Big Rapids Riverwalk: An Environmental Assessment
Summer 2002

Environmental Management Studies Center
Ferris State University
College of Allied Health Sciences
Big Rapids, Michigan
Center Provides for Excellence in Environmental Studies

The Ferris State University Environmental Management Studies Center (FSUEMSC) has been in existence since 1972. The Center provides baccalaureate degree Environmental Health and Safety Management (EHSM) students with a unique opportunity to conduct “real life” field studies and assist area communities and government agencies.

It is unique in the United States in its interdisciplinary approach to teaching environmental planning and management. Since 1972, the Center has completed 33 major community and environmental assessment reports, along with 493 background reports.

Some particularly useful projects over the years include:
- A 1979 study of Chippewa Lake that helped justify the construction of a community sewage system, thereby halting septic system nutrients from entering the lake.
- A 1992 study that helped the Village of Morley obtain funds to refurbish a dam.
- Several Muskegon River reports were cited by the City of Big Rapids in their grant requests for the removal of the Big Rapids dam remnant in 2000.

In 1972, a three year $31,000 grant was obtained from the U.S. Department of Health, Education and Welfare, Division of Health Manpower to develop the Center. Faculty teaching courses in environmental conservation (Biology Department), environmental engineering, surveying engineering (College of Technology), environmental management (EHSM Program) and cultural geography (Social Sciences Department), were brought together as a team and the FSU campus served as a laboratory and provided real life projects. The course content has changed with the removal of the Cultural Geography course, the modification of the biology course, modification of Environmental Engineering to Geomatic Engineering and the addition of Environmental Assessment and Impact Analysis. Study areas have broadened to include lakes and hazardous waste sites in the vicinity. Faculty serve as policy makers and professional consultants and students are organized as staff. Students carry out field research, conduct surveys they have developed, and study geographic information system (GIS), photography, surveying, and report writing in addition to classroom studies.

This has proven to be a highly successful educational process, which greatly improves job readiness and develops competencies otherwise not possible in a traditional academic role. Students strengthen oral presentation and writing skills in addition to learning teamwork. The experience is known as “summer block” and is the environmental health student’s capstone experience before graduation. Community members interested in receiving a copy of the Center’s reports may contact the Health Management Programs Department Head in the College of Allied Health Sciences.

Title Page Credits:
Top Center: Northend Riverside Park, picture taken facing south of trail, June 6, 2002.
Bottom Left: Future site of an aggregate fishing platform behind Big Rapids Middle School, photo taken facing south, July 1, 2002.
Bottom Center: Riverwalk Committee project groundbreaking ceremony, June 13, 2002.
Bottom Right: Dame’s Rocket located in the woods northeast of the dam remnant removal site, photo taken facing north, June 12, 2002.
The Riverwalk project area is located in Sections 3, 10, 11 Big Rapids Township, T 15 N, R 10 W, City of Big Rapids, Mecosta County, Michigan.

Location Map was produced by modifying maps from MultiMag and MapQuest of Big Rapids along the Muskegon River (46, 50).

Future Riverwalk Project Area
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Executive Summary

During Summer 2002, students from the Ferris State University Environmental Management Studies Center (FSUEMSC) performed an environmental assessment of the Big Rapids Riverwalk Project to identify what effects the construction and use of Riverwalk will have on the Big Rapids Community.

Riverwalk includes a 1.4-mile pathway along the Muskegon River from Maple Street to Northend Riverside Park. The assessment focused on the historical, cultural, social, physical, and biological aspects of the Riverwalk project.

Riverwalk was designed to provide access for all, meaning that anyone, including those with physical handicaps will be able to use it. Ninety-two percent of Riverwalk will be constructed of asphalt. The remainder will be constructed of Chromated Copper Arsenic treated wood. There will also be two metal frame pedestrian bridges with wooden plank walkways connecting the east and west banks of the Muskegon River in the vicinity of Big Rapids Middle School.

The construction of Riverwalk and its use by the public will have some impacts on the air quality, noise levels, physiography, soils, water, and plant and animals within the study area. Exhaust from motorized equipment will increase in the area during construction, but this is not a significant impact. Fugitive dusts may also be dispersed due to earth moving, but actions are being taken to prevent this. The noise levels will increase due to construction, but will also have only a short-term effect. There will be significant cutting and filling of the landscape, which may lead to erosion in some areas. Measures are being taken to prevent this. CCA treated wood may leach arsenic into the soils and water, but the amount that will be leached will not be significant as it will be diluted in the water. Some plants and animals may be affected by the construction, but this would only be a short-term effect.

Residential and business surveys were used to ascertain community knowledge and opinions about Riverwalk. Ninety-two percent of the residents surveyed said they would use Riverwalk after construction and 83% of the businesses felt that Riverwalk would increase tourism in the community.

The City of Manistee was visited to compare their Riverwalk with the Big Rapids Riverwalk. The Manistee Riverwalk is a concrete and CCA treated lumber walkway along the Manistee River, while the Big Rapids Riverwalk will be constructed of asphalt (92%) and CCA treated lumber and located by the Muskegon River. The City of Manistee has a maintenance budget for their Riverwalk ($40,000 a year), while Big Rapids presently has not allocated funds for this purpose. The Manistee Riverwalk limits access to some recreational groups such as rollerbladers, while Big Rapids plans to have open access to all users. The Manistee Riverwalk has throw rings for safety, memorial plaques on the benches, and a fish-cleaning site. Big Rapids Riverwalk will not have these features.

The following are some of the recommendations generated by this study:
• Riprap should be placed around the supports for the fishing platforms to prevent erosion of riverbed sediments
• The Big Rapids Riverwalk should design provisions that would benefit the visually impaired.
• No additional parking for Riverwalk is needed.
• The City of Big Rapids should contact the City of Manistee and other cities that have riverwalks to discuss the issues that have had with maintenance, public safety, and emergency medical services, and determine how these cities resolved those issues.
• Numbered or lettered post should be placed on Riverwalk for location and educational purposes.
1.0 Introduction

Communities develop near rivers for transportation, irrigation, commerce, access to drinking water, and waste disposal. The City of Big Rapids was no exception, having developed around the Muskegon River principally because of logging industry. Later, dams were built for hydroelectric power production. The Big Rapids community has used the Muskegon River for business and industry as well as recreation.

Plans were developed for a Riverwalk much like others built in Michigan, yet unique in providing barrier-free recreational paths and fishing access along the Muskegon River. The focus of the Big Rapids Riverwalk will be on the history, heritage, and recreational value of the Muskegon River to the Big Rapids community. Riverwalk will be located in Mecosta County, Big Rapids Township, T 15 N, R 10 W, Section 3, 10, and 11 in the City of Big Rapids, and will extend from the Maple Street Bridge to Northend Riverside Park.

During summer 2002, the Ferris State University Environmental Management Studies Center (FSUEMSC) conducted an environmental assessment of the proposed Riverwalk and surrounding area. This environmental assessment focused on the historical, cultural, social, physical, and biological aspects that the project will have on the community and the environment. Information for the assessment was obtained through library research, fieldwork, the internet and interviews.

FSUEMSC students were divided into two groups, one group evaluating the historical, social, and cultural aspects and the second group evaluating the physical and biological aspects. The two reports were then edited, condensed, and combined to form this document.

2.0 Project Description

2.1 Idea and Description

In the 1960's, the City of Big Rapids planned to designate the Upper Dam and reservoir areas of the Muskegon River as a nature center (Whitewater Park) after the Upper Dam was removed. Whitewater Park began as a feasibility study that was financed by various grants. The concept never became a reality because city officials decided to divert the grant money toward road repairs and upgrading utilities. (28, 31)

Prior to the Upper Dam remnant removal in summer 2000, Dr. Jerome Conrad, an Orthopedic Surgeon and resident of Big Rapids, visited Manistee, Michigan. Impressed by their riverwalk, he thought that a similar riverwalk would benefit the Big Rapids community. He formed a 23 member Big Rapids Riverwalk Committee, which held its first meeting in January 2000. The purpose of the committee was to raise funds and begin planning for something unique, one of the few handicapped accessible riverwalks in the Midwest. Although intended to be accessible to all handicapped individuals, no provisions have been made for the visually impaired. (23)
The Riverwalk Committee envisions a total of three phases of construction. Phase One will stretch from Maple Street Bridge to Northend Riverside Park. Phase Two will extend the pathway north along the west bank of the Muskegon River from the west pedestrian bridge constructed in Phase One to the former dam remnant site north of Baldwin Street. Phase Three would extend the pathway south under Maple Street Bridge to Highbanks Park.

Phase One has been funded by grants from the Michigan Department of Natural Resources and the Great Lakes Fisheries Trust, and donations from the City of Big Rapids and the community. Because only Phase One has been funded for construction, the description that follows will address Phase One only.

2.2 Pathway Description

Phase One of Riverwalk will be a 1.4-mile pathway extending north from the west abutment of Maple Street Bridge to Northend Riverside Park (Figure 2.1). Ninety-two percent of the pathway will be paved with hot mix asphalt (mineral aggregate coated and cemented with asphalt cement). Soil sterilizers, herbicides with long-term residual effects, will be applied under the pathways to prevent plant growth through the asphalt. All planted vegetation will receive fertilizer initially to stimulate growth. One hundred seventy-five linear feet of boardwalk, 270 linear feet of bridge deck, three fishing platforms, and many handrails will be made from Chromated Copper Arsenate (CCA) treated wood. In this treatment CCA is pressure injected into the wood. Pressure treated lumber requires lower maintenance and has a lifespan of 7 to 12 times that of untreated wood. Pressure treated lumber is available at lumberyards and has been used extensively for years for outdoor projects in both public and private sectors. (11, 12, 20, 21)

Maple Street to Hemlock Park: Riverwalk begins at Maple Street and descends to Hemlock Park. This promenade, or walkway, will be built over an existing grassy path and will include a sitting area at the summit and a scenic overlook mid-way to ease the descent/ascent. An asphalt path will follow the west bank of the Muskegon River through Hemlock Park where some foliage will be removed, two timber fishing platforms constructed (Figure 2.2 on page 4), new picnic tables installed, and grills and swings relocated. The two 14.5 x 11-foot fishing platforms will be constructed of CCA-treated lumber with 12-inch diameter timbers driven for supports. (21)

Hemlock Park to Middle School: Leaving Hemlock Park and crossing the existing Mitchell Creek bridge, the path will continue along the west bank of the Muskegon River to the location of the proposed pedestrian bridges behind Big Rapids Middle School. Concern for long-term structural stability of Mitchell Creek Bridge has prompted some discussion about replacing that bridge in the future. North of Mitchell Creek a 9 x 11-foot fishing platform will be constructed of compacted aggregate (gravel) surrounded by large boulders (Figure 2.3 on page 4). (21, 23)
Figure 2.1

Northend Riverside Park

Fishing Platform

Swede Hill Park

Baldwin Street Bridge

Sawmill Tube and Canoe

Muskegon River

River Rock

Boardwalk

Big Rapids Middle School

Pedestrian Bridges

Existing Pedestrian Bridge

Fishing Platforms

Mitchell Creek

Hemlock Park

Maple Street Bridge

Key

- 10' Asphalt Path
- Boardwalk

Big Rapids Riverwalk Phase One. (21, 39)
Figure 2.2

Proposed fishing platforms for Hemlock Park. (21)

Figure 2.3

Proposed aggregate fishing platform behind Big Rapids Middle School. (21)
Middle School to East Bank: A 110-foot prefabricated steel bridge with CCA treated wood decking will connect the west bank of the river to a deck constructed of timber on the south end of the island (Figure 2.4). Access to the island via the resting deck is not planned for Phase One. A 140-foot bridge will connect the resting deck to a wooden overlook platform on the east bank of the river. The two pedestrian bridges will be attached to supports on the riverbanks and the island. The supports will be reinforced concrete guarded by riprap. The riprap will extend from the support footings outward for a minimum of ten feet over the exposed slopes. (13)

![Figure 2.4](image)

Proposed location of pedestrian bridges for Riverwalk. (21)

East Bank to Baldwin Street: A timber boardwalk 175 lineal feet in length will connect the overlook platform to an asphalt path. The asphalt path will follow the undeveloped Race Street right-of-way north to Baldwin Street. A bench for resting will be constructed on the east side of the path approximately halfway to Baldwin Street. (13)

Baldwin Street to Northend Riverside Park: From Baldwin Street north, the path will follow the east bank of the river through Swede Hill Park and past the location of the former dam. Here a 10 x 30-foot wooden fishing platform extending into the river will be constructed where the bank is covered with large rocks (Figure 2.5 on page 6). This platform will be supported by steel supports. The asphalt path will continue north, past the fishing platform, and connect to the existing Northend Riverside Park trail. (13)
3.0 Approval Process

Once the plans for Riverwalk were developed, the Riverwalk committee applied to the Michigan Department of Natural Resources for grant funds. The MDNR approved $493,000 for construction of Riverwalk, pending the Michigan Department of Environmental Quality’s permits. (23)

The MDEQ issues permits for structures in river floodways and floodplains to ensure that the structures are properly constructed and to prevent changes in the floodplain that might endanger other structures or cause environmental damage. The 100-year floodplain is the area that would be inundated by water during a flood event that has the possibility of happening once every 100 years or a 1% chance each year. The 100-year floodplain level
is influenced by many factors including hydrogeology, soil types, topography, precipitation, and historical flood events. The Federal Emergency Management Agency (FEMA) constructed a 100-year floodplain map for Big Rapids in 1986. However, they did not establish numerical floodplain elevations. Without numerical elevations from FEMA, Prein & Newhof established a floodplain level for the Muskegon River based on information from a United States Geological Survey (USGS) study of the removal of the remnant of the Upper Dam. Prein & Newhof calculated the 100-year floodplain elevation at the location of the proposed pedestrian bridges to be at 885.3-feet above mean sea level (MSL). (27, 29, 48)

Prein and Newhof applied on May 1, 2002 for the Inland Lakes and Stream permit as required by Act 451 of the Public Acts of 1994. MDEQ is currently behind on reviewing permits, so the applications for the Riverwalk were not opened as of July 2002. (29, 48)

After the project is approved by the MDEQ, the City of Big Rapids has 45 days to give final approval before construction can begin. Since the city has been a major supporter of Riverwalk there are no anticipated problems obtaining approval. The approval process may delay construction until spring 2003.

4.0 History

4.1 Purpose and Scope

It is impossible to determine what the potential effects of a project will be on an area without looking at that area’s history. Consequently, the purpose of the history section was to research and document the history of Mecosta County and Big Rapids to determine what effects Riverwalk’s construction and use may have on the existing community.

The history portion of the assessment included the following areas: geological history, cultural history, and Big Rapids history. Geological history consists of the glacial, soils, and topography. Cultural history consists of Native American, fur trading, logging, and agriculture. Big Rapids history consists of development, transportation, bridges, dams, and Mecosta County Historical Museum.

4.2 Geological History

4.2.1 Glacial

The Wisconsin glacier, which consisted of the Saginaw Lobe and the Lake Michigan Lobe, covered the area which is now Mecosta County during the Pleistocene Era, approximately 10,000 to 12,000 years ago. As the lobes melted and receded, they left mounds, ridges, moraines, and other distinct accumulations of stratified glacial drift, as well as formed an outwash plain two to three miles wide (Figure 4.1 illustrates an outwash plain formation from glacial activity). The Muskegon River lies in this outwash plain. The different lobes of the Wisconsin Glacier were responsible for the differences
in soils found on opposing sides of the river. The Lake Michigan Lobe left its deposits in
Mecosta County's western four townships, while the Saginaw Lobe influenced the
landforms and subsequent soil types of the eastern twelve townships. (6, 18)

Figure 4.1

![Outwash plain illustration.](image)

4.2.2 Soils

The Riverwalk project area contains five general soil types: Coloma Sand with 0-6\%
slopes, Covert Sand with 0-3\% slopes, Algansee Loamy Sand with 0-3\% slopes,
Glendora Loamy Sand nearly level, and Psammaquents nearly level. (13)

Soil borings shown in the construction plans for Riverwalk indicate that the asphalt path
and bridge supports will be built over soils with a water table deeper than five feet. A
water table deeper than five feet generally presents no problem for construction or
maintenance of these types of projects. (21)

The soil located at the proposed Maple Street promenade, Hemlock Park, pedestrian
bridges, and Swede Hill Park consists of Algansee Loamy Sand and Glendora Loamy
Sand. In these soils water percolates slowly, which leads to greater capacity to hold
water on the surface. Runoff is slow due to gentle slopes. Vegetative cover and/or
containment are necessary when used for recreational purposes to prevent erosion. (13)

Soil found north of Mitchell Creek behind the Big Rapids Middle School is classified as
Psammaquents. This soil type is characterized by shallow layers of sand over wet
mineral or muck soil. Surface runoff is slow due to nearly level slopes. However, upper
sand layers percolate water rapidly, limiting surface holding capacity. This type of soil may form depressions or ruts when used for recreational purposes. (13)

Coloma and Covert Sand extend north and south of Baldwin Street. These soils percolate water rapidly, limiting surface holding capacity. Erosion potential is high because sand grains are dry and loosely packed. Vegetative cover and/or containment are necessary when used for recreational purposes to prevent erosion. (13)

4.2.3 Topography

Topography describes or represents features and configuration of land surfaces. Mecosta County, including the study area of the proposed riverwalk is characterized by a diverse topography including rolling hills and level areas, consistent with glacial activity. Mecosta County is in the hilly moraine region in Michigan. (21, 52)

Moraines are low ridges, and the area between them is often much flatter and is generally composed of outwash plains or ground moraines. The region, including the study area, can be characterized as gently rolling to hilly with a considerable amount of relatively level topography. (52)

The Maple Street promenade area is a smooth downhill slope descending from approximately 924 feet to 890 feet above MSL. This drop occurs over a distance of 600 feet horizontally for a 5.7% slope. (21)

Since Hemlock Park is a human-altered area, it is relatively flat with gentle slopes. Its elevation is approximately 885 feet above MSL, varying by not more than a foot throughout the park. (21)

The area behind the Big Rapids Middle School is very similar to the area in Hemlock Park. However, there is a small ditch (located approximately 200 feet perpendicular to and on the west bank of the river). The ditch is three to four feet below the average elevation of the area (885 feet above MSL). (21)

The island on which the supports for the pedestrian bridges will be built is located approximately 75 feet from the west bank of the Muskegon River and 50 feet from the east bank of the river. Its elevation is about 896 feet above MSL. The topography of the island is relatively level. (21)

The river’s east bank topography, near the proposed pedestrian bridge, fluctuates between 890 and 905 feet above MSL. This area is mostly wooded with some marshy areas. There is also a depression, which is the remains of a drain from a raceway, about ten feet wide, that exists in this wooded area that has a large hill on one side with a smaller hill on the other side. This depression is non-vegetated and generally very muddy with the rainwater from both the large and the small hill running off into it. Standing water is common in this area. The average elevation in this area is 889 feet above MSL. The large hill is approximately 920 feet above MSL with its base in the depression at about
885 feet. The smaller hill, which levels out into the average elevation, is roughly four feet high above the depression. This makes the depth of the depression three to four feet deeper than the average elevation in the area. The pathway from the wooded area to Baldwin Street is reasonably flat with an elevation varying from 894 to 896 feet above MSL. (21, 35)

Swede Hill Park is flat topographically because it is another human-altered environment. However, there is a steep slope on the riverbank. The flat areas have an elevation of about 1000 feet, and the water’s edge is around 885 feet above MSL. There is also a wetland consisting of ponded water located in this area at 888 feet above MSL. (21)

From Swede Hill Park to Northend Riverside Park, the topography is very flat, since this is the area where the sediment had been deposited from the Upper Dam. The elevation in this area is 895 feet above MSL. (21)

4.3 Cultural History

4.3.1 Native Americans

Prior to 1850, members of the Ojibwa tribe inhabited Mecosta County. There is some disagreement in the historical papers as to whether Native Americans were permanent residents or just established temporary camps in Mecosta County. According to Ross, Nisbett relates that there is one reference to a native village not far south of present day Big Rapids, but it cannot be determined if this settlement came into being before or after arrival of the European settlers. The Ojibwa used Mecosta County for hunting, fishing, and raising crops. They created openings by deliberately setting fires to enhance game populations, particularly white-tailed deer (*Odocoileus virginanus*). (6, 18)

4.3.2 Fur Trading

The earliest fur trading began in Michigan around 1634. The fur trade reduced populations of fur-bearing mammals over much of the northern United States and Canada. French, English, American, and other independent traders sought fortune in the fur industry. Native Americans were willing partners in the fur trade. At the end of the seventeenth century, the profits from the fur trade were falling because of lack of the beaver (*Castor canadensis*) pelts. (6)

The philosophy of the fur traders and independent fur trappers was “kill as long as there are animals to kill.” (6) This philosophy caused population levels of many animals to drop to levels close to extinction. The same philosophy that was applied to the fur trade was applied to the forests by the lumber barons. (6)

4.3.3 Logging

Logging began in Mecosta County in the mid-1800’s. Many early settlers viewed the use of forest resources as their only means of financial support. The Michigan lumber boom
surpassed the California gold rush by more than a billion dollars in total revenue. The largest markets for Michigan lumber were for the rebuilding of Chicago after the Great Fire of 1871, house building by the pioneers settling in the Great Plains, and for railroad ties. Michigan’s pine forests were expected to take 500 years to harvest but the forests were gone in 60 years and the logging era occurred before the chainsaw was even invented. (3, 6)

Before the railroads, only white pine (Pinus strobus) trees were cut because they were one of the few species of trees that would float high enough in the water. The primitive saws and axes available at the time made harvesting of hardwood trees difficult. Hardwoods were not commonly harvested until the supply of pines was exhausted. When the railroads entered the area after 1869, it meant that trees in remote locations could be cut and transported. This resulted in the remaining standing timber covering Michigan being cut. (6)

In the beginning, lumbering was a winter activity. Lumber camp crews, also known as “shanty-boys,” were largely farmers from farther south who spent the winter months in the camps. Trees were cut by hand saw and ax, and then hauled to the rivers on large

**Figure 4.2**

A former Big Rapids resident claimed that this log railway was located on the east bank of the Muskegon River in the vicinity of present day Parkview Village.

Log roll-a-way, Date Unknown. (5)

sleds pulled by oxen or draft horses. Early operations remained small and close to the water sources used to float logs to mills. Logs were stacked at various sites and at roll-a-ways (Figure 4.2) on high banks above the Muskegon River. (6)
A roll-a-way was a high area along a riverbank that was cleared of trees, so logs could be dumped into a river or stream. Logs were laid perpendicular to the stream on steep banks, and also anchored on the bank parallel to the river. During the winter cutting season, logs were hauled to and piled along the bank at the roll-a-way until spring floods, when they were dumped down the roll-a-way to be floated down the river to the mills. To keep track of each owner’s logs, both ends of the log were “branded” with a distinct log mark indicating the lumber company that cut the log. Several examples of these can be seen in Figure 4.3.

At the mills, “booming” companies sorted the logs into holding pens. From the pens, the logs were sent to the mill for cutting into planks. Only then were the cutting company and the lumberjacks paid.

A big business was log rustling, which involved cutting off the branded ends of the logs and replacing the brand with that of another company. Stealing logs and other fraud was out of control even after state regulations were established.

Figure 4.3

Examples of log marks from Michigan.
Lumbering operations caused extensive damage to the Muskegon River. Whole crews of lumbermen worked the banks of the river to widen and deepen channels and to remove trees lodged in the banks. During logging drives, logs scoured gravel from the river bottom eliminating spawning and feeding habitat needed by fish, and destroying wetlands used for waterfowl nesting. Aquatic invertebrate life was also adversely affected, and insect-dependent birds and other wildlife lost habitat and food sources. The water became turbid with silt and sand that settled to cover the gravel bottom. Waste bark and sawdust were routinely dumped into the river, which then settled in slow moving parts of the river and decayed, lowering the oxygen content of the water. In addition, dams warmed the water and prevented fish from migrating upstream to spawn. (6, 16)

Erosion from the deforested land changed the chemistry and clarity of the water. Protective vegetation was lost because of damage to stream banks by log scour. The widened channels reduced the ability of the river to carry sediment. The shallower, wider channels and lack of overhanging vegetation caused warming of the water. This resulted in the loss of many species of fish that needed clear cold water in which to live and reproduce. (6)

On the land, logging operations tore up and dried the exposed soil and damaged smaller uncut trees and saplings. Changes in light intensity injured and killed understory plants needing shade. Invading weed species grew faster because they were more adapted to disturbed areas and brighter light than forest species. This changed the composition of the flora. (6)

Around 1906, the very last of the local lumber was gone, and the lumber barons found themselves with huge land holdings that were not worth the taxes. Much of the land that wasn’t sold defaulted to the state Public Domain Commission’s hands as tax delinquent property. These lands became the basis for many of our state forests, game areas, and parks. (6)

4.3.4 Agriculture

At the end of the lumber era, vast stump fields remained in the rocky and sandy glacial soils. Large-scale growing of crops could not be attempted until the stumps and rocks were removed. The earliest farmers were lumberjacks who often used farming to supplement the lack of a paycheck during the summer months. They tilled the soil between the stumps or laboriously dug them out. The development of mechanical stump pullers (see Figure 4.4) and the use of dynamite greatly eased the backbreaking labor of stump removal, and hastened the turning of the land into true farmland. Steam-powered tractors, available at the turn of the twentieth century, were also an improvement. This was followed by the arrival in 1914 of gas-powered tractors and combines. (6)
Many early farms were more like ranches to the owners, who contracted with local managers to run them. At the beginning of the 1900’s, sheep farming was a big business. However, beginning in 1911, local sheep farms began converting to cattle when sheep farming shifted west. About the time of World War II, dairy farming became the most profitable farming enterprise in Mecosta County and continues to be to this day. Other farmers raised shorthorn cattle, chickens, hogs, and horses. (6)

The new steam- and later gas-powered tractors eased the burden of farming, and more acreage could be effectively managed. Improved all-weather paved roads began to enter the area in the mid-1920’s, increasing the farmer’s ability to market his crops. Rural electrification, begun in the 1930’s, brought the first electric conveniences to the rural scene although these had been available in the cities for some time. (6)

Presently most of the farms in Mecosta County are small-scale family dairy farms that raise hay and feed corn to feed their cows. There are also large contract farms that grow beans, wheat, sorghum, or potatoes for large corporations. Crops grown in Mecosta County in 1998 included asparagus, beans, carrots, cucumbers, corn, hay, oats, potatoes, sorghum, winter wheat, sweet corn, strawberries, raspberries, melons, squash, and pumpkins. Maple syrup is harvested on a small scale. Christmas trees are also grown on several sizeable plots scattered in the county. Large-scale pig farming has begun to enter the county’s agricultural picture, with several new facilities being built in 1998-1999. (6)
4.4 Big Rapids History

4.4.1 Development

Mecosta County was officially established in 1859 due to the expansion of the lumber industry in northern Michigan and its location on the Muskegon River with respect to railroad access. Mecosta County was named after a Potawatomi Chief. Mecosta is a Potawatomi name meaning "bear cub." There were several factors encouraging people to settle in the Michigan Territory (present day Michigan and Wisconsin) and ultimately to Mecosta County. These include the following: the opening of the United States Government’s Land Offices, which offered the land in the Michigan Territory to veterans of the War of 1812 as a bonus for serving their country. The opening of the Erie Canal in October 1825 provided the first relatively fast and inexpensive means of transport for goods to the Midwest. The lumber boom, which resulted from the removal of the timber by the lumbering operations, cleared the land for agriculture use. (6, 50)

Additional settlement followed quickly on the heels of the lumbering operations, with a number of early businesses specializing in trades related to the lumber companies. After the lumber resources were depleted, lumber barons sold out quickly to settlers and land speculators. (6)

Settlers, arriving daily, were mainly from Ohio and Indiana, having left those states in what was referred to as a “tax revolt.” They felt their taxes were too high and opted to move in lieu of paying them. (6)

The first Caucasians to settle in Mecosta County arrived in the early 1840’s, as lumber operations from Newaygo County moved into Mecosta County. In 1851, John Parish, a bachelor fur trapper, and John Davis and his family were the first permanent white settlers. Other early settlers were William and Margaret Brockway, George French and family, and Robert Mitchell. (6, 42)

The first official census figures, taken in 1860, listed the population of Mecosta County as 965. The county population increased to 20,693 according to the 1900 census. The population declined steadily until the 1940’s, due to the ending of the lumbering era. By 1960 the population of Mecosta County was 21,051. The 2000 census set the population of Mecosta County at 40,553. (6, 10, 28) Figure 4.5 illustrates the increase in population from 1900 to 2000.

The population of Mecosta County and Big Rapids in particular increased rapidly after World War II, as Ferris Institute (now Ferris State University) expanded due to the influx of GI Bill students, the baby-boomer generation reaching college age and the increase in the number of Ferris staff and faculty needed to keep pace with increased enrollment. Much of the rural land became dotted with homes as small new development areas built up. Individual homes were built on lots carved out of larger holdings. Lake and riverfront properties were rapidly bought and developed, and “urban” sprawl crept outward from the towns. The Canadian Lakes Development has become the largest
single residential area in Mecosta County with a summer population of over 40,000. Other large residential developments include Chippewa Lake, Martiny Lakes, and the Tri-Lake area. (6, 22)

4.4.2 Transportation

The County’s first roads were crude wagon tracks. At the time of early settlement of the County, lumbermen and settlers entered Mecosta County from Newaygo County. (6)

In Mecosta County, the settlers did not use the Muskegon River for transportation, though it was navigable from Muskegon to Newaygo County for shipping. (6)

The railroad was a great benefit to Michigan, as it served as the first mass transportation system for the area. As many as twenty trains daily moved through Big Rapids on both the north-south (which came north from Indiana and traveled through Grand Rapids to Big Rapids) and east-west routes (which came from Newaygo County). The arrival of railroads, brought in the bulk of settlers, took out the bulk of the county’s lumber and opened up the lumbering operation to the rural areas of softwoods and hardwoods. (6)

The US-131 corridor, which presently traverses the western four townships of Mecosta County, was opened in the early part of the twentieth century and paved in 1938. It was the first significant road in the county and it would accommodate the coming of the automobile age. Other road improvements and automobiles ultimately doomed the railroads. (6)
M-20, built in the 1950's, is the other major road that travels through Big Rapids. It is an east-west route that starts near Lake Michigan on Highway 31 (South of Shelby, Michigan), travels east through Hesperia and White Cloud before intersecting with US-131. It is then rerouted north through Big Rapids, where it continues on an easterly direction through Mt. Pleasant and Midland where it ends. (46)

4.4.3 Bridges

The Maple Street Bridge was the first bridge connecting the east and west sides of Big Rapids. The first Maple Street Bridge, erected in 1860, was a wooden framed bridge, located in close proximity to the current Maple Street Bridge. In 1887 the Maple Street Bridge was reconstructed using wrought iron instead of wood. (17)

In 1933 the Maple Street Bridge was remodeled, when a wider deck was constructed on top of the old trusses. In 1984 a large crack was discovered in the west pier and the pier was banded to strengthen the structure. (17)

In February 1984, Jutton-Kelly Construction Company from Novi, Michigan began constructing the current Maple Street Bridge. While constructing the current Maple Street Bridge, the banded pier of the old Maple Street Bridge deteriorated more rapidly than anticipated. The old bridge was immediately closed to vehicular and pedestrian traffic due to this deterioration and later reopened to pedestrian traffic only. In 1985 the present Maple Street Bridge was completed. (17) Figure 4.6 is a photograph of the construction of the current Maple Street Bridge in proximity to the old bridge.

Figure 4.6

[Image of construction site]

Construction of current Maple Street Bridge in proximity to old bridge. Photo taken facing west. 1984. (17)

The Baldwin Street Bridge, also known as the Pere Marquette Bridge, is the second bridge connecting the east and west sides of Big Rapids. The first Baldwin Street Bridge
was built in the 1870’s and was constructed of wood. Prior to 1890, the bridge was rebuilt three times due to ice problems, needed maintenance and log and ice jams. Each time wood was used in construction. The first steel bridge was constructed in 1890. The current Baldwin Street Bridge was rebuilt in 1965 after an ice cream truck, exceeding the bridge’s weight limit, caused the bridge to collapse. (5, 31)

4.4.4 Dams

The Tioga Company Dam, or Upper Dam, constructed in 1866 by F.H. Todd & Company and owned by J.Miines, was the first documented logging dam. It was a crib dam constructed of logs and rocks. Until 1907, the dam was used to raise the river’s water level to form an impoundment behind the dam in order to sort logs. (15, 18)

From 1889 to 1912, when the dam washed out, the Tioga Company Dam was also used to generate electricity. In 1914, Consumers Power Company, the City of Big Rapids, Tioga Manufacturing, Hanchett Manufacturing, and the Hood & Wright Corporation formed the Big Rapids Water Power and Development Company. This company constructed a new hydroelectric dam to replace the old Tioga Company Dam. This new dam, or Upper Dam, was an earth filled, reinforced concrete dam with a 17.7-foot head. (15, 18) A photograph of this dam can be seen in Figure 4.7.

Figure 4.7

![New Cemen Dam, 10 Feet High, Built by the Big Rapids Water Power Co., Big Rapids, MlC.](image)

Big Rapids Upper Dam and Railroad Bridge. Photo taken facing North, Date Unknown. (41)

In the 1960’s, the Upper Dam was declared to be structurally unstable. In 1965, the Big Rapids Water Power and Development Company was forced by the Department of
Conservation, to shut down hydroelectric generation. In 1966, the City of Big Rapids contracted Keith's Heavy Movers to demolish the Upper Dam for $20,000. (15, 18)

Explosives were used to remove the dam because it was inexpensive and less time consuming. No study was conducted prior to using this method of removal nor were the effects of a sudden release of sediment downstream taken into account. The sediments traveled downstream, flooding a subdivision, and creating islands in the river. The upper Dam was only partially removed because the company went bankrupt. (18)

In 1976, the City of Big Rapids purchased the remnant of the Upper Dam and six adjacent parcels of land for $6,000. Between 1976 and 2000, at least two people lost their lives because of hazards related to the dam remnant. (18, 34)

In 1995, the City of Big Rapids proposed removal of the dam remnant, thereby mitigating the safety hazard. The City of Big Rapids worked with grant funding awarded by the Michigan Department of Environmental Quality (MDEQ), the Great Lakes Protection Fund (GLPF), the National Fish and Wildlife Foundation, and the Great Lakes Fisheries Trust (GLFT) to remove the dam remnant. Two awards were granted to the Dam Remnant Removal Project: Michigan Chapter of American Public Works Association (2001 Project of the Year for Disaster less than $2,000,000) and the Great Lakes Fisheries Trust (2000 Project of the Year). (18, 41) Figures 4.8 and 4.9 show the same area on the river before and after the removal of the Upper Dam remnant in 2000.

Figure 4.8

Upper Dam Remnant photo taken from the west bank facing east. March 23, 2000. (41)
In 1870-1871 a second dam was built on the Muskegon River. It was called the Lower Dam, or the George B. Warren Dam. It was built by Warren and Bronson. Figure 4.10 is a photograph of the Lower Dam. The Lower Dam was a log-sorting dam, which spanned the Muskegon River near the site of the current River Street Park. Today, many refer to this dam as the Donley Dam. The dam could have obtained the name, Donley Dam, because by 1900 the Donley Light Company withdrew water from the river and generated direct current (DC) power primarily for industry. It also served as the electricity source for the twelve light bulbs that first illuminated downtown Big Rapids. It is not known when and how the Lower Dam was taken out or washed away. Today only a trace of this dam remains. (5, 6, 37)
4.4.5 Mecosta County Historical Museum

The Mecosta County Historical Museum, located on the northeast corner of Elm Street and Stewart Avenue, was built as a residence in 1885 and was owned by the McNaughton Family. The home was later owned by the Fitch Phelps family who donated it to the City of Big Rapids to be used as a library. The library was known as the Phelps Free Library for many years. In 1964, the Library was relocated and the Mecosta County Historical Museum was established in place of the Library. (42)

The Museum is not in a prime location that encourages visitors. With Riverwalk being constructed along the Muskegon River, locating the museum close the Riverwalk would increase accessibility and the public’s awareness of Big Rapid’s history. The Department of Natural Resources (DNR) is currently drafting a letter to the City of Big Rapids requesting them to accept the old railroad depot, located on Maple Street and along the White Pine Rails to Trails, for use as a logging and railroad history museum. The Mecosta County Historical Society plans on using the depot to exhibit the railroad and logging history that is currently on display in the Mecosta County Historical Museum. All other historical displays will remain in the Museum. (33)

5.0 Biological Assessment

5.1 Purpose and Scope

The focus of the biological assessment was to determine and describe the existing habitat types along Riverwalk, and to identify plant and animal life in the Riverwalk study area. Students and faculty conducted a partial inventory of the plant and animal species in the study area to determine if any Species of Special Concern, Threatened, or Endangered plants or animals might be affected by the construction or use of Riverwalk.

5.2 Habitat Types

5.2.1 Woodlands

Michigan has at least eight major climax forest associations including both conifer and hardwood climax communities. Hardwoods are deciduous trees, dropping their leaves in the fall. Hardwoods typically are heavily branched, and have leafy crowns with considerable lateral (decurrent) growth. Most hardwoods have soft green leaves, and a deep running taproot. Hardwoods are angiosperms, and their seeds are enclosed in fruits, nuts, and berries. Oaks (Quercus sp.), elms (Ulmus sp.), maples (Acer sp.), beeches (Fagus sp.) and sycamores (Plantanus sp.) are common deciduous trees in the Midwest region. (2)

Conifers are shallow-rooted plants adapted to acidic soil conditions. Most evergreens, or conifers, maintain spike leaves or needles all year round. A waxy covering insulates the needles of evergreens and enables them to survive harsh weather and grow in sites that
are inhospitable to hardwoods. Conifers are gymnosperms and contain their seeds in cones. (2)

Mecosta County lies within a vegetative zone referred to as the tension or transition zone, where the oak-hickory climax forests of southern Michigan become the pine and beech-maple climax forests of the north. The transition zone is approximately 60 miles wide, beginning in Muskegon County and proceeding northeasterly through Mecosta County to Bay County. (6) Changes are apparent within the transition zone even though the vegetational component has been greatly modified by humans. Oaks give way to beech-maple and naturally seeded pines begin to appear within the transition zone. Much of the diversity of the plant and animal life in Mecosta County is due to the overlap of southern and northern plant communities. (2, 6) Figure 5.1 illustrates the different vegetative zones along Riverwalk.

5.2.2 Wetlands/Swamps/Aquatic Habitat

Wetlands are habitats that contain water-saturated soil most of the year. There are six categories of wetlands: lakeshore, river or stream bank, pond, bog, marsh, and swamp. Wetlands in the study area consist of riverbank and pond. Wetlands generally contain a diverse plant community due to many factors including the nature of the land-water interface or the effect of site factors such as climate, soil type, source of water, and amount of sunlight. When left undisturbed, wetlands are stable environments, capable of maintaining constant environmental conditions. However, emerging man-made conditions including drainage, run-off, siltation, and pollution are causing environmental changes. (2)

5.2.3 Grasslands/Open Field

In Mecosta County, many of the open fields are old farm fields containing a wide variety of native and non-native weeds and grasses. They often have scattered small black cherry (Prunus serotina) and autumn olive (Elaeagnus umbellate) trees. Old fields, or open lands, are important to many species of wildlife, including migrating birds and many mammals. Old field habitat is common in Mecosta County due to the patchwork nature of agricultural lands and forest. The mixture of habitat types is largely responsible for the large deer herd in the County, since white-tailed deer (Odocoileus virginianus) prefer early to mid-succession vegetation for food and cover. There is only one area that can be considered old field habitat along Riverwalk. This area is immediately south of the beginning of Riverwalk in Northend Riverside Park. (6)

Much of the area of Riverwalk from Northend Riverside Park to the old dam site was underwater until 1965 when the dam was removed, so the vegetation is primarily black willow (Salix nigra) (Figure 5.2), cottonwood (Populus deltoides), big-toothed aspen (Populus grandidentata), trembling aspen (Populus tremuloides), green ash (Fraxinus pennsylvanica), and grasses like reed canary grass (Phalaris arundinacea). Shrubs include a large number of honeysuckle (Lonicera americana). In the grasslands (old field habitat) north of the old dam site
Figure 5.1

Key

- Phase I
- Woodland
- Grassland/
- Open Field
- Wetland

Vegetational zones. (39)
there are many flowers including mustard (*Brassica kaber*), goldenrod (*Salidago canadensis*), and mullein (*Verbascum thapsus*) (Figure 5.3). By the small pond, and in the marshy area, one can find cattails (*Typha latifolia*), and forget-me-not (*Myosolis scorpioides*). As Riverwalk proceeds south of Baldwin Street, the boardwalk goes through hardwoods including oak, maple, locust (*Gleditsia triacanthos*), and cottonwood. In Hemlock Park area large black willows and cottonwoods can be found. (2)

5.3 Plants

The river corridor through Big Rapids supports an abundant population of plant and animal life. To determine the existing habitat and identify possible endangered species in the study area, the FSUEMSC conducted a partial inventory of the plant and animal species in the study area. This was accomplished by fieldwork and library research.

![Figure 5.2](image1)

**Figure 5.2**

Black Willow in Hemlock Park, photo taken facing east on June 7, 2002.

![Figure 5.3](image2)

**Figure 5.3**

Mullein on the base of the west slope of the hill located just east of the dam remnant removal site, photo taken facing east on June 12, 2002.

There is a wide variety of plants present along the proposed Riverwalk. Plants were categorized as: weeds (Figure 5.4), grasses and aquatic plants (Figure 5.5), shrubs (Figure 5.6), vines (Figure 5.7), and trees (Figure 5.8). FSUEMSC students conducted the inventory from May 28 to June 9, 2002.
Figure 5.4: Weeds (2, 4, 7, 8, 18)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
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<tbody>
<tr>
<td>Black Medick</td>
<td><em>Medicago lupulina</em></td>
</tr>
<tr>
<td>Black Mustard</td>
<td><em>Brassica nigra</em></td>
</tr>
<tr>
<td>Black-eyed Susan</td>
<td><em>Rudbeckia hirta</em></td>
</tr>
<tr>
<td>Blue Vervain</td>
<td><em>Verbana hastate</em></td>
</tr>
<tr>
<td>Bracken Fern</td>
<td><em>Pteridium aquilinum</em></td>
</tr>
<tr>
<td>Bramble</td>
<td><em>Rubus fruticosus</em></td>
</tr>
<tr>
<td>Brier Rose</td>
<td><em>Rosa canina</em></td>
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<tr>
<td>Broadleaf Plantain</td>
<td><em>Plantago rugelii</em></td>
</tr>
<tr>
<td>Bull Thistle</td>
<td><em>Cirsium vulgare</em></td>
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<tr>
<td>Canada Anemone</td>
<td><em>Anemone canadensis</em></td>
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<td>Cardinal Flower</td>
<td><em>Lobelia cardinalis</em></td>
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<td>Chicory</td>
<td><em>Cichorium intybus</em></td>
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<td>Common Chickweed</td>
<td><em>Stellaria media</em></td>
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<td>Common Dandelion</td>
<td><em>Taraxacum officinale</em></td>
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<td>Common Yarrow</td>
<td><em>Achillea millefolium</em></td>
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<td>Cow Parsnip</td>
<td><em>Heracleum maximum</em></td>
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<td>Cuckooflower</td>
<td><em>Cardamine pratensis</em></td>
</tr>
<tr>
<td>Daisy Fleabane</td>
<td><em>Erigeron philadephious</em></td>
</tr>
<tr>
<td>Dame’s Rocket</td>
<td><em>Hesperis matronalis</em></td>
</tr>
<tr>
<td>Docks</td>
<td><em>Rumex crispus</em></td>
</tr>
<tr>
<td>Duckweed</td>
<td><em>Lemma sp.</em></td>
</tr>
<tr>
<td>Everlasting Pea</td>
<td><em>Lathyrus latifolius</em></td>
</tr>
<tr>
<td>Flat Top Aster</td>
<td><em>Aster umbellatus</em></td>
</tr>
<tr>
<td>Forget-Me-Not</td>
<td><em>Myosolis scorpioides</em></td>
</tr>
<tr>
<td>Goat’s Beard</td>
<td><em>Tragopogon dubius</em></td>
</tr>
<tr>
<td>Goldenrod</td>
<td><em>Salidago canadensis</em></td>
</tr>
<tr>
<td>Hoary Alyssium</td>
<td><em>Berteroa incana</em></td>
</tr>
<tr>
<td>Horse Mint</td>
<td><em>Glechoma hederaceae</em></td>
</tr>
<tr>
<td>Horsetail</td>
<td><em>Equisetum hyemale</em></td>
</tr>
<tr>
<td>Iris</td>
<td><em>Iris versicolor</em></td>
</tr>
<tr>
<td>Joe-pye</td>
<td><em>Eupatorium maculatum</em></td>
</tr>
<tr>
<td>Leafy Spurge</td>
<td><em>Euphorbia esula</em></td>
</tr>
<tr>
<td>Leek</td>
<td><em>Allium tricoccum</em></td>
</tr>
<tr>
<td>Milkweed</td>
<td><em>Asclepias syriaca</em></td>
</tr>
<tr>
<td>Moss</td>
<td><em>Bryophytes sp.</em></td>
</tr>
<tr>
<td>Mullein</td>
<td><em>Verbascum thapsus</em></td>
</tr>
<tr>
<td>Orange Hawkweed</td>
<td><em>Hieracium aurantiacum</em></td>
</tr>
<tr>
<td>Ox-eye Daisy</td>
<td><em>Chrysanthemum leucanthemum</em></td>
</tr>
<tr>
<td>Plantain</td>
<td><em>Plantago lanceolata</em></td>
</tr>
<tr>
<td>Poison Ivy</td>
<td><em>Rhus radicans</em></td>
</tr>
<tr>
<td>Common Name</td>
<td>Scientific Name</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Barnyard Grass</td>
<td><em>Echinochloa crusgalli</em></td>
</tr>
<tr>
<td>Broad-leaf Cattail</td>
<td><em>Typha latifolia</em></td>
</tr>
<tr>
<td>Bullrush</td>
<td><em>Scirpus sp.</em></td>
</tr>
<tr>
<td>Feather Grass</td>
<td><em>Phagmites communis</em></td>
</tr>
<tr>
<td>Quack Grass</td>
<td><em>Agropyron repens</em></td>
</tr>
<tr>
<td>Red Top</td>
<td><em>Triodia flava</em></td>
</tr>
<tr>
<td>Reed Canary Grass</td>
<td><em>Phalaris arundinacea</em></td>
</tr>
<tr>
<td>Timothy</td>
<td><em>Phleum pratense</em></td>
</tr>
<tr>
<td>Sandbur</td>
<td><em>Cenchrus longispinus</em></td>
</tr>
<tr>
<td>Sedge</td>
<td><em>Carex sp.</em></td>
</tr>
<tr>
<td>Wild Oat</td>
<td><em>Avena fatua</em></td>
</tr>
</tbody>
</table>

Figure 5.5: Grasses and Aquatic Plants (4, 8, 18)
### Figure 5.6: Shrubs (1, 2, 9, 18)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Yew</td>
<td><em>Taxus canadensis</em></td>
</tr>
<tr>
<td>Autumn Olive</td>
<td><em>Elaagnus umbellate</em></td>
</tr>
<tr>
<td>Blackberry</td>
<td><em>Rubus allegheniensis</em></td>
</tr>
<tr>
<td>Blueberry</td>
<td><em>Vaccinium corymbosum</em></td>
</tr>
<tr>
<td>Crawling Juniper</td>
<td><em>Juniperus virginiana</em></td>
</tr>
<tr>
<td>English Hawthorn</td>
<td><em>Crataegus sp.</em></td>
</tr>
<tr>
<td>Flowering Dogwood</td>
<td><em>Cornus florida</em></td>
</tr>
<tr>
<td>Honeysuckle</td>
<td><em>Lonicera americana</em></td>
</tr>
<tr>
<td>Raspberry</td>
<td><em>Rubus idaeus</em></td>
</tr>
<tr>
<td>Staghorn Sumac</td>
<td><em>Rhus typhina</em></td>
</tr>
<tr>
<td>Thimbleberry</td>
<td><em>Rubus parviflorus</em></td>
</tr>
</tbody>
</table>

### Figure 5.7: Vines (2, 4)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bindweed</td>
<td><em>Convolvulus septum</em></td>
</tr>
<tr>
<td>Cat Grape</td>
<td><em>Vitis palmate</em></td>
</tr>
<tr>
<td>Virginia Creeper</td>
<td><em>Parthenocissus quinquefolia</em></td>
</tr>
</tbody>
</table>

### Figure 5.8: Trees (1, 2, 9, 18)

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Basswood</td>
<td><em>Tilia americana</em></td>
</tr>
<tr>
<td>American Beech</td>
<td><em>Fagus grandefolia</em></td>
</tr>
<tr>
<td>American Crabapple</td>
<td><em>Malus coronaria</em></td>
</tr>
<tr>
<td>American Elm</td>
<td><em>Ulmus americana</em></td>
</tr>
<tr>
<td>American Sycamore</td>
<td><em>Platanus occidentalis</em></td>
</tr>
<tr>
<td>Alternate-leaf Dogwood</td>
<td><em>Cornus alternifolia</em></td>
</tr>
<tr>
<td>Austrian Pine</td>
<td><em>Pinus nigra</em></td>
</tr>
<tr>
<td>Big Tooth Aspen</td>
<td><em>Populus grandidentata</em></td>
</tr>
<tr>
<td>Black Ash</td>
<td><em>Fraxinus nigra</em></td>
</tr>
<tr>
<td>Black Cherry</td>
<td><em>Prunus serotina</em></td>
</tr>
<tr>
<td>Black Walnut</td>
<td><em>Juglans nigra</em></td>
</tr>
<tr>
<td>Black Willow</td>
<td><em>Salix nigra</em></td>
</tr>
<tr>
<td>Blue Spruce</td>
<td><em>Picea pungens</em></td>
</tr>
<tr>
<td>Box Elder</td>
<td><em>Acer negundo</em></td>
</tr>
<tr>
<td>Choke Cherry</td>
<td><em>Prunus virginiana</em></td>
</tr>
<tr>
<td>Eastern Cottonwood</td>
<td>Populus deltoides</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Green Ash</td>
<td>Fraxinus pennsylvanica</td>
</tr>
<tr>
<td>Hemlock</td>
<td>Tsuga canadensis</td>
</tr>
<tr>
<td>Honey Locust</td>
<td>Gleditsia triacanthos</td>
</tr>
<tr>
<td>Ironwood</td>
<td>Carpinus caroliniana</td>
</tr>
<tr>
<td>Jack Pine</td>
<td>Pinus banksiana</td>
</tr>
<tr>
<td>May Hawthorn</td>
<td>Crataegus aestivalis</td>
</tr>
<tr>
<td>Mountain Ash</td>
<td>Pyrus americana</td>
</tr>
<tr>
<td>Northern Pin Oak</td>
<td>Quercus palustris</td>
</tr>
<tr>
<td>Northern White Cedar</td>
<td>Thuja occidentalis</td>
</tr>
<tr>
<td>Norway Maple</td>
<td>Acer plantanoides</td>
</tr>
<tr>
<td>Norway Spruce</td>
<td>Picea abies</td>
</tr>
<tr>
<td>Pussy Willow</td>
<td>Salix discolor</td>
</tr>
<tr>
<td>Red Cedar</td>
<td>Juniperus communis</td>
</tr>
<tr>
<td>Red Maple</td>
<td>Acer rubrum</td>
</tr>
<tr>
<td>Red Oak</td>
<td>Quercus rubra</td>
</tr>
<tr>
<td>Red Pine</td>
<td>Pinus resinosus</td>
</tr>
<tr>
<td>Scotch Pine</td>
<td>Pinus sylvestris</td>
</tr>
<tr>
<td>Silver Maple</td>
<td>Acer saccharinum</td>
</tr>
<tr>
<td>Sugar Maple</td>
<td>Acer saccharum</td>
</tr>
<tr>
<td>Swamp White Oak</td>
<td>Quercus bicolor</td>
</tr>
<tr>
<td>Tag Alder</td>
<td>Alnus rugosa</td>
</tr>
<tr>
<td>Trembling Aspen</td>
<td>Populus tremuloides</td>
</tr>
<tr>
<td>White Ash</td>
<td>Fraxinus americana</td>
</tr>
<tr>
<td>White Birch</td>
<td>Betula papyrifera</td>
</tr>
<tr>
<td>White Oak</td>
<td>Quercus alba</td>
</tr>
<tr>
<td>White Pine</td>
<td>Pinus strobus</td>
</tr>
<tr>
<td>White Spruce</td>
<td>Picea glauca</td>
</tr>
<tr>
<td>Wild Apple</td>
<td>Malus sylvestris</td>
</tr>
<tr>
<td>Witch Hazel</td>
<td>Hamamelis virginiana</td>
</tr>
<tr>
<td>Yellow Birch</td>
<td>Betula lutea</td>
</tr>
</tbody>
</table>

5.4 Animals

FSUEMSC students and faculty observed the following vertebrate animals in the Riverwalk study area during the period of May 21 through June 18, 2002.

Particularly abundant along Riverwalk were song sparrows (*Melospiza melody*), red-winged blackbirds (*Agelaius phoeniceps*), brown-headed cowbirds (*Molothrus ater*), eastern towhees (*Pipilo erythrophthalmus*), gray catbirds (*Dumetella carolinensis*), northern cardinals (*Cardinalis cardinalis*), yellow warblers (*Dendroica petechia*), American redstarts (*Setophaga ruticilla*), and common yellowthroats (*Geothlypis trichas*). Both rough-winged (*Stelgidopteryx serripennis*) and bank swallows (*Riparia riparia*) were observed to nest in the banks of the river. A brood of Canada geese (*Branta canadensis*) and adults were frequently observed in the grassy area north of the
old dam site. Mallards (*Anas platyrhynchos*) were seen in the river, and belted
kingfishers (*Ceryle alcyon*), bald eagles (*Haliaeetus leucocephalus*), and ospreys
(*Pandion haliaetus*) were seen searching for prey in the river. Figure 5.9 lists all the
birds seen during the study period. (22)

**Figure 5.9: Birds (22)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Crow</td>
<td><em>Corvus brachyrhynchos</em></td>
</tr>
<tr>
<td>American Goldfinch</td>
<td><em>Carduelis tristis</em></td>
</tr>
<tr>
<td>American Redstart</td>
<td><em>Setophaga ruticilla</em></td>
</tr>
<tr>
<td>Bald Eagle</td>
<td><em>Haliaeetus leucocephalus</em></td>
</tr>
<tr>
<td>Bank Swallow</td>
<td><em>Riparia riparia</em></td>
</tr>
<tr>
<td>Barn Swallow</td>
<td><em>Hirundo rustica</em></td>
</tr>
<tr>
<td>Black-Capped Chickadee</td>
<td><em>Poeecile atricapillus</em></td>
</tr>
<tr>
<td>Blue-Winged Warbler</td>
<td><em>Vermivora pinus</em></td>
</tr>
<tr>
<td>Brown-Headed Cowbird</td>
<td><em>Molothora ater</em></td>
</tr>
<tr>
<td>Canada Goose</td>
<td><em>Branta canadensis</em></td>
</tr>
<tr>
<td>Cedar Waxwing</td>
<td><em>Bombycilla cedrorum</em></td>
</tr>
<tr>
<td>Chimney Swift</td>
<td><em>Chaetura pelagica</em></td>
</tr>
<tr>
<td>Common Grackle</td>
<td><em>Quiscalis quiscula</em></td>
</tr>
<tr>
<td>Common Yellowthroat</td>
<td><em>Geothlypis trichas</em></td>
</tr>
<tr>
<td>Eastern Belted Kingfisher</td>
<td><em>Ceryle alcyon</em></td>
</tr>
<tr>
<td>Eastern Bluebird</td>
<td><em>Sialia sialis</em></td>
</tr>
<tr>
<td>Eastern Kingbird</td>
<td><em>Tyrannus tyrannus</em></td>
</tr>
<tr>
<td>Eastern Towhee</td>
<td><em>Pipilo erythrophthalmus</em></td>
</tr>
<tr>
<td>European Starling</td>
<td><em>Sturnus vulgaris</em></td>
</tr>
<tr>
<td>Field Sparrow</td>
<td><em>Spizella pusilla</em></td>
</tr>
<tr>
<td>Gray Catbird</td>
<td><em>Dumetella carolinensis</em></td>
</tr>
<tr>
<td>Great Blue Heron</td>
<td><em>Ardea herodias</em></td>
</tr>
<tr>
<td>Green Heron</td>
<td><em>Butorides striatus</em></td>
</tr>
<tr>
<td>House Finch</td>
<td><em>Carpodacus mexicanus</em></td>
</tr>
<tr>
<td>House Sparrow</td>
<td><em>Passer domesticus</em></td>
</tr>
<tr>
<td>House Wren</td>
<td><em>Troglodytes aedon</em></td>
</tr>
<tr>
<td>Indigo Bunting</td>
<td><em>Passerina cyanea</em></td>
</tr>
<tr>
<td>Killdeer</td>
<td><em>Charadrius vociferus</em></td>
</tr>
<tr>
<td>Mallard Duck</td>
<td><em>Anas platyrhynchos</em></td>
</tr>
<tr>
<td>Mourning Dove</td>
<td><em>Zenaida macroura</em></td>
</tr>
<tr>
<td>Northern “Baltimore” Oriole</td>
<td><em>Icterus galbula</em></td>
</tr>
<tr>
<td>Northern Cardinal</td>
<td><em>Cardinalis cardinalis</em></td>
</tr>
<tr>
<td>Northern Rough-Winged Swallow</td>
<td><em>Stelgidopteryx serripennis</em></td>
</tr>
<tr>
<td>Osprey</td>
<td><em>Pandion haliaetus</em></td>
</tr>
<tr>
<td>Red-Winged Blackbird</td>
<td><em>Agelaius phoeiceus</em></td>
</tr>
<tr>
<td>Ring-Billed Gull</td>
<td><em>Larus delawarensis</em></td>
</tr>
</tbody>
</table>
Rose-Breasted Grosbeak | Pheucticus ludovicianus
Song Sparrow | Melospiza melodia
Spotted Sandpiper | Actitis macularia
Tree Swallow | Tachycineta bicolor
Warbling Vireo | Vireo gilvus
Yellow Warbler | Dendroica petechia
Yellow-Throated Vireo | Vireo flavifrons

The most common mammals observed along Riverwalk were white-tailed deer (Odocoileus virginianus), eastern cottontail rabbits (Sylvilagus floridanus), and fox squirrels (Sciurus niger). Eastern chipmunks (Tamias striatus) were frequently seen in the forested sections of Riverwalk. A complete list of mammals observed by FSUEMSC students and faculty appears in Figure 5.10. (22)

**Figure 5.10: Mammals (22)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>13-Lined Ground Squirrel</td>
<td>Spermophilus tridecemlineatus</td>
</tr>
<tr>
<td>Eastern Chipmunk</td>
<td>Tamias striatus</td>
</tr>
<tr>
<td>Eastern Cottontail Rabbit</td>
<td>Sylvilagus floridanus</td>
</tr>
<tr>
<td>Fox Squirrel</td>
<td>Sciurus niger</td>
</tr>
<tr>
<td>Muskrat</td>
<td>Ondatra zibethicus</td>
</tr>
<tr>
<td>Raccoon</td>
<td>Procyon lotor</td>
</tr>
<tr>
<td>Red Squirrel</td>
<td>Tamiasciurus hudsonicus</td>
</tr>
<tr>
<td>Virginia Opossum</td>
<td>Didelphis virginiana</td>
</tr>
<tr>
<td>White-Tailed Deer</td>
<td>Odocoileus virginianus</td>
</tr>
</tbody>
</table>

Numerous green frogs (Rana clamitans melanota) were seen in the wetlands area, although only a cursory attempt was made to locate other reptiles and amphibians. Amphibians and reptiles observed by the study group are listed in Figure 5.11. (22)

**Figure 5.11: Amphibians and Reptiles (22)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Snapping Turtle</td>
<td>Chelydra serpentina serpentina</td>
</tr>
<tr>
<td>Green Frog</td>
<td>Rana clamitans melanota</td>
</tr>
<tr>
<td>Midland Painted Turtle</td>
<td>Chrysemys picta marginata</td>
</tr>
<tr>
<td>Northern Ribbon Snake</td>
<td>Thamnophis sauritus septentrionalis</td>
</tr>
<tr>
<td>Red-Backed Salamander</td>
<td>Plethodon cinereus</td>
</tr>
<tr>
<td>Wood Turtle</td>
<td>Clemmys insculpta</td>
</tr>
</tbody>
</table>
No attempt was made to inventory fish in the Muskegon River adjacent to Riverwalk, although dead carp (Cyprinus carpio) and white suckers (Catostomus commersonii) had floated up to the riverbank. (22)

6.0 Potential Environmental Impacts

6.1 Purpose and Scope

The purpose of this assessment was to anticipate the potential physical and biological impacts to the area of the proposed Big Rapids Riverwalk project. The scope of the assessment is the area from Northend Riverside Park to Maple Street Bridge and approximately 100 yards on either side of the Muskegon River.

6.2 Air

The Big Rapids area is considered to have no recorded air quality problems. MDNR lists Mecosta County meets MDNR air quality standards for: carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and PM10 (particulate matter with diameters less than 10 microns). Exhaust from diesel engines during construction will be a source of air pollutants. Diesel engine exhaust contains volatile organic compounds, oxides of nitrogen, carbon monoxide, and particulate matter. Exposure to high concentrations or prolonged exposures to low concentrations of exhaust has been shown to be harmful to human health. The principle air contaminant will be fugitive dusts. Dusts will be generated from earth moving operations and equipment traveling over disturbed soils. (47)

6.3 Noise

The only significant disturbances from noise will occur during the construction process. Noise sources will come from motorized equipment, backup beepers, hammering, cutting of wooden structures, and pile driving the supports for the platforms. Pile driving will be the loudest noise of the construction project. Noise impacts from construction will be limited to sleep disturbances and inconveniences to other everyday activities. Construction work is scheduled for daylight hours only. This will reduce sleep disturbances for many residents, but may be a concern for third shift workers residing in the area. Use of Riverwalk will not elevate existing noise levels because motorized vehicles are restricted from using Riverwalk. Noise will be limited to conversational noise and noise generated by recreational activities.

6.4 Physiography

6.4.1 Erosion

During the construction process of the pathway, some cutting and filling will be required to obtain an acceptable grade. In the Maple Street promenade an additional 310 cubic yards of fill material will be hauled in to provide the grade necessary leading into
Hemlock Park from Maple Street. Riverwalk south of Baldwin Street will require 430 cubic yards of fill material and the west bridge approach will need 250 cubic yards of fill material. This fill material will require compaction to prevent settling from damaging the pathway. Prein and Newhof require all fill material to be compacted and specifications for the required soil density for under the pathways are listed in the Bidding and Specifications document. (20)

The cutting and filling will also require some temporary erosion controls during construction. Temporary erosion control will limit the amount of sediment released to the river. Bidding documents and specifications from Prein & Newhof state that the subcontractor must submit a sediment control plan and this plan must be approved before any construction begins. The sediment control plan must include schedules for construction sequences along with temporary and final erosion control measures. (20)

The Muskegon River’s floodplain had a major impact on Riverwalk plans. The designs for the Riverwalk were made utilizing Prein & Newhof’s 100-year floodplain calculation. All of the wooden fishing platforms will be above the floodplain to prevent most floods from damaging these platforms. However, the aggregate fishing platform behind the Big Rapids Middle School will be within the floodplain. This platform is designed to remain intact during a flood by using large boulders to deflect the river current from the gravel in the platform.

The two prefabricated pedestrian bridges will be attached to supports on the riverbank and the island. The supports will be constructed of reinforced concrete with riprap. A detail of the riprap can be seen in Figure 6.1. The riprap will extend from the support footings outward for a minimum of ten feet over the exposed slopes of the riverbanks.

**Figure 6.1**

Riprap detail for bridge supports. (21)
Construction of the riprap will result in the south end of the island being covered with rock; this should protect the bridge supports from erosion. The pedestrian bridges also have the greatest potential of being affected by the 100-year floodplain. In the current plans the anchor points of the bridges will be at 889.3-feet above MSL, providing 4 feet of clearance above the predicted 100-year floodplain. (21)

The proposed fishing platforms in Hemlock Park will be well protected from erosion by the use of riprap. The riprap should protect the platforms from seasonally high water levels. Past erosion protection measures behind the Middle School used large boulders pulled from the river bottom to secure the bank. These measures created a site for sediment deposition along the riverbank behind the Middle School. There should not be any erosion concerns for the aggregate fishing platform located behind the Big Rapids Middle School on this sediment deposit along the riverbank.

Upstream from the fishing platform in Swede Hill Park, a rock pile splits the river and directs a strong current toward the planned location of the fishing platform. A side view illustration of the platform is shown in Figure 6.2. Prein & Newhof believe that the amount of existing rock is sufficient to prevent erosion at this location. While the bank is well protected, the steel support pillars will be subjected to the erosive force of the river. As long as the river's natural rock bed remains intact, this should not be a problem; however, if the driven supports damage the riverbed a head cutting of softer sediment could occur and the supports could erode. (21, 29)

![Figure 6.2](image)

Side view of the fishing platform in Swede Hill Park. (21)

6.4.2 Soils and Water

Leaching of toxic chemicals into soil and water can present potential harmful effects to human health and the environment.
Analysis of soils beneath CCA treated boardwalks and playground equipment has detected arsenic at levels greater than the Environmental Protection Agency (EPA) limit. The EPA limit for arsenic in soil is 0.4-mg/kg. Arsenic could leach into the soil under the elevated boardwalk between the east end of the pedestrian bridge and the asphalt path. Biological and health effects from exposure to arsenic are not known to occur in plants and animals at this time. Skin contact with CCA treated wood or arsenic contaminated soil is not considered to pose a significant health risk. Arsenic in the soil poses no measurable health risk unless repeated long-term exposures over months and years allow the trace amounts ingested to build up in the body. However, accidental ingestion of trace amounts of arsenic found in the soil may be a health concern if young children are allowed to play under the boardwalk. (11)

Arsenic leached from lumber by runoff can enter waterways. This could potentially lead to elevated levels of arsenic appearing in the water. The EPA is currently lowering the existing limit of 50 parts per billion (ppb) of arsenic in water to 10 ppb. A 1999 study by the National Academy of Sciences, Washington D.C. linked arsenic in drinking water to bladder, lung and skin cancer. Populations most at risk are young children, elderly persons and those individuals with compromised health problems. The highest risk for these health conditions would occur by ingesting water from the river, but since Big Rapids gets its water supply from wells, the overall risk of arsenic contamination is small. The level of arsenic in the Muskegon River is not anticipated to pose health risks because arsenic will dilute rapidly in the water. (11, 54)

Asphalt has been increasingly studied over the past two or three years. The EPA believes asphalt paving can be particularly harmful because it releases various oils into soil and water for a considerable time-period after application. Since the idea of substances leaching from asphalt is still new, very few studies have been conducted. A majority of Big Rapids already contains asphalt roads, but the amount of runoff from this is currently unknown. Therefore, runoff from asphalt in Riverwalk will be a small percentage of what may already be leaching from the city. There are no field studies to indicate that chemicals leaching into surrounding soils or waters will have any impact on the environment surrounding Riverwalk. (12, 55)

6.4.3 Landscaping

The final grading and sowing of seed will allow for the development of grasses to stabilize the surface of the soil and prevent erosion. Turf management will be subcontracted and will require an established weed-free full grass cover. Ground preparation will require final grading and application of a starter fertilizer followed by grass seed sown by conventional or hydro-mulching methods. Where slopes are greater than 1:4, a tackifier (glue like substance that makes the fibers stick) must be added to the hydro-mulch to protect slopes until grass root systems are established. Prein & Newhof also require that all slopes with a grade of 1:2 or higher be stabilized with straw/coconut fiber blankets after seeding. (21)
The specifications for Riverwalk call for the application of fertilizers to all turf areas and to plantings. Adverse effects can occur if proper application rates and normal precautions are not followed. Drop feed spreaders allow better control of fertilizer than do broadcast spreaders for applications along the waters edge. (21)

The plans also call for soil sterilizers to be applied under the pathways by the subcontractor. They must be used with caution to avoid undesirable vegetation damage. Sterilizers should not be used in the floodplain area and should be applied immediately before the gravel base is added to avoid tracking of sterilizer onto neighboring soil. All turf chemicals should be applied only by Michigan Department of Agriculture certified commercial applicators. (21)

The City of Big Rapids will be responsible for grounds maintenance along Riverwalk. The city currently does not have maintenance plans for Riverwalk; however, the city normally only applies fertilizers, pesticides or herbicides to the ball fields within the city’s parks. The city will mow the grass along Riverwalk but is not planning to apply any chemicals to it. Grass clippings will increase biological oxygen demand and nutrient levels in the river if they are discharged into the river. This can be avoided by mowing the banks edge with the mower’s discharge away from the river. (38)

6.5 Biology

6.5.1 State Species of Special Concern

While not afforded legal protection under the Endangered Species Act, many species are of concern to environmentalists and the MDNR because they have declining or relic populations within the state. Species of Special Concern are species of plants or animals specially listed by the state because these species have low population levels. If populations of Species of Special Concern continue to decline, they will be listed by the MDNR as Threatened or Endangered. Maintaining adequate numbers of self-sustaining populations of Species of Special Concern within Michigan is a goal of the MDNR. Additionally some species are listed as State Species of Special Concern because precise information on their status is lacking. When such information becomes available, the status of these species could be changed to Threatened, Endangered, or the species may be deleted from the list. (49)

The Natural History of Mecosta County: A survey of the County’s Wildlife at the beginning of the Twenty-first Century, by Stephen Ross lists several Species of Special Concern known to inhabit the location of the proposed Riverwalk. Life history summaries and observational data for these species are taken primarily from this source, and are listed below.

Invertebrates

- Riverine Clubtail (Stylurus amnicola): The small S. amnicola, a dragonfly, has been collected from streams and rivers in the Upper Peninsula adjacent to Wisconsin as well as from several other records in the Lower Peninsula, including
Mecosta County. Preferred habitat is fast moving, open waters of rivers. The nymph is found in sandy substrates of smaller streams with very good water quality. (49, 51)

- Observed on, 31 August 1999 on the Muskegon River. (6)

- Elusive Clubtail (*Stylurus notatus*): *S. notatus*, in its larval stage, is found in sandy substrates of both lakes and rivers throughout the state. As a dragonfly, they are fast fliers that cruise moderate to fast moving rivers only inches above the water. Because of their speed, this dragonfly is difficult to catch, and is probably under-represented in entomological collections. (51)
  - Observed on, 1 August 1998 on Muskegon River. (6)
  - Observed on, 3 August 1999 on Muskegon River. (6)

In both dragonfly species, the life stage at highest risk is the aquatic larval stage. Construction of Riverwalk may produce some erosion and soil washed into the water may have a short-term effect on the nymph. No adverse long-term impacts are anticipated.

**Fish**

- Redside Dace (*Clinostomus elongates*): The redside dace is a small insectivorous fish (average length 7.5 cm, maximum 11 cm) that relies on visual search of prey at the water's surface. Its eggs are laid on gravel stream bottoms. It normally spends most of its time in schools in the middle part of the water column of pools. It is a specialized feeder and although it does feed on aquatic insects and other invertebrates, its primary food during May to October consists of terrestrial insects such as danceflies (*Hilara sp.* ) that occur in large swarms over the surface of the water. The redside dace leaps out of the water to obtain this prey. Its bright yellow and red color pattern may make it more visible to predators as well as more desirable for aquarists and pond keepers and thus more susceptible to both predation and exploitation. Its preference for and possible restriction to small cool water headwater streams limits widespread dispersal. (21)
  - Observation date is unknown. Found near Maple St. Bridge. (6)

- River Redhorse (*Moxostoma carinatum*): Prefer moderate to swift waters of large rivers, lower portions of their main tributaries, reservoirs and pools over clean gravel and rubble. River redhorse are seldom found in deep water with mud, silt, or sand bottom. This redhorse species is quickly restored to waters from which they have been eliminated if there is a reservoir population nearby. Both the river redhorse and mollusks on which they feed are intolerant to siltation and turbidity. (49)
  - Observed July 1997, by Richard O’Neal, State of Michigan, Department of Natural Resources, Fisheries Division. (6)

In both fish species, erosion from construction of the Riverwalk may present some short-term effects on this species if unexpected siltation covers the spawning area.

**Amphibians and reptiles**

- Wood Turtle (*Clemmys insculpta*): One of the most docile turtles, the wood turtle was relatively common in Mecosta County once, but have suffered, due to
development pressures and collecting. They reach the southern limit of their range in Mecosta County; they lack a sufficient base of young turtles to replace the mortality of the older adults. Though terrestrial in habits during the summer, they are seldom far away from water. (6)

- Observed on, 8 December 1998, Mitchell Creek Bridge at Hemlock Park. (6)

- Eastern Box Turtle (*Terrapene carolina carolina*): The Eastern Box Turtle is probably the least common turtle found in Mecosta County. Habitat destruction and collecting are the main culprits. These turtles should not be disturbed. Their home range is quite small (about 5 acres) for a turtle that may live to be 100 years old. (6)


Because both turtles lay their eggs in sandy substrates, construction may have some short-term effects on turtle reproduction. In addition, human disturbance could disrupt turtle or feeding behavior.

6.5.2 State Threatened Species

A threatened species can be defined as: any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. (49)

- Osprey (*Pandion haliaetus*): Ospreys live near water and use their keen eyesight, superb flying skills, and sharp talons to catch fish. Loss of habitat and the biomagnification of DDT and other persistent pesticides were major factors that led to their decline in the southern region of the Lower Peninsula. (49)

  - Observation date unknown, Northend Riverside Park. (6)

- Bald Eagle (*Haliaeetus leucocephalus*): The bald eagle, our national emblem, is one of two species of eagles found in the United States. Nests are usually constructed near seacoasts, lakes or large rivers to be near their most common food supply: fish. These eagles don't really migrate, they just move south enough to stay ahead of the ice and congregate near open water. Immature birds may move further south. (49)

There is no record of nesting sites along the proposed Riverwalk location, but sightings have been reported.

  - Observed on, 4 July 2002, at Northend Riverside Park by Ted Dohnal
  - Observed on, December 2000 at Northend Riverside Park. (6)

Noise due to construction may deter ospreys and eagles from fishing along the river here. Once the construction is complete, the eagles should return to regular fishing along the river, with no long-term effects.

6.5.3 Ornamental Plants

Present Riverwalk design includes introducing ornamental plants (Figures 6.3, 6.4, and 6.5) to certain areas. The addition of these plants may encourage some migratory birds, including the bohemian waxwing (*Bombycilla garrulus*), and cedar waxwing
(Bombycilla cedrum), to use the area since these species are known to favor the berries of various species of ornamental trees and shrubs as food. (6, 21)

**Figure 6.3: Ornamental Plants: Evergreen and Deciduous Trees (21)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canadian Hemlock</td>
<td>Tsuga canadensis</td>
<td>8</td>
</tr>
<tr>
<td>Patmore Green Ash</td>
<td>Fraxinus pennsylvanica</td>
<td>17</td>
</tr>
<tr>
<td>Red Maple</td>
<td>Acer rubrum</td>
<td>5</td>
</tr>
<tr>
<td>Serviceberry</td>
<td>Amelanchier canadensis</td>
<td>5</td>
</tr>
<tr>
<td>Shadermaster Honeylocust</td>
<td>Gleditsia triiernis</td>
<td>1</td>
</tr>
<tr>
<td>White Pine</td>
<td>Pinus strobos</td>
<td>9</td>
</tr>
</tbody>
</table>

**Figure 6.4: Ornamental Plants: Shrubs (21)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Chokeberry</td>
<td>Aronia melanocarpa</td>
<td>15</td>
</tr>
<tr>
<td>Compact American Cranberry</td>
<td>Viburnum triobum compactum</td>
<td>2</td>
</tr>
<tr>
<td>Compact Juniper</td>
<td>Juniperus chinensis</td>
<td>53</td>
</tr>
<tr>
<td>Goldflame Spireae</td>
<td>Spirea buraldi</td>
<td>5</td>
</tr>
<tr>
<td>Gro-low Fragrant Sumac</td>
<td>Rhus aromatica</td>
<td>75</td>
</tr>
<tr>
<td>Muszam Grey Dogwood</td>
<td>Cornus racemosa muszam</td>
<td>17</td>
</tr>
<tr>
<td>Nearly Wild Rose</td>
<td>Rosa sp.</td>
<td>57</td>
</tr>
<tr>
<td>Northern Bayberry</td>
<td>Myrica pensylvanica</td>
<td>12</td>
</tr>
<tr>
<td>Techny Arborvitae</td>
<td>Thuja occidentalis</td>
<td>3</td>
</tr>
<tr>
<td>Ward’s Yew</td>
<td>Taxus media</td>
<td>7</td>
</tr>
<tr>
<td>Weeping Forsythia</td>
<td>Forsythia suspense</td>
<td>20</td>
</tr>
</tbody>
</table>

**Figure 6.5: Ornamental Plants: Perennials (21)**

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Number of Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Flag Iris</td>
<td>Iris virginica</td>
<td>20</td>
</tr>
<tr>
<td>Heavy Metal Shenandoah</td>
<td>Panicum virgatum</td>
<td>30</td>
</tr>
<tr>
<td>King Alfred Daffodils</td>
<td>Daffodils sp.</td>
<td>60</td>
</tr>
<tr>
<td>Little Business Daylily</td>
<td>Hemerocallis sp.</td>
<td>30</td>
</tr>
<tr>
<td>Shenandoah Switchgrass</td>
<td>Panicum virgatum</td>
<td>52</td>
</tr>
</tbody>
</table>
7.0 Cultural and Socioeconomic Impacts

7.1 Purpose and Scope

The cultural and socioeconomic assessment included the following areas: demographics, city government, business and industry, educational institutions, Department of Public Safety, Emergency Medical Services, social activities, and transportation. The purpose of this study was to document the current characteristics of the Big Rapids population and to assess how Riverwalk will affect the community.

7.2 Demographics

According to Census 2000, the population of the City of Big Rapids is 10,849 persons. The age distribution of the population can be seen in Figure 7.1 on the following page. The largest population groups are in the 15 to 19 and 20 to 24 age brackets (53.3%). This is likely due to the student population of Ferris State University. (10)

<table>
<thead>
<tr>
<th>Age (in years)</th>
<th>Population Number</th>
<th>Population Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 5</td>
<td>575</td>
<td>5.30</td>
</tr>
<tr>
<td>5 to 9</td>
<td>436</td>
<td>4.00</td>
</tr>
<tr>
<td>10 to 14</td>
<td>389</td>
<td>3.60</td>
</tr>
<tr>
<td>15 to 19</td>
<td>2205</td>
<td>20.30</td>
</tr>
<tr>
<td>20 to 24</td>
<td>3579</td>
<td>33.00</td>
</tr>
<tr>
<td>25 to 34</td>
<td>1164</td>
<td>10.70</td>
</tr>
<tr>
<td>35 to 44</td>
<td>709</td>
<td>6.50</td>
</tr>
<tr>
<td>45 to 54</td>
<td>619</td>
<td>5.70</td>
</tr>
<tr>
<td>55 to 59</td>
<td>200</td>
<td>1.80</td>
</tr>
<tr>
<td>60 to 64</td>
<td>171</td>
<td>1.60</td>
</tr>
<tr>
<td>65 to 74</td>
<td>339</td>
<td>3.10</td>
</tr>
<tr>
<td>75 to 84</td>
<td>325</td>
<td>3.00</td>
</tr>
<tr>
<td>85 and Older</td>
<td>138</td>
<td>1.30</td>
</tr>
</tbody>
</table>

Age Distribution of the City of Big Rapids, Michigan. (10)

7.3 City Government

The governmental structure of the City of Big Rapids is composed of several organizational levels. The City Commission heads the government of Big Rapids and is composed of Mayor Edward Burch, and four Commission members: David Russell, Peg Brennan, Dan Rothstein, and Tom Hogenson. (28)
7.4 Business and Industry

The largest employer in Mecosta County is Ferris State University, employing 510 faculty, 1,295 staff and 1,800 students on campus during the academic year. Other Big Rapids area employers include Wal-Mart, K-Mart, Meijer, Wolverine World-Wide, Haworth, Big Rapids Public Schools, Mecosta County, the City of Big Rapids, and various area service and retail businesses. (45)

7.5 Educational Institutions

Educational Institutions in Big Rapids include Ferris State University, Big Rapids Public Schools, parochial schools, and Crossroads Charter Academy.

Ferris State University, founded in 1884 by Woodbridge N. Ferris, has more than 150 educational programs, including doctoral degrees in Optometry and Pharmacy, master’s, bachelor’s, and associate degrees. The University had an on campus enrollment of 9,665 students for Fall 2001 classes. The University also has on-campus residential facilities for more than 30 percent of its students. (45)

The Big Rapids Public School District consists of a high school, a middle school, and four elementary schools. There are 2,251 students enrolled in the district. Crossroads Charter Academy is also located in the Big Rapids area and enrolls 563 students. Parochial schools in the area include St. Mary’s Catholic School and Preschool, St. Peters Lutheran School (enrollment of 125), and Lighthouse Ministries. The Mecosta-Osceola Intermediate School District (MOISD) is also headquartered in Big Rapids, with the MOISD Math-Science Center located on the Ferris State University campus.

Riverwalk can be used as an educational tool for all instructional levels. University, secondary, and elementary students will be able to study nature and history along Riverwalk. Plaques containing historical information about Big Rapids are planned and will be placed along Riverwalk. Science classes will be able to use Riverwalk for outdoor laboratory sessions and field trips that will enable them to study the plants and animals of the Muskegon River.

7.6 Department of Public Safety

The Mission of the Big Rapids Department of Public Safety is to protect life and property through emergency response and pro-active programs designed to:

- Reduce injuries, death, and property loss from fire.
- Prevent crime, apprehend violators, and recover criminal proceeds.
- Maintain the public peace and do everything possible to improve the quality of life in the community.
- Perform rescue operations, prepare for and respond to natural and technological disasters.
- Respond to the needs of our community by maintaining open communications and treating all people with dignity and respect. (43)
There are potential public safety issues involving Riverwalk, including swimming, horseplay, and rowdy behavior. The Big Rapids Department of Public Safety is planning on patrolling Riverwalk in the same manner as City Parks. The neighborhood officer in the Riverwalk area will patrol Riverwalk as a part of his/her regular duties. Patrolling would be done on foot and on bicycle. Presently there are no plans to hire additional officers specifically for Riverwalk, however, if the amount of use or other factors increase the need for additional security on Riverwalk, the Department of Public Safety will adjust accordingly. (24)

There is also an issue of lighting to be placed along Riverwalk. Currently, the only areas that will be lighted are the pedestrian bridges. The City of Big Rapids may put in lighting at a later time. This lack of lighting may pose a risk to those using Riverwalk at night.

7.7 Emergency Medical Services

The Mecosta County Emergency Medical Services dispatches from Paris, Michigan but a call received regarding an accident on Riverwalk would be responded to by paramedics at the Big Rapids County Services building. There are 26 full and part time employees with two persons on duty at all times at the Big Rapids station. (26)

In the event that there is a need for medical assistance on Riverwalk, paramedics will need to have access to it. At this time, it is planned that emergency vehicles will park at the nearest access point and personnel will travel on foot to those needing assistance pulling a stretcher and other equipment as needed. This method of providing assistance is efficient because the trail is already designed to be easily accessible. Response time will vary depending on the amount of equipment that is needed and on the distance between the access point and the injured or ill person. (26)

7.8 Social Activities

7.8.1 Recreation

There are several social activities in which residents of Big Rapids participate while on or near the Muskegon River. The most popular activity is tubing, which is floating down the river in an inner tube. Other recreational activities available to Big Rapids residents include fishing, hiking, swimming, boating (including kayaking and canoeing), cross country skiing, biking, rollerblading, running, jogging, and walking. Riverwalk will enhance the availability of these activities.

7.8.2 Social Groups

Various clubs and social organizations are an important part of the Big Rapids community. Some of these include the American Legion, Big Brothers/Big Sisters, Big Rapids Rotary, Lions Club, Boy Scouts of America, the Jaycees, the United Way, church groups, and other organizations. Social groups will also benefit from Riverwalk by being
able to meet at parks or access points and use Riverwalk for social events, meetings, or educational purposes. (28)

7.9 Transportation

The primary routes of transportation into the Big Rapids area are Interstate US 131 and M-20. Interstate 131 runs north and south and links the cities of Grand Rapids, Big Rapids, and Cadillac, and M-20 runs east and west linking the cities of Midland and Mt. Pleasant with Big Rapids and Interstate 31. Transportation within the City of Big Rapids is primarily by private automobile or public transportation. There are two means of public transportation available in Big Rapids. These are Dial-A-Ride, which is a low-cost bus service, and Big Rapids Taxi.

Pedestrian traffic on Riverwalk also needs to be considered. With an increased number of people using Riverwalk, there is a potential for conflict between pedestrians and automobiles. This could happen on Baldwin Street where Riverwalk crosses near Swede Hill Park. This could also happen at the Maple Street Bridge because the parking area available in this location is south of Maple Street and pedestrians would have to cross three lanes of traffic to access Riverwalk. Those using Riverwalk, as well as those driving in Big Rapids will need to be aware of these situations.

There will also be several parking areas that will be available for persons using Riverwalk. Parking areas will be located at Northend Riverside Park, Swede Hill Park, Hemlock Park, and the Big Rapids Middle School. In the current Riverwalk plans, there is no parking at the south end of Riverwalk. These areas will all be handicap accessible and will include handicap parking spaces. (34)

8.0 Community Surveys

8.1 Purpose and Scope

The community surveys included residential areas that are adjacent to Riverwalk property and area businesses. These surveys provide an insight to how residents and businesses view the Riverwalk project.

8.2 Residential Surveys

8.2.1 Survey Methods

The residential surveys were conducted to gather information about the opinions of Big Rapids residents concerning the Riverwalk plans. The residential surveys were performed by visiting the residences that are adjacent to the proposed Riverwalk. This included two general areas: residences on the west side of Fourth Street (addresses 913 through 1056), and residences on Warren (addresses 204 through 318), Spruce (addresses 311 through 327), Stewart (addresses 112 through 132), and Maple (addresses 403 through 417) Streets near Hemlock Park. There were 25 responses to this survey out of a
possible 53 houses (47%). These surveys consisted of questions that related to possible impacts that Riverwalk could have on the community.

8.2.2 Survey Results

The residential surveys reveal how the residents feel about Riverwalk. First, the majority of those surveyed, 23 out of 25 (92%) were aware of the Riverwalk project, and the same numbers, 23 out of 25 (92%) were planning on using Riverwalk once it is constructed. The hours that the respondents would most likely use Riverwalk are in the evenings and weekends. 16 out of 25 (52%) plan on using Riverwalk in the evenings, and 9 out of 25 (29%) plan on using Riverwalk on the weekends. These results can be seen in Figure 8.1.

Figure 8.1: Times that residents plan on using Riverwalk

The residential surveys also show what activities residents are most likely to participate in while on Riverwalk or the Muskegon River. Multiple responses were acceptable. The most popular activity is walking, with 22 responses (88%). There were also a high number of responses for the following: tubing - 14 (56%), hiking - 12 (48%), and rollerblading - 10 (40%). All of the activities that were listed in the survey and the number of responses for each can be seen in Figure 8.2.

Residential Survey Results

1. Do you own, rent, or lease this residence?
   - Own 16 (64%)
   - Rent 9 (36%)
   - Lease 0 (0%)

2. How long have you lived at this residence?
   - <1 year 6 (24%)
   - 1-5 years 6 (24%)
   - 6-10 years 1 (4%)
   - >10 years 12 (48%)
3. How many people live at this residence?
   - One: 5 (20%)
   - Two: 6 (24%)
   - Three: 5 (20%)
   - > Four: 9 (36%)

4. Are residents employed? If yes, what hours?
   - Yes: 16 (64%)
   - No: 9 (36%)

5. Are you aware of the Big Rapids Riverwalk?
   - Yes: 23 (92%)
   - No: 2 (8%)

6. Do you plan on using the Riverwalk? If no, skip to question 9.
   - Yes: 23 (92%)
   - No: 2 (8%)

7. During what hours would you use the Riverwalk?
   - A.M.: 6 (24%)
   - P.M.: 16 (64%)
   - Weekends: 9 (36%)

8. What activities do you plan on participating in while on the Riverwalk: (Multiple answers allowed)
   - Fishing: 8 (32%)
   - Hiking: 12 (48%)
   - Swimming: 7 (28%)
   - Boating: 4 (16%)
   - Tubing: 14 (56%)
   - Cross Country Skiing: 5 (20%)
   - Biking: 9 (36%)
   - Rollerblading: 10 (40%)
   - Running/Jogging: 14 (56%)
   - Walking: 22 (88%)

9. I think the following will increase:
   **Strongly Agree:**
   - Tourism: 8 (32%)
   - Vandalism: 1 (4%)
   - Noise: 4 (16%)
   - Downtown business: 5 (20%)
   - Litter: 5 (20%)
   - Parking: 3 (12%)
<table>
<thead>
<tr>
<th>Category</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
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</thead>
<tbody>
<tr>
<td>Tourism</td>
<td>8</td>
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<td>Downtown business</td>
<td>7</td>
<td>10</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Litter</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>2</td>
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<tr>
<td>Parking</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Percentages: Agree 32%, Neutral 24%, Disagree 4%, Strongly Disagree 8%
8.3 Business Surveys

8.3.1 Survey Methods

The business surveys were conducted in two ways. First, surveys were distributed at the Chamber of Commerce meeting on June 28, 2002. There are 126 members in the Chamber of Commerce in Big Rapids, however, there were only eight members present at this meeting and each filled out a survey (6.3% of the organization). Additional surveys were distributed in person to other area businesses in the Downtown Big Rapids area. This resulted in an additional ten responses for a total response for the business surveys of 18 out of 126 (14%). These surveys consisted primarily of questions relating to possible impact of Riverwalk on area businesses and tourism.

8.3.2 Survey Results

The surveys indicate that business owners also have a positive outlook towards Riverwalk. Ten of the 18 (56%) businesses that were surveyed are participants in the Riverdays Festival. This festival is an opportunity for residents and area businesses to enjoy the Muskegon River in the Big Rapids area and to participate in various activities that will be taking place during this festival.

Riverdays is a festival that will be taking place August 29th through September 2nd, 2002. The committee that organizes the festival consists of representatives from the City of Big Rapids, the Downtown Business Association, Ferris State University, Greater Big Rapids
Convention and Visitors Bureau, Humanities Council of West Michigan, Mecosta County Area Chamber of Commerce, Mecosta County Council for the Arts, and Stage M. Some committee members are also on the Riverwalk committee. When the Riverdays festival was originally planned, it was hoped that Riverwalk would be completed in time for this festival. However, this is not feasible. This year is the first year for the Riverdays festival in Big Rapids. There will be various activities during Riverdays including a bridge walk, lumbering activities such as a lumberjack breakfast and a lumberjack show, a classic car show, a duck race, a sock hop, and many others. (32)

Fifteen out of the 18 businesses surveyed (83%) either agree or strongly agree that tourism will increase and seven out of the 18 (39%) feel that it will increase their business. Many businesses also feel that Riverwalk will have very few negative effects. When asked if vandalism will increase, 14 out of 18 (78%) disagreed or strongly disagreed. In addition, when asked if noise in the area will increase, 10 out of 18 (56%) disagreed or strongly disagreed. These results can be seen in Figures 8.3 and 8.4.

Business Riverwalk Survey Results

1. Name of your business ___________________(optional)

2. Is your business participating in the River Days Festival?
   Yes 10  (55.5%)
   No 2  (11%)
   Don't know 5  (27%)
   No Response 1  (5.5%)

3. The Riverwalk project will increase my business
   Strongly Agree 1  (5.5%)
   Agree 6  (33.3%)
   Neutral 8  (44.4%)
   Disagree 2  (11%)
   Strongly Disagree 0  (0%)
   No Response 1  (5.5%)

4. The Riverwalk project will increase tourism in the Big Rapids area.
   Strongly Agree 4  (22.2%)
   Agree 11  (61.1%)
   Neutral 3  (16.6%)
   Disagree 0  (0%)
   Strongly Disagree 0  (0%)
5. The Riverwalk project will increase litter in the Big Rapids area.
   Strongly Agree 0  (0%)
   Agree 4  (22.2%)
   Neutral 7  (38.8%)
   Disagree 6  (33.3%)
   Strongly Disagree 0  (0%)

6. The Riverwalk project will increase vandalism in the Big Rapids area.
   Strongly Agree 0  (0%)
   Agree 0  (0%)
   Neutral 3  (16.6%)
   Disagree 9  (50%)
   Strongly Disagree 5  (27.7%)
   No Response 1  (5.5%)

7. The Riverwalk project will increase noise level in the area.
   Strongly Agree 0  (0%)
   Agree 1  (5.5%)
   Neutral 6  (33.3%)
   Disagree 8  (44.4%)
   Strongly Disagree 2  (11%)
   No Response 1  (5.5%)

8. The City of Big Rapids currently has a lack of parking space.
   Strongly Agree 1  (5.5%)
   Agree 4  (22.2%)
   Neutral 1  (5.5%)
   Disagree 9  (50%)
   Strongly Disagree 2  (11%)
   No Response 1  (5.5%)

9. The Riverwalk project will interfere with parking in the downtown area.
   Strongly Agree 0  (0%)
   Agree 1  (5.5%)
   Neutral 6  (33.3%)
   Disagree 8  (44.4%)
   Strongly Disagree 3  (16.6%)

10. Is your business a sponsor of the Riverwalk project?
    Yes 6  (33.3%)
     No 9  (50%)
  Don't Know 3  (16.6%)
11. Are you aware of the Big Rapids Riverwalk Committee?
   Yes  13  (72.2%)
   No   4   (22.2%)
   No Response  1  (5.5%)

12. Would you be interested in joining?
   Yes  4  (22.2%)
   No   8  (44.4%)
   Maybe 1  (5.5%)
   Already 3  (16.6%)
   No Response  2  (11%)

8.4 Survey Comments and Problems

There were comments received on both the residential and business surveys. As with any new project, there are positive and negative attitudes towards Riverwalk. However, the majority (six out of seven comments received, 86%) of these comments were in support. Below is a list of the comments received:

"Riverwalk is a great idea!"
"Need a longer or bigger Riverwalk. It's great!"
"I love Riverwalk!"
"Would like to be a part of citizen (volunteer) maintenance efforts similar to Playscape."
"I think the Riverwalk project is a fabulous idea – I'm all for it."
"Who instigated this negative questionnaire? This [survey] isn't the approach one takes toward a wonderful new addition to the community."
"Really against Riverwalk and especially the bridge."

Figure 8.3: Will Riverwalk increase tourism?

![Pie chart showing the distribution of responses to the question: Will Riverwalk increase tourism?](chart)
There were also problems that were encountered with the residential surveys. Several of the questions were open-ended questions, which allowed for multiple responses. An example of this was the question: What hours do you work? This question received many answers that could not be compiled into categories.

9.0 Comparison of Big Rapids and Manistee Riverwalks

9.1 Purpose and Scope

The FSUEMSC visited the Manistee Riverwalk on June 28, 2002 to research and to observe important features that are comparable to the Big Rapids Riverwalk. The FSUEMSC walked the Manistee Riverwalk with Mitch Deisch, City Manager, Jack Garber, Department of Public Works Supervisor, and Jon Rose, Community Development Officer.

9.2 Locations

The locations of the two Riverwalks differ. The City of Manistee is located on the Manistee River near Lake Michigan. The Manistee River in this location is a navigable river, meaning that large commercial and recreational boats can use it. Big Rapids is located on the Muskegon River, in an inland location that is not navigable by large boats. This location difference will affect the amount of tourism increase in the Big Rapids area. In Manistee, boat access is a major factor in the increase in tourism, in addition to the Riverwalk. Because of these factors, Big Rapids will likely experience a lower increase in tourism than Manistee. (23, 25)
9.3 Construction Materials and Design

The Manistee Riverwalk is primarily a boardwalk constructed of CCA treated lumber interspersed with concrete sections, while the Big Rapids Riverwalk will be constructed primarily of asphalt with some sections of boardwalk. The Manistee Riverwalk is also constructed over the river and directly on the river's edge while the Big Rapids Riverwalk will be adjacent to but separated from the river's edge. (23, 25)

9.4 Maintenance programs

9.4.1 Budget

There is a maintenance program for the Manistee Riverwalk. The annual maintenance budget allotted by the City of Manistee for their Riverwalk is $40,000. This includes the replacement of missing or damaged boards, landscaping, annual power washing and sealing the boardwalk, repairs of vandalized property, and various other maintenance tasks. On the Big Rapids Riverwalk, the City of Big Rapids will be responsible for maintenance. This maintenance program has not been fully developed at this time. Because of the difference in construction materials, maintenance costs in Big Rapids should be less. (23, 25)

9.4.2 Sanitation

The Manistee Riverwalk has waste receptacles along the path, as will Big Rapids. The City of Big Rapids is planning on placing containers along Riverwalk and if there is a need for additional containers in the future, they will be implemented. (25, 34)

The Manistee Riverwalk has a designated dog run area for vessel owners moored at the Manistee Public Marina. This area also provides materials for dog owners to use when cleaning up their dogs waste. This reduces the amount of waste along the path. Big Rapids will be allowing dogs on all portions of Riverwalk and waste clean up will be the responsibility of the maintenance workers. (25, 34)

The Manistee Riverwalk has public fish cleaning stations that are available to the public as well as private stations. These stations help to minimize the amount of fish waste on the riverbank. There are no plans for fish cleaning stations on the Big Rapids Riverwalk. This can be attributed to the fact that the Muskegon River at the Big Rapids location has fewer anglers than Manistee and a smaller potential fish resource. The species of fish caught are also different. The Manistee River flows directly into Lake Michigan and catches of large cold-water fish including steelhead and salmon are common. The Muskegon River near Big Rapids supports populations of smallmouth bass (*Micropterus dolomieui*), and other species but trout are not abundant. However, if fish waste becomes a problem in the future, cleaning stations may have to be considered. (23, 25)
9.5 Liability and Safety Concerns

9.5.1 Park Liability

There are currently no plans for any life saving devices such as life rings along Riverwalk. Riverwalk is in the same legal category as parks. A state law, *Governmental Immunity for a Municipality*, states that the City of Big Rapids will not be held liable for any injury that occurs to persons while they are on Riverwalk or in any city parks. Consequently, the Riverwalk project will not increase the city’s insurance costs. (36)

9.5.2 Signage and Brochures

The Manistee Riverwalk has signs along Riverwalk for various purposes. First, there are signs that tell users the rules of the Riverwalk. These include: “No bicycles, rollerblades, or skateboards”, and “No Dogs Allowed”. There are also signs welcoming visitors to the Riverwalk. These signposts also contain a box with brochures and maps of the Riverwalk. There are no definite plans for the Big Rapids Riverwalk regarding signs for these issues. (25, 34)

9.5.3 Access Restrictions

On the Manistee Riverwalk, there are several user groups that are excluded from use. These include bicyclers, skateboarders, rollerbladers, and individuals with dogs. Bicycles, rollerblades, and skateboards travel faster than those walking and can pose potential danger to those walking. There are currently no plans to exclude any of these groups from the Big Rapids Riverwalk. (23, 25)

9.5.4 Crosswalk

Riverwalk will intersect Baldwin Street just east of the Baldwin Street Bridge, where pedestrians will have to cross traffic. In comparison, the Manistee Riverwalk does not cross road traffic. Baldwin Street has a large amount of traffic and a crosswalk at this location poses a safety concern for pedestrians. A crosswalk and pedestrian crossing signs should be placed as planned at this location to minimize the risk of an accident. The Maple Street Bridge will also be an area where pedestrians using Riverwalk will have to cross traffic. There are currently no plans for additional safety features at this location.

9.5.5 Pedestrian Bridge

The Big Rapids Riverwalk will have two pedestrian bridges crossing over the river. These bridges will be located near the Big Rapids Middle School, and the water in this area is fairly deep. This will present some safety concerns for the Big Rapids Middle School. There is a possibility that students will jump off of the bridge and get injured or drown. The Department of Public Safety along with the Big Rapids Middle School will need to address this issue and devise a plan. (23)
9.6 Special features

9.6.1 Historical Markers

There are historical plaques along the Manistee Riverwalk with various facts about the area. On the Big Rapids Riverwalk, there are plans to have information plaques about the logging era, the mills, and the dam removal. A plaque from the Manistee Riverwalk can be seen in Figure 9.1. (23, 25)

**Figure 9.1**

![Historical information plaque located on the Manistee Riverwalk. Photo taken June 28, 2002.]

9.6.2 Memorial Plaques

The Manistee Riverwalk also has several areas with benches along the path. These benches were donated by individuals and have a plaque on them in memory of someone. An example of one of these benches can be seen in Figures 9.2 and 9.3. There are plans for resting areas including places to sit along the Big Rapids Riverwalk, but no plans for memorial plaques as yet. (23, 25)

9.6.3 Biological Markers

There are no biological markers placed along the Manistee Riverwalk. The Big Rapids Riverwalk has plans to have markers of area flora and fauna placed along the path. However, there is no individual or group that has been placed in charge of this task.
10.0 Summary

The history of the Big Rapids area is an important aspect in regards to the construction of Riverwalk. Various activities such as logging, building of bridges and dams, and the removal of the Upper Dam, have influenced the Muskegon River. Riverwalk is another project that will affect the river and the surrounding community.

Several different factors affect the make up of the culture of Big Rapids. These include different age groups, education, employment, and social activities. The survey that was conducted shows that most residents and businesses of Big Rapids surveyed are in favor of Riverwalk. Survey results indicate that residents reacted positively regarding the potential increase in tourism and business, and believed there would be no increase in negative factors such as vandalism and noise.
Review of the construction plans indicates that the design and materials planned for use are well suited for this type of project. Plans have been specified to mitigate the most significant adverse effects created during construction, such as erosion from modification of land surfaces. Materials used in this project do not present a known significant health effect to humans if used properly. There are several threatened bird species that are present in the area but should remain unaffected by the construction and use of Riverwalk.

11.0 Conclusions

- The Muskegon River has had a significant impact on the history, culture, society, and economics of Big Rapids.
- The Big Rapids Riverwalk is perceived by the community to be a positive asset for recreation, exercise, outdoor education, and tourism.
- In comparison with the City of Manistee, the Big Rapids Riverwalk will have less of an impact on tourism, and therefore less of an effect on the local economy.
- The attitude of the community is centered more around the impact Riverwalk will have on tourism, business, and recreation than on the “Access for All” concept.
- According to current plans, the Big Rapids Riverwalk is not “Access for All” because of the lack of resources available for visually impaired individuals.
- Limiting heavy equipment operation from 7 a.m. to 9 p.m. can decrease construction noise problems. Use of Riverwalk should not generate noise problems for the Big Rapids community if Riverwalk is maintained as a non-motorized trail.
- Fertilizers will only be applied away from the water’s edge to initiate plant growth and not as part of regular turf maintenance and should not have a long-term impact on the environment.
- Construction of Riverwalk will not cause significant loss of wildlife habitat, or further threaten species that migrate through the area.
- Erosion at the Swede Hill fishing platform may be a concern.
- If correct, floodplain levels established by Prein & Newhof indicate that water from a flooding event should not endanger the path, structures, or the environment.
- There is little scientific data to indicate that substances leaching from asphalt pose a threat to human health or the environment.
- CCA treated wood used in the construction of Riverwalk should pose no significant health risk to the public.
- Exhaust from motorized equipment should cause no significant long-term impact on the air quality of the area.
- No additional parking for Riverwalk is needed at this time in the Big Rapids area.
- Fish cleaning stations are not necessary or desirable at this time.

12.0 Recommendations

Based on our research in preparation of this assignment, the following recommendations can be made:
• The City of Big Rapids should contact the City of Manistee and other cities that have river walks to discuss the issues they have had with maintenance, public safety, and emergency medical services, and determine how these cities resolved those issues.
• The Big Rapids Riverwalk should make provisions that would benefit the visually impaired.
• The Mecosta County Emergency Medical Services should devise a plan for entry to the Riverwalk in case of an emergency.
• The Big Rapids Department of Public Safety should devise a plan on how to address safety and emergency situations on Riverwalk.
• The Big Rapids Middle School and the Department of Public Safety need to address the safety issues regarding the pedestrian bridges and the middle school students.
• The Riverwalk committee should consider collecting donations for memorial benches to be used on the Riverwalk path.
• Plaques emphasizing natural history, including identifying area flora and fauna should also be placed along the Riverwalk to reinforce the educational aspect of Riverwalk.
• The Mecosta County Historical Museum should be relocated to a site near Riverwalk to promote awareness of the history of Big Rapids.
• An area volunteer organization should be placed in charge of identifying area plants and animals and placing identification plaques along Riverwalk.
• The designer should consider placing riprap around the supports for the fishing platform located at Swede Hill Park to prevent erosion of riverbed sediments.
• The City should consider alternatives to CCA treated wood, such as synthetic lumber, to limit potential soil contamination, save trees, and promote recycling of plastic.
• Heavy equipment use should be limited from 7 a.m. to no later than 9 p.m. to limit disturbance of nearby residents. Anticipated elevated noise levels should be announced to the public in advance.
• Limit the destruction of wildlife habitat by keeping equipment within the thirty-foot trail right-of-way.
• Precaution should be taken when applying soil sterilizers to prevent accidental destruction of non-target vegetation.
• Solar lighting should be considered to illuminate Riverwalk.
• To help reduce response time, location markers should be placed throughout Riverwalk. These could be alphabetical or numerical posts placed at locations known by the dispatcher receiving the emergency call. All the person in need of help would need to do is give the dispatcher the number or letter of the nearest marker.
• Signs stating “Cyclists, rollerbladers, and skateboarders – Please Respect Walkers. Slow Down!” should be implemented to ensure safety while on Riverwalk.
List of Sources

Books


Government Documents


Periodicals


Public Documents


**Newspaper Article**


**Unpublished Material**


**Interviews**

22. Beetley, Bruce L. Personal Interview. 3:00PM. July 17, 2002.


29. Hegarty, James, P.E. Prein & Newhof. Telephone Interview. 9:00 AM. June 7, 2002.


Maps and Photography


Internet


<www.sos.state.mi/history/museum.techstuff/lumber/logmarks.html>

<www.epa.gov/safewater/standards.html>