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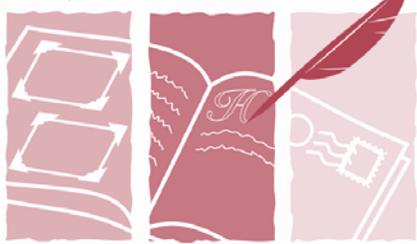
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The Environmental History of the Macatawa Watershed

By Carl Van Faasen

The Environmental History of the Macatawa Watershed, a book co-authored by Holland science teacher Carl Van Faasen, Zeeland science teacher Jennifer Soukhome, and Hope College professor Graham Peaslee, explores the problems currently facing the Macatawa Watershed. The eight chapters of the book tell this story beginning with its geological origins,

going through the natural and human history of the area, and concluding with a look at what can be done in the future to improve the conditions of the Lake Macatawa Watershed, an area which includes the cities of Holland and Zeeland, as well as their neighboring townships. The book gives a comprehensive

natural and human history of the area, focusing on the aspects of this history that affected the condition of the watershed. It also includes a discussion of the hydrological structure of the Macatawa Watershed, the nature of its pollution, and how water quality is measured.

Chapter one serves as an introduction to the book and the Lake Macatawa Watershed. The Macatawa Watershed is an area of 179 square miles (approximately 115,000 acres) in West Michigan that includes the cities of Holland and Zeeland and parts of many surrounding townships. At the center of the watershed is Lake Macatawa, formerly known as Black Lake. All surface water that flows within the watershed boundary will head

downhill and enter Lake Macatawa eventually. This includes rain and snow, as well as water from drains and garden hoses, provided it does not evaporate first. Lake Macatawa has an approximate surface area of 1800 acres, and is known as a drowned river-mouth lake. This means it appears at the end of a river, and swells into a

lake before entering a larger body of water (Lake Michigan). The average depth of Lake Macatawa is about twelve feet, which is quite shallow in comparison with many other West Michigan lakes; it has a maximum depth of thirty-eight feet at one point in Big Bay. The shape of the lake is long and slender with two bays on the



Photo courtesy of Marge Beaver <http://photography-plus.com>

north side, Big Bay and Pine Creek Bay. It is approximately four and a half miles long, and varies in width from 870 feet at its narrowest (Superior Point) to 6035 feet at its widest (Big Bay). Lake Macatawa contains approximately 7 billion gallons of water, or almost 30 million tons of water at a time.

On its west end, the lake narrows and is connected with Lake Michigan by a man-made channel built by the Dutch settlers around the time of the Civil War, and later maintained and improved by the United States Army Corps of Engineers. The channel is dredged almost every year to a depth of twenty-three feet, allowing large

(Continued on page 2)

From the Director



The Lake Macatawa Watershed is an important part of the Holland area history, and the book *The Environmental History of the Macatawa Watershed*, co-authored by Carl Van Faasen and Jennifer Soukhome, and edited by Graham Peaslee of the Hope College faculty, does a very good job of explaining it. We are happy that Van

Faasen was willing to write a summary of the book for this issue of the *Quarterly*. If you are interesting in purchasing a copy of *The Environmental History of the Macatawa Watershed*, contact the Hope-Geneva Bookstore (1-800-946-4673 or bookstore@hope.edu) for ordering information.

Geoffrey D. Reynolds

The Environmental History (continued from page 1)

commercial vessels to move freely between the lakes. This connection also keeps the surface elevation of Lake Macatawa the same as that of Lake Michigan, around 580 feet above sea level.

Surrounding and flowing into Lake Macatawa is a series of small rivers and creeks. The Macatawa River (formerly called the Black River) is the most prominent of these, flowing into the east end of Lake Macatawa with almost 90 percent of the total water volume that enters the lake. Many smaller rivers, creeks, and drains empty into the Macatawa River. Pine Creek is the second largest tributary, flowing through the northern portion of the watershed and emptying into Pine Creek Bay. Any water that exists on the land surface of the Macatawa Watershed will drain into one of these rivers, eventually working its way toward Lake Macatawa, where it will flow west to the channel and eventually through the channel into Lake Michigan.

The Macatawa Watershed is one of many watersheds found around Lake Michigan. All the watersheds of Michigan are part of the Great Lakes Drainage Basin, which empties through the Saint Lawrence River into the Atlantic Ocean. The Macatawa Watershed is one of the smaller Michigan watersheds, but its eutrophication problem is second to none in the state.

The chapter on “Physical History” describes the geology and topography of the area. Millions of years ago, this area looked much different than it does today. Over the course of geological history, the continents have drifted, and the area has been dry land at times, and under water other times. When land is under water, dirt and sediment

sink and harden under pressure to form what is known as bedrock. Geologists have surveyed and mapped the layers of bedrock that currently exist in Michigan. Under the Lake Macatawa Watershed, the bedrock layers are primarily composed of Mississippian Sandstone. This particular stone is also known as Waverly Sandstone, and many local buildings, such as the Clock Tower in downtown Holland, were built from this material. Although we know these layers exist, they are buried under hundreds of feet of glacial till, a mix of soils and rocks left by the advance and retreat of the glaciers, sheets of ice that covered the area ten to fifteen thousand years ago. This glacial activity created most of the landforms that we see in the area today, including a series of ridges, known collectively as glacial moraines. The New Holland Ridge and the ridge that goes through Graafschap are examples of glacial moraines. During this period of glaciation, the Great Lakes were also going through tremendous change. The level of Lake Michigan, which currently sits around 580 feet above sea level, varied in elevation from a high of 640 feet above sea level to a low of 230 feet. In addition, the Grand River changed its course many times, including a time in which it flowed through the area. These changes caused a series of sandy deposits and dunes to be left behind. As a result of all these geological processes, a variety of soil types were left in the area. The eastern two-thirds of the watershed are composed primarily of clay deposits, fine-grained material that is very impermeable to water, left by retreating glaciers. The western third is composed primarily of sandy deposits, large-grained material that is very permeable to water, left by the Glacial Great Lakes.

The next chapter describes the ecology of the Macatawa Watershed, including a survey of the plants and animals that are native to this area. The chapter also documents the early history of the area, including a brief history of the local Native Americans, and the early influence of Europeans prior to permanent settlement in 1847. When the original Dutch settlers arrived in the mid-nineteenth century, the area looked much different than it does today. Many acres of the area, including much of the core city of Holland, parts of Holland Township, and the area south of Zeeland, were covered by a variety of wetlands such as swamps, marshes, and bogs. The dry land in the area was very densely forested by oak, maple, pine, and hemlock trees so thick that it greatly hindered overland travel through the area. These wetlands and forests were populated by a tremendous variety of plant and animal species, many of which no longer inhabit the area, such as beavers and cougars. The lake itself, which was first called Black Lake until it was officially changed to Lake Macatawa in the early 1900s, was clear in appearance with abundant aquatic plant life and multiple species of fish. The natural outlet for the lake was a small stream whose path wandered north of the present day channel, and had an average depth of just 6 inches.

Although other races of Native Americans may have been present during its history, the most recent native inhabitants were the Odawa (Ottawa) Indians, led in the 1850s by Chief Waukazoo. They were a nomadic group that inhabited West Michigan and had permanent camps in the areas of present-day Holland and Northport. During the 18th century, French fur traders moved around the Great Lakes area hunting beaver and other fur-bearing game, as well as trading with the native population. The first permanent settlement in the Holland area was the town of Superior, a logging community of roughly seven families that settled on the north shore of Lake Macatawa, a neighborhood now known as Waukazoo. This settlement lasted less than ten years because of a financial panic that consumed the entire United States and the lack of a viable water outlet for ships to enter Lake Macatawa. In the late 1830s and early 1840s, a Presbyterian missionary, George Smith, and a government agent, Isaac Fairbanks, lived just southwest of present-day Holland in a house now known as the Old Wing Mission. These men and their families lived and worked with the local Odawa people, teaching and learning in relative peace.

The chapter on European settlement and transportation issues begins by describing the early settlement of “De Kolonie” by Albertus Van Raalte, a Dutch protestant minister, and his small band of followers. Van Raalte is credited with the establishment of Holland, as he first traveled to the area in the winter of 1846, escorted by Judge Kellogg of Allegan. He surveyed the land and harbor and met with Fairbanks and Smith to discuss the viability of a settlement. Using much of his own wealth to purchase the land, he began bringing settlers in 1847. Other leaders established other settlements in the vicinity, such as Zeeland, Graafschap, Nordeloos, and many others. All of these settlements were founded with the intent of allowing the inhabitants to practice their religion, free from persecution. Their faith was sorely tested during the first few years, as the process of establishing homes and ensuring their survival proved to be very difficult. The giant trees needed to be felled, even though few skilled woodsmen existed among the settlers. The vast wetlands were drained by straightening natural waterways to produce more dry land that could be used for farming. The new area also challenged the settlers with other obstacles, such as natural pests and predators that ate crops and livestock, as well as new diseases, such as malaria, which infected most of the settlers and killed many of them. Despite all these obstacles, the colony survived and farms were established. Most of the first farms operated strictly at a subsistence level, producing staple crops such as wheat, beans, and, a new plant to the Dutch, corn. Eventually, as more people came to the area, farming and other light industry became more established, and the establishment of trade routes became important to the community.

When the Dutch first arrived, the only land transportation routes that existed were a series of Native American footpaths that led to the established settlements of Grand Haven, Grandville, Allegan, and Singapore (nearby present-day Saugatuck). The easiest way to get around in the early days was to travel by raft or canoe on the waterways, or to walk up and down the beaches of Lake Michigan. Eventually, the towns were platted out and more permanent roads were built, including routes that followed the established Native American trails of the time. In order to improve trade in the area, Van Raalte petitioned the United States government for funding to establish a viable shipping channel into Lake Macatawa. This process ran into a series of snags, but eventually a channel was dug in its present-day location, and was maintained by the United States Army Corps of Engineers, as it is today. In 1870, the railroad industry established two routes through the area, allowing for easier trade with local communities. Although some routes were abandoned, much of the track along these routes is still maintained and used today. As transportation and trade improved, the tourism industry saw a boom beginning in the late 1800s, attracting vacationers to our beautiful shores and establishing the area as a well-known resort destination. Eventually, as the tourism boom declined, highways were built to allow cars to come to the area more easily, and the Tulip Time festival was developed and made famous nationwide. Chapter 4 ends with a description of a few of the effects of these human endeavors. Deforestation, flooding due to the straightened channels, increased pollution from engines, as well as introduction of destructive invasive species by foreign ships, all had an impact on the watershed and its delicate ecological balance.

The next chapter of the book concerns agriculture and charts the history of agriculture in the area. As the settlement became more established in the 1850s, subsistence farming was no longer needed, and many farmers were able to produce crops in surplus to trade with neighboring communities. West Michigan has a unique climate that is a result of weather patterns that move west to east over Lake Michigan, where the water acts as both an insulator and source of moisture. As a result, West Michigan has temperature ranges that are comparably mild and abundant precipitation. As the practice of farming became more sophisticated, experts realized the unique opportunities that the land offered. The clay soils on the outskirts of the watershed were best for staple crops, such as corn, which also made those areas suitable for livestock, an industry in which the city of Zeeland became well-established with their hatcheries. The alluvial deposits along the Glacial Grand River (present-day Chicago Drive) provided a mucky nutrient-rich soil that was ideal for growing celery and onions. Local industry provided a buyer for other cash crops such

as cucumbers for pickles and sugar beets. The sandy, acidic soils of the western portion of the watershed were ideal for growing blueberries and pine trees. Agriculture continues to thrive in the area, as farming still accounts for about three-fifths of the land use, and new crops, such as soybeans, are being raised and developed. The chapter ends with a discussion of some of the effects of agriculture, such as deforestation and the effects of draining wetlands, as well as a discussion of the effects of using phosphorus-containing fertilizers.

The progress of industry in the local communities is chronicled in the next chapter. While the communities on the outer edges of the watershed, such as Overisel and Vriesland, remained agricultural, the cities of Holland and Zeeland began to support a series of industrial enterprises. Some of the first industries in the area included sawmills, which sought to take advantage of the abundant lumber. Also, brick makers and quarries were opened to exploit the Waverly Sandstone and abundant clay deposits in the area. Some of the first industries to gain regional prominence were the tanneries, such as Cappon and Bertsch of Holland, which used the abundant supplies of local fur game and hemlock bark to make leather for commercial use. Eventually, these industries gave way in the late 1800s to furniture production, which used the abundant lumber and skilled craftsmen of the area to produce all sorts of items that sold across the country. In the early 1900s, Holland Furnace was established and gained national prominence, using its financial influence to promote the Tulip Time festival and make it one of the most-attended festivals in the nation. As Holland Furnace declined, a broad range of other industries, many of which still operate in the area, gained prominence and further established the area as a commercial center.

Utilities of the area are also covered in this chapter. The first heat and electrical generation plants were established in the late 1800s and early 1900s. This part of the book looks at the history of the Holland and Zeeland Boards of Public Works, and how we generate electricity and heat in the area. This portion of the book also looks at how the local communities dealt with their solid waste, from early dumping sites to more modern landfills, such as the Autumn Hills facility near Drenthe. The chapter ends with a discussion of the effects of industry, such as the chromium products that came from the tanneries, air and water pollution, depletion of natural resources, and poor planning of waste management sites.

The book also covers the area's current state and looks at the current condition of our local watershed. It begins by discussing the physical structure of the watershed and how pollution and large volumes of water are transported throughout the area. All the human endeavors discussed in Chapters 4-6 have had an impact on the quality of

water in our area. The factors that scientists use to measure water quality, such as pH, dissolved oxygen (DO), the presence of heavy metals and other solids, turbidity, chlorophyll a counts, and nitrate and phosphate concentrations are introduced and discussed. The primary factor that negatively impacts the Macatawa Watershed is an overabundance of phosphate in the water. The soils of area are naturally high in phosphates, and the clay soils in the upper part of the watershed that are used for farming are exposed due to the lack of plant cover and are easily eroded. As a result, when a major rain event occurs, large volumes of clay soil are transported quickly through the straightened waterways and dumped into Lake Macatawa, where the phosphorus attached to the soil causes excessive algae blooms. These blooms affect the ecology of the lake by making the lake uninhabitable for more complex plant species, which, as a result, make the lake uninhabitable for many species of fish. The excess sediment also settles to the bottom of the lake, making it shallower. This process, which does occur naturally in all inland lakes, is called eutrophication, and in Lake Macatawa, this process is occurring at a highly accelerated rate due to the overabundance of phosphorus. As a result, the Michigan Department of Environmental Quality (MDEQ) established a Total Maximum Daily Load (TMDL) of 50 parts per billion of phosphorus.

This chapter also looks at water management in the area and its history. The manner in which the Holland Water Treatment Plant pumps in fresh water and makes it safe for human use is discussed and explained. In addition, the BPW Waste Water Treatment plants of Holland and Zeeland and how they treat water before returning it to the environment are explained as well. The chapter ends with a discussion of other environmental concerns and their impact on the watershed, such as *E. coli* outbreaks, the effects of invasive species, global warming, and man-made ponds and wetlands.

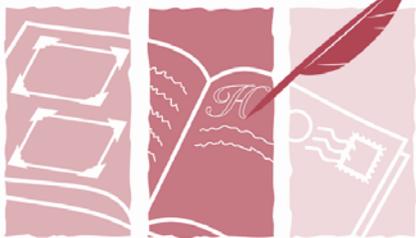
The final chapter focuses on what is being done to address the environmental problems of the watershed. It discusses the Macatawa Area Coordinating Council (MACC) and what it is doing to bring community leaders together to address the TMDL issue and reduce phosphorus levels in the watershed. Among the solutions are a series of best management practices (BMPs) for agriculture, reduction of phosphorus use by citizens on their lawns, shipping regulations, constant monitoring of storm drain systems, and, finally, the most valuable tool in the fight to protect an environment: educated citizens. This is the primary goal of the authors, and they invite members of the community to join them in making the Macatawa Watershed a resource that can be enjoyed by many generations to come.

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