping growth, development and preservation policies. The presence of wetland can present severe challenges for certain land uses and provide important wildlife habitats. Soil conditions can impact the agricultural value of property and on-site construction practices. The presence of rivers, streams, lakes and other water resources can be magnets for recreation and development while, at the same time, are vulnerable to environmental degradation. This part of the Master Plan provides an overview of county-wide environmental features.

Geology & Topography

During the Paleozoic era of geological history, Cass County and the state as a whole was inundated by successive warm, shallow seas during which large amounts of sediment were deposited. These deposits subsequently lithified to form bedrock. Cass County exhibits two types of bedrock which generally interface with each other along an irregular line extending from its northwest corner to its southeast corner. The northeastern half of the county is characterized principally by Coldwater Shale and the southwest half is characterized principally by Ellsworth Shale. Both bedrocks have shale as their primary component with interbedded siltstone and sandstone. Coldwater Shale also includes occurrences of dolomite and limestone.

The Ice Age brought four successive continental glaciers across the Great Lakes area. As these ice sheets moved southward from Canada, they scoured and abraded the surface of the land leaving behind deeper valleys and more rounded hilltops. The advancing glaciers carried large quantities of rock materials scraped and gouged from the land's surface. These materials were then deposited during the melting of the ice to form drift materials covering the bedrock below. While the depth to bedrock exceeds 800 feet in some parts of Michigan, bedrock depth in Cass County ranges from approximately 100 to 600 feet although the majority of the county exhibits depths of 200 to 400 feet. The shallower depths to the bedrock are located in the county's northwest corner (northwest half of Silver Creek Township) and in the county's south central region including portions of Mason, Ontwa and Calvin Townships. The greatest depths are found along a diagonal line along portions of Howard and LaGrange Townships and nearly all of Volinia Township.

The township's topography can be described as level to generally rolling. Approximately one-third of the county reflects grades of less than 3% and three-quarters of the county reflects grades of 0% to 6%. Approximately 20% of the county reflects grades of greater than 6%, of which approximately half is characterized by grades of 12% and greater.

The character of an area's geology and topography can have bearing on development and land use planning. It is generally recommended that development be restricted in intensity where grades exceed approximately 12%, and be strongly discouraged where grades exceed 18%. As grades increase in severity, significant challenges arise for septic systems and there is an increased potential for soil erosion and sedimentation of water courses and wetlands. Construction costs frequently increase as well. Geology can also impact development within the context of the availability of adequate potable water (where public water service is not available). This issue is discussed under "Groundwater."

Drainage & Water Resources

Cass County abounds with lakes. The county is home to approximately 165 lakes which occupy 3.6% of the county's area, or 18.3 square miles. The lakes are scattered throughout nearly all areas of the county and while they vary considerably in size, approximately 60 approach 40 acres or more in size and nearly 20 approach 200 acres or more in size. See Water Resources Maps, Appendix H.

The largest of the county's lakes is Diamond Lake, centrally located just east of Dowagiac in Penn Township and extending into Calvin and Jefferson Townships. Diamond Lake covers 1,020 acres with depths approaching 65 feet. The next largest lakes are substantially smaller than Diamond lake. Juno Lake occupies approximately 560 acres and is located at the convergence of the townships of Jefferson, Calvin, Ontwa and Mason. Indian Lake in Silver Creek Township occupies approximately 485 acres. The county's many lakes play a critical role in collecting and storing runoff and facilitating drainage in the county.

County-wide drainage is also facilitated by a network of rivers, streams, creeks and intermittent water courses, the most significant of which are identified below:

The Dowagiac River enters Cass County in Wayne Township and flows southwest through Silver Creek and Pokagon Townships before exiting the county in the northwest tip of Howard Township. The Dowagiac River is the county's longest drainage course, flowing through the northwest portion of the county for approximately 18 miles,

Dowagiac Creek flows southwest from Bunker Lake in Volinia Township into Lake LaGrange in LaGrange Township before heading northwest through Dowagiac and emptying into the Dowagiac River several miles further west. The Dowagiac Creek flows through the northwest portion of the county for approximately 18 miles.

Christiana Creek begins near Wildcat Lake in the northeast corner of Penn Township and flows south through Vandalia and southwest through Calvin Township before emptying into Painter Lake in the southeast tip of Jefferson Township. The creek flows approximately 17 miles through the central and south-central region of the county.

Pokagon Creek begins in northwest LaGrange Township near Southwestern Community College and flows southwest through LaGrange Township and into the southeast tip of Pokagon Township and the northeast quarter of Howard Township, where it then flows northwest through Pokagon Township before emptying into the Dowagiac River several miles further west. The creek flows approximately 13 miles through the west central region of the county.

The St. Joseph River comprises approximately 3.5 miles of the county's southeast border. Though its presence in the county is limited, it is perhaps the most significant of the county's water courses due to its regional presence. The St. Joseph River begins in Hillsdale County and flows through the counties of Calhoun, Branch and St. Joseph before exiting Michigan at the southeast tip of Cass County, and reappears in Michigan in Berrien County where it empties into Lake Michigan. All of Cass County's lakes, rivers, creeks and streams ultimately flow into the St. Joseph River.

Wetlands also comprise a critical part of Cass County's drainage and water resources, and are discussed later in this section.

Lands abutting or in close proximity to drainage courses, such as streams, ponds, and lakes, are subject to flood conditions where the drainage courses do not have the capacity to accommodate the rate of runoff from a single heavy rainfall or numerous lighter rainfalls over a relatively short period of time. Floods and long periods of high water have not been serious conditions in Cass County. This is due in part to the comparatively high percolation rates of the county's soils and its network of drainage courses and wetlands that carry and store runoff. The National Flood Insurance Program identifies areas designated as potential flood prone areas and property that is located within a 100-year or 500-year flood plain. Those areas most vulnerable to flooding are typically within the comparatively narrow corridors of the principal water courses, such as the Dowagiac River and Dowagiac Creek, and the more wetland areas adjacent to the water courses. See Floodplains Map, Appendix H.

Improperly managed land development practices can impact flood conditions both locally and in the communities downstream. Development within flood plains is nearly always discouraged. The threat to property and life is heightened as are typically construction costs associated with elevating buildings and flood proofing. Floodplains are often comprised of sensitive environmental resources including woodlands and wetlands, and are typically reserved for open space uses such as parks, conservation areas, and farming.

Ground Water

As runoff flows across land surfaces and travels through drainage courses, a portion of the runoff seeps into the ground and collects in great quantities in the underlying soils and deeper bedrock. These reservoirs of water are referred to as "aquifers" and serve as the sources of drinking water for most of the residents of Cass County. Nearly all potable wells in Cass County draw water from the drift material above the deeper bedrock below due to the limited water-bearing potential of the bedrock shale. The overall quality of Cass County groundwater is considered to be good. Instances of high iron and calcium are common but these conditions are not typically considered to be health concerns but, rather, aesthetic or secondary concerns due to potential staining of appliances and clothes (iron) and deposits in plumbing systems (calcium). There are sporadic instances of contaminated sites in the county due to leaking underground storage tanks or other contamination sources, and pose varying levels of threat to ground water resources. The Michigan Department of Environmental Quality keeps a record of all known contamination sites and is available to the public.

Aquifers can be "*confined*" or "*unconfined*" systems. Confined systems have an impermeable soil layer (typically clay) above them which acts to confine the aquifer and protect it from contaminants seeping into the subsurface above the confining soil layer. These contaminants may be a result of petroleum products, improperly disposed household liquids, poorly operating septic drain fields, floor drains that discharge to the outdoors, storage of hazardous and toxic substances without the necessary safeguards, improper disposal of fuels and oils, excessive use of fertilizers, and improper disposal of wastes by industrial, commercial and residential activities. Unconfined systems do not have this protective clay layer and are much more prone to contamination. Even confined systems can be contaminated due to hazardous material entering the groundwater due to groundwater flows from nearby non-confined aquifers. While there are confining layers of clay in portions of the county, many areas are void of such confining layers. Shallow wells in the absence of a confining layer are particularly vulnerable to groundwater contamination. The protection of groundwater quality requires appropriate land use management.

Woodlands and Wetlands

Cass County is comprised of approximately 40,000 acres of wetlands, making up nearly 15% of the county's area. Approximately half of the wetlands are of a wooded character including species such as oak, red maple, and willow. Approximately one-quarter of the wetlands are of an emergent character dominated by herbaceous plants with submerged roots including cattails and various grasses. The balance of the wetlands are of a scrub/shrub character except for limited instances of aquatic beds comprised principally of plants that grow on or below the surface of the water including algae and mosses.

Wetlands are present throughout the county but are far more prevalent in the county's northwest quarter and, in particular, along the Dowagiac River corridor in Wayne, Silver Creek and Pokagon Townships. Like the Dowagiac River corridor, the majority of the county's wetlands are closely associated with its open waters including segments along streams, creeks, and lakes. As a result, many of the wetland areas are part of extensive elongated systems stretching for miles. See Water Resources Maps, Appendix H.

The fabric of watercourses and wooded and non-wooded wetlands, and upland forested areas, is important because of the vital role these mixed resources play in flood control, runoff purification, groundwater recharge, wildlife habitats, recreational opportunities, and supporting the rural character of the county. Wetlands are environmentally sensitive resources and can experience degradation and destruction due to changes in water levels, erosion and sedimentation, filling, dredging, and draining. The degradation or pollution of a wetland area can have a destructive impact upon wetlands and related woodland resources distances away due to the frequent physical linkages between these resources. In addition to the environmental constraints wetlands pose for development, they present severe physical constraints for land development due to flooding and instability of soils.

Because of the important environmental role of wetlands, they are protected by the Michigan Environmental and Natural Resources Protection Act, Part 303. Wetlands are regulated by the state if they meet any of the established criteria including, but not limited to, wetlands connected to one of the Great Lakes or located within 1,000 feet of one of the Great Lakes, wetlands located within 500 feet of an inland lake, pond, river or stream, and other wetlands of five acres or more in area. The law requires a permit be obtained from the state for depositing fill in a wetland, dredging or removing soil from a wetland, constructing or operating a use in a wetland, or draining surface water from a wetland. The Michigan Department of Environmental Quality will not issue a permit unless it finds, in part, that there would be no unacceptable disruption to aquatic resources, and that the proposed activity is wetland dependent or no feasible and prudent alternatives exist.

Soils

The U.S. Department of Agriculture, Natural Resources Conservation Service, has prepared a soil survey for Cass County. The survey reveals that nearly the entire county is comprised of soils of a loam or sand character. Approximately one-third of the county is characterized by loamy soils and an additional third is character by sandy loam soils. Another one-fifth of the county exhibits loamy sand soils. The remainder is comprised of muck soils – soils consisting of well decomposed organic material to the point that plant structures cannot be readily identified. Muck soils are frequently evident in wetland areas.

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The character of soils can have a profound impact on the suitability of development with regard to groundwater contamination, buckling and shifting of foundations and roads, erosion, on-site sewage disposal, and agricultural productivity. The Natural Resources Conservation Service has identified specific individual soil units throughout the county based upon the characteristics of the upper soil layers (approximately five feet in depth).

According to the Natural Resources Conservation Service, nearly three-quarters of the county is characterized by soils that present “severe” conditions to on-site sewage disposal (septic systems). A primary concern in this regard is the soil’s ability to absorb and break down the leachate from the septic drain fields before it reaches underground water supplies. The soils are rated as “severe” due to such conditions as surface ponding, soil wetness, and the poor filtering characteristics. Many of the county’s soils permit percolation of the leachate from the drain field but do not provide adequate filtering features as the leachate seeps into the soil. This results in increased vulnerability for surface and ground water contamination. Limitations on septic systems due to soil conditions can often be overcome by special construction measures that may increase normal construction costs, including the use of mounded systems where the drain field is raised to allow the depositing of more effective soils.

The Van Buren County and Cass County District Health Department is responsible for issuing permits for on-site sewage disposal. A permit will not be issued unless all Department requirements have been met including a back-up area should the initial drain field fail. According to current standards, home sites as small as one-half acre, with beneficial soils, frequently begin to present challenges for meeting department standards.

The provision of sanitary sewer to those areas designated for growth and development greatly reduces the risk of contamination of the county’s water resources by ensuring the safe disposal of human waste.

It should be noted that while a site may be classified by the Natural Resources Conservation Service as presenting a limitation to septic systems and building construction, on-site investigation may show the classification to be less than fully accurate and/or show that the deeper soils (more than five feet deep) present different characteristics than the upper layer soils and thus, varying limitations. On-site investigations should be carried out before specific land development projects are initiated.

Much of Cass County is characterized by soils that are very supportive of farming. Approximately 51% of the county’s soils are classified as “prime farmland.” See Prime Farmland Maps, Appendix H. The Natural Resources Conservation Service generally defines *prime farmland* as land that is, under proper management, particularly well suited to food, feed, forage, fiber, and oilseed crops and is capable of producing sustained high yields. In some cases, this classification is based on the condition that measures are taken to ensure adequate drainage. All townships in the county include prime farmland soils that occupy approximately one-third or more of the community’s area. Those townships where prime farmland soils occupy approximately 60% or more of the community’s area are Calvin, Jefferson, LaGrange, Mason, Ontwa, Penn, Pokagon, Porter and Volinia.