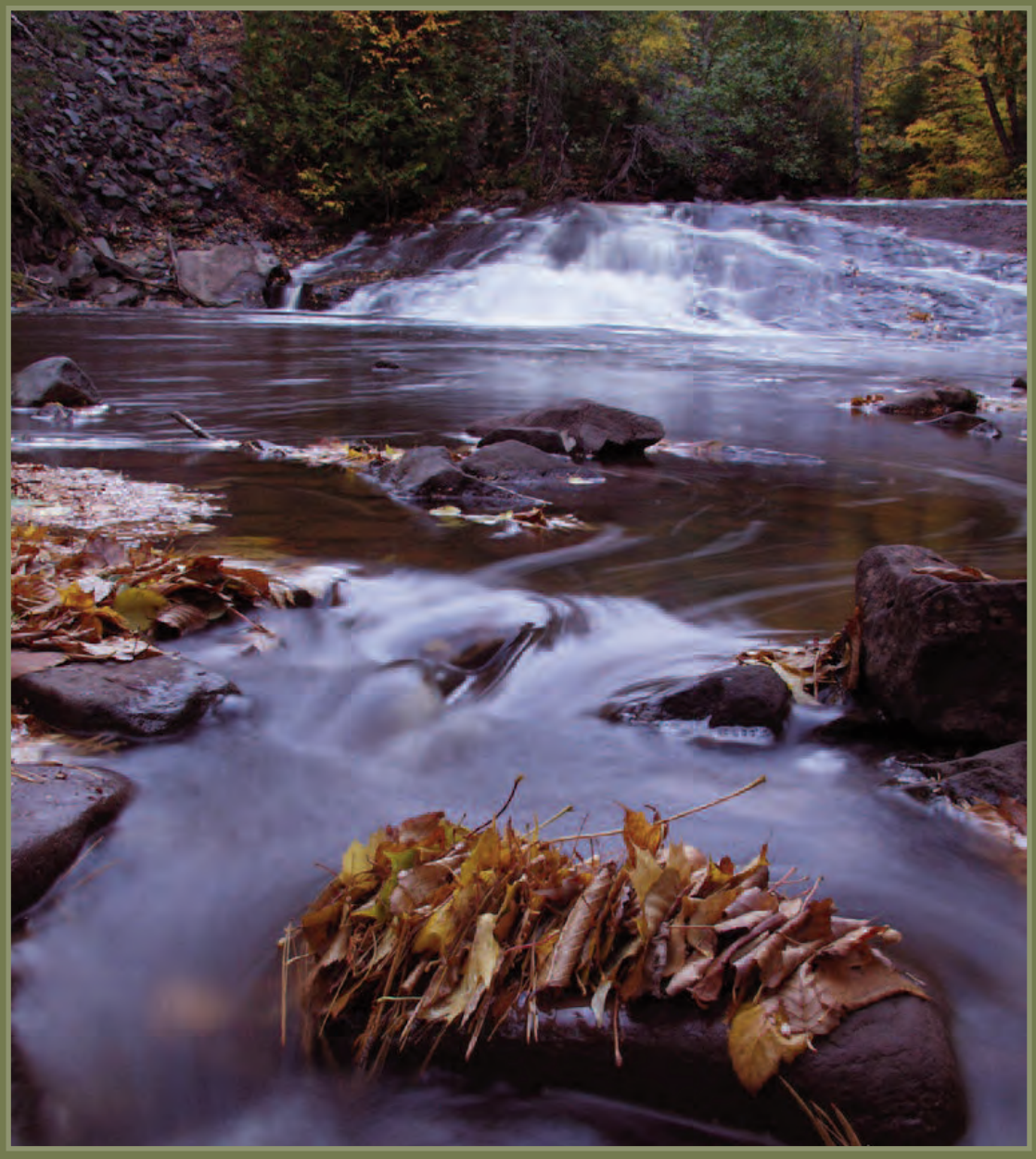
CARP RIVER WATERSHED POLLUTANT REDUCTION PLAN

TRACKING MERCURY AND SEDIMENT REDUCTIONS IN AN AOC WATERSHED



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CARP RIVER WATERSHED MANAGEMENT PLAN

A Guide for Water Quality Protection and Habitat Restoration with Emphasis on Mercury and Sediment Reduction

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Chapter One
THE NATURAL ENVIRONMENT

The following sections summarize the natural character and condition of the Carp River watershed based on the results of past and recent inventories of natural features. Included are general descriptions of the location, climate, geology, topography and soils, hydrology and significant natural features.

Location

The Carp River watershed is located in Marquette County in the central-western region of Michigan's Upper Peninsula (Figure 1.1). The watershed encompasses approximately 47,000 acres (73.7 square miles) and is the southern-most subwatershed of the Dead-Kelsey (Hydrologic Unit 04020105) watershed. The Carp River watershed incorporates all of the land that is drained by the Carp River and its tributaries including Carp Creek, Carson Creek, Gold Mine Creek, Morgan Creek, and Partridge Creek; with all water draining into Lake Superior. The majority of the watershed lies within Ishpeming and Negaunee Townships with smaller western segments (i.e., headwaters) of the watershed located in Ely and Tilden Townships and the eastern portion of the watershed falling in Marquette, Richmond, and Sands Townships. The cities of Ishpeming, Negaunee, and Marquette are all found within the Carp River watershed boundary.

Geology

Bedrock Geology

The bedrock geology of the Carp River watershed consists of three older, basement Canadian Shield (crystalline rock) formations overlain by five younger sedimentary and granoblastic formations (Figure 1.2). The three crystalline formations are all Archean (3.6 to 2.65 billion years) in age and consist of ultramafic, granitic and gneissic, or volcanic and sedimentary rocks that formed during the generation, assemblage, and subsequent breakup of continental crust (LaBerge 1994). The Archean formations cover approximately thirty-eight percent of the Carp River watershed, with the majority of the formations found in the northern half of the watershed, and smaller fractions of the Archean granite and gneissic formation occurring in the southwestern and southeastern portions of the watershed (Table 1.1).

The five younger sedimentary and granoblastic formations lie unconformably above the Archean formations, are all Early Proterozoic (~2.3 billion years) in age, and are predominately located in the southern half of the watershed. The oldest of these formations is the Chocolay Group, comprised of a basal quartzite and dolomite units, which were deposited in a shallow marine environment. The quartzite unit (originally deposited as sandstone and conglomerate) is composed of mainly quartz sand that is reddish to gray in color with cross-bedding and ripple marks abundantly present (LaBerge 1994). The quartzite unit gradually transitions upward into dolomite. The dolomite (chemically precipitated sedimentary rock) unit is gray to buff in color, contains stromatolites (rock-like structures built by microbes), and was deposited in very shallow water, however slightly offshore from sandy beaches (LaBerge 1994).

A period of tilting and erosion preceded the deposition of the next Early Proterozoic formation, known as the Menominee Group, which unconformably overlies the Chocolay Group. The Menominee Group was deposited in a large basin (Animikie Basin) as the sea advanced over the land surface and consists of three distinct units: the Ajibik Quartzite, the Siamo Slate, and the Negaunee Iron Formation. The Ajibik Quartzite is white, buff, and pink in color and is the oldest and basal unit of the Menominee Group. It was originally deposited as quartz sand and gravel before being cemented into sandstone and conglomerates that later metamorphosed to quartzite.

As the middle member of the Menominee Group, the Siamo Slate lies conformably between the basal Ajibik Quartzite member and the upper Negaunee Iron Formation unit. The Siamo Slate mainly consists of interbedded siltstone and argillite, is typically green in color, and is laminated. The rocks of the Siamo Slate were deposited in a dominantly low-energy, moderate to deep-water, basinal environment, and are interpreted as turbidites (underwater sediment slide).

The environment changed after the deposition of the Siamo Slate and was characterized by the deposition of iron-rich sedimentary rock known as the Negaunee Iron Formation. The Negaunee Iron Formation is composed of a layering of chert and iron minerals that vary in color. The chert-rich layers can be white to gray, black, green to brown, red, or maroon in color; whereas, the iron-rich layers can be black, metallic gray, light to dark brown, or green to black (LaBerge 1994). The Negaunee Iron Formation was deposited in shallow and deep water environments, as water levels fluctuated within the Animikie Basin, and contains many iron specific lithologies (e.g., jaspilites, taconites, and specularites) that are still mined today.

Unconformably overlying the Negaunee Iron Formation are two members of the Baraga Formation: the Goodrich Quartzite and the Michigamme Formation. The Goodrich Quartzite consists of alternating beds of coarse quartzite and pebble conglomerate, represents the basal unit of the Baraga Group, and was deposited in shallow water (i.e., shoreline and fluvial) environments and subsequently metamorphosed.

As the water deepened a thick sequence of sandstone (i.e., greywacke) and shale were deposited. This sequence of rock was eventually metamorphosed and today comprises part of the Michigamme Formation. In some places the Michigamme Formation consists of varying lithologies; however, the dominant rock types are greywackes and slate. The slate is typically gray to black in color; whereas the greywackes are gray.

Quaternary Geology

The majority of quaternary geology found in Michigan's Upper Peninsula is a result of continental glaciation that occurred during the last ice advancement of the Pleistocene Epoch (USDA 2006). The landforms present in the Carp River watershed are no exception; materializing as glaciers advanced and subsequently retreated from the area during the last major glacial stage known as the Greatlakean. There are four distinct

surficial deposits in the Carp River watershed: course-textured glacial till, glacial outwash sediment, lacustrine (lake) sand and gravel, and thin to discontinuous glacial till over bedrock (Figure 1.3).

Glacial till is the most prevalent deposit in the Carp River watershed and is one of the most common types of glacial sedimentation found in the Upper Peninsula. Thin to discontinuous glacial till over bedrock and course-textured glacial till, collectively, comprise nearly three-quarters (71%) of the watershed's Quaternary Geology; with thin to discontinuous glacial till covering fifty-nine percent of the watershed and coarse-textured glacial till covering twelve percent (Table 1.2). Glacial till refers to unsorted and unstratified drift and typically consists of heterogeneous mix of sand, silt, clay, and gravel; which is deposited directly by and/or underneath a glacier without meltwater reworking (USDA 2006).

As the glaciers began to melt, vast amounts of sediment from glacial meltwater were carried and deposited forming outwash plains throughout the Upper Peninsula and thus the Carp River watershed. These glacial outwash sediments are the second most abundant type of surficial deposit found in the Carp River watershed; accounting for twenty-six percent of the watershed's Quaternary Geology. Typically, glacial outwash sediments consist of well sorted, sand and gravel deposits. However, some consist primarily of well or excessively drained sands; whereas, others are dominated by poorly drained sands and organic soils (USDA 2006).

Covering less than one percent of the area, lacustrine (lake) sand and gravel deposits are the least abundant type of surficial sediments found in the Carp River watershed. Lacustrine (lake) sediments were deposited by means of glacial lakes that formed by melting ice, especially in low-lying portions of the watershed (USDA 2006). These sediments can be found on the fair eastern side of the watershed, near where the mouth of the Carp River flows into Lake Superior.

Topography and Soils

The topography of the Carp River watershed is viewable on the Harvey, Ishpeming, Negaunee, Negaunee SW, Marquette, Marquette OE E, Palmer, and Sands quadrangles of the U.S. Geological Survey (USGS) 7.5 minute series topographic maps.

The topography of the Carp River watershed exhibits a rough east-west trend, with higher elevations located in the western portion of the watershed and lower elevations occurring near the shoreline (eastern portion) of Lake Superior (Figure 1.4). The highest elevation found in the watershed is 1,781 feet above mean sea level; whereas, the lowest elevation is 604 feet above mean sea level. The topographic relief of the watershed is quite substantial, rising approximately 1,177 feet above Lake Superior. Slightly more than half of the watershed (51%) contains areas that have a slope of zero to five percent; whereas, the greatest percent slopes (30-100%) only comprise two percent of the watershed (Table 1.3). Areas with steeper slopes (30-100%) are located throughout the Carp River watershed; however, higher percentage slopes have a

propensity to be located in the eastern portion of the watershed (near the mouth of the Carp River) and on the northern shorelines of Teal and Deer Lakes (Figure 1.5).

Of the twelve orders of soil taxonomy developed by the United States Department of Agriculture (USDA) and National Cooperative Soil Survey, five orders can be found within the Carp River watershed including entisols, histosols, inceptisols, mollisols and spodosols (Figure 1.6). Spodosols cover the vast majority (66%) of the watershed (Table 1.4) and are formed from weathering processes that create a mixture of organic matter and aluminum (with or without iron) from the surface layer which then accumulates in the subsoil. Commonly occurring in areas of coarse-textured deposits under coniferous or boreal forests of in humid regions, spodosols tend to be acidic and infertile (USDA 2007).

In addition, there are 43 distinct soil types present within the Carp River watershed (Figure 1.7) as determined by the USDA Natural Resources Conservation Service Soil Survey Geographic Database (SSURGO) for Marquette County, Michigan (USDA 2007). The 43 soil types range from excessively drained sandy soils to poorly drained muck and range from young to mature soils (USDA 2007). The Carbondale is the most prominent soil within the Carp River watershed, covering 4,284 acres (or approximately 9%) of the total watershed land area (Table 1.5).

Of the 43 distinct soil types mapped in the Carp River watershed, twelve fulfill the requirements for being classified as a hydric soil. Hydric soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic (wetland vegetation) (USDA 2006). Hydric soils occur sporadically throughout the watershed and comprise 11,581 acres (or approximately 25%) of the watershed (Table 1.6, Figure 1.8).

Wetlands

The National Wetland Inventory, produced by the U.S Fish and Wildlife Service, indicates that there are three different wetland types within the Carp River watershed (USFWS 1979-1994) cover over 6,800 acres or just under fifteen percent of the total watershed land area (Table 1.7). The three types of wetlands include (1) Emergent – characterized by rooted herbaceous and grass-like plants which stand erect above the water or ground surface (excluding mosses or lichens), vegetation is present for most of the growing season in most years (e.g., marshes, meadows, and fens); (2) Forested – dominated by woody vegetation twenty feet or taller and generally include an overstory of trees, an understory of young trees and shrubs, and a herbaceous layer (e.g., forested swamps); and (3) Scrub-Shrub – dominated by woody vegetation less than twenty feet tall and plant species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions (e.g., shrub swamps and bogs). The most prevalent wetland type is forested, covering 4,698 acres (approximately 10%) of the land area (Figure 1.9). Scrub-shrub wetlands are the second most prevalent wetland type and encompass 1,745 acres (approximately 4%).

The least prevalent wetland type is emergent, only covering 376 acres (less than 1%) of the total watershed land area.

Erosion Potential

While conducting soil surveys, soil scientists collected extensive field observations and collect soil samples for laboratory analysis and for engineering tests. Soil properties and expected soil properties (e.g., erosion, doughtiness, crop yield, etc.) are then interpreted by scientists from these analyses, tests, and field-observed characteristics. This information combined with other data sources (e.g., research information, production records, climate, and biological activities) can be used to predict limitations and potentials of soil behavior (USDA 2007).

Highly erodible land is an example of one of these predictable soil behavior potentials. Highly erodible land is based on an erodibility index as defined in the National Food Security Act Manual. The erodibility index (EI) of soils is calculated by dividing the potential erodiblility for each soil map unit by the loss tolerance (T) value established for the soil (see Eq. 1 below), with an erodibility of eight or more being classified as highly erodible land.

$$EI = \frac{R \times K \times LS}{T} \qquad \textbf{(Eq. 1)}$$

Where, *R* is the rainfall runoff factor and is simply defined as the erosive force of rainfall; *K* is the soil erodibility factor and represents both susceptibility of soil to erosion and the amount and rate of runoff, as measured under the standard unit plot condition; *LS* is a combination of slope length and steepness factors, *L* represents slope length factor and is the horizontal distance from the origin of overland flow to the point where either the slope gradient decreases enough that deposition begins or runoff becomes concentrated in a defined channel, *S* represents slope steepness or gradient factor and is the difference in elevation between two points and is expressed as a percentage of the distance between those points; and *T* represents the soil loss tolerance and is defined as the maximum rate of annual soil erosion that will permit crop productivity to be sustained economically and indefinitely.

This soil characteristic is rated as (1) not highly erodible land, (2) potentially highly erodible land, or (3) highly erodible land. A soil map is considered not highly erodible if the longest slope length and maximum percent of slope used results in an EI value less than eight. A rating of potentially highly erodible land is given to a map unit if the EI value using the minimum slope length and slope steepness factors is less than eight and the EI value using the maximum slope length and slope steepness factors is equal to or greater than eight. A soil map unit is rated as highly erodible if the slope length and slope steepness factors for the shortest length and minimum percent of slope used result in an EI value that equals or exceeds eight.

Soil erosion potential for the Carp River watershed was classified using the highly erodible land categories, previously described, in the following manner:

- Not highly erodible land is classified as slight erosion potential,
- Potentially highly erodible and is classified as moderate erosion potential; and,
- Highly erodible land is classified as severe erosion potential.

The soil erosion potential classification (i.e., slight, moderate, and severe) specifies the level of erosion-control measures needed, with the slight classification requiring the least precautions and severe requiring the most (USDA 2007).

A little more than half of the land in the Carp River watershed (22,235 acres or 51%) is rated as having a slight erosion potential classification (Table 1.8, Figure 1.10). Land characterized as having moderate or severe erosion potential comprise 12,753 (29%) and 8,515 acres (20%) of the total watershed land area, respectively. Areas with severe erosion potential classification typically correspond with locations that have steeper slopes (see Figure 1.5). For example, near the mouth of the Carp River and on the northern shorelines of Teal and Deer Lakes.

Chapter Two
THE HUMAN ENVIRONMENT

Community Profile (Population Only)

In 2010, Marquette County had a population of 67,077 (29th in the state, which has 83 counties total) with 37.1 people per square mile (U.S. Census Bureau 2010) (Figure 2.1). Figures 2.2 and 2.3 show the population distribution by census block group and by census block, respectively.

The population within the Carp River watershed is approximately 18,000. Population is most dense in the urban areas of Marquette, Ishpeming and Negaunee (Figure 2.3). The City of Marquette is located at the mouth of the Carp River on the shore of Lake Superior. With 21,355 residents, the City of Marquette is the most populated city in the entire Upper Peninsula; however, only a small portion of those live within the limits of the Carp River watershed (Figure 1.1). Ishpeming and Negaunee have populations of 6,470 and 4,568, respectively, and lie within the watershed boundary (Figure 1.1).

Population change between 2000 and 2010 was insignificant in Negaunee and Ishpeming). The City of Marquette; however, saw an increase of 1,894 people.

Land Ownership

In the early 17th century, the land around Marquette, including the Carp River watershed, was home to French missionaries and by fur trappers in the early-19th century. However, the development and the history of Marquette County is closely associated with the discovery of iron ore in the mid-19th century. Several iron ore mines opened in the region and Marquette became a major shipping port. Though the number of active iron ore mines has declined, there are still some active iron ore mines in the region (e.g., Tilden and Empire Mines) today.

Parcel ownership data was obtained from the Marquette County Equalization Department. The parcel data was then categorized into one of eight categories: (1) commercial; (2) county; (3) federal; (4) local; (5) Native American land; (6) private; (7) state; and (8) unknown.

Figure 2.4 shows the current distribution of land ownership within the Carp River watershed. Thirty-nine percent (18,883 acres) of the land in the watershed can be categorized as being commercially owned (Table 2.1). Land categorized as private and local (i.e., owned by local governing bodies) are the second and third most common type of land ownership accounting for thirty-three (15,963 acres) and twenty-one percent (10,200 acres) of the watershed, respectively.

Land Use/Cover

Land use/cover maps were generated using land use/cover datasets obtained from the Michigan Department of Environmental Quality (MDEQ) Geographic Information Systems (GIS) Geographic Data Library for years 1992 and 2001 (Figures 2.5 and 2.6).

The 1992 land use/cover dataset was created from the United States Geological Survey (USGS) National Land Cover Data (NLCD) by the Michigan Center for Geographic Information (MCGI) and compiled from Landsat Thematic Mapper (TM) Satellite Imagery collected in 1992. This dataset was classified using the following categories: (1) barren – areas characterized by bare rock, gravel, sand, silt, clay, or other earthen material, with little or no green vegetation present regardless of its inherent ability to support life; (2) developed – areas characterized by high percentage (approximately 30% or greater) of constructed materials (e.g., asphalt, concrete, buildings, etc.); (3) forested upland – areas characterized by tree cover (natural or semi-natural woody vegetation, generally greater than 6 meters tall); (4) herbaceous planted/cultivated – herbaceous areas that have been planted or is intensively managed for the production of food, feed, or fiber; or is maintained in developed settings for specific purposes; (5) herbaceous upland – upland areas characterized by natural or semi-natural herbaceous vegetation; (6) water – all areas of open water or permanent ice/snow cover; and (7) wetlands – areas where the soil or substrate is periodically saturated with or covered with water.

The most abundant type of land use/cover found in the Carp River watershed circa 1992 was categorized as forested upland; which accounted for sixty-six percent (31,238 acres) of the total watershed (Table 2.2). Land classified as wetland was the second most abundant land use/cover type in 1992, covering eighteen percent (8,547 acres) of the watershed. Developed land comprised six percent (2,625 acres) of the Carp River watershed, was the third must abundant land use/cover type, and is predominately represents the areas where the cities of Ishpeming, Negaunee, and Marquette are located.

The 2001 land use/cover dataset was originated by the Michigan Department of Natural Resources' Forest, Mineral and Fire Management Division and was, also, derived from Landsat TM Imagery collected from March 1997 to September 2001. The dataset was classified into the following categories: (1) agricultural – land intensely managed for vegetation production excluding forestry; (2) bare/sparsely vegetated – land that is less than twenty-five percent vegetated; (3) upland forest – land not periodically flooded nor on hydric soils with a proportion of trees that exceeds twenty-five percent of land area; (4) upland openland – land not periodically flooded nor on hydric soils with less than twenty-five percent of land area covered by tree canopy and greater than twenty-five percent of land area is vegetated; (5) urban – land areas greater than ten percent man-made structures including paved and gravel roads and parking lots; (6) water – proportion of open water exceeds seventy-five percent of land area; and (7) wetlands – land that is periodically flooded and/or on hydric soils.

Similarly to the 1992 dataset, the three most abundant types of land use/cover found in the Carp River watershed circa 2001 were (in descending order) upland forest, wetlands, or urban. Upland forest land decreased by one percent between 1992 and 2001, but still accounted for sixty-five percent (30,867 acres) of the total watershed (Table 2.2). Land classified as wetland also decreased between 1992 and 2001 (by

three percent), covering fifteen percent (7,149 acres) of the watershed in 2001. Urban land exhibited a two percent increase from 1992 to 2001, comprising eight percent (3,725 acres) of the Carp River watershed in 2001, and is still centralized in the cities of Ishpeming, Negaunee, and Marquette.

Impervious Surfaces

Land use/cover data, described above, was utilized to create impervious surface maps for the Carp River watershed for 1992 and 2001 (Figures 2.7 and 2.8, respectively). Impervious surface maps were generated by re-categorizing land use/cover types, from both the 1992 and 2001 datasets, into three possible classifications: (1) pervious; (2) impervious; and (3) water. Land use/cover types described as developed (1992 dataset) or urban (2001 dataset) were categorized as impervious; whereas, all other types of land use/cover, excluding water, were categorized as pervious (e.g., agricultural, barren, forested upland, herbaceous planted/cultivated, herbaceous upland, upland openland, and wetlands). Land use/cover categorized as water was also defined as water for the impervious surface maps.

In 1992, six percent (2,625 acres) of the Carp River watershed was considered impervious, while pervious surfaces accounted for eighty-nine percent (41,995 acres) of the water (Table 2.3). Between 1992 and 2001, the amount of land categorized as impervious increased by two percent to a total of eight percent or 3,725 acres. Concurrently, land categorized as pervious decreased by two percent between 1992 and 2001 now accounting for eighty-seven or 41,227 acres of the Carp River watershed.

Chapter Three
DESIGNATED USES AND POLLUTANTS OF CONCERN

Controls on Mercury Mobilization (A Review)

The following text is largely borrowed from Schelker's 2011 paper titled "Hydrological mobilization of mercury and dissolved organic carbon in a snow-dominated, forested watershed: Conceptualization and modeling," which includes a review of current scientific literature related to controls on mercury mobilization.

Anthropogenic emissions of mercury (Hg) to the atmosphere have increased the actively cycled pool of mercury by threefold to fivefold, and Hg contamination of aquatic ecosystems in the United States and across the globe is widespread (Schelker et al. 2011). Methylmercury (MeHg) is of particular concern because this form bioaccumulates and biomagnifies in aquatic and terrestrial food webs, and as a result, Hg fish consumption advisories have been listed for surface waters in all 50 U.S. states (US EPA 2009). The source of Hg to most watersheds is believed to be atmospheric deposition that originates from human and natural emissions of which coal burning is the leading source (Schelker et al. 2011).

Soils are the largest store of Hg in most watersheds and by soil mass mineral soil typically has a greater store of Hg than the forest floor. Highest Hg concentrations are observed in wetlands and in peaty soils. Hg is believed to be largely associated with soil organic carbon, suggesting that organic carbon distribution controls Hg distribution (Schelker et al. 2011).

Concentrations of THg and MeHg vary greatly among surface waters and this spatial variation typically exceeds the spatial variations in atmospheric Hg deposition. The range of concentrations of THg typically found in US rivers and streams is 1-7 nanogram per liter (ng/L) (US EPA 1997). Wetlands are believed to be one of the key landscape features that affect Hg storage and transport, and if hydrologic connection between wetlands and surface water and, to a lesser degree, other factors are favorable, percent wetland area can be strongly related to surface water Hg concentrations (Schelker et al. 2011).

Some of the Hg pool in soils can become methylated by bacteria under anaerobic conditions. Methylation is generally believed to be carried out largely by sulfate reducing bacteria (SRB) for which the availability of sulfate and labile DOC are often controlling factors. Additional losses of Hg within watersheds can occur by photoreduction of Hg and volatilization of the resulting Hg, directly from surface waters, and MeHg can be removed through biological and physical demethylation processes in streams and ponds (Schelker et al. 2011).

The transport of Hg between upland areas and riparian areas is often favored by the flux of water between these two landscape features. Rapid runoff from uplands can

speed the transport of Hg to wetlands, where methylation may occur. The loads of Hg and DOC that reach the outlet of a watershed may be less dependent on the amount of Hg stored in the soils, than on the efficiency of physical and chemical mobilization processes (Schelker et al. 2011).

There appears to be a strong positive relationship between total mercury and DOC or particulate organic carbon (POC) concentration in stream water, which reflects the dependence of Hg(II) on binding to soluble organic matter to facilitate transport. Furthermore, the hydrophobic organic acid fraction (HPOA) of DOC has been found to explain a higher fraction of the variability of Hg concentrations in surface waters than can be explained by DOC concentrations.

The mobilization of Hg from soils is driven in large part by changing hydrological conditions, especially high‐flow events such as rain storms and snowmelt events. Snowmelt is a major period for Hg transport during the year, and accounts for a relatively large proportion of annual export (Schelker et al. 2011).

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TABLES

Table 1.1 Bedrock Geology
Carp River Watershed

Bedrock Geology	Acres	Percent of Watershed
Archean Granite and Gneissic	2,261	5
Archean Ultramafic	1,849	4
Archean Volcanic and Sedimentary	14,018	30
Chocolay Group	6,664	14
Goodrich Quartzite	4,191	9
Michigamme Formation	5,515	12
Negaunee Iron Formation	5,638	12
Siamo Slate and Ajibik Quartzite	7,039	15
Total	47,175	100

Table 1.2 Quaternary Geology
Carp River Watershed

Quaternary Geology	Acres	Percent of Watershed
Coarse-Textured Glacial Till	5,515	12
Glacial Outwash Sand and Gravel and Postglacial Alluvium	12,074	26
Lacustrine Sand and Gravel	60	<1
Thin to Discontinuous Glacial Till over Bedrock	27,929	59
Water	1,596	3
Total	47,175	100

Table 1.3 Slope
Carp River Watershed

Slope By Percent	Acres	Percent of Watershed
0 - 5	23,945	51
5 - 10	11,049	23
10 - 20	8,794	19
20 - 30	2,396	5
30 - 100	991	2
Total	47,175	100

Table 1.4 Soil Taxonomy
Carp River Watershed

Soil Taxonomy	Acres	Percent of Watershed
Entisols	3,454	7
Histosols	6,576	14
Inceptisol	1,722	4
Mollisols	455	1
Pits, quarries	1,368	3
Slickens	61	<1
Spodosols	31,296	66
Udorthents, Ash	13	<1
Water	2,229	5
Total	47,175	100

Table 1.5 Soil Type
Carp River Watershed

Type of Soil	Acres	Percent of Watershed
Carbondale	4,284	9
Kalkaska	3,643	8
Schweitzer	3,470	7
Michigamme	3,404	7
Keweenaw	3,272	7
Gogebic	2,823	6
Pence	2,789	6
Rubicon	2,428	5
Water	2,227	5
Udipsamments	2,041	4
Keewaydin	1,713	4
Pits, quarries	1,371	3
Sundog	1,349	3
Udorthents	1,347	3
Dishno	989	2
Peshekee	929	2
Greenwood	859	2
Tawas	801	2
Minocqua	736	2
Garlic	683	1
Witbeck	634	1
Histosols	633	1
Chabeneau	574	1
Evart	449	1
Sayner	446	1
Ishpeming	412	1
Croswell	366	1
Pleine	352	1
Yalmer	281	1
Rousseau	276	1
Au Gres	245	1
Channing	232	<1
Tula	214	<1
Karlin	201	<1
Kinross	185	<1
Waiska	155	<1
Goodman	69	<1
Deford	67	<1
Slickens	61	<1
Liminga	36	<1
Net	31	<1
Paquin	24	<1
Farquar	21	<1
Pelissier	21	<1
Udorthents, Ash	13	<1
Fence	8	<1
Frohling	6	<1
Shag	5	<1
Total	47,175	100

Table 1.6 Hydric Soils
Carp River Watershed

Hydric Soils	Acres	Percent of Watershed
Hydric Soils	11,581	25
Non-Hydric Soils	27,620	59
Unranked	7,974	17
Total	47,175	100

Table 1.7 Wetlands
Carp River Watershed

Type of Wetland	Acres	Percent of Watershed
Uplands	38,310	81
Emergent	376	1
Flat	36	<1
Forested	4,698	10
Open Water/Unknown Bottom	2,010	4
Scrub-Shrub	1,745	4
Total	47,175	100

Table 1.8 Erosion Potential
Carp River Watershed

Erosion Potential Rating	Acres	Percent of Watershed
Slight	22,235	47
Moderate	12,753	27
Severe	8,515	18
Pits, quarries	24	<1
Not rated	3,648	8
Total	47,175	100

Table 2.1 Land Ownership
Carp River Watershed

Type of Landowner	Acres	Percent of Watershed
Commercial	18,883	40
County	137	<1
Federal	3	<1
Local	10,200	22
Native American Land	76	<1
Private	15,963	34
State	572	1
Unknown	1,341	3
Total	47,175	100

Table 2.2 Land Use in 1992 and 2001
Carp River Watershed

Type of Land Use/Cover	1992		2001	
	Acres	Percent of Watershed	Acres	Percent of Watershed
Barren or Bare/Sparsely Vegetated	330	1	174	<1
Developed or Urban	2,625	6	3,725	8
Forested Upland or Upland Forest	31,238	66	30,867	65
Herbaceous Planted/Cultivated or Agricultural	1,474	3	60	<1
Herbaceous Upland or Upland Openland	406	1	2,977	6
Water	2,554	5	2,222	5
Wetlands	8,547	18	7,149	15
Total	47,175	100	47,175	100

Table 2.3 Impervious Surface in 1992 and 2001
Carp River Watershed

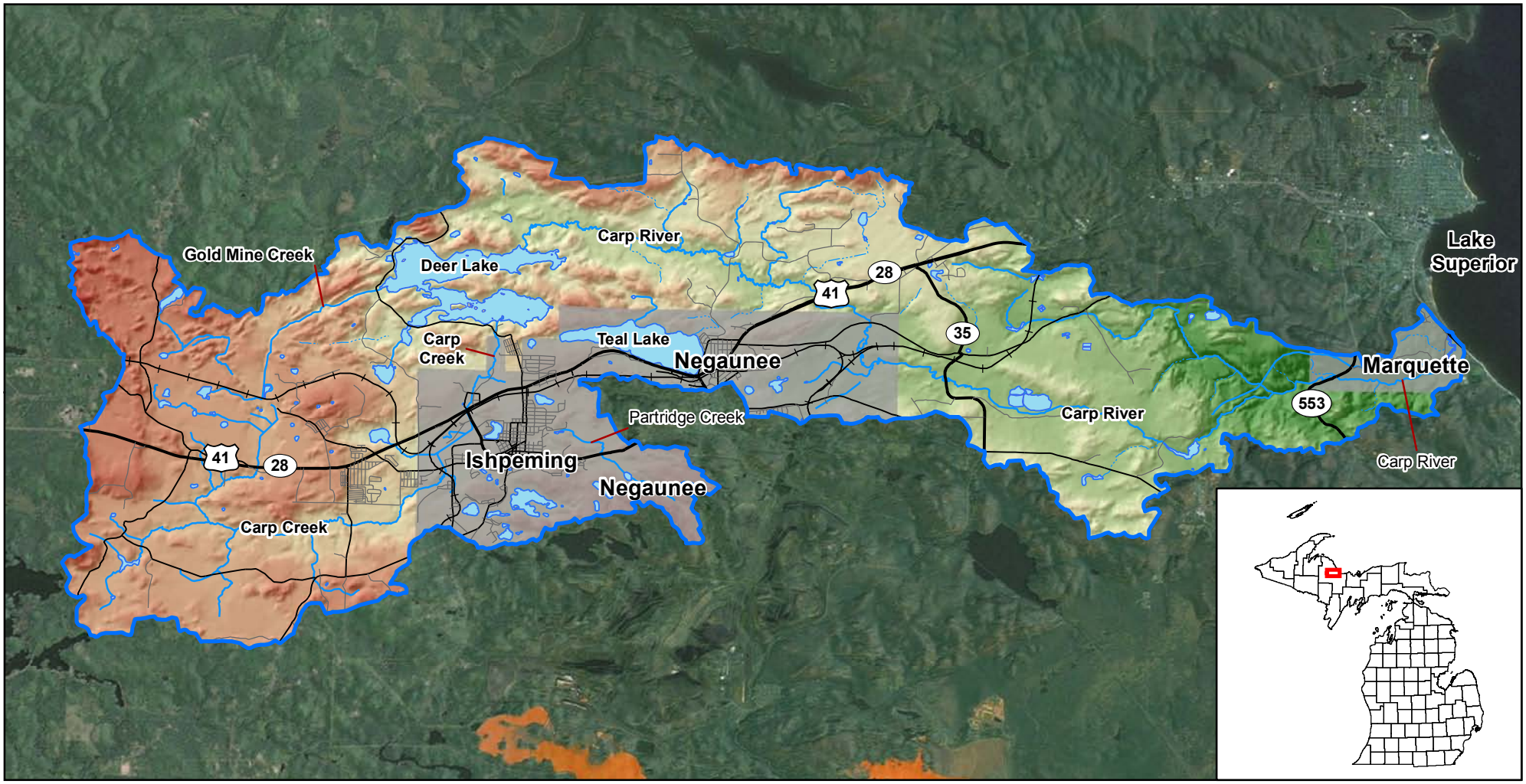
Type of Surface	1992		2001	
	Acres	Percent of Watershed	Acres	Percent of Watershed
Impervious	2,625	6	3,725	8
Pervious	41,995	89	41,227	87
Water	2,554	5	2,222	5
Total	47,175	100	47,175	100

FIGURES

Carp River Watershed

Marquette County, Michigan

Carp River Watershed Location Map



Transportation

- U.S. & State Highways
- Principal Arterial Road
- Minor Arterial Road
- Residential Court or Cul-de-Sac
- Railroad

Elevation (ft above MSL)

Maximum: 1781.34

Minimum: 604.18

Other

- City Limits
- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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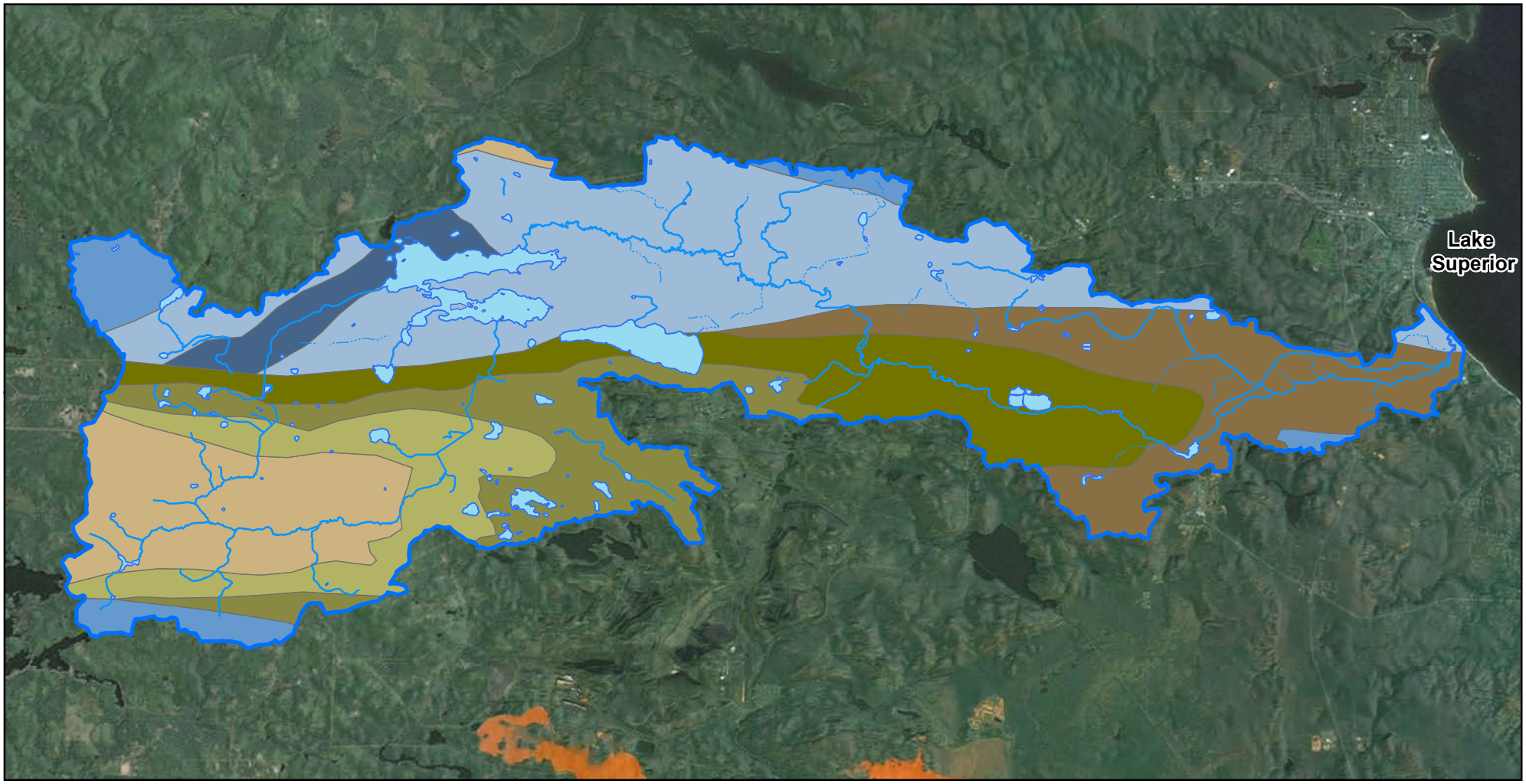
Figure: 1.1

Carp River Watershed

Marquette County, Michigan

Bedrock Geology



Bedrock Geology

- Michigamme Formation
- Goodrich Quartzite
- Negaunee Iron Formation
- Siamo Slate & Ajibik Quartzite
- Chocolay Group

Bedrock Geology Continued...

- Archean Volcanic & Sedimentary
- Archean Granite & Gneissic
- Archean Ultramafic

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

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Projection & Datum: Hotine Oblique Mercator Azimuth
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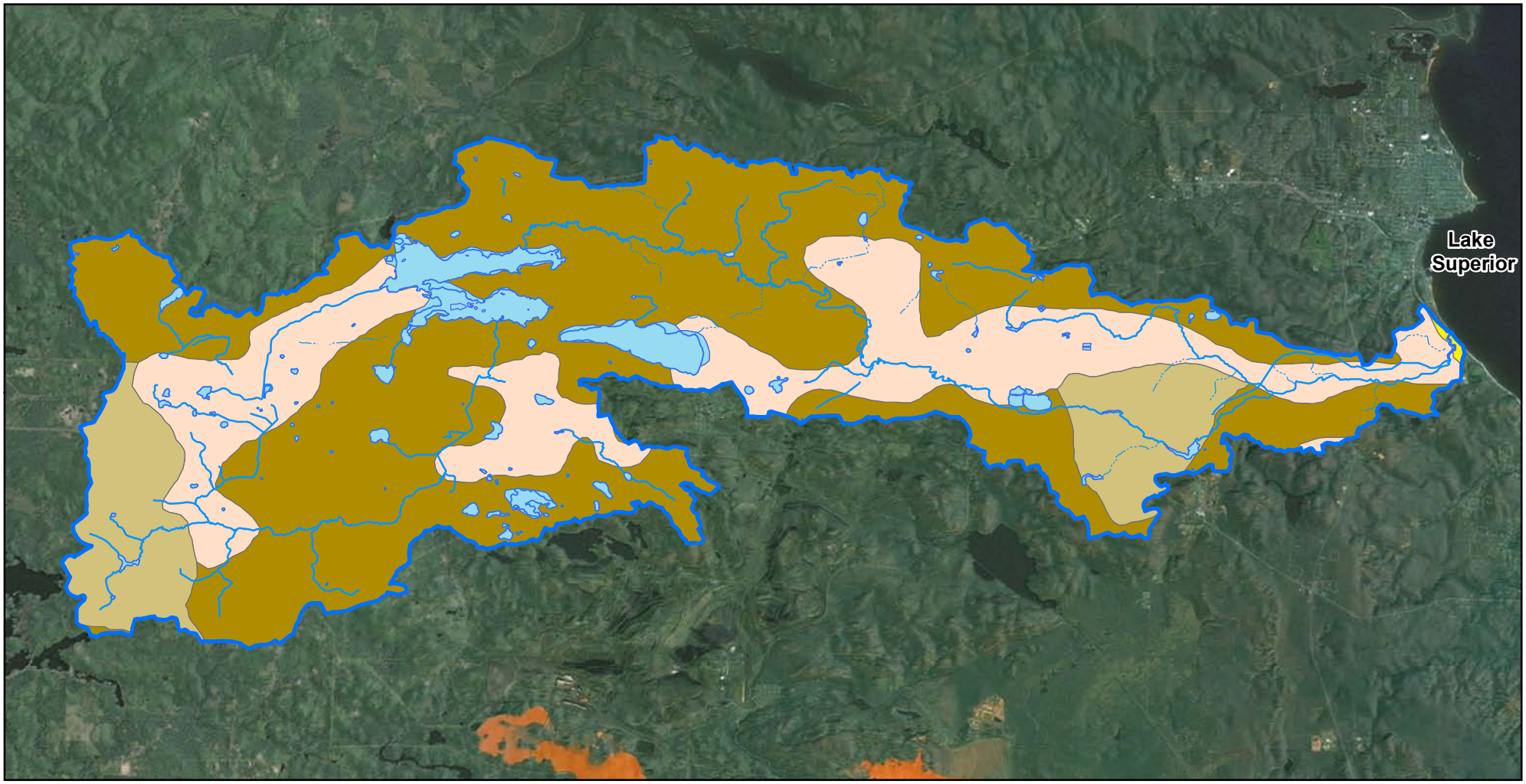
Figure: 1.2

Carp River Watershed

Marquette County, Michigan

Quaternary Geology



Quaternary Geology

- Glacial Till
- Glacial Outwash Sediment
- Lacustrine Sand and Gravel
- Thin Glacial Till (Over Bedrock)
- Water

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

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Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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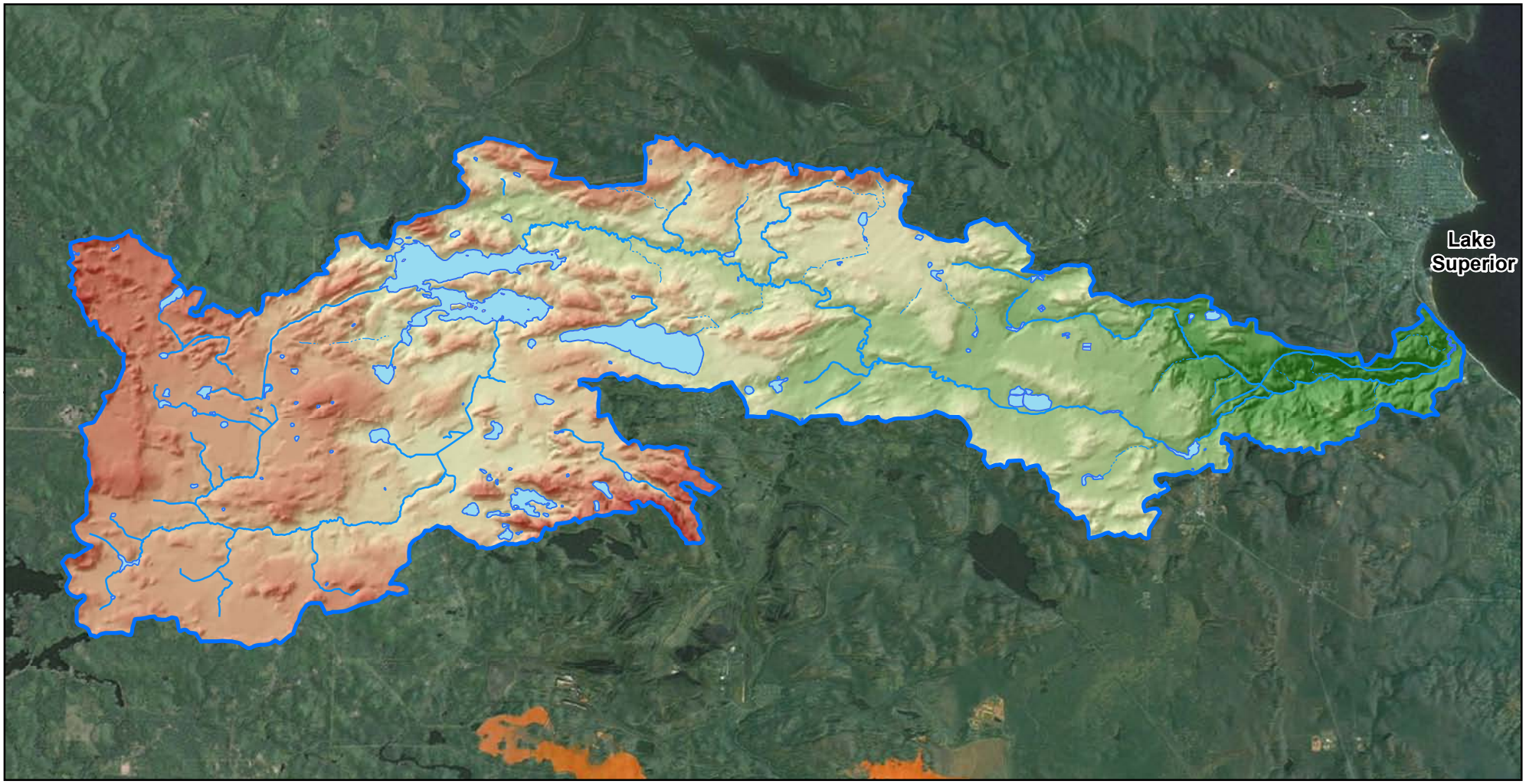
Figure: 1.3

Carp River Watershed

Marquette County, Michigan

Topography



Elevation (ft above MSL)

Maximum: 1781.34

Minimum: 604.18

Other

Watershed Boundary

Hydrology

Rivers & Streams

Drains & Intermittent Streams

Lake

0 2 4 Miles

1:135,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
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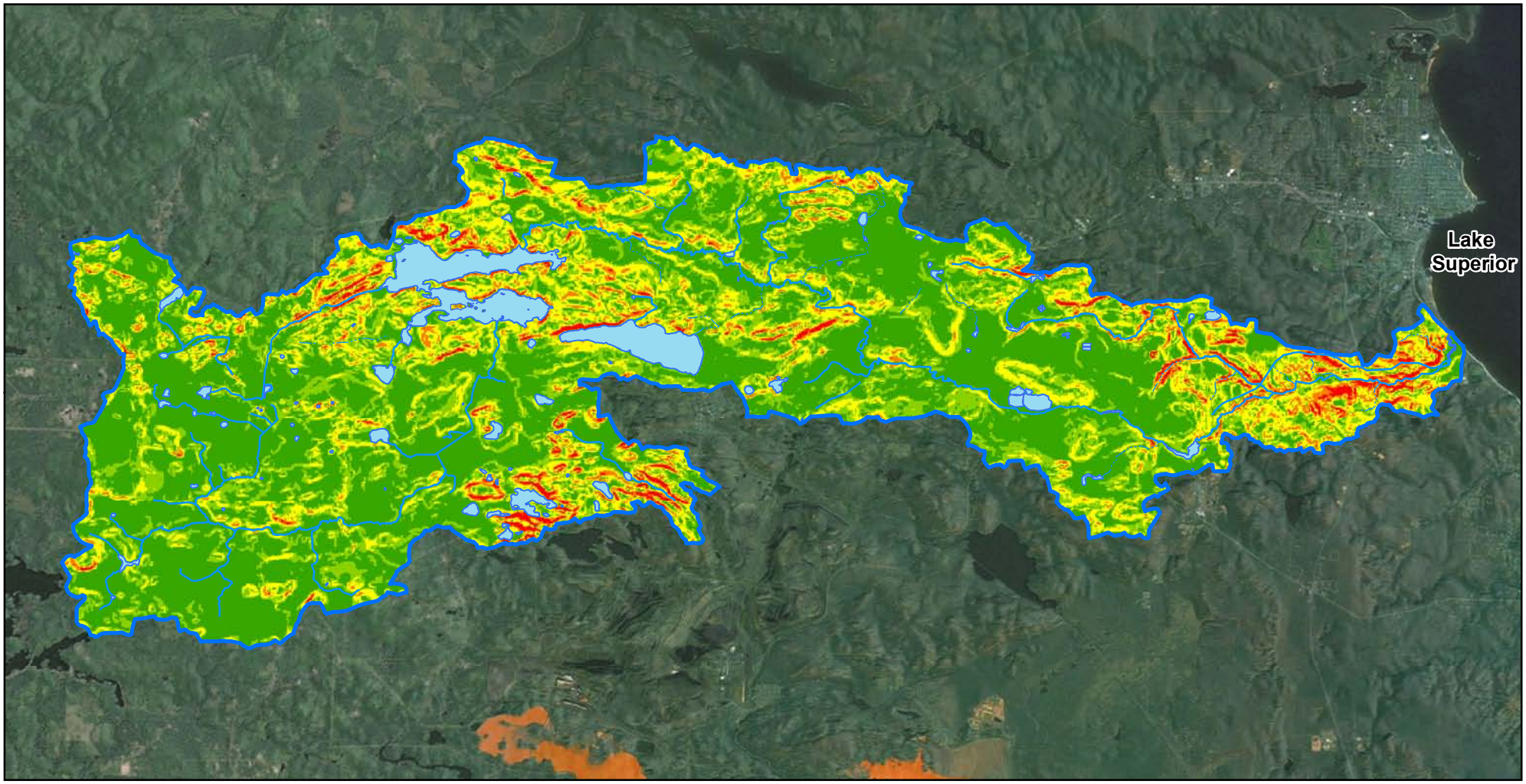
Figure: 1.4

Carp River Watershed

Marquette County, Michigan

Slope



Slope By Percent

- 0 - 5
- 5 - 10
- 10 - 20
- 20 - 30
- 30 - 100

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth
Natural Origin NAD 83

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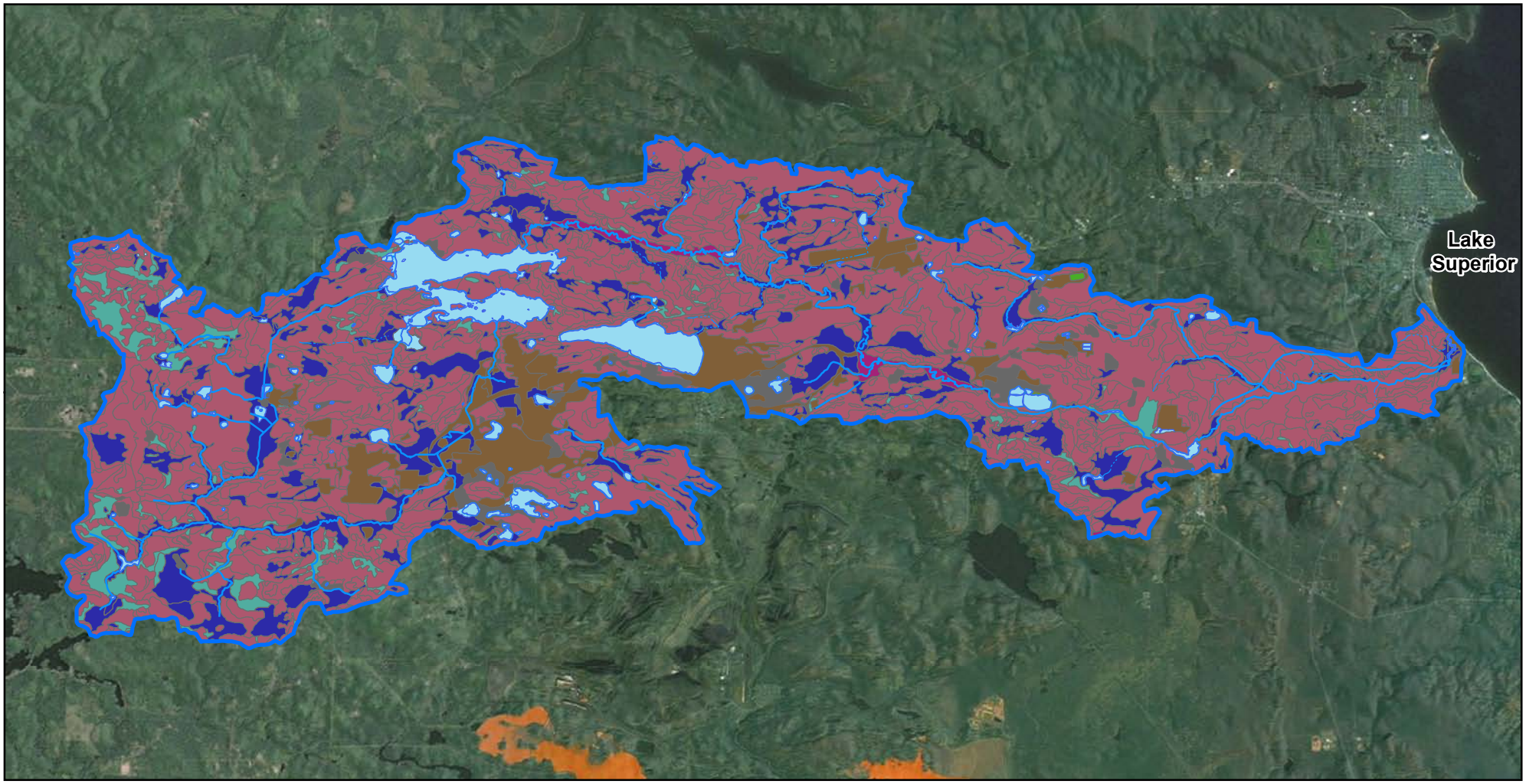
Figure: 1.5

Carp River Watershed

Marquette County, Michigan

Soil Taxonomy



Soil Taxonomy

- Entisols
- Histosols
- Inceptisol
- Mollisols
- Pits & Quarries

Soil Taxonomy Continued...

- Slickens
- Spodosols
- Udorthents
- Water

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

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Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth
Natural Origin NAD 83

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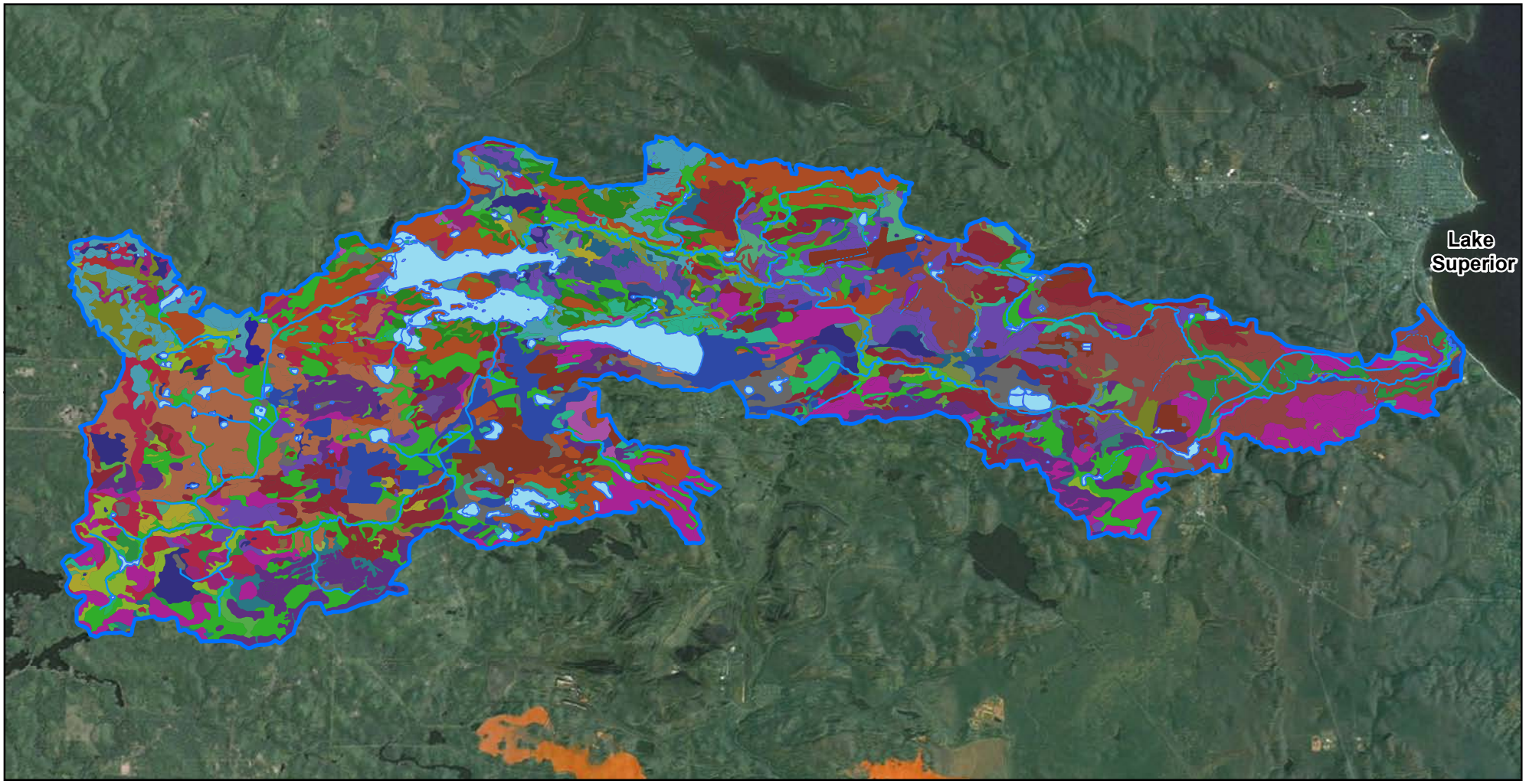
Figure: 1.6

Carp River Watershed

Marquette County, Michigan

Soil Type



Soil Type
- Au Gres
- Carbondale
- Chabeneau
- Channing
- Croswell
- Deford
- Dishno
- Evart

Soil Type Cont...
- Farquar
- Fence
- Frohling
- Garlic
- Gogebic
- Goodman
- Greenwood
- Histosols

Soil Type Cont...
- Ishpeming
- Kalkaska
- Karlin
- Keewaydin
- Keweenaw
- Kinross
- Liminga
- Michigamme

Soil Type Cont...
- Minocqua
- Net
- Paquin
- Pelissier
- Pence
- Peshekee
- Pits & Quarries
- Pleine

Soil Type Cont...
- Rousseau
- Rubicon
- Sayner
- Schweitzer
- Shag
- Slickens
- Sundog
- Tawas

Soil Type Cont...
- Tula
- Udipsamments
- Udorthents
- Waiska
- Water
- Witbeck
- Yalmer

Hydrology
- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other
- Watershed Boundary

0 2 4
Miles

1:135,000

N

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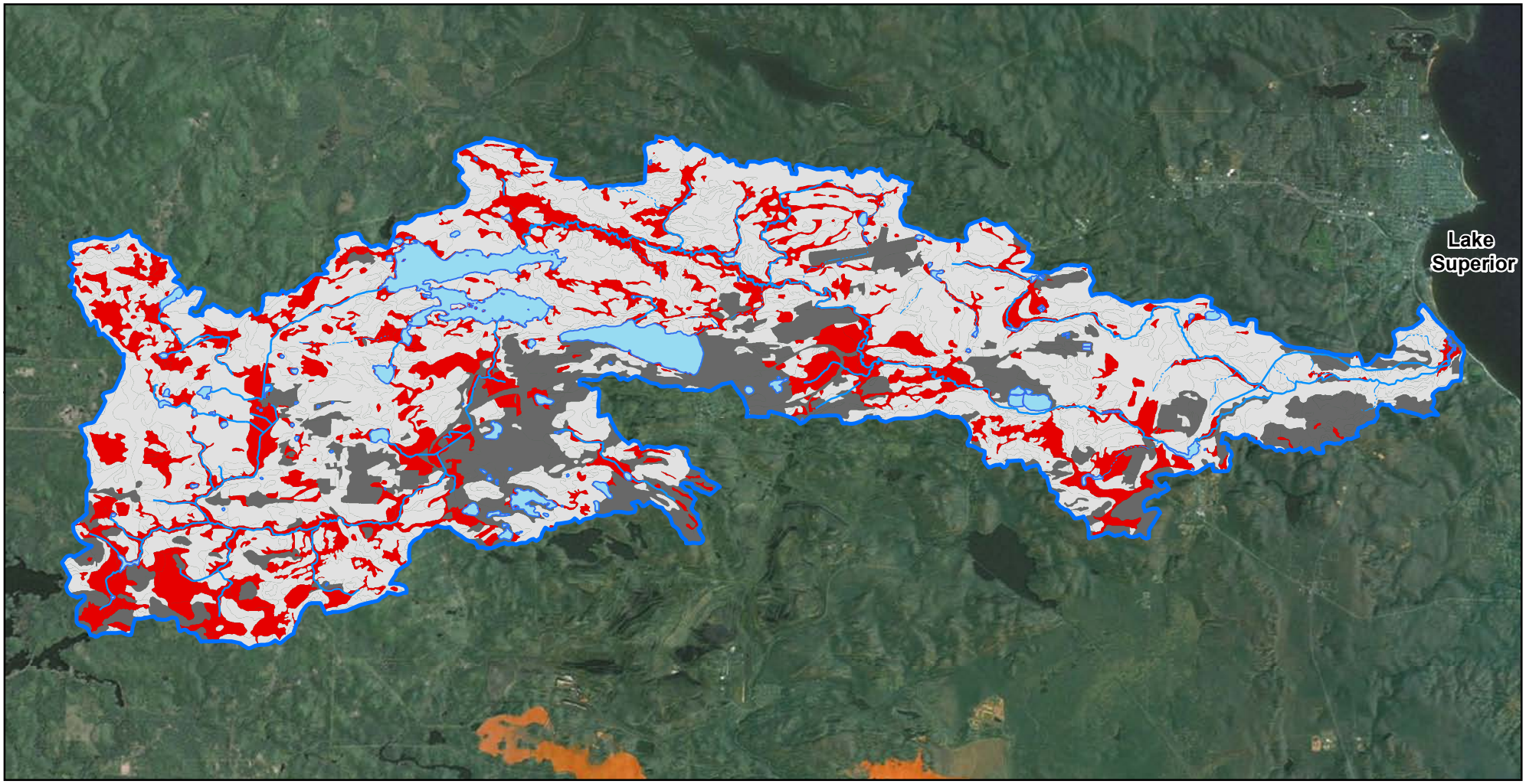
Figure: 1.7

Carp River Watershed

Marquette County, Michigan

Hydric Soils



Hydric Soils

- Hydric Soils
- Non-Hydric Soils
- Unranked

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

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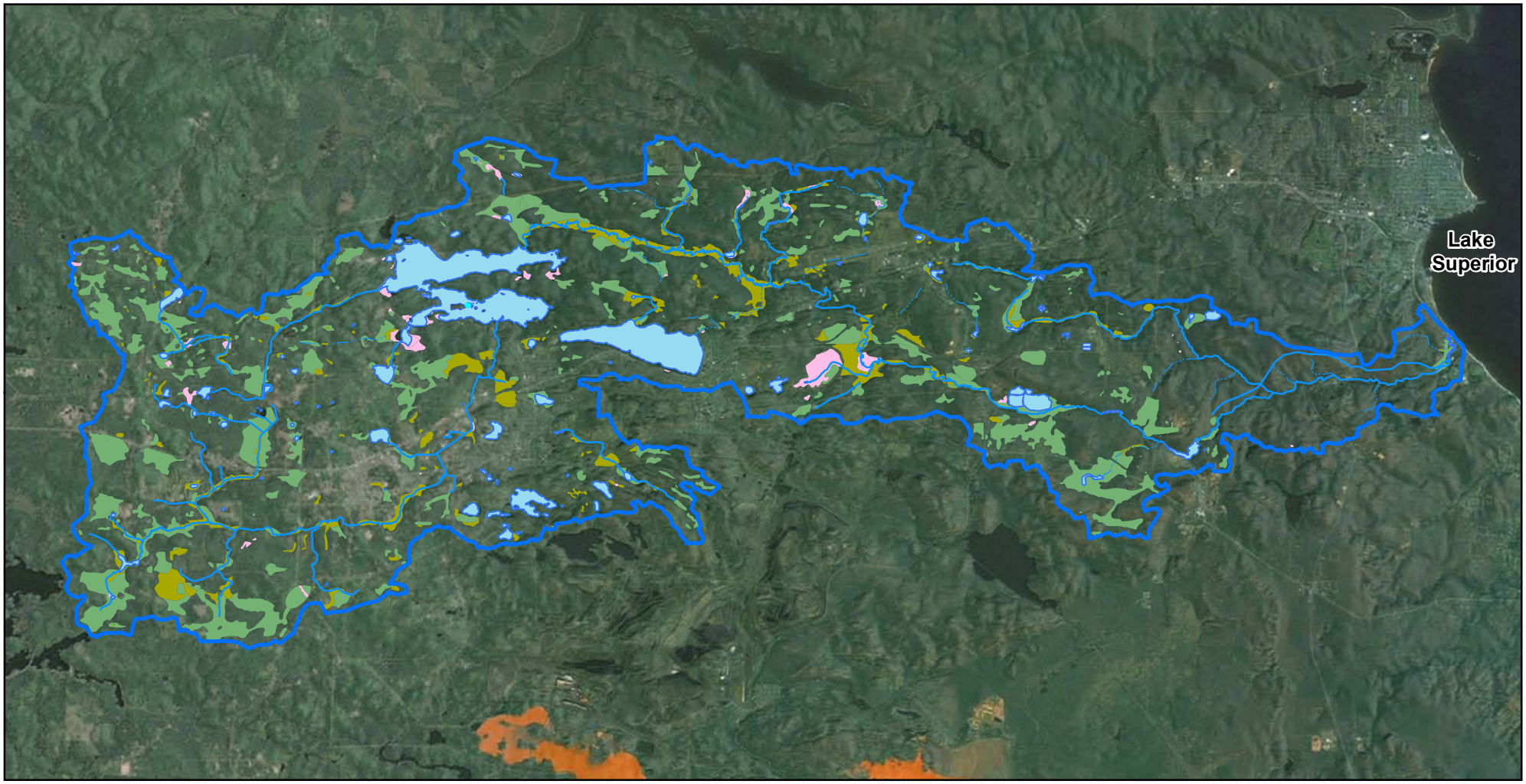
Figure: 1.8

Carp River Watershed

Marquette County, Michigan

Wetlands



Wetland Type

- Emergent
- Forested
- Scrub-Shrub

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

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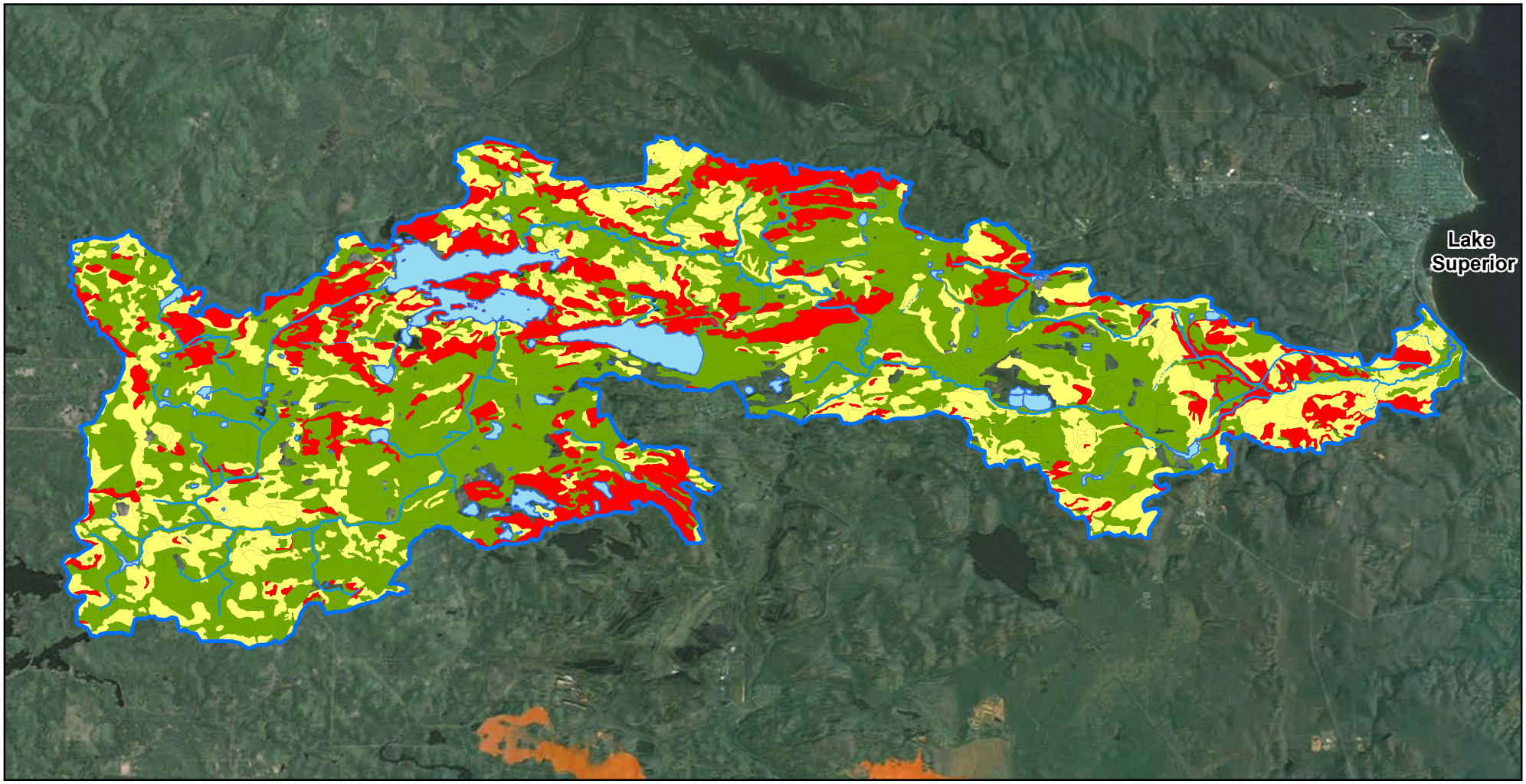
Figure: 1.9

Carp River Watershed

Marquette County, Michigan

Erosion Potential



Erosion Potential

- Slight
- Moderate
- Severe
- Not Rated

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

N

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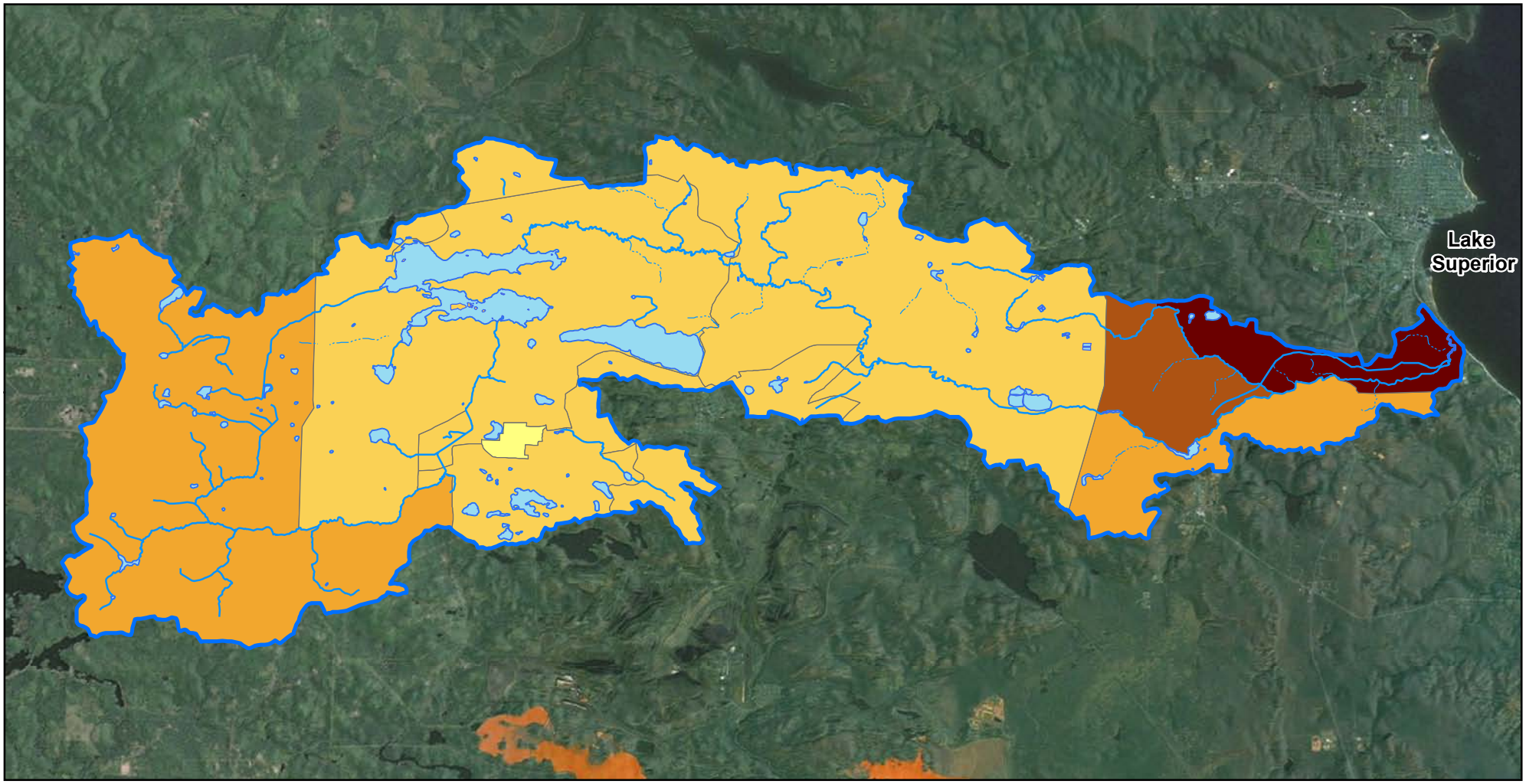
Figure: 1.10

Carp River Watershed

Marquette County, Michigan

Population Per 2010 Census Tract



Population

- < 2000
- 2001 - 3000
- 3001 - 4000
- 4001 - 5000
- > 5001

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

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Satellite Image taken on: September 2011

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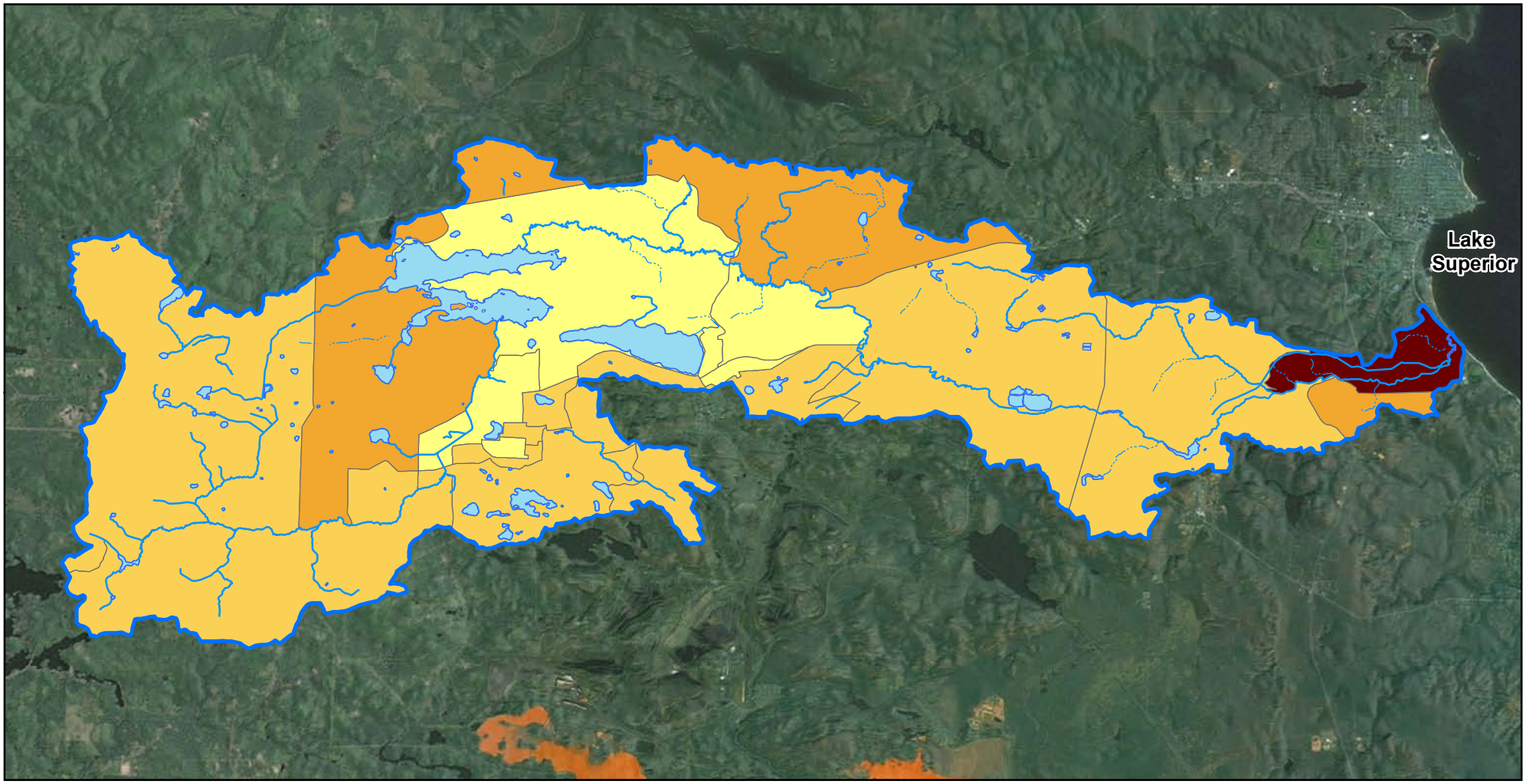
Figure: 2.1

Carp River Watershed

Marquette County, Michigan

Population Per 2010 Block Group



Population

- < 1000
- 1001 - 1500
- 1501 - 2000
- 2001 - 2500
- > 2501

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

N

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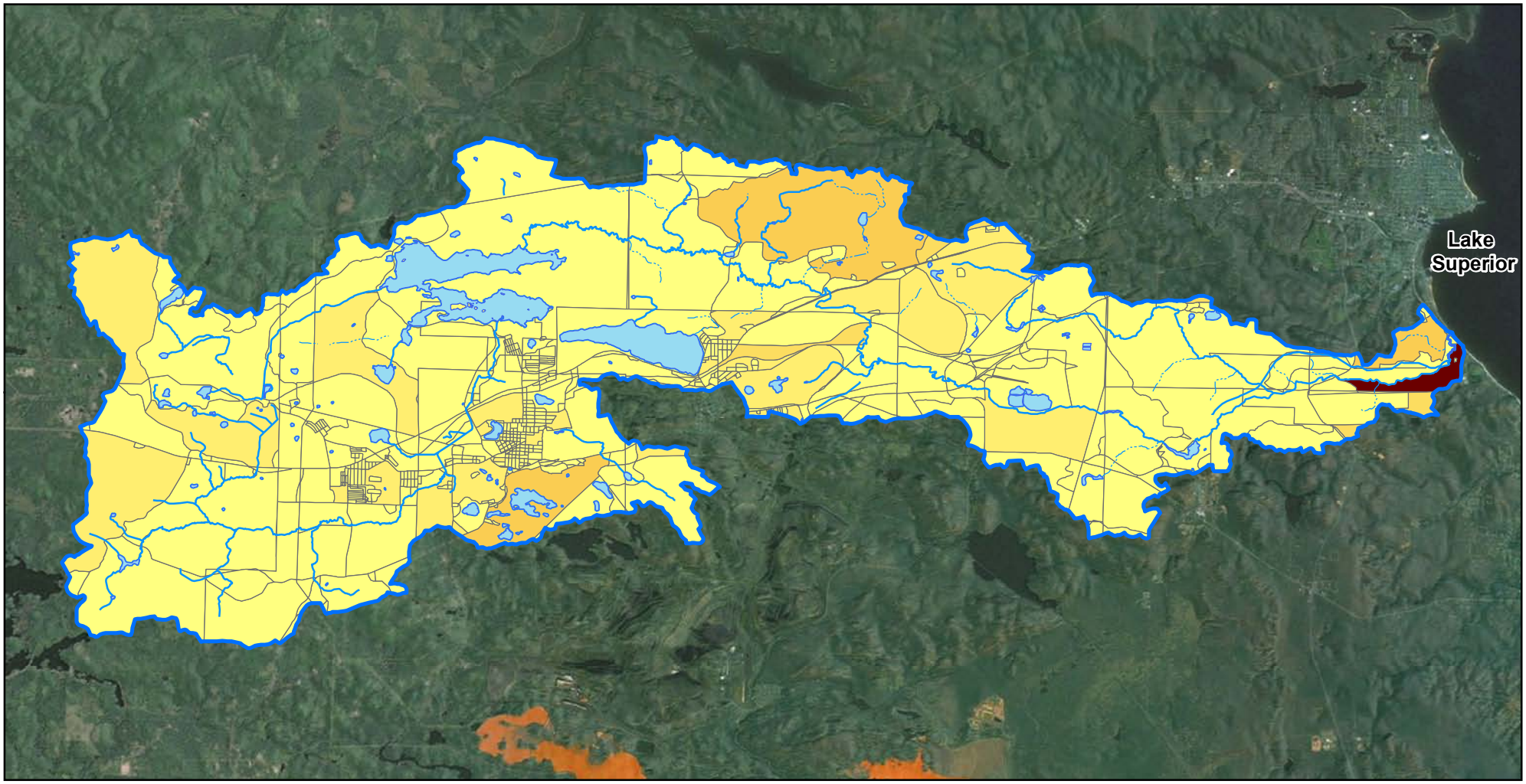
Figure: 2.2

Carp River Watershed

Marquette County, Michigan

Population Per 2010 Census Block



Population

- < 100
- 101 - 200
- 201 - 300
- 301 - 400
- 401 - 500

Population Continued...

- 501 - 600
- 601 - 700
- 701 - 800
- 801 - 900
- 901 - 1000

Population Continued...

- 1001 - 1100
- > 1101

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

N

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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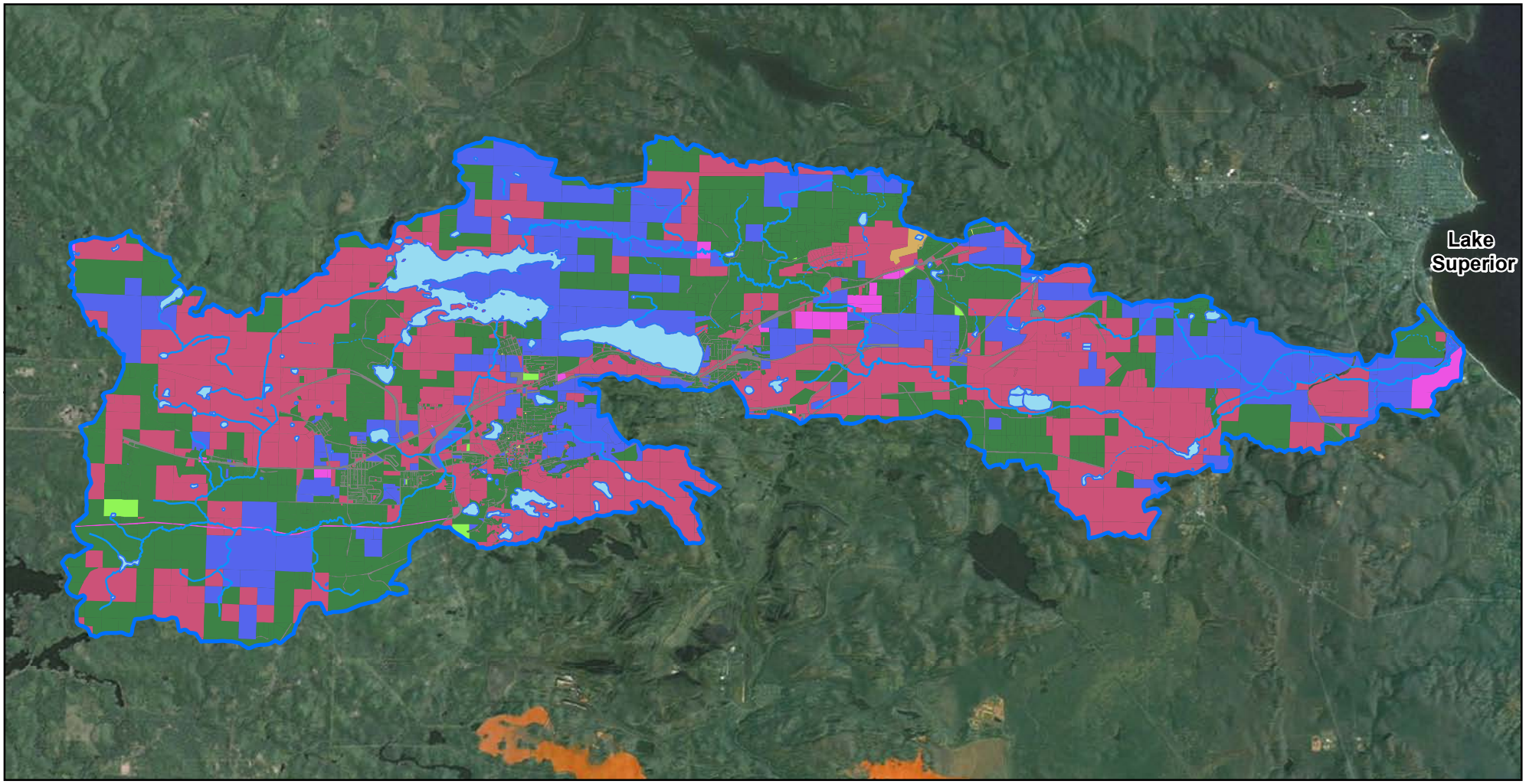
Figure: 2.3

Carp River Watershed

Marquette County, Michigan

Land Ownership



Land Ownership

- Commercial
- County
- Federal
- Local
- Native American Land

Land Ownership Continued...

- Private
- State
- Unknown

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

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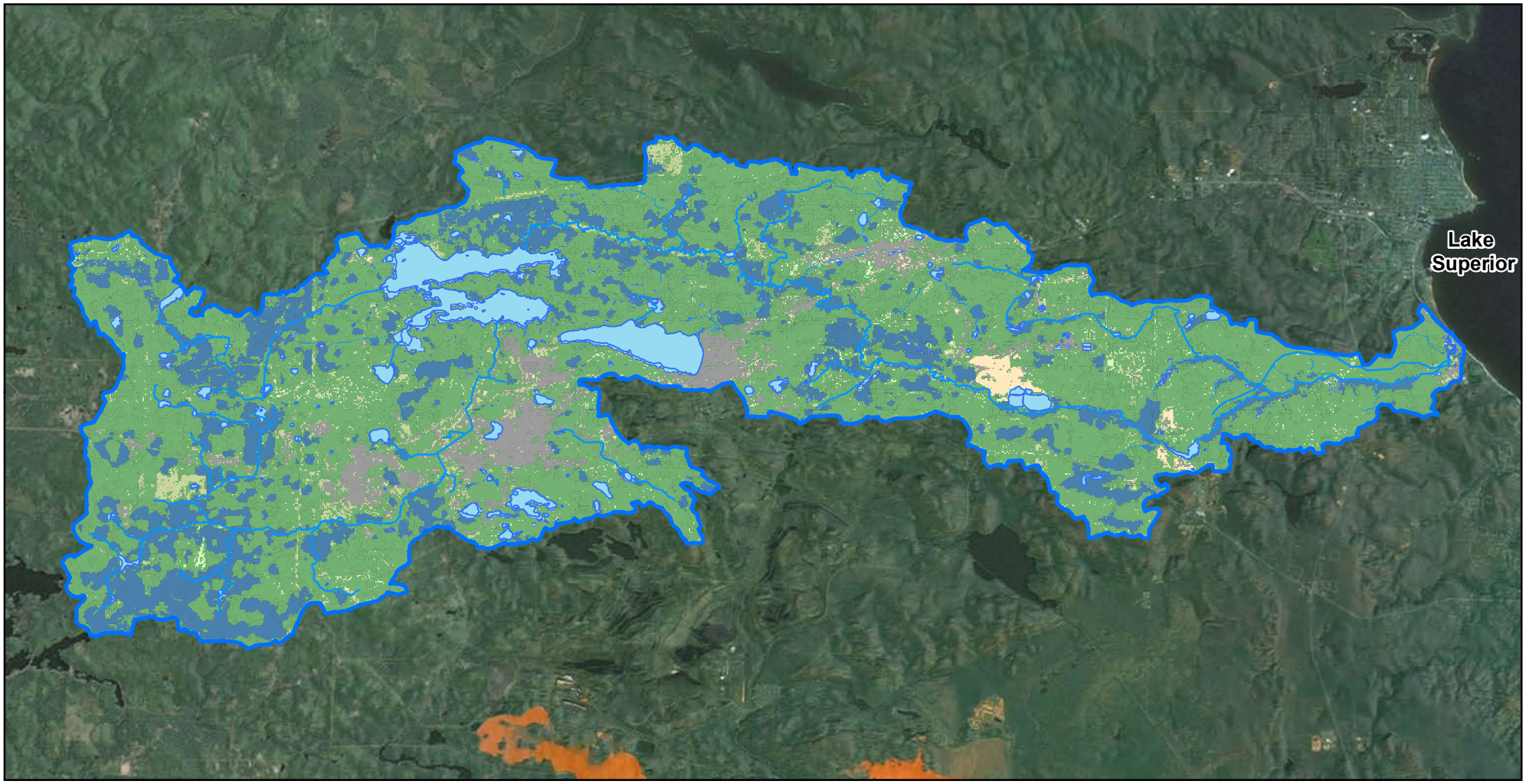
Figure: 2.4

Carp River Watershed

Marquette County, Michigan

Land Use/Cover (1992)



Land Use/Cover

- Barren
- Developed
- Forested Upland
- Herbaceous Planted/Cultivated
- Herbaceous Upland

Land Use/Cover Continued...

- Wetlands
- Water

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

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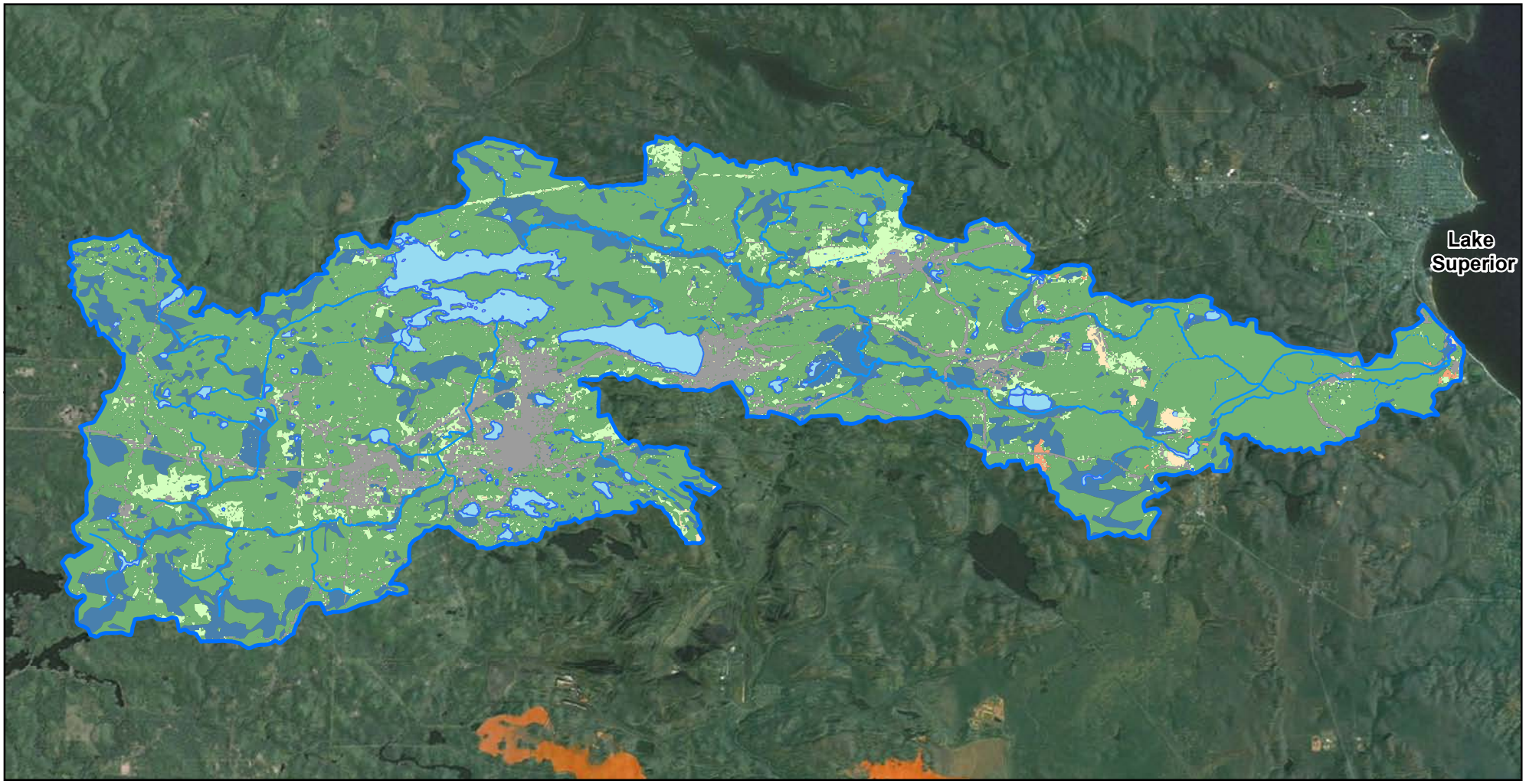
Figure: 2.5

Carp River Watershed

Marquette County, Michigan

Land Use/Cover (2001)



Land Use/Cover

- Agricultural
- Bare/Sparsely Vegetated
- Upland Forest
- Upland Openland
- Urban

Land Use/Cover Continued...

- Wetlands
- Water

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

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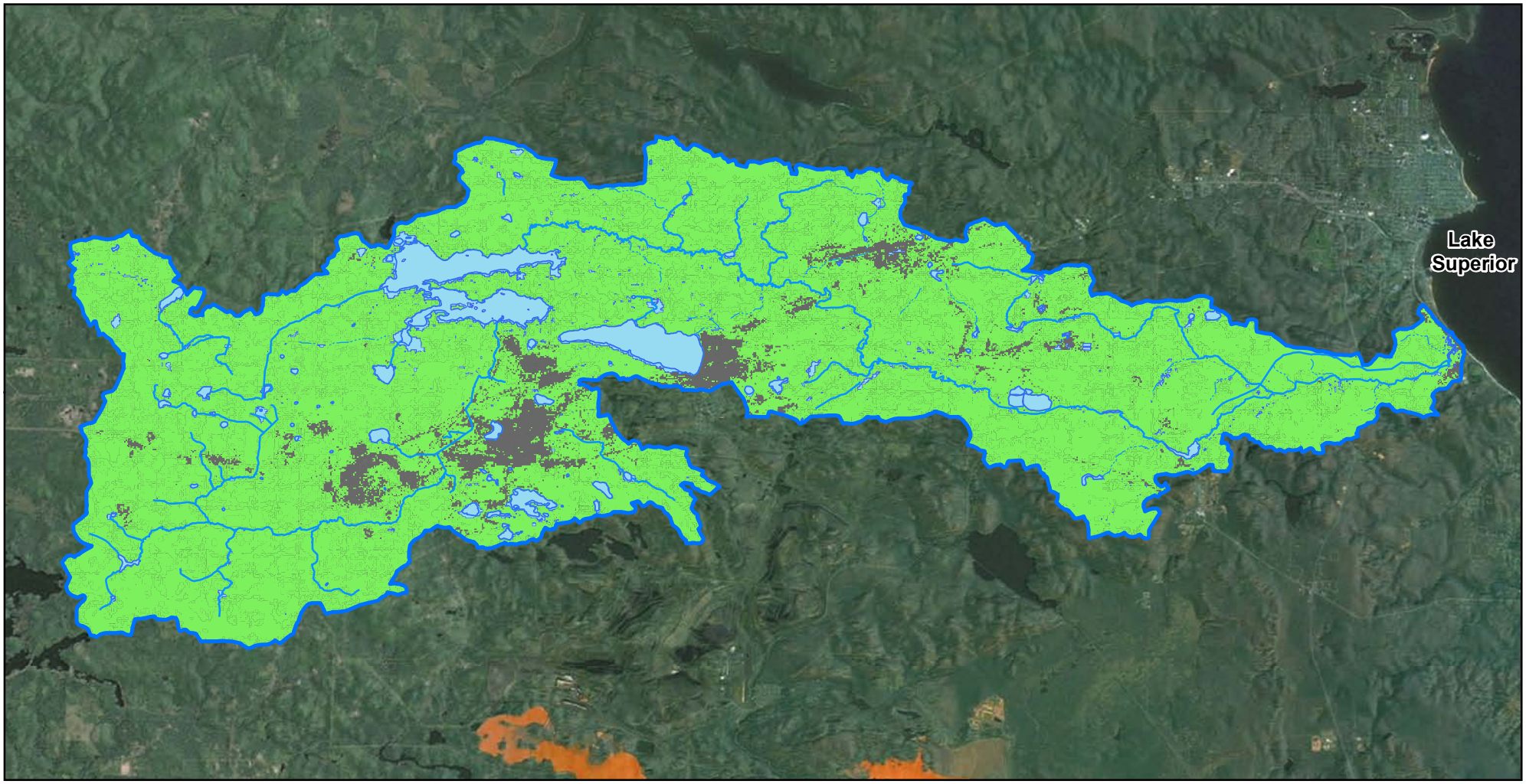
Figure: 2.6

Carp River Watershed

Marquette County, Michigan

Impervious Surface (1992)



Impervious Surface

- Impervious
- Pervious
- Water

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

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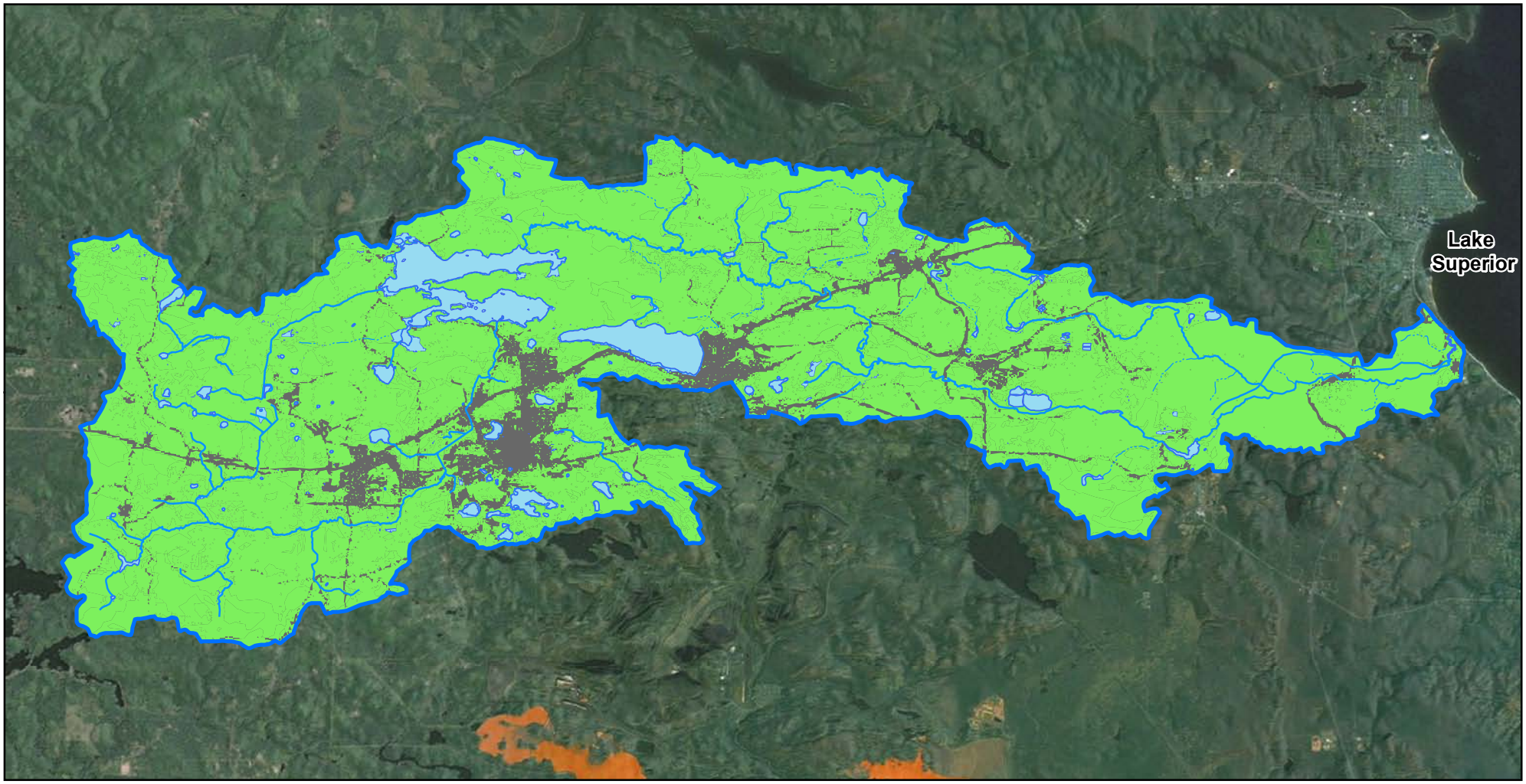
Figure: 2.7

Carp River Watershed

Marquette County, Michigan

Impervious Surface (2001)



Impervious Surface

- Impervious
- Pervious
- Water

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 2 4 Miles

1:135,000

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Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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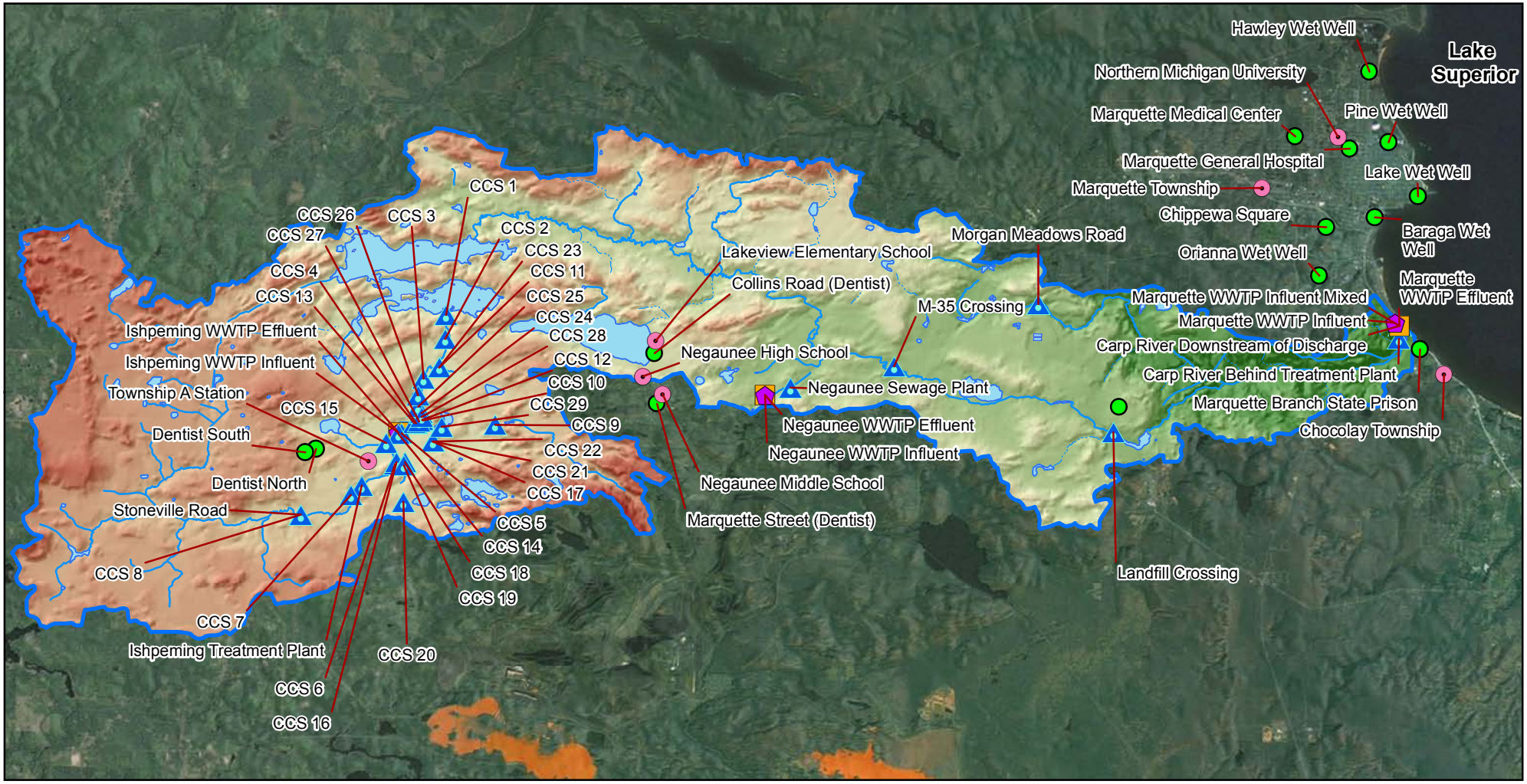
Figure: 2.8

Carp River Watershed

Marquette County, Michigan

Mercury Sampling Locations



Sampling Location Type

- Drinking Water
- WWTP Effluent
- WWTP Influent
- Source
- Surface Water

Note: CCS stands for Carp Creek Station.

Elevation (ft above MSL)

Maximum: 1781.34

Minimum: 604.18

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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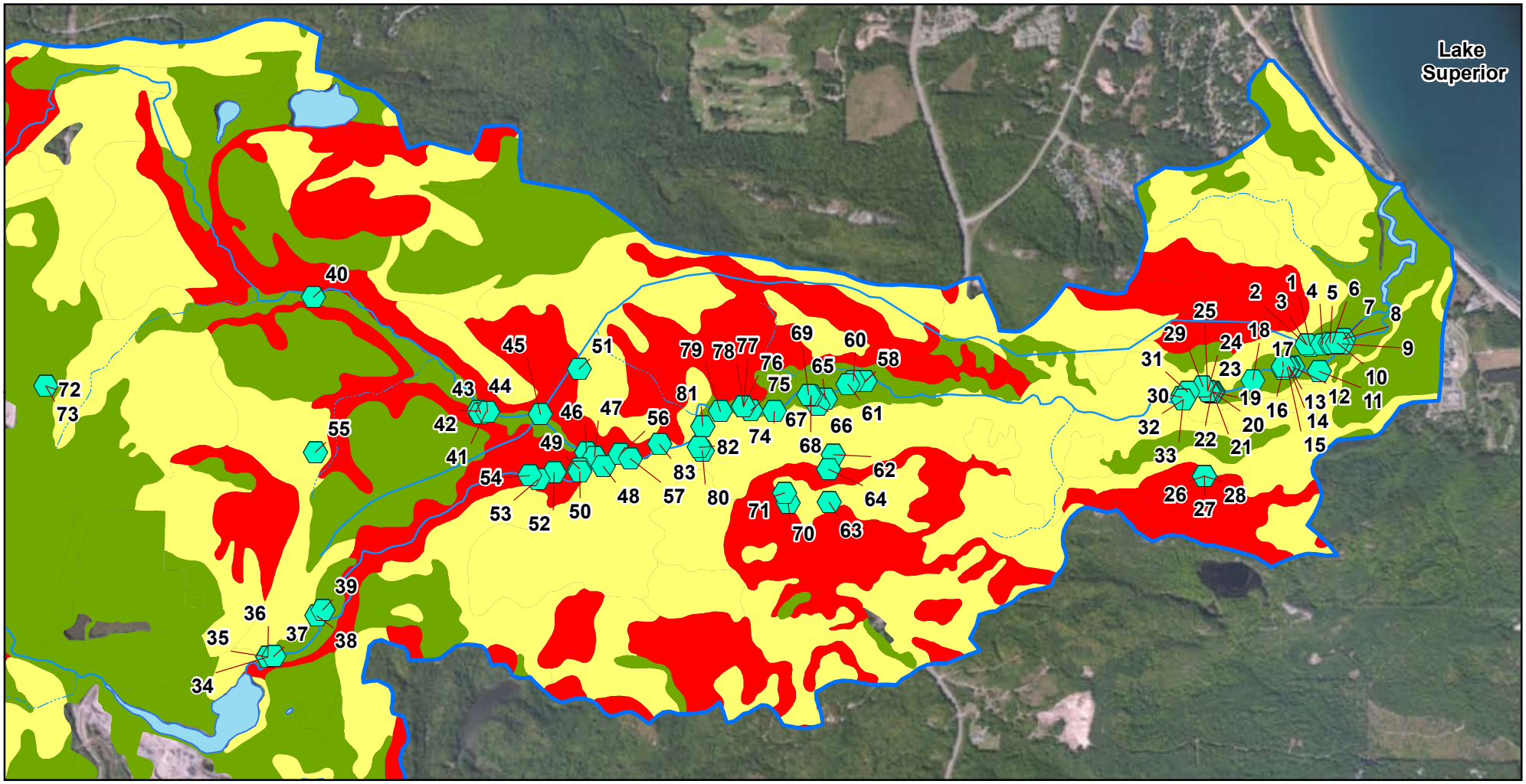
Figure: 3.1

Carp River Watershed

Marquette County, Michigan

Erosion Locations



Location Type

- Erosion Location

Erosion Potential

- Slight
- Moderate
- Severe
- Not Rated

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 0.5 1 Miles

1:30,000

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Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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Figure: 3.2

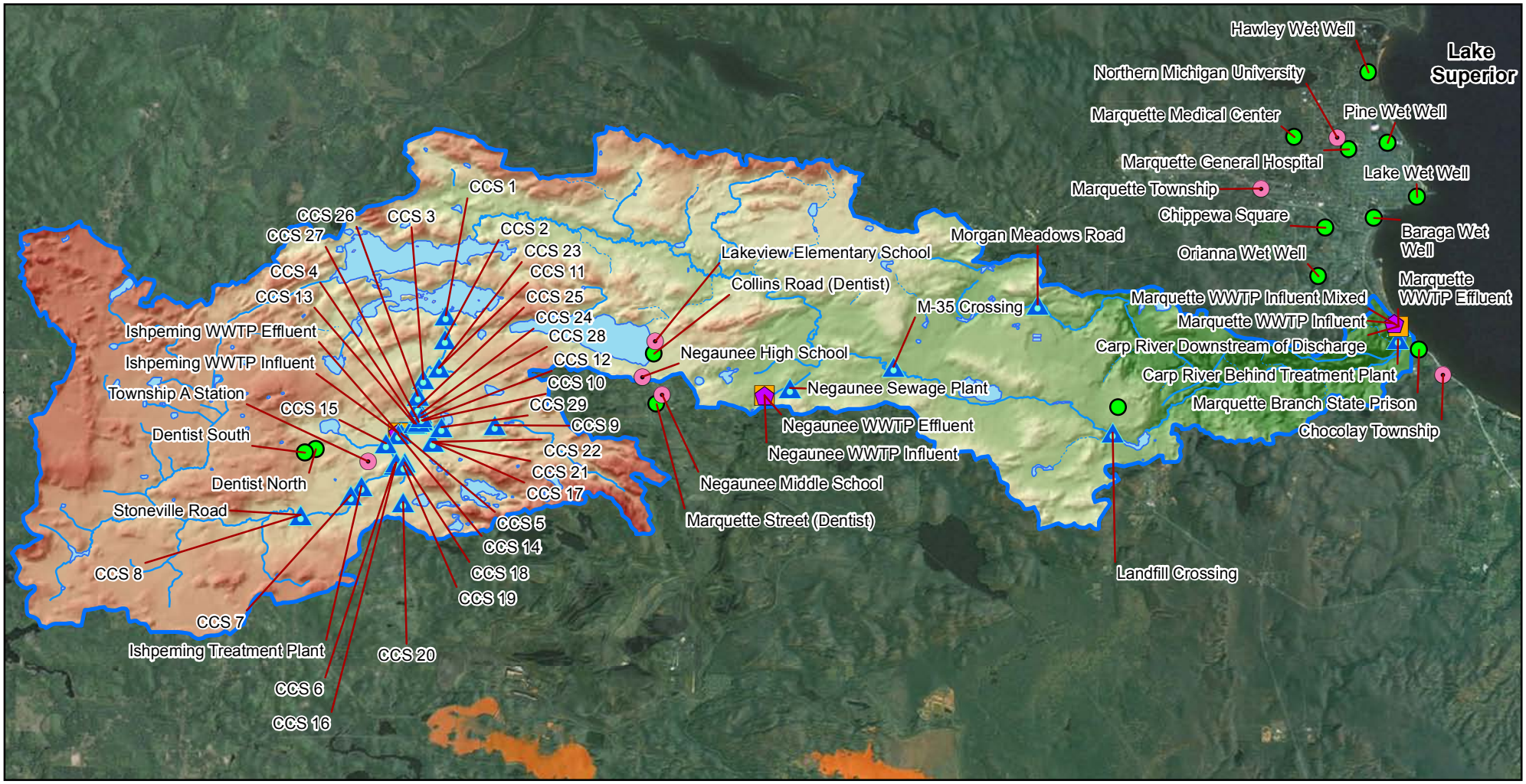
APPENDIX A

Mercury Monitoring

Carp River Watershed

Marquette County, Michigan

Mercury Sampling Locations



Sampling Location Type

- Drinking Water
- WWTP Effluent
- WWTP Influent
- Source
- Surface Water

Note: CCS stands for Carp Creek Station.

Elevation (ft above MSL)

Maximum: 1781.34

Minimum: 604.18

Other

- Watershed Boundary

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

0 2 4 Miles

1:135,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

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North Jackson Company
ENVIRONMENTAL SCIENCE & ENGINEERING

Figure: A.1

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Baraga Wet Well	Source	03/24/05	Mercury	45	ng/L
Baraga Wet Well	Source	03/08/06	Mercury	250	ng/L
Baraga Wet Well	Source	10/15/07	Mercury	240	ng/L
Baraga Wet Well	Source	11/06/08	Mercury	250	ng/L
Baraga Wet Well	Source	10/04/12	Mercury	110	ng/L
Carp Creek Station 1	Surface Water	04/15/03	Mercury	25	ng/L
Carp Creek Station 1	Surface Water	04/15/03	Discharge	141	CFS
Carp Creek Station 1	Surface Water	10/22/03	Mercury	3.7	ng/L
Carp Creek Station 1	Surface Water	10/22/03	Discharge	16.8	CFS
Carp Creek Station 1	Surface Water	04/22/04	Mercury	12	ng/L
Carp Creek Station 1	Surface Water	04/22/04	Discharge	92.6	CFS
Carp Creek Station 2	Surface Water	09/10/02	Mercury	7.3	ng/L
Carp Creek Station 2	Surface Water	09/10/02	Discharge	20	CFS
Carp Creek Station 2	Surface Water	11/26/02	Mercury	9.01	ng/L
Carp Creek Station 2	Surface Water	11/26/02	Discharge	28.5	CFS
Carp Creek Station 3	Surface Water	04/15/03	Mercury	26	ng/L
Carp Creek Station 3	Surface Water	04/15/03	Discharge	126	CFS
Carp Creek Station 3	Surface Water	10/22/03	Mercury	4.4	ng/L
Carp Creek Station 3	Surface Water	10/22/03	Discharge	15.9	CFS
Carp Creek Station 4	Surface Water	11/26/02	Mercury	2.58	ng/L
Carp Creek Station 4	Surface Water	11/26/02	Discharge	17	CFS
Carp Creek Station 4	Surface Water	10/21/03	Mercury	2	ng/L
Carp Creek Station 4	Surface Water	10/21/03	Discharge	15.6	CFS
Carp Creek Station 4	Surface Water	04/22/04	Mercury	4.8	ng/L
Carp Creek Station 4	Surface Water	04/22/04	Discharge	65.1	CFS
Carp Creek Station 5	Surface Water	04/15/03	Mercury	8.7	ng/L
Carp Creek Station 5	Surface Water	04/15/03	Discharge	97	CFS
Carp Creek Station 5	Surface Water	10/21/03	Mercury	1.6	ng/L
Carp Creek Station 5	Surface Water	10/21/03	Discharge	14.8	CFS
Carp Creek Station 5	Surface Water	04/21/04	Mercury	6	ng/L
Carp Creek Station 5	Surface Water	04/21/04	Discharge	66.1	CFS
Carp Creek Station 6	Surface Water	11/26/02	Mercury	3.55	ng/L
Carp Creek Station 6	Surface Water	11/26/02	Discharge	16.1	CFS
Carp Creek Station 7	Surface Water	11/26/02	Mercury	1.79	ng/L
Carp Creek Station 7	Surface Water	11/26/02	Discharge	17.1	CFS
Carp Creek Station 8	Surface Water	09/10/02	Mercury	1.5	ng/L
Carp Creek Station 8	Surface Water	09/10/02	Discharge	6.3	CFS
Carp Creek Station 8	Surface Water	11/26/02	Mercury	1.56	ng/L
Carp Creek Station 8	Surface Water	11/26/02	Discharge	11.9	CFS
Carp Creek Station 8	Surface Water	04/15/03	Mercury	8.4	ng/L
Carp Creek Station 8	Surface Water	04/15/03	Discharge	73	CFS
Carp Creek Station 9	Surface Water	09/10/02	Mercury	3.6	ng/L
Carp Creek Station 9	Surface Water	09/10/02	Discharge	0.04	CFS
Carp Creek Station 9	Surface Water	11/26/02	Mercury	3.62	ng/L
Carp Creek Station 9	Surface Water	11/26/02	Discharge	5.8	CFS
Carp Creek Station 9	Surface Water	04/15/03	Mercury	5.7	ng/L
Carp Creek Station 9	Surface Water	04/15/03	Discharge	19	CFS
Carp Creek Station 9	Surface Water	10/22/03	Mercury	2.1	ng/L
Carp Creek Station 9	Surface Water	10/22/03	Discharge	0.22	CFS
Carp Creek Station 9	Surface Water	04/22/04	Mercury	7.1	ng/L
Carp Creek Station 9	Surface Water	04/22/04	Discharge	6.1	CFS
Carp Creek Station 10	Surface Water	09/10/02	Mercury	28	ng/L
Carp Creek Station 10	Surface Water	09/10/02	Discharge	1	CFS
Carp Creek Station 10	Surface Water	11/26/02	Mercury	31.7	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Carp Creek Station 10	Surface Water	11/26/02	Discharge	2.8	CFS
Carp Creek Station 10	Surface Water	04/15/03	Mercury	39	ng/L
Carp Creek Station 10	Surface Water	04/15/03	Discharge	19	CFS
Carp Creek Station 10	Surface Water	10/22/03	Mercury	26	ng/L
Carp Creek Station 10	Surface Water	10/22/03	Discharge	0.44	CFS
Carp Creek Station 10	Surface Water	04/21/04	Mercury	55	ng/L
Carp Creek Station 10	Surface Water	04/21/04	Discharge	10.1	CFS
Carp Creek Station 11	Surface Water	09/10/02	Mercury	4.6	ng/L
Carp Creek Station 11	Surface Water	09/10/02	Discharge	0.3	CFS
Carp Creek Station 11	Surface Water	11/26/02	Mercury	1.27	ng/L
Carp Creek Station 11	Surface Water	11/26/02	Discharge	0.1	CFS
Carp Creek Station 12	Surface Water	09/10/02	Mercury	22	ng/L
Carp Creek Station 12	Surface Water	09/10/02	Discharge	1.4	CFS
Carp Creek Station 12	Surface Water	11/26/02	Mercury	5.86	ng/L
Carp Creek Station 12	Surface Water	11/26/02	Discharge	2.6	CFS
Carp Creek Station 12	Surface Water	10/22/03	Mercury	1.4	ng/L
Carp Creek Station 12	Surface Water	04/22/04	Mercury	7.5	ng/L
Carp Creek Station 13	Surface Water	09/10/02	Mercury	16	ng/L
Carp Creek Station 13	Surface Water	09/10/02	Discharge	0.2	CFS
Carp Creek Station 14	Surface Water	09/10/02	Mercury	3.5	ng/L
Carp Creek Station 14	Surface Water	09/10/02	Discharge	1.7	CFS
Carp Creek Station 14	Surface Water	11/26/02	Mercury	13.2	ng/L
Carp Creek Station 14	Surface Water	11/26/02	Discharge	0.9	CFS
Carp Creek Station 15	Surface Water	09/10/02	Mercury	2.7	ng/L
Carp Creek Station 15	Surface Water	09/10/02	Discharge	2	CFS
Carp Creek Station 15	Surface Water	11/26/02	Mercury	0.912	ng/L
Carp Creek Station 15	Surface Water	11/26/02	Discharge	2.6	CFS
Carp Creek Station 16	Surface Water	09/10/02	Mercury	19	ng/L
Carp Creek Station 16	Surface Water	09/10/02	Discharge	0.2	CFS
Carp Creek Station 16	Surface Water	11/26/02	Mercury	1.49	ng/L
Carp Creek Station 16	Surface Water	11/26/02	Discharge	2.2	CFS
Carp Creek Station 17	Surface Water	09/10/02	Mercury	35	ng/L
Carp Creek Station 17	Surface Water	09/10/02	Discharge	0.1	CFS
Carp Creek Station 18	Surface Water	11/26/02	Mercury	3.15	ng/L
Carp Creek Station 18	Surface Water	11/26/02	Discharge	0.2	CFS
Carp Creek Station 19	Surface Water	11/26/02	Mercury	1.63	ng/L
Carp Creek Station 19	Surface Water	11/26/02	Discharge	3.1	CFS
Carp Creek Station 20	Surface Water	09/10/02	Mercury	0.9	ng/L
Carp Creek Station 20	Surface Water	09/10/02	Discharge	0.1	CFS
Carp Creek Station 21	Surface Water	09/10/02	Mercury	25	ng/L
Carp Creek Station 21	Surface Water	09/10/02	Discharge	0.4	CFS
Carp Creek Station 22	Surface Water	09/10/02	Mercury	28	ng/L
Carp Creek Station 22	Surface Water	09/10/02	Discharge	0.4	CFS
Carp Creek Station 23	Surface Water	10/22/03	Mercury	1.5	ng/L
Carp Creek Station 24	Surface Water	10/21/03	Mercury	5.5	ng/L
Carp Creek Station 24	Surface Water	10/21/03	Discharge	16.1	CFS
Carp Creek Station 24	Surface Water	04/22/04	Mercury	10	ng/L
Carp Creek Station 24	Surface Water	04/22/04	Discharge	74.9	CFS
Carp Creek Station 25	Surface Water	10/21/03	Mercury	4.6	ng/L
Carp Creek Station 25	Surface Water	10/21/03	Discharge	16.1	CFS
Carp Creek Station 26	Surface Water	10/21/03	Mercury	4.8	ng/L
Carp Creek Station 26	Surface Water	10/21/03	Discharge	15.3	CFS
Carp Creek Station 27	Surface Water	04/22/04	Mercury	5.7	ng/L
Carp Creek Station 27	Surface Water	04/22/04	Discharge	65.1	CFS

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Carp Creek Station 28	Surface Water	04/22/04	Mercury	11	ng/L
Carp Creek Station 28	Surface Water	04/22/04	Discharge	74.9	CFS
Carp Creek Station 29	Surface Water	04/21/04	Mercury	1	ng/L
Carp River Behind Treatment Plant	Surface Water	11/09/11	Mercury	<0.500	ng/L
Carp River Behind Treatment Plant	Surface Water	11/09/11	Mercury	1	ng/L
Carp River Downstream of Discharge	Surface Water	11/09/11	Mercury	<0.500	ng/L
Carp River Downstream of Discharge	Surface Water	11/09/11	Mercury	1	ng/L
Chippewa Square	Source	03/24/05	Mercury	720	ng/L
Chippewa Square	Source	10/15/07	Mercury	2100	ng/L
Chippewa Square	Source	11/06/08	Mercury	3700	ng/L
Chippewa Square	Source	10/04/12	Mercury	100	ng/L
Chocolay Township	Drinking Water	03/24/05	Mercury	36	ng/L
Chocolay Township	Drinking Water	03/08/06	Mercury	240	ng/L
Chocolay Township	Drinking Water	10/15/07	Mercury	53	ng/L
Chocolay Township	Drinking Water	11/06/08	Mercury	27	ng/L
Chocolay Township	Drinking Water	10/04/12	Mercury	12	ng/L
Collins Road (Dentist)	Source	09/28/05	Mercury	9.9	ng/L
Collins Road (Dentist)	Source	09/28/06	Mercury	110	ng/L
Collins Road (Dentist)	Source	09/10/07	Mercury	37	ng/L
Dentist North	Source	09/14/04	Mercury	160	ng/L
Dentist North	Source	04/05/05	Mercury	37	ng/L
Dentist North	Source	06/02/05	Mercury	2330000	ng/L
Dentist North	Source	06/02/05	Mercury	0.9	ng/L
Dentist North	Source	10/04/05	Mercury	120	ng/L
Dentist North	Source	04/04/06	Mercury	96	ng/L
Dentist North	Source	10/02/06	Mercury	1.8	ng/L
Dentist North	Source	04/03/07	Mercury	257000	ng/L
Dentist North	Source	04/03/07	Mercury	<0.5	ng/L
Dentist North	Source	10/02/07	Mercury	4.2	ng/L
Dentist North	Source	04/08/08	Mercury	19	ng/L
Dentist North	Source	10/01/08	Mercury	28	ng/L
Dentist North	Source	04/02/09	Mercury	14.3	ng/L
Dentist North	Source	10/04/09	Mercury	8.2	ng/L
Dentist North	Source	04/07/10	Mercury	2.2	ng/L
Dentist North	Source	10/05/10	Mercury	92.0	ng/L
Dentist North	Source	04/06/11	Mercury	48	ng/L
Dentist North	Source	10/03/11	Mercury	37	ng/L
Dentist North	Source	04/10/12	Mercury	5	ng/L
Dentist South	Source	09/14/04	Mercury	3.1	ng/L
Dentist South	Source	04/05/05	Mercury	<0.2	ng/L
Dentist South	Source	06/02/05	Mercury	43500	ng/L
Dentist South	Source	06/02/05	Mercury	1.2	ng/L
Dentist South	Source	10/04/05	Mercury	<0.2	ng/L
Dentist South	Source	04/04/06	Mercury	5.0	ng/L
Dentist South	Source	10/02/06	Mercury	1.1	ng/L
Dentist South	Source	04/03/07	Mercury	1030	ng/L
Dentist South	Source	04/03/07	Mercury	<0.5	ng/L
Dentist South	Source	10/02/07	Mercury	96	ng/L
Dentist South	Source	04/08/08	Mercury	<0.20	ng/L
Dentist South	Source	10/01/08	Mercury	1.8	ng/L
Dentist South	Source	04/02/09	Mercury	66.0	ng/L
Dentist South	Source	10/04/09	Mercury	0.1	ng/L
Dentist South	Source	04/07/10	Mercury	5.7	ng/L
Dentist South	Source	10/05/10	Mercury	8.6	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Dentist South	Source	04/06/11	Mercury	6.4	ng/L
Dentist South	Source	10/03/11	Mercury	14	ng/L
Dentist South	Source	04/10/12	Mercury	0.38	ng/L
Hawley Wet Well	Source	03/24/05	Mercury	15	ng/L
Hawley Wet Well	Source	10/15/07	Mercury	21	ng/L
Hawley Wet Well	Source	11/06/08	Mercury	26	ng/L
Hawley Wet Well	Source	10/04/12	Mercury	25	ng/L
Ishpeming Treatment Plant	Surface Water	11/09/11	Mercury	<0.500	ng/L
Ishpeming Treatment Plant	Surface Water	11/09/11	Mercury	1.2	ng/L
Ishpeming Treatment Plant	Surface Water	03/21/12	Mercury	<0.500	ng/L
Ishpeming Treatment Plant	Surface Water	03/21/12	Mercury	4.20	ng/L
Ishpeming Treatment Plant	Surface Water	03/21/12	Water Temp.	11.10	° C
Ishpeming Treatment Plant	Surface Water	03/21/12	pH	6.50	S.U.
Ishpeming Treatment Plant	Surface Water	03/21/12	D.O.	10090	ng/L
Ishpeming WWTP Effluent	Effluent	01/02/04	Mercury	11.6	ng/L
Ishpeming WWTP Effluent	Effluent	01/02/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	02/02/04	Mercury	1.8	ng/L
Ishpeming WWTP Effluent	Effluent	02/02/04	Mercury	1.7	ng/L
Ishpeming WWTP Effluent	Effluent	02/02/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	03/02/04	Mercury	2.8	ng/L
Ishpeming WWTP Effluent	Effluent	03/02/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/05/04	Mercury	6.1	ng/L
Ishpeming WWTP Effluent	Effluent	04/05/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	05/03/04	Mercury	16.2	ng/L
Ishpeming WWTP Effluent	Effluent	05/03/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	06/02/04	Mercury	3.7	ng/L
Ishpeming WWTP Effluent	Effluent	06/02/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	07/06/04	Mercury	4.6	ng/L
Ishpeming WWTP Effluent	Effluent	07/06/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	08/02/04	Mercury	2.9	ng/L
Ishpeming WWTP Effluent	Effluent	08/02/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	09/13/04	Mercury	3.5	ng/L
Ishpeming WWTP Effluent	Effluent	09/13/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/05/04	Mercury	5.9	ng/L
Ishpeming WWTP Effluent	Effluent	10/05/04	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	12/07/04	Mercury	1.7	ng/L
Ishpeming WWTP Effluent	Effluent	12/07/04	Mercury	0.5	ng/L
Ishpeming WWTP Effluent	Effluent	01/04/05	Mercury	1.8	ng/L
Ishpeming WWTP Effluent	Effluent	01/04/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	02/01/05	Mercury	3.5	ng/L
Ishpeming WWTP Effluent	Effluent	02/01/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	03/01/05	Mercury	2.0	ng/L
Ishpeming WWTP Effluent	Effluent	03/01/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/01/05	Mercury	3.4	ng/L
Ishpeming WWTP Effluent	Effluent	04/01/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	05/02/05	Mercury	2.8	ng/L
Ishpeming WWTP Effluent	Effluent	05/02/05	Mercury	3.8	ng/L
Ishpeming WWTP Effluent	Effluent	05/02/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	06/01/05	Mercury	6.8	ng/L
Ishpeming WWTP Effluent	Effluent	06/01/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	07/11/05	Mercury	2.6	ng/L
Ishpeming WWTP Effluent	Effluent	07/11/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	08/02/05	Mercury	2.2	ng/L
Ishpeming WWTP Effluent	Effluent	08/02/05	Mercury	<0.5	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Ishpeming WWTP Effluent	Effluent	09/13/05	Mercury	2.9	ng/L
Ishpeming WWTP Effluent	Effluent	09/13/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/03/05	Mercury	2.1	ng/L
Ishpeming WWTP Effluent	Effluent	10/03/05	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/06	Mercury	1.3	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/06	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/04/06	Mercury	4.7	ng/L
Ishpeming WWTP Effluent	Effluent	04/04/06	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	07/10/06	Mercury	1.4	ng/L
Ishpeming WWTP Effluent	Effluent	07/10/06	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/02/06	Mercury	1.6	ng/L
Ishpeming WWTP Effluent	Effluent	10/02/06	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/07	Mercury	3.0	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/07	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/03/07	Mercury	3.0	ng/L
Ishpeming WWTP Effluent	Effluent	07/10/07	Mercury	1.7	ng/L
Ishpeming WWTP Effluent	Effluent	07/10/07	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/02/07	Mercury	1.7	ng/L
Ishpeming WWTP Effluent	Effluent	10/02/07	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/08	Mercury	1.7	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/08	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/03/08	Mercury	1.7	ng/L
Ishpeming WWTP Effluent	Effluent	04/03/08	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	07/07/08	Mercury	2.4	ng/L
Ishpeming WWTP Effluent	Effluent	07/07/08	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/01/08	Mercury	1.1	ng/L
Ishpeming WWTP Effluent	Effluent	10/01/08	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	01/05/09	Mercury	2.9	ng/L
Ishpeming WWTP Effluent	Effluent	01/05/09	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/01/09	Mercury	2.6	ng/L
Ishpeming WWTP Effluent	Effluent	04/01/09	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	07/13/09	Mercury	1.1	ng/L
Ishpeming WWTP Effluent	Effluent	07/13/09	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/02/09	Mercury	3.8	ng/L
Ishpeming WWTP Effluent	Effluent	10/02/09	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	01/07/10	Mercury	0.6	ng/L
Ishpeming WWTP Effluent	Effluent	01/07/10	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	04/07/10	Mercury	4.1	ng/L
Ishpeming WWTP Effluent	Effluent	04/07/10	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	07/01/10	Mercury	2.3	ng/L
Ishpeming WWTP Effluent	Effluent	07/01/10	Mercury	<0.5	ng/L
Ishpeming WWTP Effluent	Effluent	10/04/10	Mercury	2.1	ng/L
Ishpeming WWTP Effluent	Effluent	10/04/10	Mercury	<0.500	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/11	Mercury	1.3	ng/L
Ishpeming WWTP Effluent	Effluent	01/03/11	Mercury	<0.500	ng/L
Ishpeming WWTP Effluent	Effluent	04/05/11	Mercury	3.7	ng/L
Ishpeming WWTP Effluent	Effluent	04/05/11	Mercury	<0.500	ng/L
Ishpeming WWTP Effluent	Effluent	07/22/11	Mercury	1.3	ng/L
Ishpeming WWTP Effluent	Effluent	07/22/11	Mercury	<0.500	ng/L
Ishpeming WWTP Effluent	Effluent	10/03/11	Mercury	4.9	ng/L
Ishpeming WWTP Effluent	Effluent	10/03/11	Mercury	<0.500	ng/L
Ishpeming WWTP Effluent	Effluent	01/04/12	Mercury	1	ng/L
Ishpeming WWTP Effluent	Effluent	01/04/12	Mercury	1.2	ng/L
Ishpeming WWTP Effluent	Effluent	01/04/12	Mercury	<0.500	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Ishpeming WWTP Effluent	Effluent	04/10/12	Mercury	1.8	ng/L
Ishpeming WWTP Effluent	Effluent	04/10/12	Mercury	<0.500	ng/L
Ishpeming WWTP Effluent	Effluent	07/02/12	Mercury	4.9	ng/L
Ishpeming WWTP Effluent	Effluent	07/02/12	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	07/06/04	Mercury	<0.4	ng/L
Ishpeming WWTP Influent	Influent	10/06/04	Mercury	<0.4	ng/L
Ishpeming WWTP Influent	Influent	01/05/05	Mercury	0.2	ng/L
Ishpeming WWTP Influent	Influent	04/05/05	Mercury	<0.2	ng/L
Ishpeming WWTP Influent	Influent	10/04/05	Mercury	<0.2	ng/L
Ishpeming WWTP Influent	Influent	04/04/06	Mercury	<0.2	ng/L
Ishpeming WWTP Influent	Influent	07/10/06	Mercury	116	ng/L
Ishpeming WWTP Influent	Influent	07/10/06	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	10/02/06	Mercury	477	ng/L
Ishpeming WWTP Influent	Influent	01/03/07	Mercury	45.5	ng/L
Ishpeming WWTP Influent	Influent	01/03/07	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	04/03/07	Mercury	128	ng/L
Ishpeming WWTP Influent	Influent	04/03/07	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	07/10/07	Mercury	49	ng/L
Ishpeming WWTP Influent	Influent	07/10/07	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	10/02/07	Mercury	94	ng/L
Ishpeming WWTP Influent	Influent	10/02/07	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	01/03/08	Mercury	77	ng/L
Ishpeming WWTP Influent	Influent	01/03/08	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	04/03/08	Mercury	251	ng/L
Ishpeming WWTP Influent	Influent	04/03/08	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	07/07/08	Mercury	126	ng/L
Ishpeming WWTP Influent	Influent	07/07/08	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	10/01/08	Mercury	242	ng/L
Ishpeming WWTP Influent	Influent	10/01/08	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	01/05/09	Mercury	129	ng/L
Ishpeming WWTP Influent	Influent	01/05/09	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	04/01/09	Mercury	54	ng/L
Ishpeming WWTP Influent	Influent	04/01/09	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	07/13/09	Mercury	70	ng/L
Ishpeming WWTP Influent	Influent	07/13/09	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	10/02/09	Mercury	90	ng/L
Ishpeming WWTP Influent	Influent	10/02/09	Mercury	0.5	ng/L
Ishpeming WWTP Influent	Influent	01/07/10	Mercury	66	ng/L
Ishpeming WWTP Influent	Influent	01/07/10	Mercury	0.6	ng/L
Ishpeming WWTP Influent	Influent	04/07/10	Mercury	23	ng/L
Ishpeming WWTP Influent	Influent	04/07/10	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	07/01/10	Mercury	15	ng/L
Ishpeming WWTP Influent	Influent	07/01/10	Mercury	<0.5	ng/L
Ishpeming WWTP Influent	Influent	10/04/10	Mercury	157	ng/L
Ishpeming WWTP Influent	Influent	10/04/10	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	01/03/11	Mercury	17.2	ng/L
Ishpeming WWTP Influent	Influent	01/03/11	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	04/05/11	Mercury	93.3	ng/L
Ishpeming WWTP Influent	Influent	04/05/11	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	07/07/11	Mercury	2170	ng/L
Ishpeming WWTP Influent	Influent	07/07/11	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	10/03/11	Mercury	271	ng/L
Ishpeming WWTP Influent	Influent	10/03/11	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	01/04/12	Mercury	17.4	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Ishpeming WWTP Influent	Influent	01/04/12	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	04/10/12	Mercury	157	ng/L
Ishpeming WWTP Influent	Influent	04/10/12	Mercury	<0.500	ng/L
Ishpeming WWTP Influent	Influent	07/02/12	Mercury	85.1	ng/L
Ishpeming WWTP Influent	Influent	07/02/12	Mercury	<0.500	ng/L
Lake Wet Well	Source	03/24/05	Mercury	46	ng/L
Lake Wet Well	Source	10/15/07	Mercury	51	ng/L
Lake Wet Well	Source	11/06/08	Mercury	57	ng/L
Lake Wet Well	Source	10/04/12	Mercury	32	ng/L
Lakeview Elementary School	Drinking Water	09/28/05	Mercury	<0.2	ng/L
Landfill Crossing	Surface Water	11/09/11	Mercury	<0.500	ng/L
Landfill Crossing	Surface Water	11/09/11	Mercury	1.1	ng/L
Landfill Crossing	Surface Water	03/21/12	Mercury	<0.500	ng/L
Landfill Crossing	Surface Water	03/21/12	Mercury	6.40	ng/L
Landfill Crossing	Surface Water	03/21/12	Water Temp.	10.30	° C
Landfill Crossing	Surface Water	03/21/12	pH	6.50	S.U.
Landfill Crossing	Surface Water	03/21/12	D.O.	12320	ng/L
M-35 Crossing	Surface Water	11/09/11	Mercury	<0.500	ng/L
M-35 Crossing	Surface Water	11/09/11	Mercury	1.2	ng/L
M-35 Crossing	Surface Water	03/21/12	Mercury	<0.500	ng/L
M-35 Crossing	Surface Water	03/21/12	Mercury	4.80	ng/L
M-35 Crossing	Surface Water	03/21/12	Water Temp.	13.40	° C
M-35 Crossing	Surface Water	03/21/12	pH	6.50	S.U.
M-35 Crossing	Surface Water	03/21/12	D.O.	8380	ng/L
Marquette Branch State Prison	Source	03/24/05	Mercury	64	ng/L
Marquette Branch State Prison	Source	10/15/07	Mercury	58	ng/L
Marquette Branch State Prison	Source	11/06/08	Mercury	220	ng/L
Marquette Branch State Prison	Source	10/04/12	Mercury	14	ng/L
Marquette County Solid Waste	Source	10/01/08	Mercury	5.84	ng/L
Marquette County Solid Waste	Source	04/01/09	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	05/01/09	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	06/01/09	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	07/01/09	Mercury	5.2	ng/L
Marquette County Solid Waste	Source	08/01/09	Mercury	4.8	ng/L
Marquette County Solid Waste	Source	09/01/09	Mercury	0.5	ng/L
Marquette County Solid Waste	Source	10/01/09	Mercury	4.6	ng/L
Marquette County Solid Waste	Source	04/01/10	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	05/01/10	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	06/01/10	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	07/01/10	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	08/01/10	Mercury	3.2	ng/L
Marquette County Solid Waste	Source	09/01/10	Mercury	4.4	ng/L
Marquette County Solid Waste	Source	10/01/10	Mercury	5.3	ng/L
Marquette County Solid Waste	Source	04/01/11	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	05/01/11	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	06/01/11	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	07/01/11	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	08/01/11	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	09/01/11	Mercury	No Sample	ng/L
Marquette County Solid Waste	Source	10/01/11	Mercury	3.8	ng/L
Marquette County Solid Waste	Source	04/01/12	Mercury	No Report	ng/L
Marquette County Solid Waste	Source	05/01/12	Mercury	No Discharge	ng/L
Marquette County Solid Waste	Source	06/01/12	Mercury	6.2	ng/L
Marquette County Solid Waste	Source	07/01/12	Mercury	3.8	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Marquette County Solid Waste	Source	08/01/12	Mercury	5.6	ng/L
Marquette County Solid Waste	Source	09/01/12	Mercury	2.5	ng/L
Marquette County Solid Waste	Source	10/01/12	Mercury	8.5	ng/L
Marquette County Solid Waste	Source	04/01/13	Mercury	5.6	ng/L
Marquette County Solid Waste	Source	05/01/13	Mercury	3.2	ng/L
Marquette County Solid Waste	Source	06/01/13	Mercury	5.7	ng/L
Marquette County Solid Waste	Source	07/01/13	Mercury	6.8	ng/L
Marquette County Solid Waste	Source	08/01/13	Mercury	No Discharge	ng/L
Marquette General Hospital	Source	03/24/05	Mercury	14	ng/L
Marquette General Hospital	Source	10/15/07	Mercury	12	ng/L
Marquette General Hospital	Source	11/06/08	Mercury	28	ng/L
Marquette Medical Center	Source	03/24/05	Mercury	390	ng/L
Marquette Medical Center	Source	10/15/07	Mercury	19	ng/L
Marquette Medical Center	Source	11/06/08	Mercury	18	ng/L
Marquette Street (Dentist)	Source	09/28/05	Mercury	1.1	ng/L
Marquette Street (Dentist)	Source	09/28/06	Mercury	1.9	ng/L
Marquette Street (Dentist)	Source	09/10/07	Mercury	0.20	ng/L
Marquette Township	Drinking Water	03/24/05	Mercury	360	ng/L
Marquette Township	Drinking Water	03/08/06	Mercury	83	ng/L
Marquette Township	Drinking Water	10/15/07	Mercury	33	ng/L
Marquette Township	Drinking Water	11/06/08	Mercury	280	ng/L
Marquette Township	Drinking Water	10/04/12	Mercury	<10	ng/L
Marquette WWTP Effluent	Effluent	01/06/03	Mercury	6.0	ng/L
Marquette WWTP Effluent	Effluent	02/17/03	Mercury	6.8	ng/L
Marquette WWTP Effluent	Effluent	03/31/03	Mercury	10.8	ng/L
Marquette WWTP Effluent	Effluent	04/01/03	Mercury	12.0	ng/L
Marquette WWTP Effluent	Effluent	05/06/03	Mercury	13.2	ng/L
Marquette WWTP Effluent	Effluent	06/13/03	Mercury	12.4	ng/L
Marquette WWTP Effluent	Effluent	07/07/03	Mercury	9.0	ng/L
Marquette WWTP Effluent	Effluent	08/12/03	Mercury	7.0	ng/L
Marquette WWTP Effluent	Effluent	09/15/03	Mercury	4.4	ng/L
Marquette WWTP Effluent	Effluent	10/20/03	Mercury	5.5	ng/L
Marquette WWTP Effluent	Effluent	11/05/03	Mercury	6.6	ng/L
Marquette WWTP Effluent	Effluent	12/08/03	Mercury	7.4	ng/L
Marquette WWTP Effluent	Effluent	01/12/04	Mercury	6.5	ng/L
Marquette WWTP Effluent	Effluent	02/09/04	Mercury	11.0	ng/L
Marquette WWTP Effluent	Effluent	03/08/04	Mercury	8.6	ng/L
Marquette WWTP Effluent	Effluent	04/12/04	Mercury	7.5	ng/L
Marquette WWTP Effluent	Effluent	05/17/04	Mercury	7.5	ng/L
Marquette WWTP Effluent	Effluent	06/23/04	Mercury	8.1	ng/L
Marquette WWTP Effluent	Effluent	07/08/04	Mercury	8.6	ng/L
Marquette WWTP Effluent	Effluent	08/10/04	Mercury	8.2	ng/L
Marquette WWTP Effluent	Effluent	09/13/04	Mercury	7.3	ng/L
Marquette WWTP Effluent	Effluent	10/11/04	Mercury	6.3	ng/L
Marquette WWTP Effluent	Effluent	11/08/04	Mercury	5.2	ng/L
Marquette WWTP Effluent	Effluent	12/06/04	Mercury	7.8	ng/L
Marquette WWTP Effluent	Effluent	01/03/05	Mercury	8.9	ng/L
Marquette WWTP Effluent	Effluent	02/02/05	Mercury	10.6	ng/L
Marquette WWTP Effluent	Effluent	03/08/05	Mercury	6.9	ng/L
Marquette WWTP Effluent	Effluent	04/04/05	Mercury	6.7	ng/L
Marquette WWTP Effluent	Effluent	05/02/05	Mercury	7.3	ng/L
Marquette WWTP Effluent	Effluent	06/07/05	Mercury	8.6	ng/L
Marquette WWTP Effluent	Effluent	07/05/05	Mercury	4.0	ng/L
Marquette WWTP Effluent	Effluent	08/02/05	Mercury	7.1	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Marquette WWTP Effluent	Effluent	09/06/05	Mercury	7.7	ng/L
Marquette WWTP Effluent	Effluent	10/04/05	Mercury	4.8	ng/L
Marquette WWTP Effluent	Effluent	11/02/05	Mercury	60.6	ng/L
Marquette WWTP Effluent	Effluent	12/06/05	Mercury	7.1	ng/L
Marquette WWTP Effluent	Effluent	01/03/06	Mercury	9.5	ng/L
Marquette WWTP Effluent	Effluent	02/06/06	Mercury	6.9	ng/L
Marquette WWTP Effluent	Effluent	03/06/06	Mercury	7.2	ng/L
Marquette WWTP Effluent	Effluent	04/04/06	Mercury	9.9	ng/L
Marquette WWTP Effluent	Effluent	05/18/06	Mercury	11.4	ng/L
Marquette WWTP Effluent	Effluent	06/06/06	Mercury	10.1	ng/L
Marquette WWTP Effluent	Effluent	07/10/06	Mercury	7.2	ng/L
Marquette WWTP Effluent	Effluent	08/07/06	Mercury	7.9	ng/L
Marquette WWTP Effluent	Effluent	09/11/06	Mercury	27.1	ng/L
Marquette WWTP Effluent	Effluent	10/03/06	Mercury	5.0	ng/L
Marquette WWTP Effluent	Effluent	11/05/06	Mercury	7.9	ng/L
Marquette WWTP Effluent	Effluent	12/04/06	Mercury	7.8	ng/L
Marquette WWTP Effluent	Effluent	01/09/07	Mercury	13.0	ng/L
Marquette WWTP Effluent	Effluent	02/13/07	Mercury	58.0	ng/L
Marquette WWTP Effluent	Effluent	03/12/07	Mercury	6.0	ng/L
Marquette WWTP Effluent	Effluent	04/10/07	Mercury	8.3	ng/L
Marquette WWTP Effluent	Effluent	05/07/07	Mercury	5.0	ng/L
Marquette WWTP Effluent	Effluent	06/11/07	Mercury	5.4	ng/L
Marquette WWTP Effluent	Effluent	07/11/07	Mercury	6.9	ng/L
Marquette WWTP Effluent	Effluent	08/06/07	Mercury	4.7	ng/L
Marquette WWTP Effluent	Effluent	09/13/07	Mercury	4.8	ng/L
Marquette WWTP Effluent	Effluent	10/09/07	Mercury	4.5	ng/L
Marquette WWTP Effluent	Effluent	11/29/07	Mercury	4.3	ng/L
Marquette WWTP Effluent	Effluent	12/18/07	Mercury	5.6	ng/L
Marquette WWTP Effluent	Effluent	01/07/08	Mercury	3.1	ng/L
Marquette WWTP Effluent	Effluent	02/20/08	Mercury	4.5	ng/L
Marquette WWTP Effluent	Effluent	03/21/08	Mercury	1.4	ng/L
Marquette WWTP Effluent	Effluent	04/15/08	Mercury	5.5	ng/L
Marquette WWTP Effluent	Effluent	05/19/08	Mercury	5.1	ng/L
Marquette WWTP Effluent	Effluent	06/25/08	Mercury	2.2	ng/L
Marquette WWTP Effluent	Effluent	07/21/08	Mercury	2.1	ng/L
Marquette WWTP Effluent	Effluent	08/21/08	Mercury	1.9	ng/L
Marquette WWTP Effluent	Effluent	09/16/08	Mercury	4.8	ng/L
Marquette WWTP Effluent	Effluent	10/14/08	Mercury	2.5	ng/L
Marquette WWTP Effluent	Effluent	11/24/08	Mercury	2.4	ng/L
Marquette WWTP Effluent	Effluent	12/22/08	Mercury	4.1	ng/L
Marquette WWTP Effluent	Effluent	01/26/09	Mercury	3.8	ng/L
Marquette WWTP Effluent	Effluent	02/24/09	Mercury	4.9	ng/L
Marquette WWTP Effluent	Effluent	03/24/09	Mercury	3.8	ng/L
Marquette WWTP Effluent	Effluent	04/21/09	Mercury	1.5	ng/L
Marquette WWTP Effluent	Effluent	05/27/09	Mercury	1.5	ng/L
Marquette WWTP Effluent	Effluent	07/15/09	Mercury	1.8	ng/L
Marquette WWTP Effluent	Effluent	08/26/09	Mercury	1.6	ng/L
Marquette WWTP Effluent	Effluent	09/21/09	Mercury	3.8	ng/L
Marquette WWTP Effluent	Effluent	10/20/09	Mercury	2.2	ng/L
Marquette WWTP Effluent	Effluent	11/10/09	Mercury	1.8	ng/L
Marquette WWTP Effluent	Effluent	12/30/09	Mercury	5.2	ng/L
Marquette WWTP Effluent	Effluent	01/25/10	Mercury	2.70	ng/L
Marquette WWTP Effluent	Effluent	02/23/10	Mercury	11.50	ng/L
Marquette WWTP Effluent	Effluent	03/24/10	Mercury	3.80	ng/L

Appendix A
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Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Marquette WWTP Effluent	Effluent	04/12/10	Mercury	3.70	ng/L
Marquette WWTP Effluent	Effluent	05/17/10	Mercury	2.30	ng/L
Marquette WWTP Effluent	Effluent	06/06/10	Mercury	1.20	ng/L
Marquette WWTP Effluent	Effluent	07/20/10	Mercury	2.20	ng/L
Marquette WWTP Effluent	Effluent	08/24/10	Mercury	1.40	ng/L
Marquette WWTP Effluent	Effluent	09/21/10	Mercury	3.00	ng/L
Marquette WWTP Effluent	Effluent	10/25/10	Mercury	1.70	ng/L
Marquette WWTP Effluent	Effluent	11/22/10	Mercury	1.70	ng/L
Marquette WWTP Effluent	Effluent	12/27/10	Mercury	2.70	ng/L
Marquette WWTP Effluent	Effluent	01/18/11	Mercury	3.50	ng/L
Marquette WWTP Effluent	Effluent	02/28/11	Mercury	5.60	ng/L
Marquette WWTP Effluent	Effluent	03/14/11	Mercury	9.30	ng/L
Marquette WWTP Effluent	Effluent	04/29/11	Mercury	5.30	ng/L
Marquette WWTP Effluent	Effluent	05/24/11	Mercury	2.50	ng/L
Marquette WWTP Effluent	Effluent	06/27/11	Mercury	4.60	ng/L
Marquette WWTP Effluent	Effluent	07/11/11	Mercury	1.60	ng/L
Marquette WWTP Effluent	Effluent	08/29/11	Mercury	0.70	ng/L
Marquette WWTP Effluent	Effluent	09/20/11	Mercury	1.00	ng/L
Marquette WWTP Effluent	Effluent	10/25/11	Mercury	1.60	ng/L
Marquette WWTP Effluent	Effluent	11/22/11	Mercury	1.60	ng/L
Marquette WWTP Effluent	Effluent	12/12/11	Mercury	3.20	ng/L
Marquette WWTP Influent	Influent	01/06/03	Mercury	303	ng/L
Marquette WWTP Influent	Influent	05/06/03	Mercury	178.5	ng/L
Marquette WWTP Influent	Influent	07/07/03	Mercury	225	ng/L
Marquette WWTP Influent	Influent	10/20/03	Mercury	255	ng/L
Marquette WWTP Influent	Influent	01/12/04	Mercury	190	ng/L
Marquette WWTP Influent	Influent	04/12/04	Mercury	42.8	ng/L
Marquette WWTP Influent	Influent	07/08/04	Mercury	90	ng/L
Marquette WWTP Influent	Influent	10/12/04	Mercury	28.9	ng/L
Marquette WWTP Influent	Influent	12/06/04	Mercury	316	ng/L
Marquette WWTP Influent	Influent	01/03/05	Mercury	184	ng/L
Marquette WWTP Influent	Influent	04/04/05	Mercury	71	ng/L
Marquette WWTP Influent	Influent	07/05/05	Mercury	359	ng/L
Marquette WWTP Influent	Influent	10/04/05	Mercury	505	ng/L
Marquette WWTP Influent	Influent	01/03/06	Mercury	119	ng/L
Marquette WWTP Influent	Influent	04/05/06	Mercury	143	ng/L
Marquette WWTP Influent	Influent	07/11/06	Mercury	489	ng/L
Marquette WWTP Influent	Influent	01/09/07	Mercury	46	ng/L
Marquette WWTP Influent	Influent	04/10/07	Mercury	30.5	ng/L
Marquette WWTP Influent	Influent	07/11/07	Mercury	56	ng/L
Marquette WWTP Influent	Influent	04/15/08	Mercury	106	ng/L
Marquette WWTP Influent	Influent	08/21/08	Mercury	129	ng/L
Marquette WWTP Influent	Influent	10/14/08	Mercury	527	ng/L
Marquette WWTP Influent	Influent	01/26/09	Mercury	249	ng/L
Marquette WWTP Influent	Influent	07/15/09	Mercury	103	ng/L
Marquette WWTP Influent	Influent	10/20/09	Mercury	330	ng/L
Marquette WWTP Influent	Influent	01/25/10	Mercury	106	ng/L
Marquette WWTP Influent	Influent	04/12/10	Mercury	804	ng/L
Marquette WWTP Influent	Influent	07/20/10	Mercury	1330	ng/L
Marquette WWTP Influent	Influent	10/25/10	Mercury	71.1	ng/L
Marquette WWTP Influent	Influent	04/29/11	Mercury	510	ng/L
Marquette WWTP Influent	Influent	11/18/11	Mercury	1740	ng/L
Marquette WWTP Influent	Influent	01/24/12	Mercury	634	ng/L
Marquette WWTP Influent Mixed	Influent	03/08/06	Mercury	140	ng/L

Appendix A
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Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Marquette WWTP Influent Mixed	Influent	10/15/07	Mercury	98	ng/L
Marquette WWTP Influent Mixed	Influent	11/06/08	Mercury	180	ng/L
Marquette WWTP Influent Mixed	Influent	10/04/12	Mercury	58	ng/L
Morgan Meadows Road	Surface Water	11/09/11	Mercury	<0.500	ng/L
Morgan Meadows Road	Surface Water	11/09/11	Mercury	0.8	ng/L
Morgan Meadows Road	Surface Water	03/21/12	Mercury	<0.500	ng/L
Morgan Meadows Road	Surface Water	03/21/12	Mercury	1.80	ng/L
Morgan Meadows Road	Surface Water	03/21/12	Water Temp.	15.60	° C
Morgan Meadows Road	Surface Water	03/21/12	pH	6.50	S.U.
Morgan Meadows Road	Surface Water	03/21/12	D.O.	10680	ng/L
Negaunee High School	Drinking Water	09/28/05	Mercury	0.75	ng/L
Negaunee High School	Drinking Water	09/28/06	Mercury	0.69	ng/L
Negaunee High School	Drinking Water	09/10/07	Mercury	<0.20	ng/L
Negaunee Middle School	Drinking Water	09/28/05	Mercury	<0.2	ng/L
Negaunee Sewage Plant	Surface Water	11/09/11	Mercury	<0.500	ng/L
Negaunee Sewage Plant	Surface Water	11/09/11	Mercury	2.2	ng/L
Negaunee Sewage Plant	Surface Water	03/21/12	Mercury	<0.500	ng/L
Negaunee Sewage Plant	Surface Water	03/21/12	Mercury	2.50	ng/L
Negaunee Sewage Plant	Surface Water	03/21/12	Water Temp.	10.30	° C
Negaunee Sewage Plant	Surface Water	03/21/12	pH	5.50	S.U.
Negaunee Sewage Plant	Surface Water	03/21/12	D.O.	10380	ng/L
Negaunee WWTP Effluent	Effluent	01/03/05	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	01/03/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	02/01/05	Mercury	2.5	ng/L
Negaunee WWTP Effluent	Effluent	02/01/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	03/01/05	Mercury	4.7	ng/L
Negaunee WWTP Effluent	Effluent	03/01/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	04/01/05	Mercury	16.0	ng/L
Negaunee WWTP Effluent	Effluent	04/01/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	05/02/05	Mercury	3.3	ng/L
Negaunee WWTP Effluent	Effluent	05/02/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	06/02/05	Mercury	2.6	ng/L
Negaunee WWTP Effluent	Effluent	06/02/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	07/07/05	Mercury	1.8	ng/L
Negaunee WWTP Effluent	Effluent	07/07/05	Mercury	0.5	ng/L
Negaunee WWTP Effluent	Effluent	08/04/05	Mercury	3.2	ng/L
Negaunee WWTP Effluent	Effluent	08/04/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	09/01/05	Mercury	1.7	ng/L
Negaunee WWTP Effluent	Effluent	09/01/05	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	09/01/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	10/03/05	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	10/03/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	11/01/05	Mercury	2.2	ng/L
Negaunee WWTP Effluent	Effluent	11/01/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	12/02/05	Mercury	2.4	ng/L
Negaunee WWTP Effluent	Effluent	12/02/05	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	01/03/06	Mercury	2.8	ng/L
Negaunee WWTP Effluent	Effluent	01/03/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	02/01/06	Mercury	2.3	ng/L
Negaunee WWTP Effluent	Effluent	02/01/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	03/01/06	Mercury	3.3	ng/L
Negaunee WWTP Effluent	Effluent	03/01/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	04/03/06	Mercury	3.4	ng/L
Negaunee WWTP Effluent	Effluent	04/03/06	Mercury	<0.5	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Negaunee WWTP Effluent	Effluent	05/01/06	Mercury	9.5	ng/L
Negaunee WWTP Effluent	Effluent	05/01/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	06/01/06	Mercury	5.0	ng/L
Negaunee WWTP Effluent	Effluent	06/01/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	07/06/06	Mercury	2.3	ng/L
Negaunee WWTP Effluent	Effluent	07/06/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	08/02/06	Mercury	2.8	ng/L
Negaunee WWTP Effluent	Effluent	08/02/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	09/05/06	Mercury	2.1	ng/L
Negaunee WWTP Effluent	Effluent	09/05/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	10/03/06	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	10/03/06	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	10/03/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	11/03/06	Mercury	2.2	ng/L
Negaunee WWTP Effluent	Effluent	11/03/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	12/01/06	Mercury	2.9	ng/L
Negaunee WWTP Effluent	Effluent	12/01/06	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	01/11/07	Mercury	4.1	ng/L
Negaunee WWTP Effluent	Effluent	01/11/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	02/01/07	Mercury	3.1	ng/L
Negaunee WWTP Effluent	Effluent	02/01/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	03/01/07	Mercury	2.9	ng/L
Negaunee WWTP Effluent	Effluent	03/01/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	04/05/07	Mercury	5.6	ng/L
Negaunee WWTP Effluent	Effluent	04/05/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	05/03/07	Mercury	16.9	ng/L
Negaunee WWTP Effluent	Effluent	05/03/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	06/01/07	Mercury	3.2	ng/L
Negaunee WWTP Effluent	Effluent	06/01/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	07/02/07	Mercury	1.6	ng/L
Negaunee WWTP Effluent	Effluent	07/02/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	08/01/07	Mercury	2.7	ng/L
Negaunee WWTP Effluent	Effluent	08/01/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	09/04/07	Mercury	38.6	ng/L
Negaunee WWTP Effluent	Effluent	09/04/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	10/08/07	Mercury	2.8	ng/L
Negaunee WWTP Effluent	Effluent	10/08/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	11/01/07	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	11/01/07	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	11/01/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	12/03/07	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	12/03/07	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	01/03/08	Mercury	2.5	ng/L
Negaunee WWTP Effluent	Effluent	01/03/08	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	02/05/08	Mercury	1.6	ng/L
Negaunee WWTP Effluent	Effluent	02/05/08	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	03/03/08	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	03/03/08	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	04/02/08	Mercury	1.6	ng/L
Negaunee WWTP Effluent	Effluent	04/02/08	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	06/22/08	Mercury	<0.20	ng/L
Negaunee WWTP Effluent	Effluent	07/01/08	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	10/30/08	Mercury	<0.20	ng/L
Negaunee WWTP Effluent	Effluent	11/04/08	Mercury	1.66	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Negaunee WWTP Effluent	Effluent	11/04/08	Mercury	1.61	ng/L
Negaunee WWTP Effluent	Effluent	01/13/09	Mercury	1.6	ng/L
Negaunee WWTP Effluent	Effluent	01/13/09	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	04/01/09	Mercury	3.0	ng/L
Negaunee WWTP Effluent	Effluent	04/01/09	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	07/01/09	Mercury	1.5	ng/L
Negaunee WWTP Effluent	Effluent	07/01/09	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	10/05/09	Mercury	1.1	ng/L
Negaunee WWTP Effluent	Effluent	10/05/09	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	01/04/10	Mercury	1.5	ng/L
Negaunee WWTP Effluent	Effluent	01/04/10	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	04/05/10	Mercury	5.0	ng/L
Negaunee WWTP Effluent	Effluent	04/05/10	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	07/07/10	Mercury	1.9	ng/L
Negaunee WWTP Effluent	Effluent	07/07/10	Mercury	<0.5	ng/L
Negaunee WWTP Effluent	Effluent	10/04/10	Mercury	4.8	ng/L
Negaunee WWTP Effluent	Effluent	10/04/10	Mercury	<0.500	ng/L
Negaunee WWTP Effluent	Effluent	01/03/11	Mercury	3	ng/L
Negaunee WWTP Effluent	Effluent	01/03/11	Mercury	<0.500	ng/L
Negaunee WWTP Effluent	Effluent	04/04/11	Mercury	2.9	ng/L
Negaunee WWTP Effluent	Effluent	04/04/11	Mercury	<0.500	ng/L
Negaunee WWTP Effluent	Effluent	07/05/11	Mercury	1.2	ng/L
Negaunee WWTP Effluent	Effluent	07/05/11	Mercury	<0.500	ng/L
Negaunee WWTP Effluent	Effluent	10/04/11	Mercury	1.8	ng/L
Negaunee WWTP Effluent	Effluent	10/04/11	Mercury	<0.500	ng/L
Negaunee WWTP Effluent	Effluent	01/04/12	Mercury	4.1	ng/L
Negaunee WWTP Effluent	Effluent	01/04/12	Mercury	4	ng/L
Negaunee WWTP Effluent	Effluent	01/04/12	Mercury	<0.500	ng/L
Negaunee WWTP Influent	Influent	01/03/05	Mercury	30.2	ng/L
Negaunee WWTP Influent	Influent	05/02/05	Mercury	108	ng/L
Negaunee WWTP Influent	Influent	05/02/05	Mercury	0.5	ng/L
Negaunee WWTP Influent	Influent	07/07/05	Mercury	10.4	ng/L
Negaunee WWTP Influent	Influent	07/07/05	Mercury	0.7	ng/L
Negaunee WWTP Influent	Influent	10/03/05	Mercury	13.5	ng/L
Negaunee WWTP Influent	Influent	10/03/05	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	01/03/06	Mercury	108	ng/L
Negaunee WWTP Influent	Influent	01/03/06	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	04/03/06	Mercury	74.0	ng/L
Negaunee WWTP Influent	Influent	04/03/06	Mercury	Broken	ng/L
Negaunee WWTP Influent	Influent	07/06/06	Mercury	287	ng/L
Negaunee WWTP Influent	Influent	10/03/06	Mercury	308	ng/L
Negaunee WWTP Influent	Influent	10/03/06	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	01/11/07	Mercury	155	ng/L
Negaunee WWTP Influent	Influent	01/11/07	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	04/05/07	Mercury	17.5	ng/L
Negaunee WWTP Influent	Influent	04/05/07	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	07/02/07	Mercury	223	ng/L
Negaunee WWTP Influent	Influent	07/02/07	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	10/08/07	Mercury	227	ng/L
Negaunee WWTP Influent	Influent	10/08/07	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	01/03/08	Mercury	43	ng/L
Negaunee WWTP Influent	Influent	01/03/08	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	04/02/08	Mercury	78	ng/L
Negaunee WWTP Influent	Influent	04/02/08	Mercury	<0.5	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Negaunee WWTP Influent	Influent	07/01/08	Mercury	0.6	ng/L
Negaunee WWTP Influent	Influent	01/13/09	Mercury	16	ng/L
Negaunee WWTP Influent	Influent	04/01/09	Mercury	15	ng/L
Negaunee WWTP Influent	Influent	04/01/09	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	07/01/09	Mercury	27	ng/L
Negaunee WWTP Influent	Influent	07/01/09	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	10/05/09	Mercury	26	ng/L
Negaunee WWTP Influent	Influent	10/05/09	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	01/04/10	Mercury	56	ng/L
Negaunee WWTP Influent	Influent	01/04/10	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	04/05/10	Mercury	17	ng/L
Negaunee WWTP Influent	Influent	04/05/10	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	07/07/10	Mercury	22	ng/L
Negaunee WWTP Influent	Influent	07/07/10	Mercury	<0.5	ng/L
Negaunee WWTP Influent	Influent	10/04/10	Mercury	17.7	ng/L
Negaunee WWTP Influent	Influent	10/04/10	Mercury	<0.500	ng/L
Negaunee WWTP Influent	Influent	01/03/11	Mercury	26.1	ng/L
Negaunee WWTP Influent	Influent	01/03/11	Mercury	<0.500	ng/L
Negaunee WWTP Influent	Influent	04/04/11	Mercury	63.4	ng/L
Negaunee WWTP Influent	Influent	04/04/11	Mercury	<0.500	ng/L
Negaunee WWTP Influent	Influent	07/05/11	Mercury	29.8	ng/L
Negaunee WWTP Influent	Influent	07/05/11	Mercury	<0.500	ng/L
Negaunee WWTP Influent	Influent	10/04/11	Mercury	19.5	ng/L
Negaunee WWTP Influent	Influent	10/04/11	Mercury	<0.500	ng/L
Negaunee WWTP Influent	Influent	01/04/12	Mercury	27.2	ng/L
Negaunee WWTP Influent	Influent	01/04/12	Mercury	<0.500	ng/L
Northern Michigan University	Drinking Water	03/24/05	Mercury	77	ng/L
Northern Michigan University	Drinking Water	03/08/06	Mercury	120	ng/L
Northern Michigan University	Drinking Water	10/15/07	Mercury	23	ng/L
Northern Michigan University	Drinking Water	11/06/08	Mercury	29	ng/L
Orianna Wet Well	Source	03/24/05	Mercury	18	ng/L
Orianna Wet Well	Source	10/15/07	Mercury	15	ng/L
Orianna Wet Well	Source	11/06/08	Mercury	31	ng/L
Orianna Wet Well	Source	10/04/12	Mercury	16	ng/L
Pine Wet Well	Source	03/24/05	Mercury	99	ng/L
Pine Wet Well	Source	10/15/07	Mercury	160	ng/L
Pine Wet Well	Source	11/06/08	Mercury	130	ng/L
Pine Wet Well	Source	10/04/12	Mercury	110	ng/L
Stoneville Road	Surface Water	11/09/11	Mercury	<0.500	ng/L
Stoneville Road	Surface Water	11/09/11	Mercury	1	ng/L
Stoneville Road	Surface Water	03/21/12	Mercury	<0.500	ng/L
Stoneville Road	Surface Water	03/21/12	Mercury	4.70	ng/L
Stoneville Road	Surface Water	03/21/12	Water Temp.	10.3	° C
Stoneville Road	Surface Water	03/21/12	pH	6.50	S.U.
Stoneville Road	Surface Water	03/21/12	D.O.	10780	ng/L
Township A Station	Drinking Water	04/05/05	Mercury	<0.2	ng/L
Township A Station	Drinking Water	10/04/05	Mercury	1.2	ng/L
Township A Station	Drinking Water	04/04/06	Mercury	0.41	ng/L
Township A Station	Drinking Water	10/02/06	Mercury	0.36	ng/L
Township A Station	Drinking Water	04/03/07	Mercury	<0.20	ng/L
Township A Station	Drinking Water	10/02/07	Mercury	<0.20	ng/L
Township A Station	Drinking Water	04/08/08	Mercury	1.0	ng/L
Township A Station	Drinking Water	10/01/08	Mercury	0.80	ng/L
Township A Station	Drinking Water	04/02/09	Mercury	0.6	ng/L

Appendix A
Mercury Monitoring Database
Carp River Watershed

Location	Location Type	Collection Date	REACH Parameter	REACH Parameter Result	REACH Parameter Unit
Township A Station	Drinking Water	10/04/09	Mercury	0.7	ng/L
Township A Station	Drinking Water	04/07/10	Mercury	<0.20	ng/L
Township A Station	Drinking Water	10/05/10	Mercury	0.5	ng/L
Township A Station	Drinking Water	04/06/11	Mercury	0.39	ng/L
Township A Station	Drinking Water	10/03/11	Mercury	<0.20	ng/L
Township A Station	Drinking Water	04/10/12	Mercury	0.15	ng/L

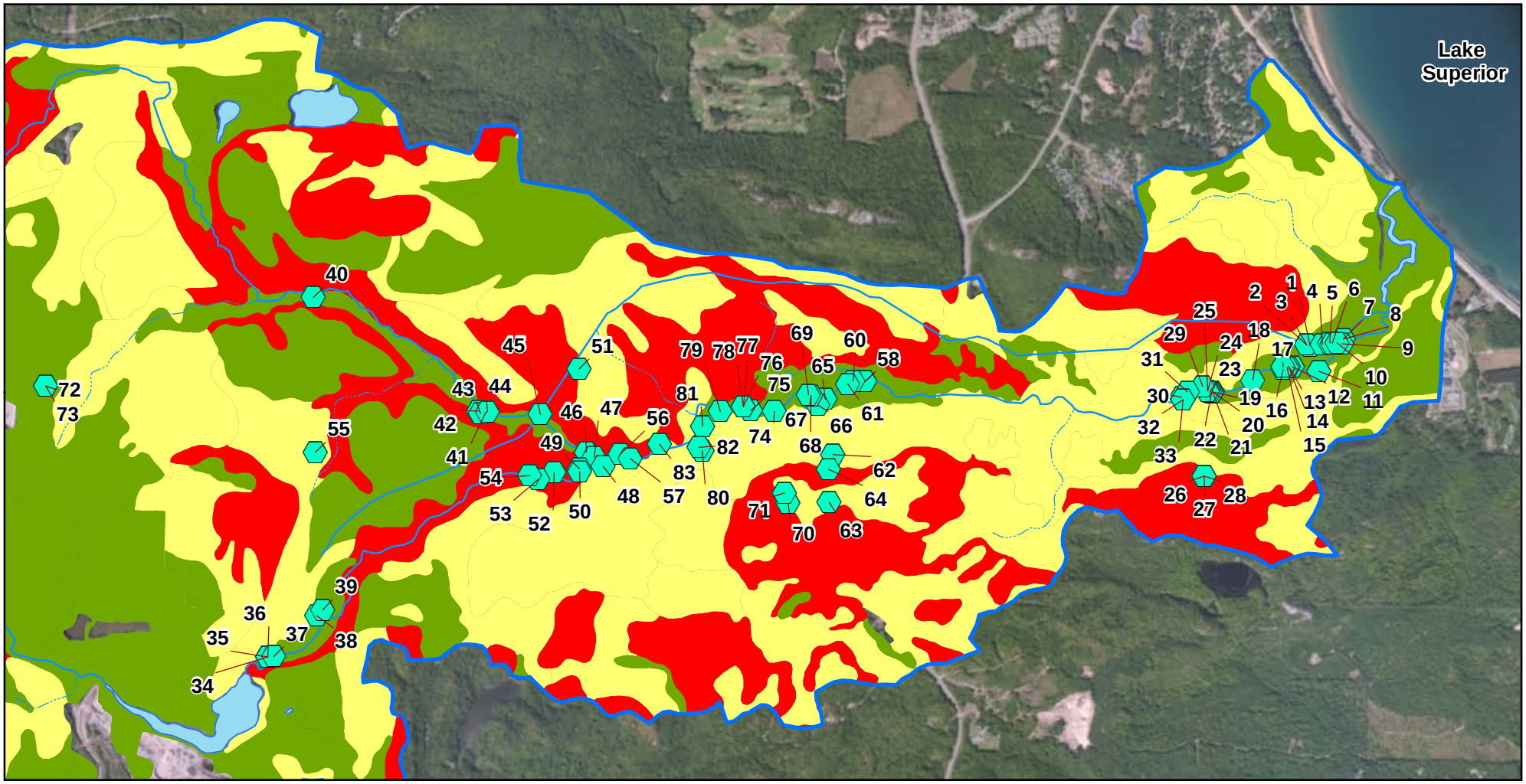
APPENDIX B

Sediment Delivery Monitoring

Carp River Watershed

Marquette County, Michigan

Sediment Delivery Monitoring Locations



Location Type

- Sediment Delivery Location

Erosion Potential

- Slight
- Moderate
- Severe
- Not Rated

Hydrology

- Rivers & Streams
- Drains & Intermittent Streams
- Lake

Other

- Watershed Boundary

0 0.5 1 Miles

1:30,000

Data provided by Superior Watershed Partnership, North Jackson Company, and the Michigan Geographic Data Library

Satellite Image acquired from: ArcGIS Online
Satellite Image taken on: September 2011

Projection & Datum: Hotine Oblique Mercator Azimuth Natural Origin NAD 83

Superior Watershed Partnership and Land Trust

North Jackson Company
ENVIRONMENTAL SCIENCE & ENGINEERING

Figure: B.1

Appendix B
Sediment Delivery Monitoring
Carp River Watershed

Site NO.	Lattitude (North)	Longitude (West)	Date	Width (ft)	Length (ft)	Area (ft)	Depth (ft)	Sediment Delivery Rate (Tons/Year)	Type
1	46.51119	-87.38985	8/27/2013	15.4	18.3	281.8	3.4	3.2	Moderate
2	46.51122	-87.39008	8/27/2013	24.0	38.8	930.0	10.0	10.7	Moderate
3	46.51122	-87.39008	8/27/2013	12.3	15.5	190.7	1.3	2.2	Moderate
4	46.51125	-87.38902	8/27/2013	35.7	16.4	585.5	0.5	6.7	Moderate
5	46.51134	-87.38853	8/27/2013	25.5	12.3	312.4	0.5	12.3	Severe
6	46.51131	-87.38834	8/27/2013	45.6	11.8	535.8	0.5	12.3	Severe
7	46.51152	-87.38761	8/27/2013	2.0	11.0	22.0	0.5	0.5	Severe
8	46.51152	-87.38761	8/27/2013	8.0	11.0	88.0	3.3	2.5	V. Severe
9	46.51130	-87.38770	8/27/2013	7.3	11.0	80.3	3.3	2.3	V. Severe
10	46.51133	-87.38802	8/27/2013	20.5	17.8	363.9	0.5	4.2	Moderate
11	46.51000	-87.38921	8/27/2013	45.0	6.0	270.0	1.5	7.8	V. Severe
12	46.51019	-87.39100	8/27/2013	2.0	3.0	6.0	0.8	0.2	V. Severe
13	46.51020	-87.39126	8/27/2013	4.3	7.0	29.8	0.7	0.9	V.severe
14	46.51020	-87.39126	8/27/2013	6.8	8.7	58.7	0.7	1.7	V. Severe
15	46.51015	-87.39137	8/27/2013	3.8	4.8	18.2	2.3	0.5	V. Severe
16	46.51007	-87.39162	8/27/2013	4.5	4.9	22.1	1.3	0.6	V. Severe
17	46.51017	-87.39165	8/27/2013	7.5	5.5	41.3	0.5	0.9	Severe
18	46.59540	-87.39366	8/27/2013	10.8	2.5	27.0	0.5	0.3	Moderate
19	46.50895	-87.39637	8/27/2013	5.9	5.6	33.0	0.8	0.7	V. Severe
20	46.50895	-87.39637	8/27/2013	4.0	2.9	11.6	0.7	0.1	Moderate
21	46.50895	-87.39637	8/27/2013	4.4	7.6	33.4	0.8	0.3	Moderate
22	46.50893	-87.39645	8/27/2013	18.3	15.0	274.5	2.0	4.9	Severe
23	46.50896	-87.39659	8/27/2013	7.4	7.8	57.7	0.8	0.5	Moderate
24	46.50899	-87.39672	8/27/2013	9.5	3.4	32.3	1.7	0.3	Moderate
25	46.50899	-87.39672	8/27/2013	5.4	4.8	25.9	3.0	0.6	V. Severe
26	46.50501	-87.39683	8/27/2013	8.4	5.6	47.0	1.0	10.6	V. Severe
27	46.50501	-87.39683	8/27/2013	9.4	7.5	70.5	1.0	1.6	V. Severe
28	46.50501	-87.39683	8/27/2013	7.4	30.0	222.0	2.4	5.0	V. Severe
29	46.50919	-87.39705	8/27/2013	50.0	50.0	2500.0	3.5	232.5	Moderate
30	46.50868	-87.39845	8/27/2013	15.0	10.0	150.0	0.5	2.7	Severe
31	46.50893	-87.39807	8/27/2013	30.0	8.0	240.0	1.0		Moderate
32	46.50856	-87.39837	8/27/2013	19.7	25.0	492.5	2.8	5.7	Moderate
33	46.50856	-87.39837	8/27/2013	14.5	20.0	290.0	0.8	2.6	Moderate
34	46.49580	-87.45985	8/28/2013	6.6	11.0	72.6	0.5	0.8	Moderate
35	46.49580	-87.45985	8/28/2013	7.5	3.3	24.8	1.0	0.3	Moderate
36	46.49580	-87.45985	8/28/2013	6.5	7.0	45.5	2.5	0.5	Moderate
37	46.49582	-87.45946	8/28/2013	9.3	9.3	86.5	1.7	1.0	Moderate
38	46.49775	-87.45660	8/28/2013	7.0	6.8	47.6	0.5	0.4	Moderate
39	46.49804	-87.45621	8/28/2013	40.0	30.0	1200.0	12.0	32.1	V. Severe
40	46.51261	-87.45722	8/28/2013	9.0	140.0	1260.0	2.0	31.5	V. Severe
41	46.50741	-87.44543	8/28/2013	18.5	2.0	37.0	1.0	0.5	Severe
42	46.50744	-87.44592	8/28/2013	17.6	3.0	52.8	1.5	0.7	Severe
43	46.50734	-87.44579	8/28/2013	9.5	6.8	64.6	1.6	0.4	Moderate
44	46.50740	-87.44532	8/28/2013	18.5	6.7	124.0	2.5	3.1	V. Severe

Appendix B
Sediment Delivery Monitoring
Carp River Watershed

Site NO.	Lattitude (North)	Longitude (West)	Date	Width (ft)	Length (ft)	Area (ft)	Depth (ft)	Sediment Delivery Rate (Tons/Year)	Type
45	46.50735	-87.44173	8/28/2013	6.7	28.0	187.6	1.0	4.0	Severe
46	46.50561	-87.43858	8/28/2013	10.5	2.5	26.3	0.5	0.3	Moderate
47	46.50539	-87.43804	8/28/2013						V. Severe
48	46.50497	-87.43745	8/28/2013	300.0	3.0	900.0	1.0	20.3	V. Severe
49	46.50484	-87.43904	8/28/2013	4.0	10.0	40.0	0.6	0.5	Moderate
50	46.50471	-87.43904	8/28/2013	18.8	9.7	182.4	2.7	4.9	V. Severe
51	46.50949	-87.43919	8/28/2013	19.6	5.0	98.0	1.3	2.3	Severe
52	46.50463	-87.44073	8/28/2013	3.5	8.0	28.0	0.7	0.2	Moderate
53	46.50429	-87.44183	8/28/2013	10.4	5.0	52.0	1.2	0.3	Moderate
54	46.50447	-87.44238	8/28/2013	100.0	40.0	4000.0			
55	46.50539	-87.45689	8/28/2013	30.3	5.3	160.6	1.7		Moderate
56	46.50556	-87.43630	8/28/2013	150.0	4.0	600.0	1.0	10.8	Severe
57	46.50537	-87.43562	8/28/2013	40.0	12.0	480.0	1.0	7.8	V. Severe
58	46.50914	-87.41987	8/29/2013	6.6	5.0	33.0	1.5	0.7	Severe
59	46.50914	-87.41987	8/29/2013	40.0	4.0	160.0	1.0	3.2	Severe
60	46.50916	-87.42067	8/29/2013	2.0	23.0	46.0	0.5	0.9	Severe
61	46.50902	-87.42103	8/29/2013			0.0			Moderate
62	46.50572	-87.42192	8/29/2013	4.0	2.4	9.6	0.7	0.1	Moderate
63	46.50349	-87.42215	8/29/2013	16.5	6.0	99.0	0.5	1.0	Moderate
64	46.50502	-87.42221	8/29/2013	18.0	5.0	90.0	1.0	1.0	Moderate
65	46.50830	-87.42254	8/29/2013			0.0			Moderate
66	46.50837	-87.42335	8/29/2013	30.0	6.0	180.0	1.0	1.9	Moderate
67	46.50843	-87.42348	8/29/2013	13.0	2.5	32.5	0.7	0.7	Severe
68	46.50843	-87.42348	8/29/2013	20.0	2.5	50.0	0.7	1.2	Severe
69	46.50849	-87.42365	8/29/2013			0.0			
70	46.50342	-87.42490	8/29/2013	9.0	2.0	18.0	1.0	0.4	Severe
71	46.50388	-87.42516	8/29/2013			0.0			
72	46.50825	-87.47517	8/29/2013	3.0	2.0	6.0	1.0	0.1	Severe
73	46.50825	-87.47517	8/29/2013	4.5	3.7	16.7	1.0	0.4	Severe
74	46.50768	-87.42596	8/29/2013	100.0	10.0	1000.0	1.0	22.5	V. Severe
75	46.50769	-87.42755	8/29/2013			0.0			
76	46.50788	-87.42803	8/29/2013	50.0	15.0	750.0	3.0	16.9	V. Severe
77	46.50788	-87.42803	8/29/2013	15.0	20.0	300.0	4.0	6.8	V. Severe
78	46.50788	-87.42803	8/29/2013	40.0	6.0	240.0	1.0	6.9	V. Severe
79	46.50764	-87.42960	8/29/2013	40.0	30.0	1200.0	2.0	27.0	V. Severe
80	46.50579	-87.43076	8/29/2013	40.0	8.0	320.0	3.0	7.2	V. Severe
81	46.50692	-87.43076	8/29/2013			0.0			V. Severe
82	46.50594	-87.43097	8/29/2013			0.0			V. Severe
83	46.50605	-87.43365	8/29/2013	10.0	12.0	120.0	1.5	2.2	Severe

Appendix B
Sediment Delivery Monitoring
Carp River Watershed

Site NO.	Lattitude (North)	Longitude (West)	Date	Width (ft)	Length (ft)	Area (ft)	Depth (ft)	Sediment Delivery Rate (Tons/Year)	Type
1	46.51119	-87.38985	8/27/2013	15.4	18.3	281.8	3.4	3.2	Moderate
2	46.51122	-87.39008	8/27/2013	24.0	38.8	930.0	10.0	10.7	Moderate
3	46.51122	-87.39008	8/27/2013	12.3	15.5	190.7	1.3	2.2	Moderate
4	46.51125	-87.38902	8/27/2013	35.7	16.4	585.5	0.5	6.7	Moderate
5	46.51134	-87.38853	8/27/2013	25.5	12.3	312.4	0.5	12.3	Severe
6	46.51131	-87.38834	8/27/2013	45.6	11.8	535.8	0.5	12.3	Severe
7	46.51152	-87.38761	8/27/2013	2.0	11.0	22.0	0.5	0.5	Severe
8	46.51152	-87.38761	8/27/2013	8.0	11.0	88.0	3.3	2.5	V. Severe
9	46.51130	-87.38770	8/27/2013	7.3	11.0	80.3	3.3	2.3	V. Severe
10	46.51133	-87.38802	8/27/2013	20.5	17.8	363.9	0.5	4.2	Moderate
11	46.51000	-87.38921	8/27/2013	45.0	6.0	270.0	1.5	7.8	V. Severe
12	46.51019	-87.39100	8/27/2013	2.0	3.0	6.0	0.8	0.2	V. Severe
13	46.51020	-87.39126	8/27/2013	4.3	7.0	29.8	0.7	0.9	V.severe
14	46.51020	-87.39126	8/27/2013	6.8	8.7	58.7	0.7	1.7	V. Severe
15	46.51015	-87.39137	8/27/2013	3.8	4.8	18.2	2.3	0.5	V. Severe
16	46.51007	-87.39162	8/27/2013	4.5	4.9	22.1	1.3	0.6	V. Severe
17	46.51017	-87.39165	8/27/2013	7.5	5.5	41.3	0.5	0.9	Severe
18	46.59540	-87.39366	8/27/2013	10.8	2.5	27.0	0.5	0.3	Moderate
19	46.50895	-87.39637	8/27/2013	5.9	5.6	33.0	0.8	0.7	V. Severe
20	46.50895	-87.39637	8/27/2013	4.0	2.9	11.6	0.7	0.1	Moderate
21	46.50895	-87.39637	8/27/2013	4.4	7.6	33.4	0.8	0.3	Moderate
22	46.50893	-87.39645	8/27/2013	18.3	15.0	274.5	2.0	4.9	Severe
23	46.50896	-87.39659	8/27/2013	7.4	7.8	57.7	0.8	0.5	Moderate
24	46.50899	-87.39672	8/27/2013	9.5	3.4	32.3	1.7	0.3	Moderate
25	46.50899	-87.39672	8/27/2013	5.4	4.8	25.9	3.0	0.6	V. Severe
26	46.50501	-87.39683	8/27/2013	8.4	5.6	47.0	1.0	10.6	V. Severe
27	46.50501	-87.39683	8/27/2013	9.4	7.5	70.5	1.0	1.6	V. Severe
28	46.50501	-87.39683	8/27/2013	7.4	30.0	222.0	2.4	5.0	V. Severe
29	46.50919	-87.39705	8/27/2013	50.0	50.0	2500.0	3.5	232.5	Moderate
30	46.50868	-87.39845	8/27/2013	15.0	10.0	150.0	0.5	2.7	Severe
31	46.50893	-87.39807	8/27/2013	30.0	8.0	240.0	1.0		Moderate
32	46.50856	-87.39837	8/27/2013	19.7	25.0	492.5	2.8	5.7	Moderate
33	46.50856	-87.39837	8/27/2013	14.5	20.0	290.0	0.8	2.6	Moderate
34	46.49580	-87.45985	8/28/2013	6.6	11.0	72.6	0.5	0.8	Moderate
35	46.49580	-87.45985	8/28/2013	7.5	3.3	24.8	1.0	0.3	Moderate
36	46.49580	-87.45985	8/28/2013	6.5	7.0	45.5	2.5	0.5	Moderate
37	46.49582	-87.45946	8/28/2013	9.3	9.3	86.5	1.7	1.0	Moderate
38	46.49775	-87.45660	8/28/2013	7.0	6.8	47.6	0.5	0.4	Moderate
39	46.49804	-87.45621	8/28/2013	40.0	30.0	1200.0	12.0	32.1	V. Severe
40	46.51261	-87.45722	8/28/2013	9.0	140.0	1260.0	2.0	31.5	V. Severe
41	46.50741	-87.44543	8/28/2013	18.5	2.0	37.0	1.0	0.5	Severe
42	46.50744	-87.44592	8/28/2013	17.6	3.0	52.8	1.5	0.7	Severe
43	46.50734	-87.44579	8/28/2013	9.5	6.8	64.6	1.6	0.4	Moderate
44	46.50740	-87.44532	8/28/2013	18.5	6.7	124.0	2.5	3.1	V. Severe

Appendix B
Sediment Delivery Monitoring
Carp River Watershed

Site NO.	Lattitude (North)	Longitude (West)	Date	Width (ft)	Length (ft)	Area (ft)	Depth (ft)	Sediment Delivery Rate (Tons/Year)	Type
45	46.50735	-87.44173	8/28/2013	6.7	28.0	187.6	1.0	4.0	Severe
46	46.50561	-87.43858	8/28/2013	10.5	2.5	26.3	0.5	0.3	Moderate
47	46.50539	-87.43804	8/28/2013						V. Severe
48	46.50497	-87.43745	8/28/2013	300.0	3.0	900.0	1.0	20.3	V. Severe
49	46.50484	-87.43904	8/28/2013	4.0	10.0	40.0	0.6	0.5	Moderate
50	46.50471	-87.43904	8/28/2013	18.8	9.7	182.4	2.7	4.9	V. Severe
51	46.50949	-87.43919	8/28/2013	19.6	5.0	98.0	1.3	2.3	Severe
52	46.50463	-87.44073	8/28/2013	3.5	8.0	28.0	0.7	0.2	Moderate
53	46.50429	-87.44183	8/28/2013	10.4	5.0	52.0	1.2	0.3	Moderate
54	46.50447	-87.44238	8/28/2013	100.0	40.0	4000.0			
55	46.50539	-87.45689	8/28/2013	30.3	5.3	160.6	1.7		Moderate
56	46.50556	-87.43630	8/28/2013	150.0	4.0	600.0	1.0	10.8	Severe
57	46.50537	-87.43562	8/28/2013	40.0	12.0	480.0	1.0	7.8	V. Severe
58	46.50914	-87.41987	8/29/2013	6.6	5.0	33.0	1.5	0.7	Severe
59	46.50914	-87.41987	8/29/2013	40.0	4.0	160.0	1.0	3.2	Severe
60	46.50916	-87.42067	8/29/2013	2.0	23.0	46.0	0.5	0.9	Severe
61	46.50902	-87.42103	8/29/2013			0.0			Moderate
62	46.50572	-87.42192	8/29/2013	4.0	2.4	9.6	0.7	0.1	Moderate
63	46.50349	-87.42215	8/29/2013	16.5	6.0	99.0	0.5	1.0	Moderate
64	46.50502	-87.42221	8/29/2013	18.0	5.0	90.0	1.0	1.0	Moderate
65	46.50830	-87.42254	8/29/2013			0.0			Moderate
66	46.50837	-87.42335	8/29/2013	30.0	6.0	180.0	1.0	1.9	Moderate
67	46.50843	-87.42348	8/29/2013	13.0	2.5	32.5	0.7	0.7	Severe
68	46.50843	-87.42348	8/29/2013	20.0	2.5	50.0	0.7	1.2	Severe
69	46.50849	-87.42365	8/29/2013			0.0			
70	46.50342	-87.42490	8/29/2013	9.0	2.0	18.0	1.0	0.4	Severe
71	46.50388	-87.42516	8/29/2013			0.0			
72	46.50825	-87.47517	8/29/2013	3.0	2.0	6.0	1.0	0.1	Severe
73	46.50825	-87.47517	8/29/2013	4.5	3.7	16.7	1.0	0.4	Severe
74	46.50768	-87.42596	8/29/2013	100.0	10.0	1000.0	1.0	22.5	V. Severe
75	46.50769	-87.42755	8/29/2013			0.0			
76	46.50788	-87.42803	8/29/2013	50.0	15.0	750.0	3.0	16.9	V. Severe
77	46.50788	-87.42803	8/29/2013	15.0	20.0	300.0	4.0	6.8	V. Severe
78	46.50788	-87.42803	8/29/2013	40.0	6.0	240.0	1.0	6.9	V. Severe
79	46.50764	-87.42960	8/29/2013	40.0	30.0	1200.0	2.0	27.0	V. Severe
80	46.50579	-87.43076	8/29/2013	40.0	8.0	320.0	3.0	7.2	V. Severe
81	46.50692	-87.43076	8/29/2013			0.0			V. Severe
82	46.50594	-87.43097	8/29/2013			0.0			V. Severe
83	46.50605	-87.43365	8/29/2013	10.0	12.0	120.0	1.5	2.2	Severe

APPENDIX C
Web-Enabled Data Discovery Tool
(Description of the Carp River Watershed REACH System)

The Carp River Watershed REACH System

Introduction

The Carp River REACH System is designed to combine communities and technology to achieve documented National Pollutant Discharge Eliminations System reductions in a Great Lakes Area of Concern watershed. Mercury monitoring data are available for exploration and download on this site. The data have been provided from three sources: (1) Wastewater Treatment Plant (WWTP) (Ishpeming, Marquette, and Negaunee); (2) Michigan Department of Environmental Quality (MDEQ); and (3) the Superior Watershed Partnership. WWTP data have been collected from 2004 to present in accordance with each facility's Mercury Pollution Minimization Plan and include a combination of samples collected within each Facility's collection system. MDEQ data were collected in part to identify mercury sources and estimate mercury loads to Deer Lake from Carp Creek. MDEQ monitored mercury at 29 surface water sampling locations within the Carp Creek Watershed from 2002 to 2004. The Superior Watershed Partnership has been monitoring mercury levels at eight surface water locations on the Carp River since 2011. These data provide documentation of the successful reduction of mercury levels in a Great Lakes Area of Concern watershed.

Sampling Locations

Mercury data are available from a total of 64 sampling locations. There are five different types of sampling locations: (1) drinking water; (2) influent; (3) effluent; (4) source; and (5) surface water. The five categories are defined as follows:

Drinking water – water quality samples collected from locations (e.g., schools and townships) identified as potential mercury sources (via collection system sampling) with the primary water usage of the location being drinking water

Influent – water quality samples collected from wastewater flowing into a wastewater treatment plant (before treatment)

Effluent – water quality samples collected from wastewater, after treatment to reduce pollution or health hazards, released from a treatment facility

Source – water quality samples collected from locations (e.g., dentist offices and hospitals) identified as potential mercury sources (via collection system sampling) with the primary water usage of the location not being drinking water

Surface water – water quality samples collected from streams (i.e., Carp Creek and Carp River) located within the Carp River Watershed

APPENDIX C
Web-Enabled Data Discovery Tool
(Description of the Carp River Watershed REACH System)

Criteria used for Screening

Data may be screened against three criteria or thresholds: (1) Criteria Maximum Concentration (CMC); (2) Criterion Continuous Concentration (CCC); and (3) National Pollutant Discharge Elimination System (NPDES). The selected benchmarks are defined as follows:

Criteria Maximum Concentration (CMC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. The CMC concentration for mercury is 1400 ng/L.

Criterion Continuous Concentration (CCC) is an estimate of the highest concentration of a material in surface water to which an aquatic community can be exposed indefinitely without resulting in an unacceptable effect. The CCC concentration for mercury is 770 ng/L.

National Pollutant Discharge Elimination System (NPDES) Concentration is the highest concentration of a material in surface water to which a wastewater treatment facility is permitted to release (after treatment). The NPDES concentration for mercury is 1.3 ng/L.

Data Exploration

Mercury data are available for viewing, exploration and download on the Carp River Watershed REACH System. Data exploration options include:

- Spatial depiction of monitoring locations and results, including where mercury has exceeded a selected criterion.
- Through charts and tables explore how often mercury was monitored or found to exceed a specified criterion.
- Download Carp River Watershed mercury and erosion monitoring databases.
- View or download project maps (PDFs).

In addition to allowing spatial depiction of where reported mercury concentrations have exceeded selected criteria, the map page provides a wealth of on-line GIS information pertaining to the Carp River Watershed. The table of contents includes layers depicting public land surveys, contours, geology, soil, land use, impervious surface, ownership, and population.