

Chapter 4.0 Natural Features

4.1 Introduction

No other aspect of an area has a bigger impact on the planning process than the natural features that are found within and around a community. These features dictate what land uses are available, where people live, work and recreate and what potential exists for further development and resource production. Often, communities are established, or grow and shrink based on one or more natural features and resources. Republic Township has certainly experienced booming growth and population decline due to its natural mineral resources.

4.2 Water Features

Over seventy percent of the earth's surface is water. Water features, i.e. lakes, streams and rivers have important functions as natural resources. Among those important functions is the source of water for residential and commercial development. According to a 1999 Michigan Department of Environmental Quality publication, surface water serves as a drinking water source for approximately fifty percent of the state's population. Sufficient amounts of surface water are necessary for many industries and for the generation of electricity. Surface water features are also important for recreational use and often add scenic beauty to an area.

The Michigamme River has long been a source of recreation for Township residents and visitors. The Michigamme River drains from Lake Michigamme in the northwest corner of the Township, running south to the border with Humboldt Township. Watersheds, or basins, collect and drain water to a common point within a topographically defined area. Much of the Township is located in the Menominee River watershed, with just the northeast corner of the Township draining into the Carp River Watershed. (See Map 4-1). There are a total of four (4) public access points on the river within the Township, providing ample opportunity for recreation along its length. Boating, paddling, fishing, hiking, wildlife viewing, etc. are just a few of the activities the river provides.

The river is dammed just south of North Republic, creating a series of large basins. This dam does not currently provide hydroelectric power, although it has in the past. At present, the dam is privately owned. It may benefit the Township to take over ownership and control of the dam, not only to regulate the water level of the basins (maintaining shorelines) but perhaps to produce electricity in the future.

While there are a number of homes, camps and resorts along the river, the potential exists for increased development of both seasonal and year-round residences. Many tributaries empty into the Michigamme River, providing additional waterfront sites.

There are numerous lakes, varying in size, scattered throughout the Township, with the majority found in the southern half of the Township (See Map 4-2). Two of these lakes have State Forest Campgrounds (Squaw Lake and North Horseshoe Lake); five have public boat launch sites (Squaw Lake, North Horseshoe Lake, Witch Lake and Twin Lake, all located in the southern end of the Township and Perch Lake, located just east of Republic).

Many lakes are dotted with camps and homes, some verging on overuse, putting these lakes at risk of pollution and draw-down of the water table. However, many lakes are under-utilized, creating the potential for much more waterfront development to take place. Safeguarding the quality of our lakes and streams is a paramount concern of this Master Plan. This can be accomplished by amending the existing zoning criteria, including, but not limited to:

- Increasing minimum lot size on certain lakes to avoid potential over-burdening by septic systems and draw-down of the water table by wells.
- Increasing the minimum setbacks and encouraging growth of natural vegetation along the shoreline to protect the lakes and rivers from pesticide and fertilizer run-off as well as deforestation and silting.
- Requiring construction of water and sewage systems capable of servicing multiple units on desirable properties.

Wetlands are found throughout the Township, with a major parcel found at the old Republic Mine, where 2,300 acres have been set aside as a conservation easement as mitigation for other wetlands overtaken by the mining processes. The preservation of wetlands is important for the following reasons, including but not limited to: reducing flood hazard by providing areas for water storage; filtering water; providing an ecosystem for wildlife and fish; preventing soil erosion.

4.3 Land Features

A majority of the land surface in the Township is forestland; much of it is zoned for Resource Production (See Map 4-3 and 4-4). There are many varieties of both hard- and softwoods. This natural resource is extremely important to the economy of the Township. Not only do these forests provide raw material for the paper and construction industry and potentially for ethanol production, but the forests are also home to a variety of flora and wildlife. Another key use of woodlands is for recreation including ATV and snowmobile trails, hunting, hiking, bird watching and similar activities. The Township could develop a Forestry Plan in order to better regulate use and preservation of this resource.

There is a limited amount of agricultural land; most of it is in the southern half of the Township, with hay and potatoes being the dominant crops. Other agricultural pursuits include beef cattle, corn, oats, maple syrup and honey.

A considerable amount of land is designated as mining production. Although no mines are currently in production within the Township, the possible existence of desirable metals and materials as yet undiscovered may lead to a modern-day mining boom in the near future.

4.4 Topography

The unique character of an area is derived from the physical features of its landscape. Topography describes this character in terms of elevation above mean sea level. This reveals the size and shape of watersheds and places to avoid development due to grades in excess of recommended standards.

Steep topography or slopes of 10 percent or greater (a rise in gradient of more than 10 feet in a horizontal distance of 100 feet) can be aesthetically attractive for residential development and some commercial establishments. However, the steep grade increases the likelihood of soil movement or slides, and the weight of structures is an added force that encourages this movement. In addition, there is an added expense if development occurs on the sloping surface itself. Excavation of a hillside and/or construction of retaining walls can greatly increase building costs. There is also a problem of erosion as the water rushes down the steep grades. Natural water courses provide the pathway for such water and should be maintained in this capacity. Soil disturbance of one or more acres or within 500 feet of a lake or stream generally requires a permit as authorized under Part 91 (Soil Erosion and Sedimentation Control) of the Natural Resources Environmental Protection Act.

The topography of the Township ranges from moderately hilly in the north, with many outcroppings of bedrock occurring, to relatively flat lands in the southern half of the Township (See Map 4-1). Elevations in the Township range from approximately 583 to 1922 feet above sea level.

4.5 Soils

*Note: Much of the following information was taken from the Soil Survey of Marquette County, produced by the USDA, together with other agencies. See Appendix for more information.

Soil is the surface layer of the land that was formed through the interaction of many factors. Physical, chemical and mineral composition of the parent material combined

with climate, plant and animal life on and in the soil are major factors. Other factors include time and relief, or lay of the land. Soils are grouped into associations based on common characteristics such as drainage, slope and texture. The soils in these associations respond similarly to the various uses to which they may be subjected.

The soils in Republic Township are generally considered fair to poor, composed of glacial till (gravels and sands) and heavy loams, with a minimum of topsoil present. (See Map 4-5). This severely limits agricultural production and presents problems in developing parcels for residential use due to septic issues. All soil types present are best used for woodlands, as indeed they are.

Map 4-5, Soil Types, shows that much of the Township is characterized by **Goodman-Sundog-Greenwood** Association soils (all but the northeast corner of the Township) This type is described as very deep, nearly level to very hilly, well-drained, loamy soils; and very poorly drained peaty soils, on disintegration moraines. Slopes range from 0-45%.

Soil Properties:

- **Goodman:** (45% extent of soils in this association)
 - Very deep, well drained, silty mantle over sandy till, silt loam surface, gently undulating to very hilly slope.
- **Sundog:** (35% of soils in this association)
 - Very deep, well-drained, silty or loamy mantle over sandy and gravelly outwash, silt loam surface, gently undulating to very hilly
- **Greenwood:** (10% of soils in this association)
 - Very deep, very poorly drained, organic deposits, peat surface layer, nearly level.
- **Soils of minor extent:** (10%) include Keewaydin, Wabeno, Cathro, Tawas and Witbeck soils.
- **Major use of this Association:** Woodland.
- **Management concerns include:** erosion hazard, equipment limitations and plant competition.
- **Management considerations include:**
 - Building logging roads on the contour, installing water bars and culverts and seeding logging roads to prevent excessive soil loss in very hilly areas.
 - Special care is needed when laying out logging roads in the very hilly areas. The grade of these roads should be kept as low as possible.
 - Selective cutting can reduce the seedling mortality rate.
 - Because of extreme acidity and wetness, the Greenwood soils are generally unsuited to woodlands.

The second-largest soil association is located in the northeast corner of the Township, east of the Michigamme River. It is known as the **Keewaydin-Michigamme-Rock Outcrop** Association. It is characterized by rock outcroppings and very deep and moderately deep, nearly level to very hilly, well-drained soils; on bedrock-controlled moraines. Slopes range from 1-70%.

Soil properties:

- **Keewaydin:** (45% extent of soils in this association)
 - Very deep, well-drained, loamy and silty eolian deposits over gravelly and sandy till; cobbly fine sandy loam, nearly level to very hilly.
- **Michigamme:** (20% extent of the soils in this association)
 - Moderately deep to igneous or metamorphic bedrock; well-drained, silty or loamy mantle over loamy till overlying igneous or metamorphic bedrock; cobbly fine sandy loam, gently rolling to very hilly.
- **Soils of minor extent:** Carbondale, Cathro, Net and Witbeck soils in depressions and drainage ways; Champion, Dishno, Peshekee, and Sundog soils in landscape positions similar to those of the major soils.
- **Major use of this Association:** Woodlands.
- **Management concerns:** Erosion hazard, equipment limitations and plant competition.
- Management considerations:
 - Building roads on the contour, installing water bars and seeding logging roads help prevent excessive soil loss.
 - Special logging methods, such as yarding with a cable, may be necessary in the very hilly areas.
 - Selective cutting can reduce the windthrow hazard.
 - Site preparation helps control plant competition.

Also present in the Township (at the old Republic Mine location) are soils characterized as **Pits-dumps, Mine-slickens** Association. The settings for these soils are bedrock-controlled moraines, with slopes from 0-70%.

- **Major uses of this Association:** Active and inactive open-pit mines.
- **Management concerns:** Onsite investigation is needed to determine suitability for specific uses.
- At the Republic Mine site, much of this area has been designated as a wetlands preserve.

A small portion of the Township around Gamble's Creek in the eastern central portion of the Township is characterized by **Pence** and **Sundog-Minoqua-Channing** Associations. **Pence Association** soils are found in outwash plains and outwash terraces, with slopes ranging from 0-35%.

Soil properties: (85% extent of the soils in this Association)

- Very deep, somewhat excessively drained; loamy mantle over sandy outwash; fine sandy loam texture with slopes nearly level to very hilly.
- **Soils of minor extent:** (15% of the extent of this association) Gogebic, Rubicon, Sayner and Sundog soils in landscape positions similar to those of the Pence soils; Carbondale and Greenwood soils in depressions and drainage ways.
- **Major use of this Association:** Woodlands.
- **Management concerns:** Erosion hazard and equipment limitations
- **Management considerations:**
 - Building roads on the contour, installing water bars, and seeding logging roads help to prevent excessive soil loss
 - Special care is needed in laying out logging roads and operating logging equipment in the very hilly areas. The grade should be kept as low as possible.

Sundog-Minoqua-Channing Association soils are characterized as very deep, nearly level to very hilly, well drained (Sundog), poorly drained (Minoqua) and somewhat poorly drained (Channing), loamy soils; on outwash plains and outwash terraces, with slopes of 0-35%.

Soil properties:

- **Sundog:** Very deep, well drained, silty or loamy mantle over sandy and gravelly outwash; silty loam texture, nearly level to very hilly slopes.
- **Minoqua:** Very deep, poorly drained, loamy deposits over stratified sandy and gravelly outwash, with a mucky texture and nearly level slopes.
- **Channing:** Soils are very deep, somewhat poorly drained, loamy deposits over stratified sandy and gravelly outwash, with fine, sandy loam texture and nearly level slopes.
- **Soils of minor extent:** Pellisier and Pence soils in landscape positions similar to those of the Sundog soils; Charbeneau soils in landscape positions between Sundog and Channing soils; Carbondale and Tawas soils in depressions and drainage ways.
- **Major use of this Association:** Woodlands.
- **Management concerns:** Erosion hazards, equipment limitations, seedling mortality, windthrow hazard and plant competition.
- **Management considerations:**
 - Building roads on the contour, installing water bars, and seeding logging roads help prevent excessive soil loss.
 - The seasonal high water table in areas of Minoqua and Channing soils restricts the use of equipment to midsummer, when the soils are dry or midwinter, when there is adequate snow cover. Culverts are needed to

- Special care is need in the very hilly areas of the Sundog soils. Grade should be kept as low as possible.
- Because of wetness, seedling mortality and plant competition, trees are not generally planted in Minoqua and Channing soils.
- Harvest methods that leave the remaining trees relatively closely spaced can reduce the risk of windthrow.

A very small area in the extreme southeastern corner of the Township is characterized by the **Sagola-Rubicon** Soil Association. The characteristics of this association are very deep, gently undulating to very hilly, well drained (Sagola) and excessively drained (Rubicon) loamy and sandy soils on disintegration moraines. Again, the major use of this association is wetlands, where planting special nursery stock can reduce seedling mortality rate and site preparation can reduce plant competition.

Development planning should include a thorough assessment of soil suitability for the type of land use being considered. For example, residential subdivisions should avoid areas of shallow and/or poorly drained soils or areas where the water table is close to the surface, since such soils are unsuitable for septic drain fields and problematic for roads.

4.6 Septic Suitability

Much of the Township has high water table levels found at the surface or within one foot of the surface. (See Map 4-6). Soil permeability is generally poor to fair, with a majority of the Township having rates of 2" or less per hour. Despite these factors, modern techniques, equipment and processes may be able to overcome these limitations. Septic suitability must be determined on a case-by-case basis, as conditions vary greatly from parcel to parcel.

4.7 Geology, Bedrock Geology, Mineral Resources and Groundwater

Among the primary factors which make geology important to a community's development is the ability to supply groundwater. The quality and quantity of groundwater are influenced by the types of bedrock in which it is found and also influenced by the layers through which the water passes before it is extracted. Bedrock geology consists of solid rock formations found below the soil formed during the early periods of the earth's evolution. These formations have undergone extensive folding, uplifting, eroding, and weathering during the millions of years that have since passed, and are now overlain by surface geology and soil.

The geology of Republic Township is the result of glacial activity upon the underlying bedrock of Precambrian rock known as the Canadian Shield. Outcroppings of this rock are found throughout the Township, creating dramatic scenery but also difficulties for residential and commercial development.

Iron ore deposits, located in what is known as the Republic Trough (corresponding with the Negaunee Iron Formation, see Map 4-7), have in the past been exploited, resulting in the development and growth of the township. The first iron ore mines were underground operations. The Republic Iron Company was formed in 1870 and operated until 1913, when Cleveland Cliffs Iron Company took over ownership. During the years of underground mining nearly 9 million tons of iron ore were shipped. The resource lay relatively dormant for the next 30 years, until new technologies enabled the profitable mining of lower-grade ores, using open-pit methods and palletizing of the ore. The mine produced 2.7 million tons of pellets annually. Economic factors forced the closing of the Republic mine in 1981, resulting in great economic upheaval. After the mine closed, the pit was flooded, creating a man-made lake, which is 600 feet deep and covers 250 acres. This lake has potential as a recreation area, although currently it is privately-owned and inaccessible by the public.

While iron ore mining no longer seems viable, the possible existence of other ores and minerals may bring about resurgence in mining within the township. Such mining activity should be closely monitored to prevent damage to our greatest asset: the natural beauty of our surroundings.

Finding water for domestic use is a concern within the Township. The village of Republic (including the area known as South Republic) is connected to a municipal water and sewer system, but residences and business located outside of the village must rely on wells for their water supply. Because of the nature of the geology in the Township, the depth of wells varies greatly, as does the volume of water produced by these wells. Quite frequently, in order to obtain a satisfactory volume, a process known as hydro-fracturing must be used, whereby water is forced into bedrock under pressure, resulting in fractures that allow extra ground water to enter the well. This sometimes results in poorer quality, however. Limitations posed by these factors can affect development of properties.

4.8 Climate

The climate of the Township is slightly less severe than that of neighboring northern townships, with less snowfall on average. Temperatures, however, can be much colder in the winter and warmer in the summer, as the moderating effects of the Great Lakes is not as pronounced this far inland. Republic Township receives 33 inches of rain per year

with the US average at 37 inches. The Township receives about 130 inches of snowfall, while the average US city gets 25 inches of snow per year. The number of days with any measurable precipitation is 149. On average; there are 186 sunny days per year in Republic Township. The July high is around 79 degrees. The January low is 1 degree.

The growing season is short, with few suitable crop varieties able to be grown here. At present, only hay and potatoes are grown with any success. Several small truck gardens are in existence, but provide only supplemental income to their owners.

Seasons are quite definite. Spring thaw begins in March/early April. Road restrictions in place during the thaw affect many economic activities, including logging, construction and hauling. Summers can be quite warm, or quite chilly, depending on many factors. In general, the Township experiences comfortable summer weather, not too hot or humid. A drawback to the warmer weather is the proliferation of insects, including sand flies, mosquitoes, deer flies and ticks. At times, insect hatches can prove detrimental to the tourist trade. Fall color season peaks in late September/early October. Color season provides a boost to the local economy, as vacationers from Wisconsin and Lower Michigan come north for color tours. There is ample snowfall for all winter activities (skiing, snowmobiling, snowshoeing, etc). Ice fishing is possible from December through March. These activities are the lifeblood of the tourist trade in this “off season”.

4.9 Alternative Energy

Alternative energy is typically defined as energy sources that do not deplete natural resources or harm the environment. Examples of alternative energy sources include compressed natural gas, biomass, hydroelectric, solar and wind power. Due to the steadily increasing cost of fossil fuels, alternative energy sources are being considered for everyday use.

As a renewable resource, wind is classified according to wind power classes, which are based on typical wind speeds. These classes range from Class 1 (the lowest) to Class 7 (the highest). In general, at 50 meters, wind power Class 4 or higher can be useful for generating wind power with large turbines. Class 4 and above are considered good resources. Particular locations in the Class 3 areas could have higher wind power class values at 80 meters than shown on the 50 meter map because of possible high wind shear. Given the advances in technology, a number of locations in the Class 3 areas may be suitable for utility-scale wind development.

Most areas within Republic Township are classified as having poor to moderate potential for wind power. Currently, the possibility of implementing wind power within the Township is somewhat remote, but new technologies and more precise

measurements may allow for such implementation in the future. Accordingly, allowance for and regulation of wind farms should be addressed in this Master Plan and in the Zoning Ordinance.

Likewise, solar power may not be economically feasible at this juncture, but new technologies combined with the rising cost of fossil fuels may make solar power a viable option in the future. Again, regulation may be required to place standards and limitations on this type of power. The current Zoning Ordinance could be amended to implement any changes regarding solar power.

4.10 Issues and Opportunities

The natural features of Republic Township are important to the local quality of life. Scenic and natural areas have been identified throughout the Township. These areas present many possibilities for outdoor recreation. Preservation of these natural areas will be crucial in order to maintain these opportunities.

The climate of Marquette County presents a variety of challenges. Examples include: the need for snow removal from streets and parking lots, building codes which provide adequate support for snow loads and a short growing season which limits the type of crops which can be grown. The local climate may be attractive to a number of people and can be suitable for businesses or industries which specialize in certain types of goods or services.

As discussed in earlier chapters, iron ore mining has been an integral part of the development of Republic Township. Beginning with underground mining in the late 1800s and ending with the closure of the open pit Republic Mine in 1981, this resource has dominated our economic landscape. While redevelopment of iron ore mining is unlikely, the possible existence of other ores and mineral deposits within the township may indeed provide additional economic impact in the near future.

Development of lake and riverfront properties should be carefully considered. The Township wants to encourage development and the corresponding increase in tax base. Zoning Ordinance regulations for the two waterfront residential districts should be reviewed to ensure that adequate space for septic systems is available.