NONPOINT SOURCE ASSESSMENT REPORT

FOR

THE SAGINAW CHIPPEWA INDIAN TRIBE OF

MICHIGAN

PUBLIC REVIEW

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Prepared for - Saginaw Chippewa Indian Tribe
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ACRONYMS AND ABBREVIATIONS LIST

BIA	Bureau of Indian Affairs
cfs	cubic feet per second
CFU	colony forming unit
CMU	Central Michigan University
CREP	Conservation Reserve Enhancement Program
CWA	Clean Water Act
°C	degrees Celsius
DO	dissolved oxygen
DWP	Drinking Water Plant
EPT	Ephemeroptera, Plecoptera, and Trichoptera
FMP	Forest Management Plan
HUC	Hydrologic Unit Code
IHS	Indian Health Service
MCL	maximum contamination level
MDARD	Michigan Department of Agriculture and Rural Development
MDEQ	Michigan Department of Environmental Quality
mg/L	milligrams per liter
MITC	Inter-Tribal Council of Michigan, Inc.
NPS	nonpoint source
NRCS	Natural Resources Conservation Service
NTU	number of transfer units
ppm	parts per million
RC&D	Resource, Conservation & Development
SCIT	Saginaw Chippewa Indian Tribe
STORET	STOrage and RETrieval
SWiMS	Surface Water Information Management System
TAS	treatment as state
TDS	total dissolved solids
TN	total nitrogen
TP	total phosphorus
µg/L	micrograms per liter
USEPA	United States Environmental Protection Agency
USGS	U.S. Geological Survey
WQS	Water Quality Standards
WY	Water Year

SECTION 1 - OVERVIEW

Nonpoint source (NPS) pollution delivers pollutants to surface waters from diffuse origins rather than from one or more discernible point sources. NPS pollution includes runoff from precipitation as well as stressors such as habitat alteration, dams, or channelization. Urban runoff; agricultural runoff; leaking septic tanks; and air pollution are major NPSs (USEPA 2009). NPS pollution remains the most significant source of water quality problems in the United States. It is the main reason that approximately 44 percent of surveyed rivers, lakes, and estuaries in 2004 were not clean enough to meet basic uses such as fishing or swimming (USEPA 2009).

This NPS assessment report for the Saginaw Chippewa Indian Tribe (SCIT) analyzes NPS problems for tribal waters on the SCIT's Reservation lands. This report will fulfill the statutory requirement for a NPS assessment report for development of an approvable Clean Water Act (CWA) Section 319 NPS management plan for these tribal waters. In order to qualify for 319 funding a tribe must meet four criteria (EPA, 2010a):

1. Be a federally recognized tribe
2. Complete an approved CWA section 319(a) NPS assessment report
3. Complete an approved CWA section 319(b) NPS management program plan
4. Be CWA section 518(e) approved for treatment similar to a state ("treatment as a state" or TAS)

The SCIT currently owns approximately 139,000 acres of land in Isabella County and 1,000 acres of land in Arenac County Michigan near Saginaw Bay, in trust, as shown in Figure 1 (SCIT 2012a). Land use in the Reservation is mostly agricultural—over 50 percent of land is used for row crops or livestock pasture lands. Just over twenty percent of the land is forested and there are a few urban areas including the northern portion of the City of Mt. Pleasant. In 2011 the SCIT assessed their tribal waters and identified several issues of tribal concern including high bacteria levels in the North Branch of the Chippewa River, high total dissolved solids (TDS) in Saganing River, polychlorinated biphenyl (PCB) advisories on the Chippewa River downstream of the Reservation, and potential drinking water restrictions in Mt. Pleasant due to historical discharges of cadmium and other contaminants.

The SCIT have made it a priority to keep water within the Tribal boundary as pristine as possible for spiritual, cultural, and health reasons. SCIT see water as a Tribal lifeline and a source of growth. The Anishinabek people migrated to the area for the local water and its potential for food sources like wild rice. The SCIT would like tribal waters to support a stock of healthy fish, aquatic insects, reptiles, and amphibians; to be free of stream bank erosion, cattle crossings, sedimentation, and toxins; and to support the community, native wildlife, wild rice, sweetgrass, black ash trees, and other needs.

This report provides additional analysis of the 2011 assessment of tribal waters to assess NPS problems and identify the sources of NPS pollutants on the SCIT lands in Isabella and Arenac counties. This report fulfills the statutory requirements for an NPS assessment report and will serve as the basis for targeting reduction of NPS pollution in the tribal Reservation. Through partnerships, future program expansion, and the completion of a Section 319 NPS management plan, the SCIT would like to promote improvements in water quality.

The primary NPS problems on the Isabella Reservation appear to be related to the following:

- Agriculture (pasture land, crop production, tile drainage)
- On-site wastewater systems (septic systems)
- Channelization/Streambank destabilization
- Removal/Loss of Riparian Vegetation
- Construction
- Urban runoff (Mt. Pleasant, Weidman, Beal City, Rosebush, Loomis)

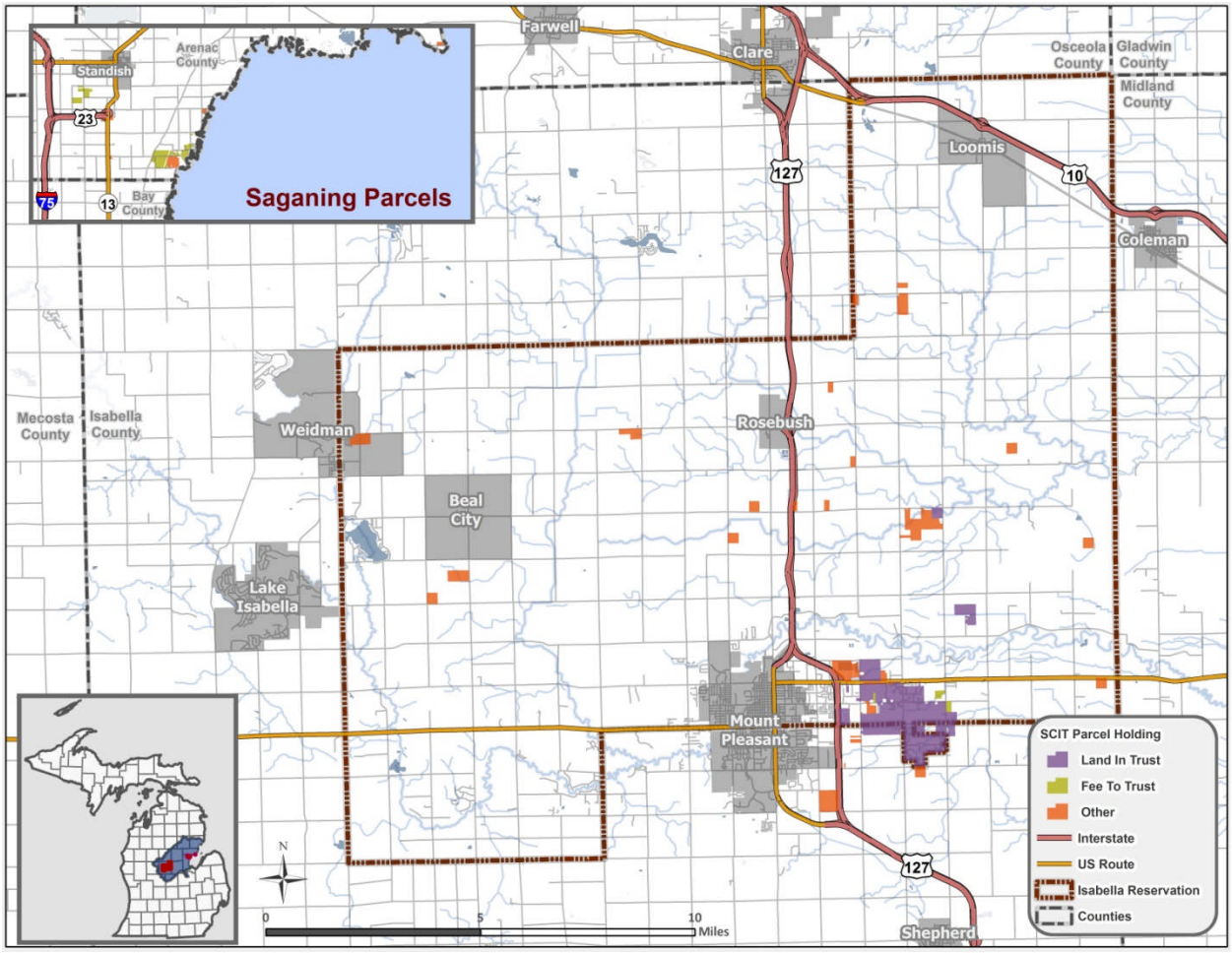


Figure 1. Location of the SCIT Isabella Reservation

SECTION 2 - INTRODUCTION

The SCIT has one Reservation, the Isabella Reservation, that was established by an August 2, 1855 Treaty. The Reservation includes areas in Arenac and Isabella counties of Michigan as shown in Figure 1 (the main Reservation in Isabella County, and several Saganing area parcels in Arenac County). A substantial number of lakes and streams exist in both areas. The SCIT lands consist of approximately 140,000 acres. The Reservation has approximately 1,200 tribal members living on tribally owned lands in addition to approximately 25,100 non-tribal residents. Of the 138,240 acres on the Reservation, 724 acres of allotted land remain in trust status (twenty-two allotments). All land draining to the SCIT water quality stations are assessed in this report.

Historically, land on the Isabella Reservation was used for timber harvesting and agriculture. Land was also used for gas and oil production, as well as manufacturing. Crop farming and livestock continue to be strong in the tribal community. Currently, the SCIT has established a successful gaming industry which has provided economic opportunity for improvement of Reservation conditions. There is ongoing construction of business and residential areas around Mt. Pleasant in Isabella County. The SCIT is concerned with improving surface water quality on the Reservation to maintain the beneficial uses of tribal waters.

Water quality monitoring data for the Isabella Reservation suggest NPSs of pollution adversely affect water quality and designated uses on streams in the Reservation. The SCIT seeks to control NPS pollutants by implementing NPS management practices and modifying behavior.

The SCIT's primary goal is to establish an NPS pollution control program to address polluted runoff impacts and qualify the tribe for a Section 319 grant designed to expand and continue NPS management efforts to minimize NPS pollution on the Reservation. In addition the SCIT wishes to assess and track the condition of its tribal waters. A third goal is to attain water quality standards.

The SCITs primary objectives to achieve these goals are:

- Quantify and qualify goal attainment status of bacteria, nutrients, and sediment to Chippewa River, North Branch Chippewa River, Coldwater River, and Saganing River
- Identify and quantify sources of nutrients, bacteria, and sediment on Reservation lands and waters to better distinguish and address NPSs of pollutants.
- Continue current monitoring and reevaluation as necessary

The purpose of this NPS Assessment Report is to identify existing and potential water quality problems caused by NPS pollution on the SCIT Isabella Reservation, which supports the SCIT's overall intent to meet tribal water quality goals in the future. The report identifies the nature, extent, and effect of NPS pollution for tribal waters on the SCIT's Reservation lands, as well as the sources of such pollution. The assessment evaluates water quality monitoring data and information from various sources, such as anecdotal information from members of the SCIT and various documents and reports written for the SCIT. The report will categorize NPS pollution sources for those individual waters identified as needing control of NPS pollution. In addition, this report will discuss how the SCIT will identify best management practices (BMPs) needed to control NPS pollution on the Reservation. The assessment report will include a description of any existing tribal, state, federal, and other programs that could be used for helping to control NPS pollution on the Reservation.

SECTION 3 – METHODOLOGY

The SCIT has collected surface water quality data at 22 monitoring stations through 2011, and added three additional stations in 2012. These stations include twelve stations along the Chippewa River, three stations on the Coldwater River, seven stations on the North Branch of the Chippewa River, and three stations on the Saganing River. These monitoring stations have been evaluated from April through October each year. In 2012 SCIT modified their sampling plan and will use a 5 year rotating basin approach which intends to add stations on Salt River in 2015. Five sites on the North Branch Chippewa River were sampled in 2012 as well as three long term monitoring sites on the Chippewa River. Saganing River will be sampled in 2013.

The SCIT monitoring program objectives are as follows:

- Identify a set of key monitoring parameters that appropriately characterize water quality.
- Identify parameters exceeding State of Michigan Water Quality Standards.
- Identify potential sources of pollution, contamination, etc. entering Tribal Waters.
- Identify potential threats to human health due to water quality issues.
- Evaluate expansion of monitoring to lakes and wetlands in the future.
- Establish an understanding of the health and current status of tribal waters by monitoring on a rotational basis.
- Maintain a database of monitoring locations and information collected concerning the water quality of tribal waters.
- To maintain and improve the Water Program established by the SCIT with support from the Environmental Protection Agency.
- Collaborate with internal Tribal departments and external agencies and organizations to develop programs for improvement to degraded water, health risks for community members, potential contamination, etc.
- Educate and build enthusiasm in community members concerning water quality, water issues, and water related activities.
- Make Tribal Community, including Tribal Council, aware of issues concerning water.

2011 sampling data and the results from the *2011 Tribal Assessment Report for The Saginaw Chippewa Indian Tribe of Michigan* (Fishbeck 2011) were used to evaluate water quality goal exceedances, as well as a basis for identifying contributing NPSs to each tribal water across the Reservation. The USEPA (2010) *Handbook for Developing and Managing Tribal NPS Pollution Programs Under Section 319 of The Clean Water Act* suggests that NPS assessment analysis should be done on a 12-digit HUC subwatershed basis (USEPA 2010a). The subwatersheds, data, water quality standards to serve as interim tribal water quality goals, and NPS categories are described in the following sections.

The SCIT Reservation waters lie within four 8-digit Hydrologic Unit Code (HUC) watersheds and eighteen 12-digit HUC subwatersheds, of which eight are currently sampled by the SCIT. Table 1 summarizes the 12-digit HUC subwatersheds on the Isabella Reservation. Table 2 summarizes the SCIT sampling stations by each 12-digit HUC subwatershed. Figure 2 displays the station locations relative to the Reservation boundaries.

Table 1. The SCIT Hydrologic Watershed Units (8 and 12-digit HUCs)

HUC 8 ID	HUC12 ID	HUC12 Name	River Sampled by the SCIT
04080202	040802020202	Lake Isabella-Chippewa River	Chippewa River
	040802020204	Coldwater River	Coldwater River
	040802020205	Schofield Creek-North Branch Chippewa River	North Branch Chippewa River
	040802020206	Hogg Creek-North Branch Chippewa River	

HUC 8 ID	HUC12 ID	HUC12 Name	River Sampled by the SCIT
	040802020207	Johnson Creek-Chippewa River	Chippewa River
	040802020501	Mission Creek-Chippewa River	
	040802020504	Onion Creek	Not Currently Sampled
	040802020505	Salt Creek	
	040802020508	Dice Drain-Chippewa River	Chippewa River
04080102	040801020105	Saganing River	Saganing River
	040801020102	South Branch Pine River	Not Currently Sampled
	040801020104	White Feather Creek-Frontal Lake Huron	
04080101	040801010502	Big Creek-Frontal Lake Huron	
04080201	040802010501	Spring Creek-South Branch Salt River	
	040802010502	McDonald Drain-North Branch Salt River	
	040802010503	South Branch Salt River	
	040802010504	North Branch Salt River	
	040802010505	Bluff Creek	
	040802010506	Howard Creek-Salt River	

Table 2. The SCIT Sampling Stations

River	HUC12 ID (0408-xxxxxxxx)	HUC12 Name	Station ID	Monitoring Location Name	D.O.	Temp.	Turb.	S.C.	TDS	TP	TN	*E. coli*
Chippewa River	2020202	Lake Isabella-Chippewa River	CHIP1	Rolland Rd at Chip	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011		2009-2011
	2020207	Johnson Creek-Chippewa River	CHIP2	School Rd at Chip	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011		2009-2011
			CHIP3A	River Rd West	2004-2010	2004-2010	2004-2010	2004-2010	2009-2010	2009-2010	2009	2009-2010
			CHIP3	Broomfield Rd at Chip	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011		2009-2011
			CHIP4A	Vandecar Rd	2004-2009	2004-2009	2004-2009	2004-2009	2009-2011	2009-2011		2009
			CHIP4	Meridian Rd at Chip	2010-2011	2010-2011	2010-2011	2010-2011	2009-2011	2009-2011	2010	2010-2011
	2020501	Mission Creek-Chippewa River	CHIP8	Lincoln Road	2004-2007	2004-2007	2004-2007	2004-2007				
			CHIP5	Pickard Rd at Chip	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011	2009-2010	2009-2011
			CHIP9B	Mission Rd	2004, 2007-2010	2004, 2007-2010	2004, 2007-2010	2004, 2007-2010	2009-2010	2009-2010	2009-2010	2009-2010
			CHIP9A	Isabella Rd	2005-2006	2005-2006	2005-2006	2005-2006				
	2020508	Dice Drain-Chippewa River	CHIP6	Leaton Rd at Chip	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011	2009-2011	2009-2011

River	HUC12 ID (0408-xxxxxxxx)	HUC12 Name	Station ID	Monitoring Location Name	D.O.	Temp.	Turb.	S.C.	TDS	TP	TN	*E. coli*
			CHIP7	Chippewa Rd at Chip	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011	2009-2011	2009-2011
Coldwater River	2020204	Coldwater River	CR1	Vernon Rd at CWR	2011	2011	2011	2011	2011	2011		
			CR2	Weidman Rd at CWR	2011	2011	2011	2011	2011	2011		2011
			CR3	River Rd at CWR	2004-2011	2004-2011	2004-2011	2004-2011	2009-2011	2009-2011	2009-2011	2009-2011
North Branch Chippewa River	2020205	Schofield Creek-North Branch Chippewa River	NB1	Vandecar Rd at North Branch	2011	2011	2011	2011	2011	2011	2011	2011
			NB2	Vernon Rd at North Branch	2011	2011	2011	2011	2011	2011	2011	2011
	2020206	Hogg Creek-North Branch Chippewa River	NB3	Meridian Rd at North Branch	2011	2011	2011	2011	2011	2011	2011	2011
			NB4	Beal Rd	2012	2012	2012	2012	2012	2012	2012	2012
			Drain1	Beal Rd	2012	2012	2012	2012	2012	2012	2012	2012
			NB5	River Rd	2012	2012	2012	2012	2012	2012	2012	2012
			NB6	Remus Rd	2008-2010	2008-2010	2008-2010	2008-2010	2009-2011	2009-2011	2009-2011	2009-2011
Saganing River	1020105	Saganing River	SC3	Mouth at Saganing River	2011	2011	2011	2011	2011	2011	2011	

River	HUC12 ID (0408-xxxxxxxx)	HUC12 Name	Station ID	Monitoring Location Name	D.O.	Temp.	Turb.	S.C.	TDS	TP	TN	*E. coli*
			SC2/SC2A*	Sturman Rd/Community Center at Saganing River	2004-2011	2004-2011	2004-2011	2004-2011		2009-2011	2009-2011	
			SC1 /SC1A*	Worth Rd /Deep River Rd at Saganing River	2008-2011	2008-2011	2008-2011	2008-2011	2009-2011	2009-2011	2009-2011	2009-2011

*In 2011 Saganing River stations were moved from Sturman Rd to the Community Center and from Worth Rd to Deep River Rd. These datasets were combined for all water quality analyses.
D.O. = Dissolved Oxygen (mg/L and % Saturation)
Temp= Temperature in Degrees Celsius
Turb. = Turbidity (NTU)
S.C. = Specific Conductivity (mS/cm)
TDS = Total Dissolved Solids (mg/L)
TP = Total Phosphorus (µg/L)
TN = Total Nitrogen (mg/L)

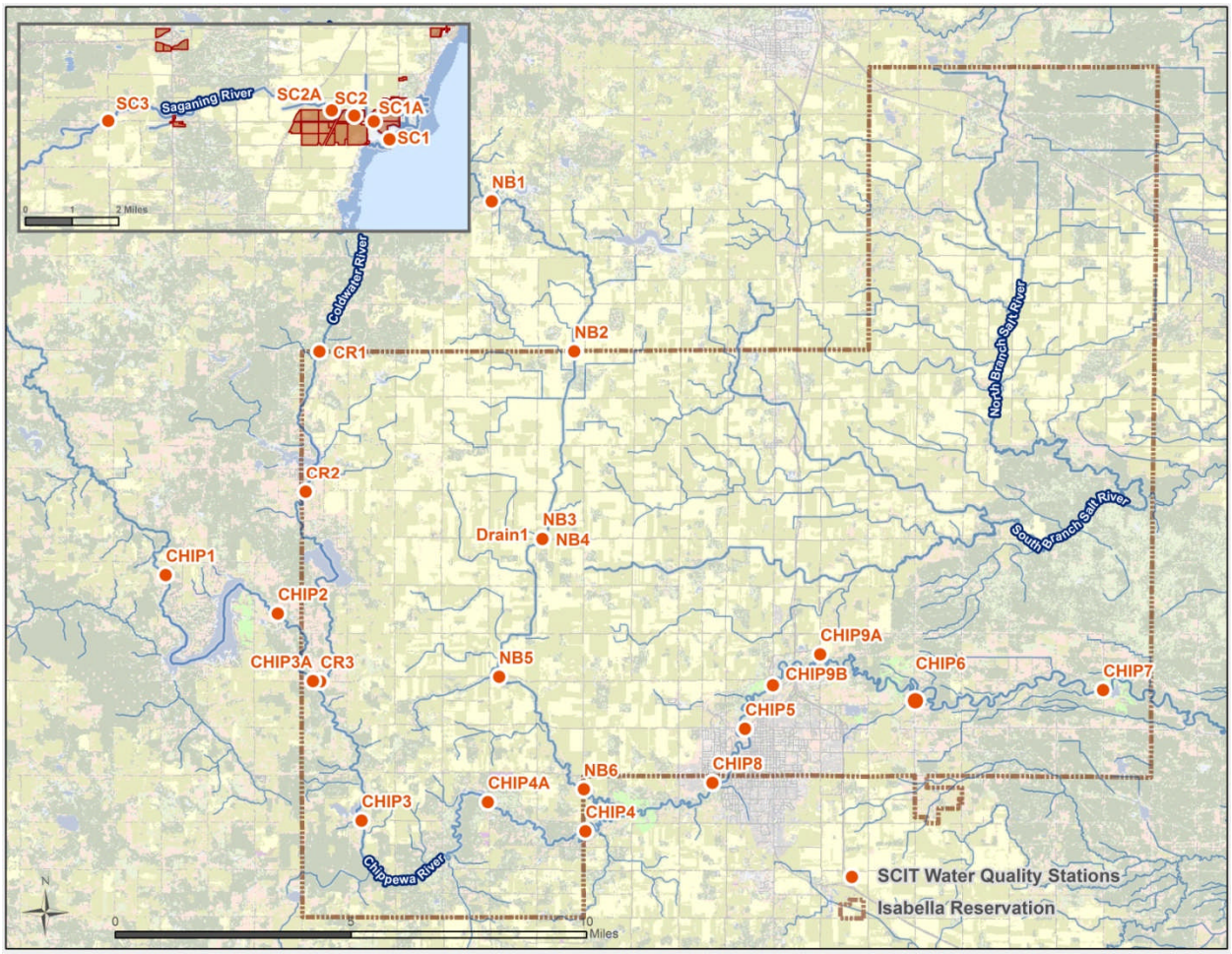


Figure 2. SCIT Sampling Stations

Data Collection Methods and Sources

Data were collected by the SCIT for Isabella Reservation and Saganing waters on a monthly basis from 2004 through 2011 in April through October. Bacteria data were taken on a weekly basis in 2011 from April through October to compare to the MDEQ water quality standards. The SCIT measured the following parameters at its assessment sites, though not every parameter was analyzed in every sample taken (Fishbeck 2011):

- **Field Parameters**: pH, Dissolved Oxygen, Specific Conductivity, temperature, and turbidity.
- **Habitat Assessment**: Physical characterization and habitat assessment.
- **Chemistry**: Total phosphorus, total nitrogen, and total dissolved solids (TDS). Due to high costs of total nitrogen, a Hach test was performed in the field to identify if nitrites or nitrates were present. In 2009 and 2010 all fixed monitoring stations were screened. In the event that any level was detected, the sample was sent to the Water Research Lab at Central Michigan University (CMU) for total nitrogen analysis.
- **Biological**: *Escherichia coli* (*E. coli*) and macroinvertebrate sampling.
- **Additional Measurements**: Stream velocity measurements were taken at eight of the twelve sites sampling sites from 2004-2011.

Data from the U.S. Geological Survey (USGS), MDEQ, and Central Michigan University's (CMU) Michigan Water Research Center were used to supplement the SCIT's data. The CMU laboratory is responsible for total phosphorus and total nitrogen testing. The SCIT DWP is responsible for total coliform and *E. coli* testing. The SCIT Water Quality Specialist (WQ Specialist) collects the raw field data, the SCIT Drinking Water Plant (DWP) laboratory microbiology data, and the CMU Water Research Center data and stores the data electronically in the SCIT Water Quality Database (Fishbeck 2011).

Additional data beyond the SCIT and CMU sampling is minimal for Reservation waters and was not included in the water quality analysis. Based on Modern STORET data, Michigan Department of Environmental Quality (MDEQ) sampled three lake stations on Littlefield Lake and Coldwater Lake on four dates from 2001 to 2003. Littlefield Lake and Coldwater Lake lie in the Coldwater River HUC (040802020204). Littlefield Lake lies upstream of the Isabella Reservation and the SCIT station CR1 on Coldwater River. Coldwater Lake lies in the Isabella Reservation between the SCIT stations CR2 and CR3 on Coldwater River. MDEQ has not performed any stream sampling on the SCIT tribal waters. USGS has sampled streamflow on the Chippewa River near Mt. Pleasant at station 04154000 and this data is summarized in the Surface and Ground Water Quality section of the report.

Water Quality Standards and Reference Conditions

The SCIT has not adopted tribal water quality standards for its water bodies, though the SCIT goal is for Tribal waters to fully support spiritual, cultural, and domestic uses. The SCIT planning department has chosen to use the State of Michigan's water quality standards to assess the state of tribal waters until tribal WQS are adopted. Table 3 lists the water quality standards numeric and narrative criteria values for all parameters sampled by the SCIT. For parameters with no current Michigan water quality standards, USEPA ecoregion reference conditions, and other applicable national criteria shown in Table 4 were used to assess goal attainment status.

Table 3. Michigan Water Quality Standards for parameters sampled by the SCIT

Parameter	WQS Rule No.	Value
pH	53	6.5 – 9.0
Dissolved Oxygen	64 & 65	Coldwater fisheries must be 7.0 mg/L or above Warmwater fisheries must be 5.0 mg/L or above
Water Temperature	69–75	Warmwater fisheries – for a line between Bay City, Midland, Alma, and North Muskegon monthly maximum temps. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38 38 41 56 70 80 83 81 74 64 49 39 Coldwater fisheries monthly maximum temps. Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 38 38 43 54 65 68 68 68 63 56 48 40
Turbidity	50	No numeric value – narrative
Specific Conductivity	51	Specific Conductivity- No numeric value – no narrative
E. coli	62	Total body contact requires 130 *E. coli*/100 mL as a 30 day mL geometric mean* and never over 300 *E. coli*/100 mL at any one time. Partial body contact is 1000 *E. coli*/100
Total phosphorus	60	At point source dischargers, 1.0 mg/L of total phosphorus as a monthly average
Total nitrogen	60	No numeric value

*Compliance shall be based on the geometric mean of all individual samples taken during 5 or more sampling events representatively spread over a 30-day period.

Table 4. Proposed Reference Conditions for Parameters with no current Michigan Water Quality Standards

Parameter	Reference	Value
Specific Conductivity	USEPA Freshwater (USEPA 2012b)	0.15 and 0.5 mS/cm
Total phosphorus	USEPA Nutrient Ecoregion Reference Conditions (Ecoregion 56 and 57)	20.76 – 70 µg/L
Total nitrogen	USEPA Nutrient Ecoregion Reference Conditions (Ecoregion 56 and 57)	0.47-1.55 mg/L
Turbidity	USEPA Nutrient Ecoregion Reference Conditions (Ecoregion VI, VII, and 56)	Level III Ecoregion VI: 9.89 NTU Level III Ecoregion VII: 1.7 NTU Level IV Ecoregion 56: 14.5 NTU Level IV Ecoregion 57: Not Available
Total dissolved solids	Lake Michigan Water Quality Use Standard (http://www.ilga.gov/commission/jcar/admincode/035/035003020E05040R.html)	1000 mg/L

Data Collection Observations and Assumptions

Data from 2004 through 2010 were evaluated in the SCIT's 2011 water quality assessment report. This NPS Assessment report analyzes additional data from 2011, as well as the potential NPSs of each parameter. In general, the SCIT found several key water quality issues in the tribal waters during the 2011 water quality assessment. The known issues are as follows (Fishbeck 2011):

- Pathogens – Bacteria were found exceeding water quality criteria levels in the North Branch of the Chippewa River and downstream of the confluence in the Main Branch of the Chippewa River.
- TDS/Conductivity – High levels of TDS and conductivity were found in the Saganing River.
- PCBs – A PCB fishery advisory is in effect on the downstream sections of the Chippewa River.
- Cadmium – Cadmium levels above the drinking water standard have historically been found in the Chippewa River, which is used as a source of drinking water in the tribal portions of Mt. Pleasant. As noted in the 1968 Chippewa River Water Quality Study, at that time Ferro Manufacturing Corporation was discharging supernatant from its plant to the Chippewa River that may have contained residual cadmium.

The data analyses used for this NPS Assessment Report are more detailed and coupled with an NPS source assessment, therefore, the findings of this report have the potential to differ from the findings of the 2011 water quality assessment report. While PCBs and cadmium are a tribal concern the focus of this report is on pollutants monitored by the SCIT and does not include a PCB or cadmium analysis.

SECTION 4 – LAND USE SUMMARY

This section describes land use on the SCIT Isabella Reservation and Saganing lands by 12-digit HUC subwatershed within the Reservation boundary. This section also characterizes the ecological conditions of the Reservation. A general summary is provided for the entire Reservation and then individual summaries are provided for each of the 12-digit HUC subwatersheds. A detailed land use map, pie chart, and table summary are provided for the area within the Reservation for each 12-digit HUC subwatershed. The land use data, provided by the Michigan 2002 Integrated Forest Monitoring, Assessment, and Prescription (IFMAP) program, was reclassified into broader categories to aid in analysis. This section is organized as follows:

- General Setting
- Land Use/Land Base
- Ecoregions
- Climate
- Topography
- Geology
- Soils
- Hydrology
- Socioeconomic Conditions
- Individual 12-digit HUC Subwatershed Summaries

General Setting

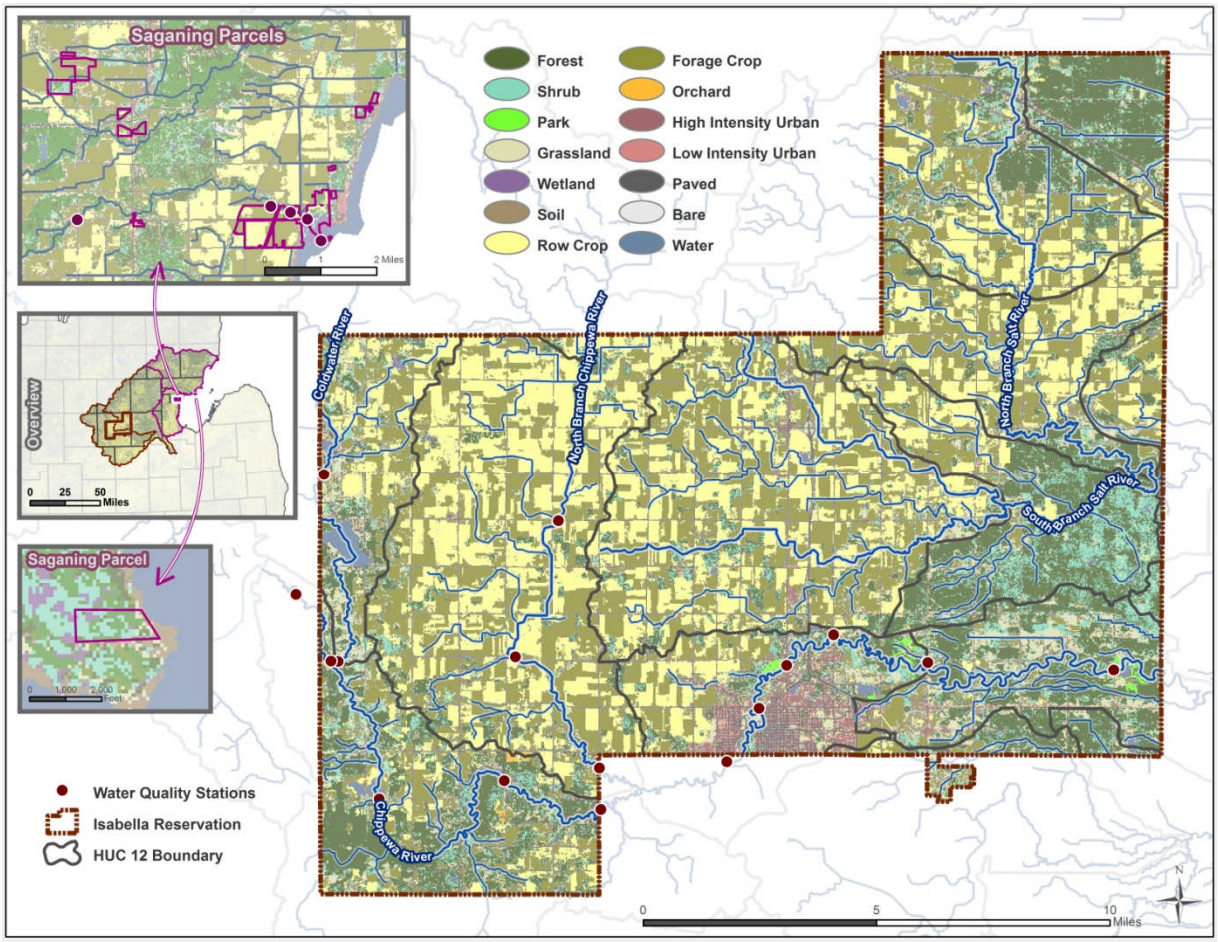
The SCIT Isabella Reservation shown in Figure 1 and Figure 3 lies in central Michigan and is comprised of 139,000 acres of Reservation land within approximately 450 land parcels in Isabella County. There are an additional 1,000 acres of land across 59 parcels in a small portion of Arenac County. Table 5 details land ownership with the Isabella Reservation Boundaries.

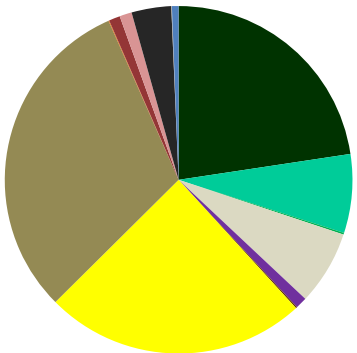
Table 5. Isabella Reservation Land Ownership

Isabella Reservation Parcels	
Holding	**Acres**
Fee	54
Trust	2,230
Other	1,329
All Other Land in Isabella Reservation Boundaries	135,928
Saganing Parcels	
Holding	**Acres**
Fee	668
Other	378

Land Use/Land Base

Land use on the Isabella Reservation and Saganing parcels is primarily agricultural, specifically forage crops for grazing. Forage crops combined with row crops constitute 55.2 percent of all land use. Total forested land accounts for another 22.6 percent, most of it categorized as deciduous, while shrub and grassland combined equal another 14.2 percent of land cover. Impervious surfaces, concentrated around the city of Mount Pleasant, cover 5.9 percent of the landscape. Figure 3 shows the land cover types on the Isabella Reservation and Saganing parcels, along with the land cover breakdown by acres and percent.





Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	31,574	22.62	Forage Crop	43,037	30.83
Shrub	10,211	7.32	Orchard	75	< 1
Park	254	< 1	High Intensity Urban	1,480	1.06
Grassland	9,620	6.89	Low Intensity Urban	1,584	1.14
Wetland	1,510	1.08	Paved	5,145	3.69
Soil	167	< 1	Bare	95	< 1
Row Crop	33,980	24.34	Water	850	< 1
			Total	**139,584**	

Figure 3. Land Use on the Isabella Reservation in Isabella County (Michigan 2002 IFMAP)

Ecoregions, Climate, Topography, Geology, Soils, and Hydrology

Ecoregions

Three distinct ecoregions are represented within the Isabella Reservation: Cadillac, Lansing, and Saginaw Bay Lake Plain, as seen in Figure 4. The Saganing parcels owned by SCIT in Arenac County belong to the Standish Ecoregion, which is similar to the Saginaw Bay Lake Plain, though a shorter growing season leads to differences in vegetation characteristics. General descriptions and land use summaries for each ecoregion, adapted from Albert 1995, are provided below in Table 6.

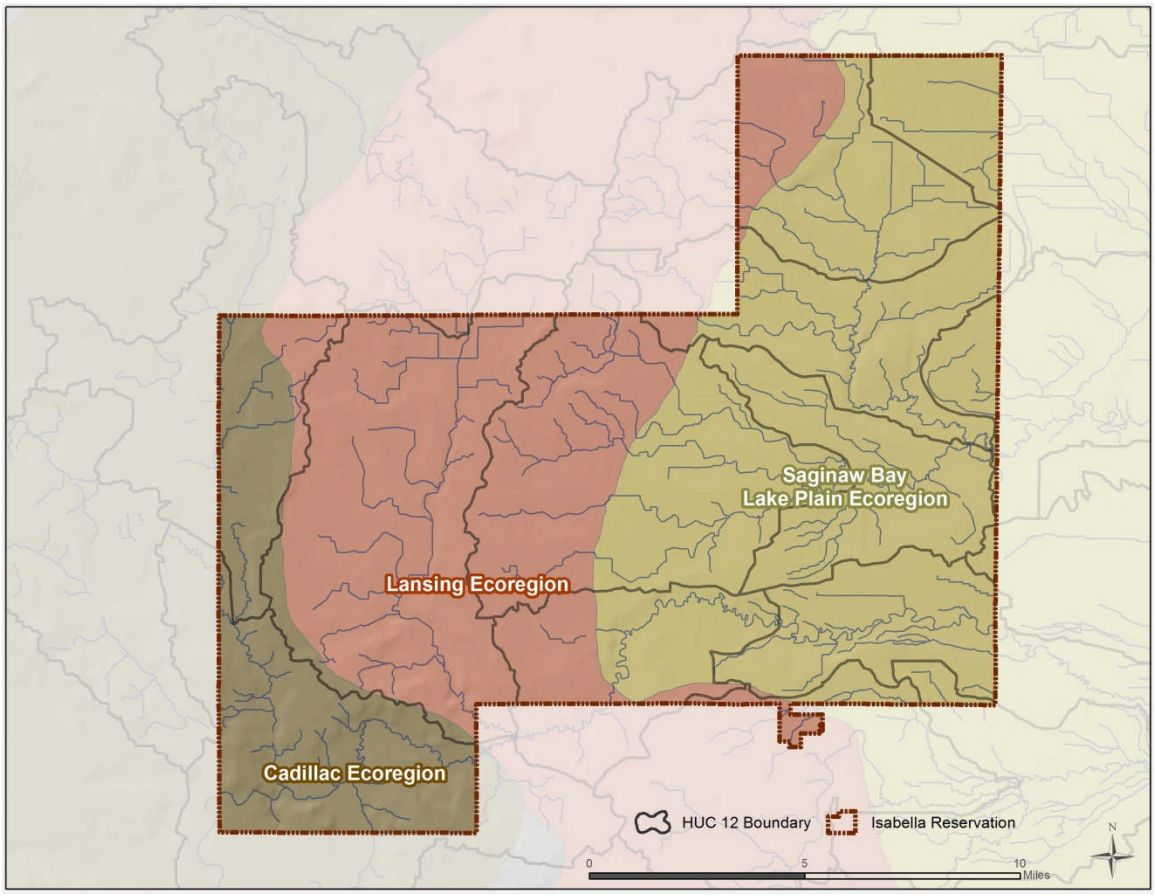


Figure 4. Ecoregions of the SCIT Isabella Reservation

Table 6. Summary of Ecoregions in the Isabella Reservation and Saganing Parcels.

Name	Summary	Description
Cadillac Ecoregion	steep, sandy end moraine; northern hardwood forest, white oak-red oak forest	The Cadillac Ecoregion consists of hilly topography and well-drained soils which result in few lakes or wetlands within the ecoregion. Forests on the outwash plain are dominated by oaks, with few pines remaining from presettlement conditions due to timber harvesting. The moraines are primarily covered by beech-maple forests.

Name	Summary	Description
Lansing Ecoregion	medium-textured ground moraine; beech-sugar maple forest and hardwood swamp	The Lansing Ecoregion consists of gently sloping till plain with rich, loamy soils has largely been converted from beech-maple forest to row crops. The swamps and wet meadows that previously dominated depressions and riparian areas have been drained with ditches and are primarily used for forage crops.
Saginaw Bay Lake Plain Ecoregion	glacial lake plain and reworked till plain; mesic to wet-mesic forests, swamp forest, wet and wet-mesic prairie, and emergent marshes	The Saginaw Bay Lake Plain Ecoregion consists of a relatively flat clay plain that supported hemlock forests, though many hardwood species were also present, while sandy portions of the plain support beech-maple forests. Much of this land was intensively harvested for timber. Afterwards, the clay plains were ditched and tiled for agriculture, along with all but the wettest sections of the sand plain, which remain as swamps or marshes.
Standish Ecoregion	lake plain; jack pine barrens, northern hardwood forests, upland conifer forests, conifer swamps, shallow peatlands, coastal marshes	The Standish Ecoregion consists of poorly drained clay basins and flat, excessively well drained sand plains. The basins historically supported jack pine barrens, while beech-maple forests existed on the plains. Bogs and shrub swamps were present near the lake. Due to the extreme drainage characteristics of this region, agricultural use is relatively less intensive than in neighboring areas, and much of the land is managed for either timber harvesting or recreation.

Level II, III, and IV Ecoregions for the National Nutrient Strategy

The state of Michigan does not currently have numeric nutrient criteria for surface waters. This document uses the USEPA recommended criteria based on nationally available data for each aggregate Level III and Level IV ecoregions. Figure 5 displays the Level II Ecoregion and level IV ecoregions that fall within the Isabella Reservation boundaries. The majority of the Reservation is in level III aggregate ecoregion VII and level IV ecoregion 56. Characteristics of each of the level III and level IV ecoregions in the Reservation are discussed briefly below (USEPA 2001a-c).

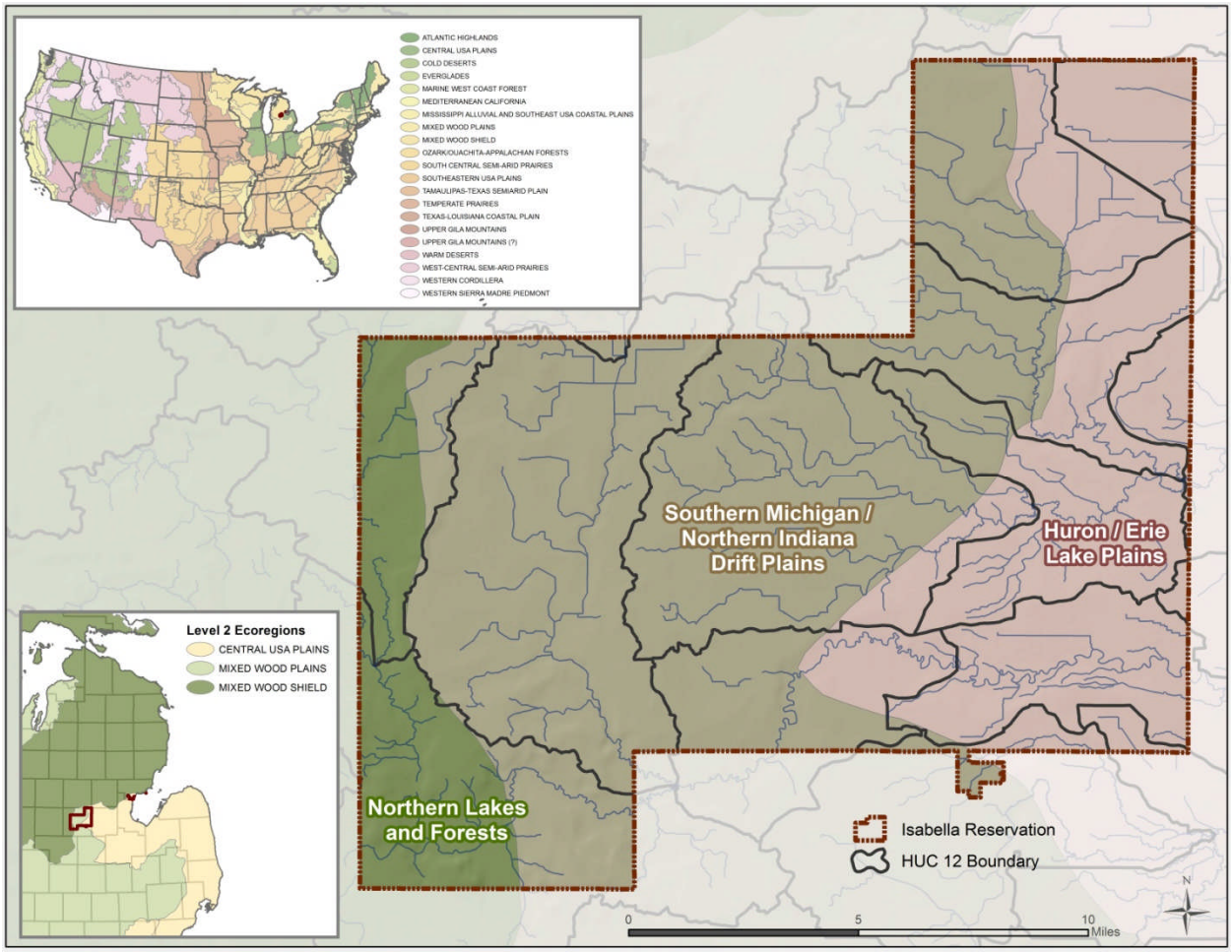


Figure 5. Level II and IV Ecoregions of the SCIT Isabella Reservation

Aggregate Ecoregion VI - Corn Belt and Northern Great Plains

The eastern portion of the Isabella Reservation as well as the Saganing parcels lie in ecoregion VI. The ecoregion has moist, fertile soils which are often more nutrient-rich than those of Regions IV, VII, VIII, and IX. Nutrient-rich agricultural runoff and waste water treatment effluent cause elevated concentrations of nitrate and phosphorus.

57. Huron/Erie Lake Plain

Most of the Huron/Erie Lake Plain area contains highly productive farms producing corn, soybeans, livestock, and vegetables. The area has been cleared and the use of drainage tiles is abundant. Channelization, ditching, and agricultural activities have degraded stream habitat and quality.

Aggregate Ecoregion VII - Mostly Glaciated Dairy Region

The majority of the Isabella Reservation lies in the transitional Mostly Glaciated Dairy Region (VII). This ecoregion has a mix of nutrient-rich and nutrient-poor soils as opposed to the mostly fertile soils of Region VI in the eastern portions of the Isabella Reservation, and the relatively thin, nutrient-poor soils of Region VIII and the western portion of the Isabella Reservation.

Median total phosphorus concentration in ecoregion VII lakes are less than half of Region VI's and about twice that of Region VIII's median concentrations. Nutrient concentrations from NPSs are usually above the levels found in ecoregion VIII but below those measured in the ecoregion VI.

56. Southern Michigan/Northern Indiana Drift Plains

The Southern Michigan/Northern Indiana Drift Plains soils are not as nutrient poor as the region to the north. The region has many potential nutrient NPSs including: feed grain, soybean, and livestock farming as well as woodlots, quarries, recreational development, and urban-industrial areas.

Aggregate Ecoregion VIII—Nutrient Poor, Largely Glaciated Upper Midwest and Northeast

The western portion of the Isabella Reservation lies in the Nutrient Poor Largely Glaciated Upper Midwest and Northeast ecoregion (VIII). This ecoregion has less cropland and fewer people than neighboring nutrient ecoregions. Surface waters in this ecoregion have less frequent related nutrient problems, though water quality issues centered on the effects of acid precipitation, logging, lake recreation, and near-lake septic systems are still present.

50. Northern Lakes and Forests

The Northern Lakes and Forests ecoregion has nutrient-poor glacial soils that are thicker than those to the north and generally less arable than soils in ecoregions to the south. Lakes in this ecoregion show less production and are clearer than lakes in ecoregions to the south.

Topography

The Isabella Reservation grades from west to east, with increasing slopes on ridges near the western edge, as seen in Figure 6. The highest elevation, at 304 meters (997 feet), occurs in the southwestern corner while the lowest elevation, at 211 meters (692 feet), occurs near the southeastern corner. The Saganing parcels owned by SCIT in Arenac County grade gently from 193 meters (633 feet) to the shore of Lake Huron at 177 meters (580 feet) over a distance of approximately 5 miles.

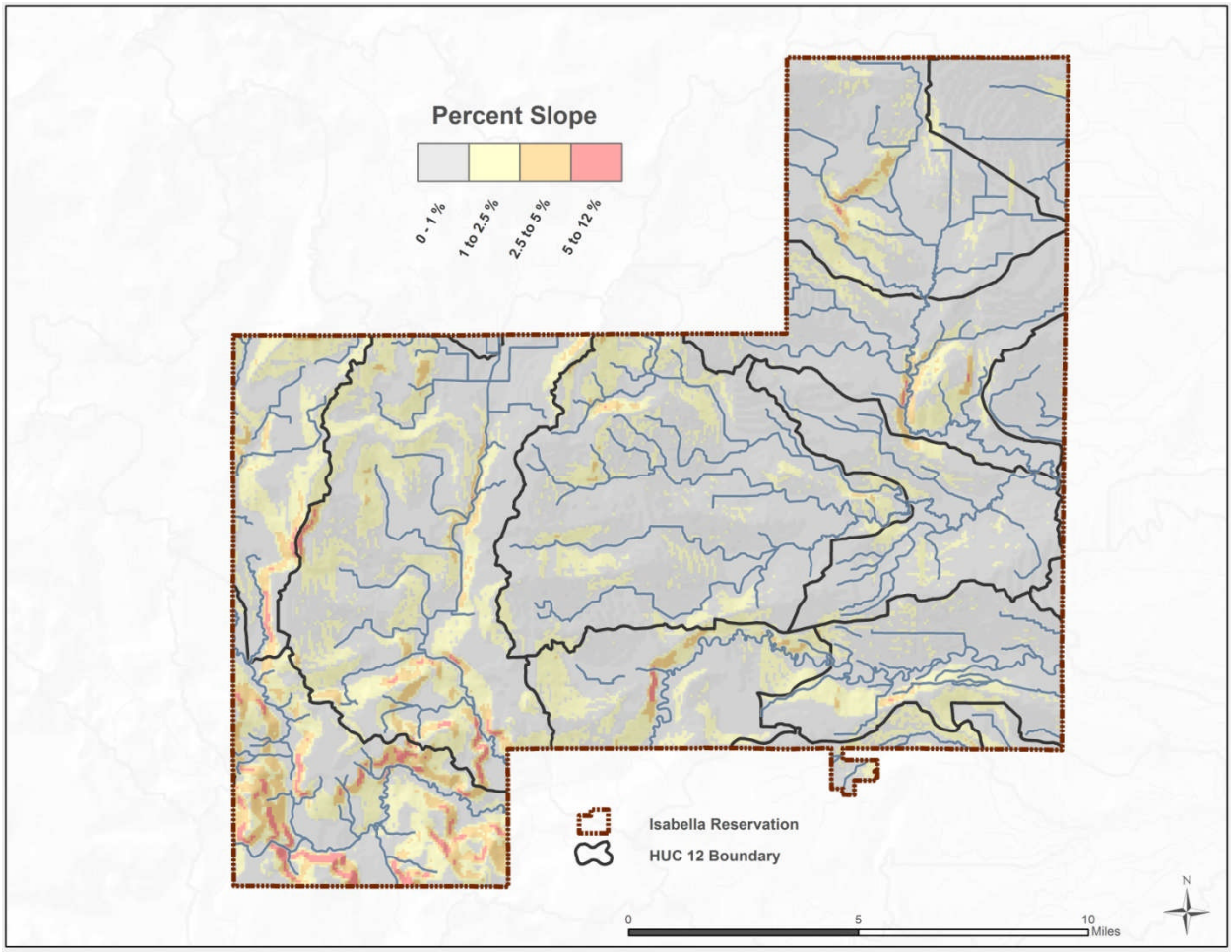


Figure 6. Topography on the SCIT Isabella Reservation

Climate

Table 7 contains historic temperature and precipitation data collected at Mount Pleasant from 1949 to 2010 at the National Climate Data Center (NCDC) station 205662, as seen in Figure 7. The median growing season (consecutive days with low temperatures greater than or equal to 32 degrees) is 140 days. Total annual precipitation is approximately 28.6 inches including approximately 25.5 inches of snowfall. Monthly temperature, precipitation, and snowfall are shown in Figure 8.

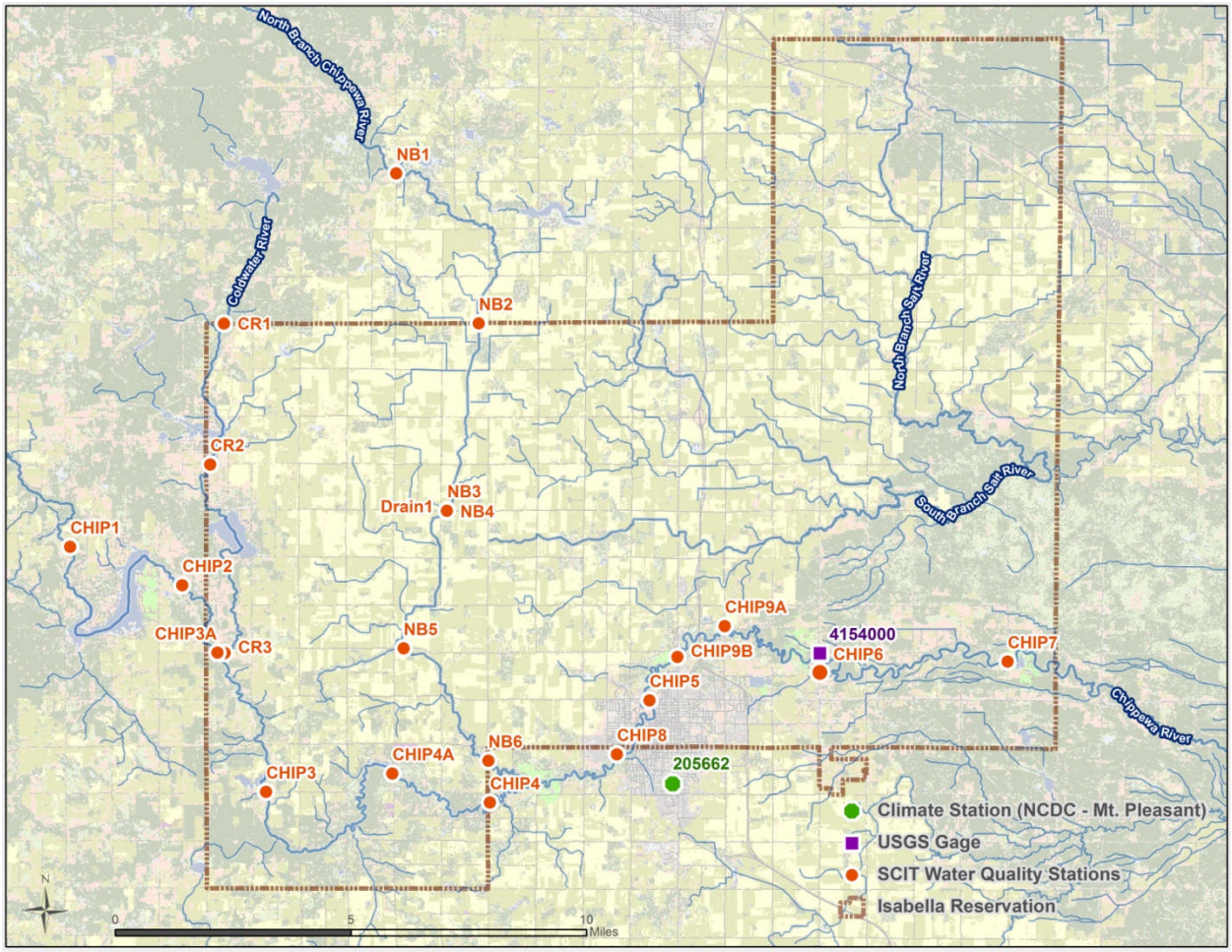


Figure 7. Climate and USGS flow gauge location

Examination of precipitation patterns is a key part of watershed characterization. In particular, rainfall intensity and timing affect watershed response to precipitation. Figure 9 presents one way to show rainfall intensity. Using 1971 to 2000 data from the Mount Pleasant station, 39.7 percent of the precipitation events were very low intensity (i.e., less that 0.1 inches) and 5.8 percent of the measurable precipitation events were greater than one inch.

Table 7. Climate data summary for Mount Pleasant.

	Month											
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
High Temp	28.8	31.5	41.6	56.5	69.0	78.3	82.7	80.8	72.4	60.4	46.0	33.4
Low Temp	13.9	14.6	22.8	34.2	44.7	54.5	58.9	57.3	49.4	39.4	30.0	19.9
Precipitation	1.5	1.3	1.8	2.9	2.8	3.1	2.8	3.1	2.8	2.5	2.3	1.7
Snowfall	7.3	5.4	4.2	1.1	0.0	0.0	0.0	0.0	0.0	0.1	1.9	5.5

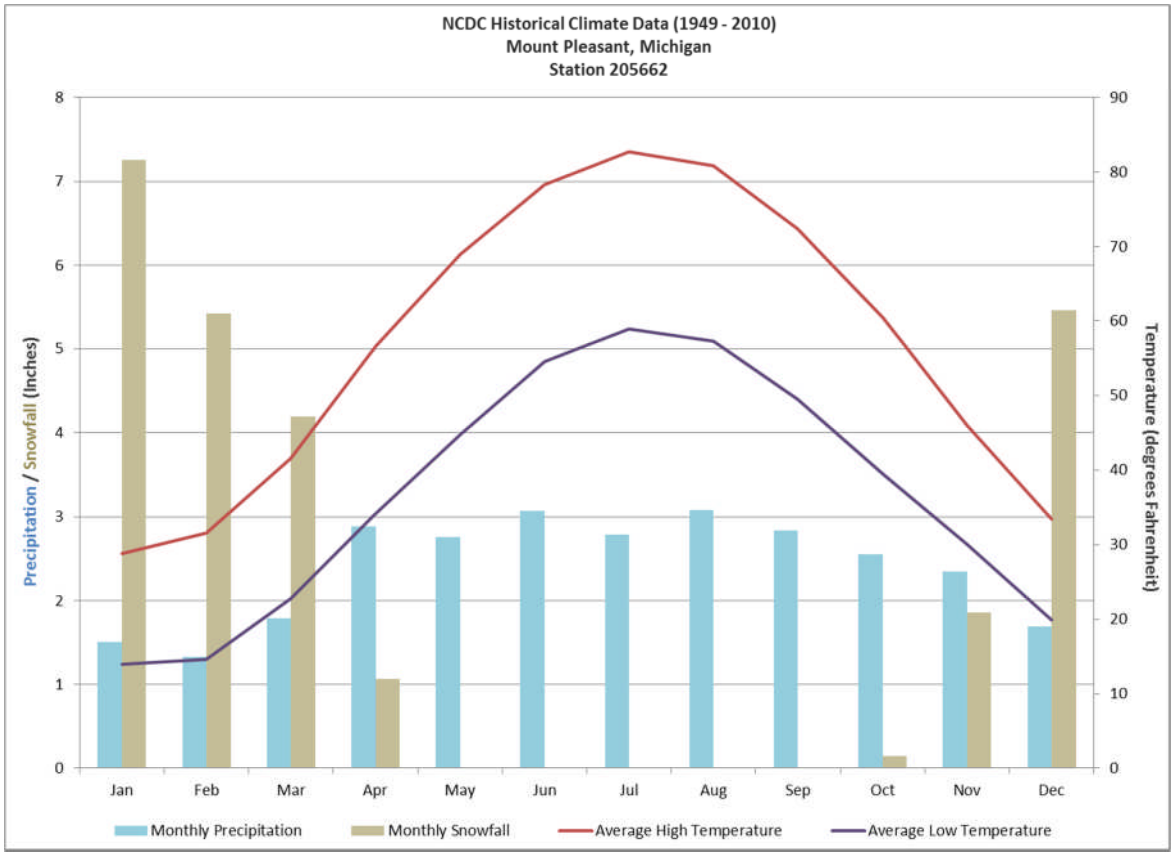


Figure 8. Temperature and precipitation summary – Mount Pleasant.

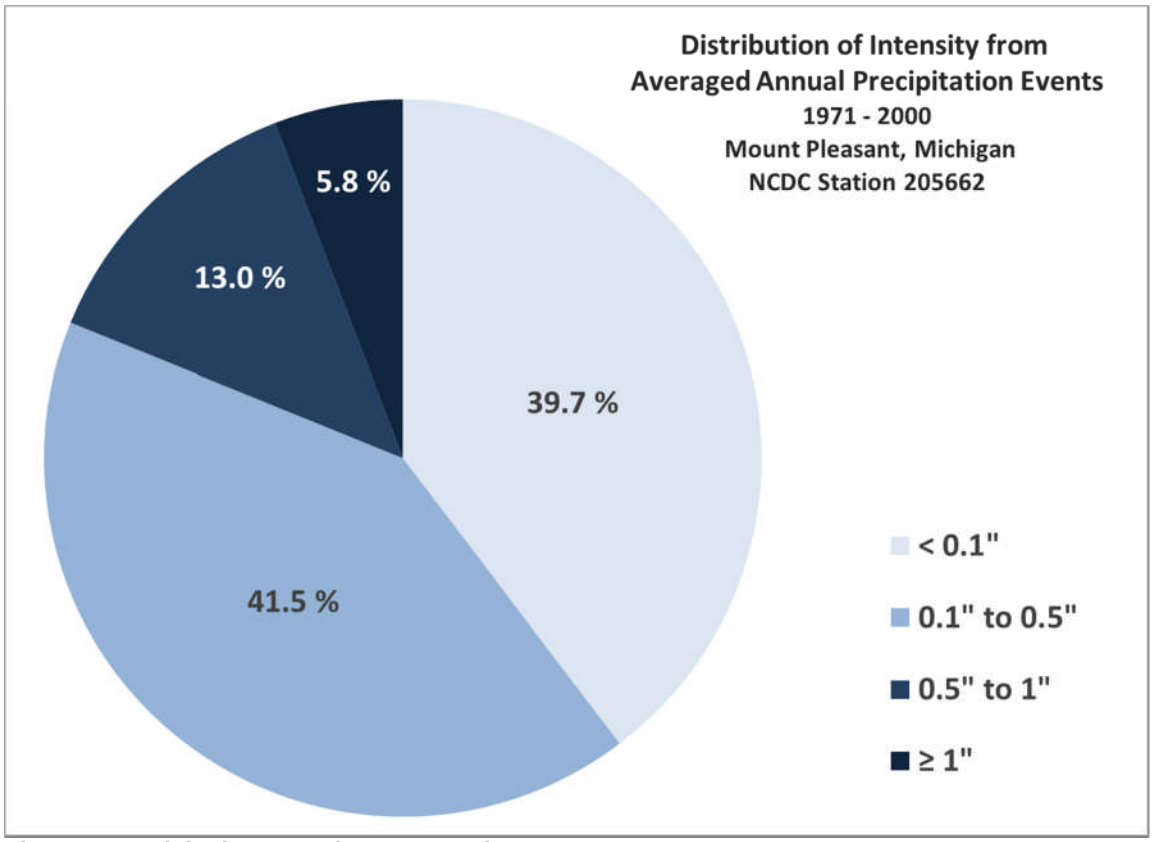


Figure 9. Precipitation Intensity – Mount Pleasant.

Geology

Jurassic red beds and the Pennsylvanian Saginaw Formation constitute the uppermost bedrock layer within the Isabella Reservation, as seen in Figure 10, while the Saganing parcels under SCIT ownership in Arenac County belong to the Michigan Formation. The red beds consist primarily of sandstone, shale, and clay, with minor beds of limestone and gypsum. The Saginaw Formation is predominantly sandstone, though shale, coal, and limestone are also present. The Michigan Formation consists primarily of shale, though sandstone, limestone, dolostone, gypsum, and anhydrite are also present. Exposed areas of bedrock are rare (Albert 1995). Figure 11 illustrates the quaternary geology, which is typical of the Great Lakes region, with lacustrine deposits near the lakes, and an alternating series of end moraines and till plains further inland.

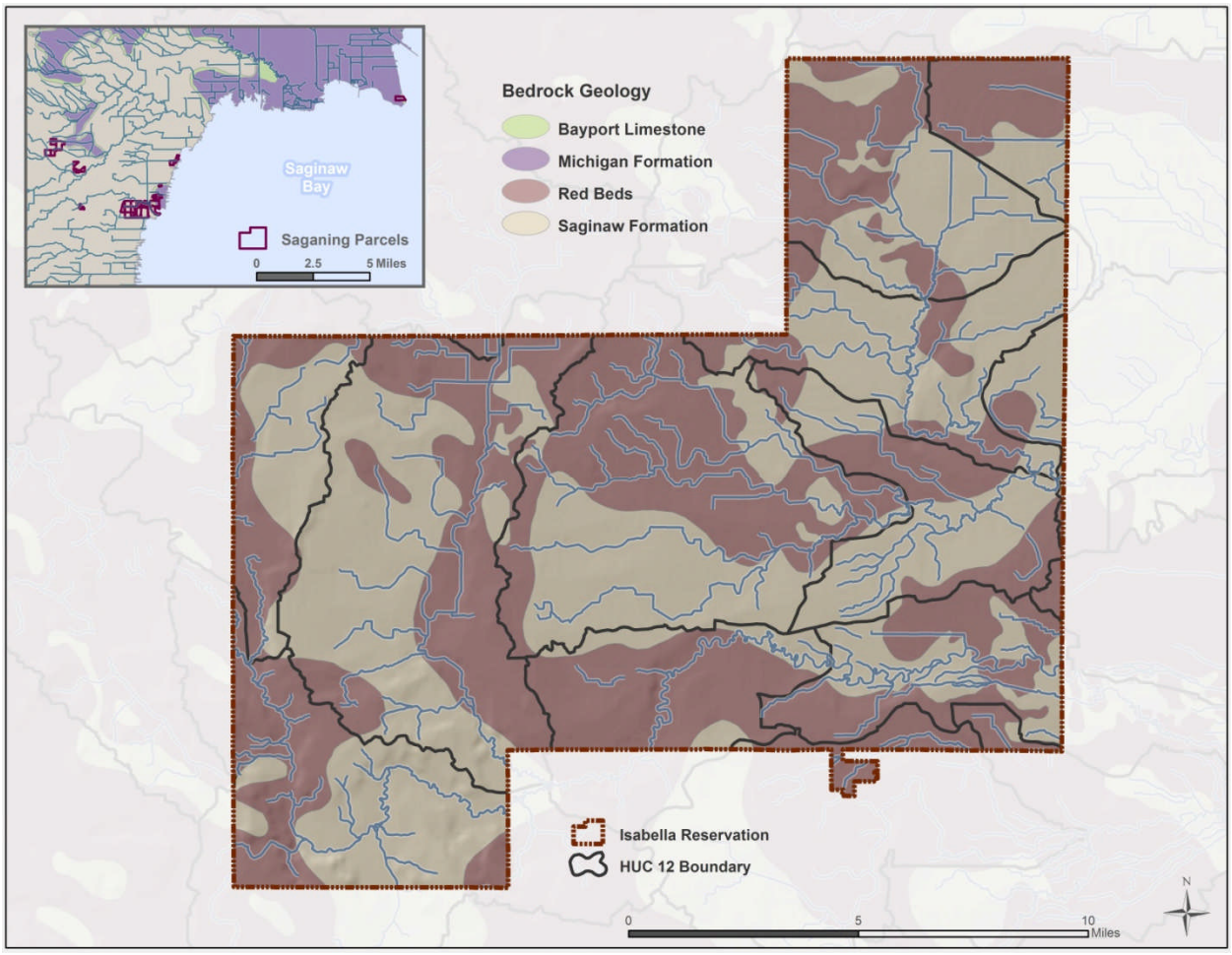


Figure 10. Bedrock geology on the SCIT Isabella Reservation

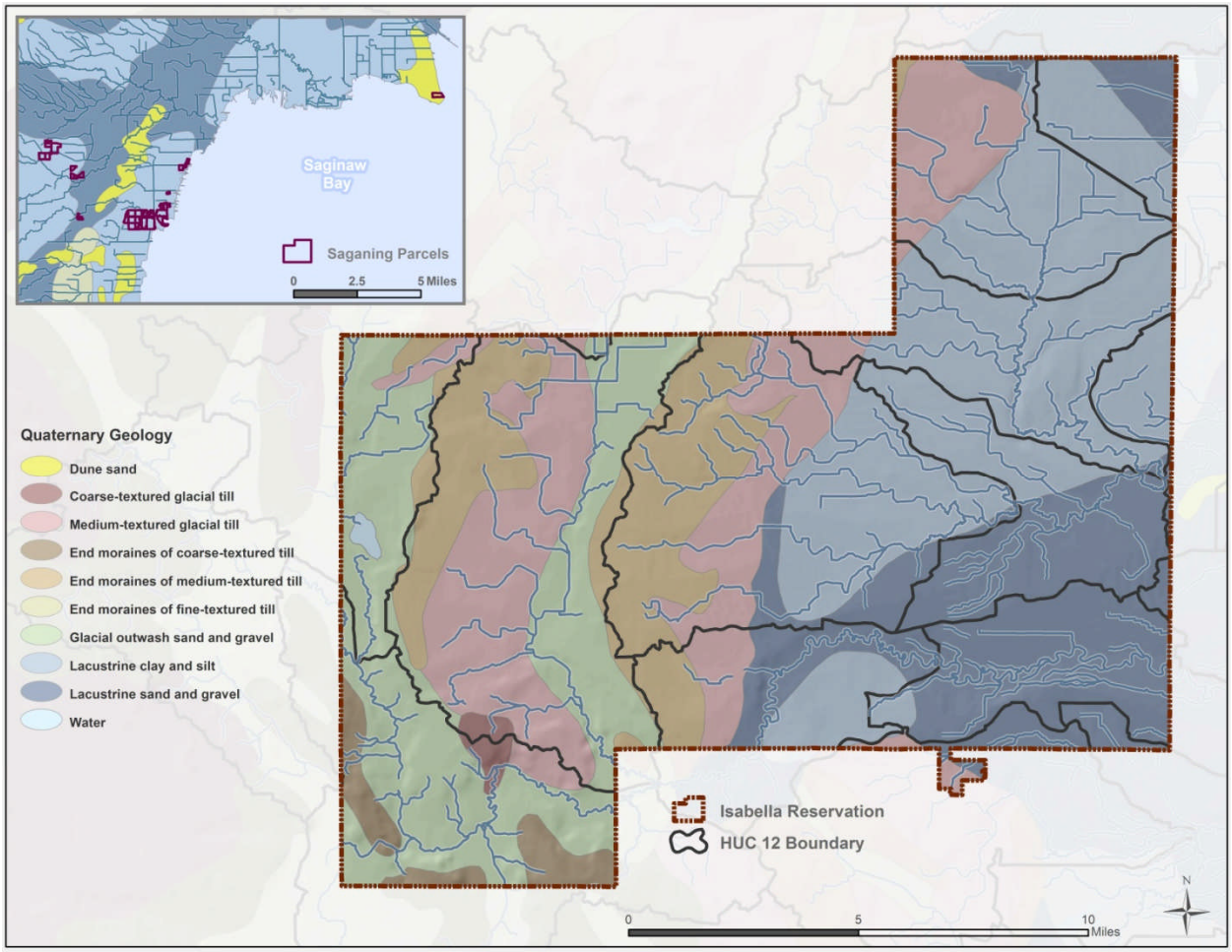


Figure 11. Quaternary geology on the SCIT Reservation.

Soils

The majority of soils in the Isabella Reservation belong to Hydrologic Soil Group C, followed by B, B/D, A/D, A, and D (NRCS 2002). Figure 12 shows that most of the central area of the Isabella Reservation is composed of C or D group soils, while the higher A and B group soils lie near the perimeter. Figure 13 illustrates the distribution of soils within and surrounding the Saganing parcels owned by SCIT in Arenac County, which belong primarily to Groups B/D and B. Table 8 and Table 9 summarize this information, obtained through analysis with SSURGO data, and include an explanation of Hydrologic Soil Groups (SCS 1986).

Soil types within SCIT lands are predominately loam or sand. Appendix A includes a description of all soil types constituting greater than 1 percent of the land area.

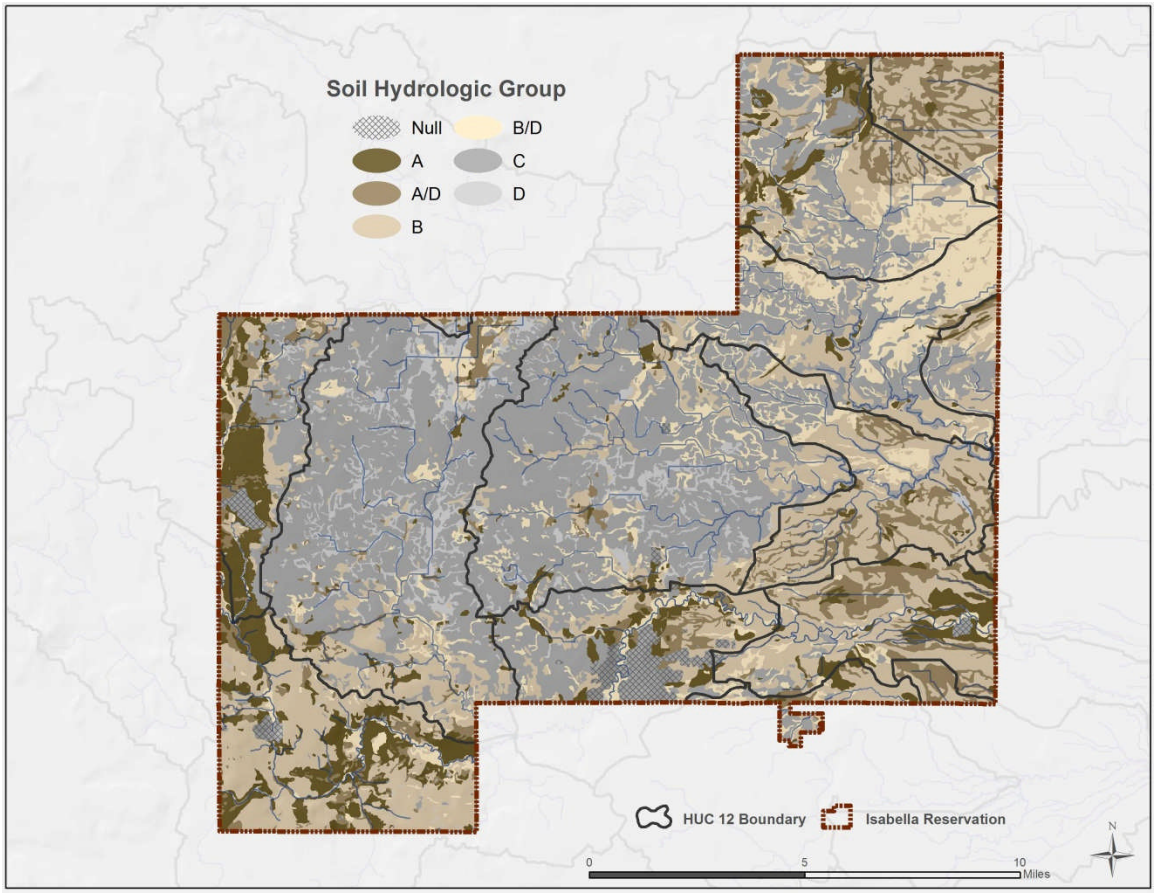


Figure 12. Hydrologic Soil Groups on the SCIT Isabella Reservation

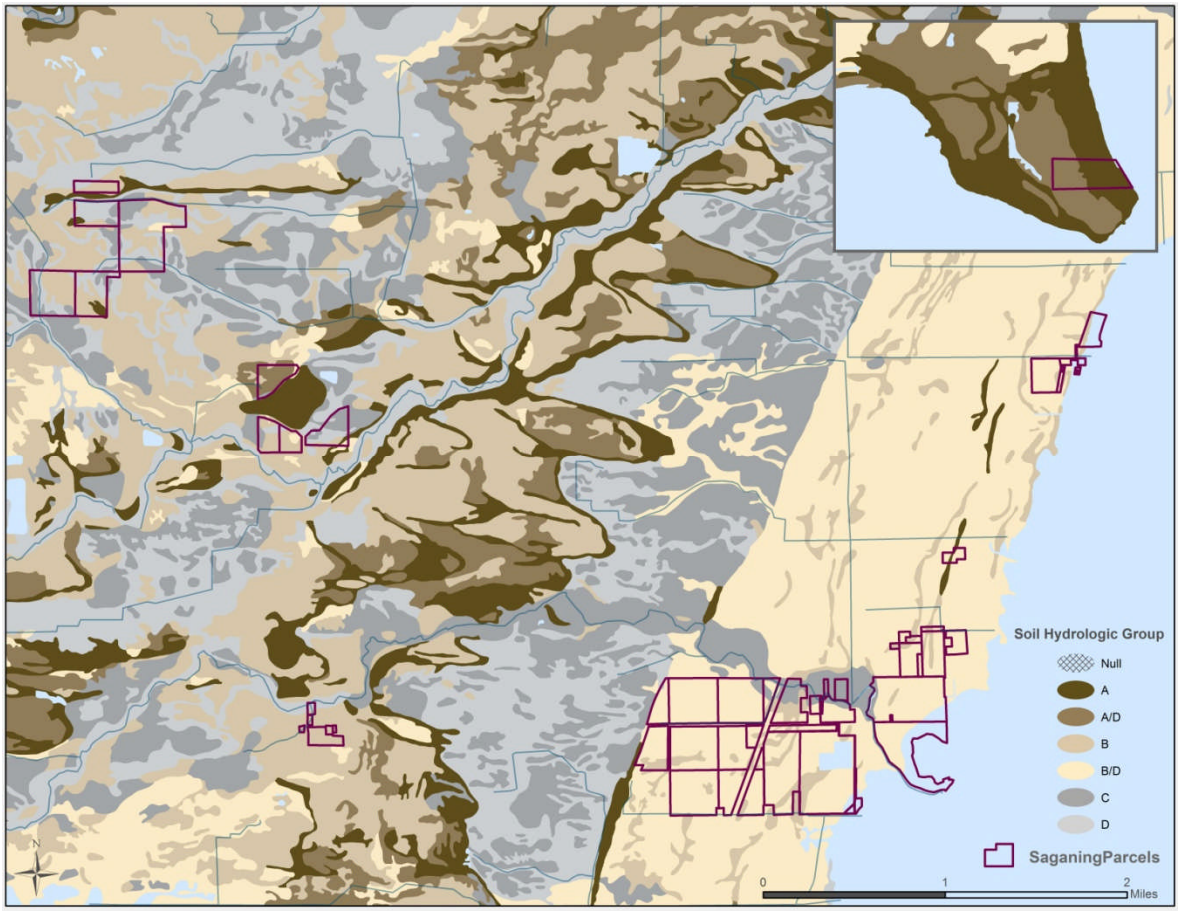


Figure 13. Hydrologic Soil Groups within SCIT owned parcels in Arenac County

Table 8. Percent composition of soil hydrologic groups within the main Isabella Reservation boundaries

Group	Acres	Percent	Description
Null	2,970	2.13	Soils are not classified in SSURGO database, and are typically underneath paved surfaces or water.
A	11,982	8.58	Soils have low runoff potential and high infiltrations rates, consisting chiefly of deep, well to excessively well drained sand or gravel, with a high rate of water transmission.
A/D	12,164	8.72	Soils have high water tables that prevent drainage, placing them in Group D, but can be placed in Group A if effectively drained.
B	40,291	28.87	Soils have moderate infiltration rates, consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures.
B/D	16,135	11.56	Soils have high water tables that prevent drainage, placing them in Group D, but can be placed in Group B if effectively drained.
C	49,545	35.5	Soils have low infiltration rates, consisting chiefly of soils with a layer that impedes downward movement of water, with moderately fine to fine textures.
D	6,477	4.64	Soils have high runoff potential and very low infiltration rates, consisting of clay soils with high swelling potential, a permanently high water table, a claypan or clay layer at or near the surface, and/or nearly impervious material just below the surface.

Table 9 Percent composition of soil hydrologic groups within SCIT owned parcels in Arenac County

Group	Acres	Percent	Description
Null	50.17	5.32	Soils are not classified in SSURGO database, and are typically underneath paved surfaces or water.
A	28.63	3.03	Soils have low runoff potential and high infiltrations rates, consisting chiefly of deep, well to excessively well drained sand or gravel, with a high rate of water transmission.
A/D	31.10	3.30	Soils have high water tables that prevent drainage, placing them in Group D, but can be placed in Group A if effectively drained.
B	173.06	18.34	Soils have moderate infiltration rates, consisting chiefly of moderately deep to deep, moderately well to well drained soils, with moderately fine to moderately coarse textures.
B/D	514.57	54.53	Soils have high water tables that prevent drainage, placing them in Group D, but can be placed in Group B if effectively drained.
C	73.16	7.75	Soils have low infiltration rates, consisting chiefly of soils with a layer that impedes downward movement of water, with moderately fine to fine textures.
D	72.88	7.72	Soils have high runoff potential and very low infiltration rates, consisting of clay soils with high swelling potential, a permanently high water table, a claypan or clay layer at or near the surface, and/or nearly impervious material just below the surface.

Hydrology

The Chippewa River has one major dam that creates Lake Isabella. Lake Isabella lies upstream of the Isabella Reservation. Drawdowns at the Lake Isabella Dam could have an effect on downstream water levels on the Reservation. In 2002 the Mill Pond Dam on the Chippewa River near Mt. Pleasant was removed and a series of five pinch point rock weirs and plunge pools was established. Removal of this dam opened 71 miles of habitat to steelhead and other local fish. The removal was funded by the Michigan Natural Resources Trust Fund and City funds from Tribal gaming revenues.

The SCIT receive drinking water from the city of Mt. Pleasant. The water treatment plant draws groundwater from seven groundwater wells located south and southwest of Mt. Pleasant. The wells range from 120' to 465' deep. The plants' groundwater collector is located southwest of Mt. Pleasant adjacent to the Chippewa River. Water from the wells and the collector is pumped to the Water Treatment Plant where it is softened, filtered, disinfected and sent to the distribution system for domestic use (City of Mt. Pleasant 2011). The City of Mt. Pleasant recognizes the importance of protecting groundwater for drinking water consumption and has a wellhead protection program in place. Further details about the hydrology of surface waters within the Reservation are included in Section 5.

Socioeconomic Conditions

The SCIT has approximately 3,300 members, of which approximately 1,200 live on tribally owned lands within the Reservation. Census data estimates the total population within Reservation boundaries as 26,300 (see Figure 14). 724 acres of allotted land remains in trust status (twenty-two allotments) within the Reservation boundaries. The largest community near the Tribe is the City of Mt. Pleasant, which is located three miles west of the tribal center with a population of 25,946. Figure 14 shows population density per census block on the Isabella Reservation. Population density is sparse (0-500 people per square mile) through most of the Reservation with the highest density reflected in Mt. Pleasant.

The SCIT's primary form of economic success has been through the gaming industry. The SCIT opened the Soaring Eagle Casino and Resort in 1999, and as of 2000 it was the largest employer in Isabella County. Before the SCIT established its gaming and entertainment industry, tribal housing, education, and health care programs efforts were not able to fully meet local needs. These programs have seen

significant improvements in the past 20 years (SCIT 2012a). Crop farming and livestock continue to be strong in the community as well.

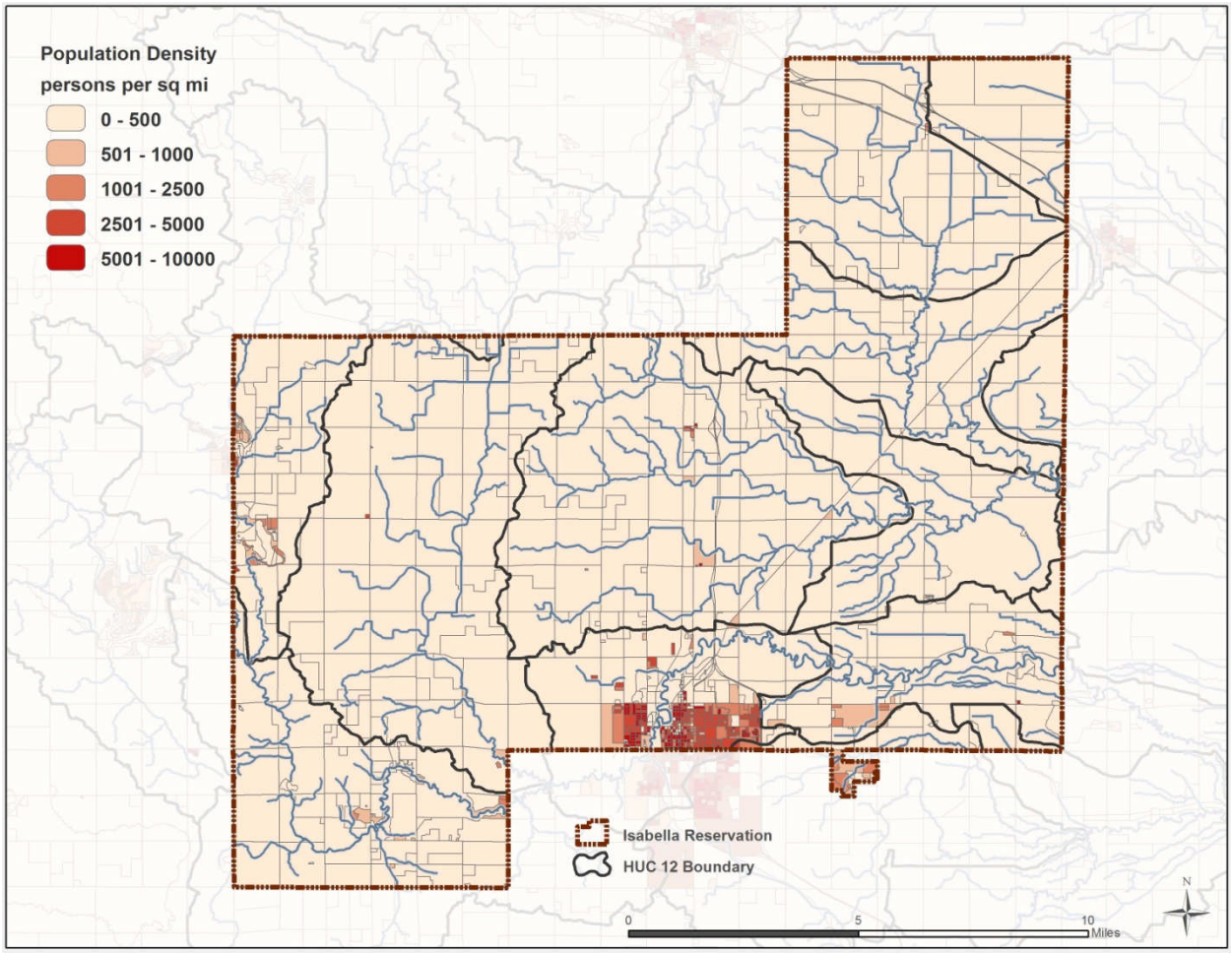


Figure 14. Population density by Census Block Group on the SCIT Isabella Reservation

Individual 12-digit HUC Subwatershed Summaries

This section provides a detailed land use summary for the individual 12-digit HUC subwatersheds in the Reservation. A summary of the land use and major characteristics is provided with a map and table of land use for each 12-digit HUC subwatershed. The individual tables and pie charts demonstrate the predominant land uses in each subwatershed listed below:

8–digit HUC 04080202 Chippewa River

- 040802020202 Lake Isabella-Chippewa River
- 040802020204 Coldwater River
- 040802020205 Schofield Creek-North Branch Chippewa River
- 040802020206 Hogg Creek-North Branch Chippewa River
- 040802020207 Johnson Creek-Chippewa River
- 040802020501 Mission Creek-Chippewa River
- 040802020504 Onion Creek
- 040802020505 Salt Creek
- 040802020508 Dice Drain-Chippewa River

8–digit HUC 04080102 Saganing River

- 040801020105 Saganing River
- 040801020102 South Branch Pine River
- 040801020104 White Feather Creek-Frontal Lake Huron

8–digit HUC 04080101 Au Gres Rifle River

- 040801010502 Big Creek-Frontal Lake Huron

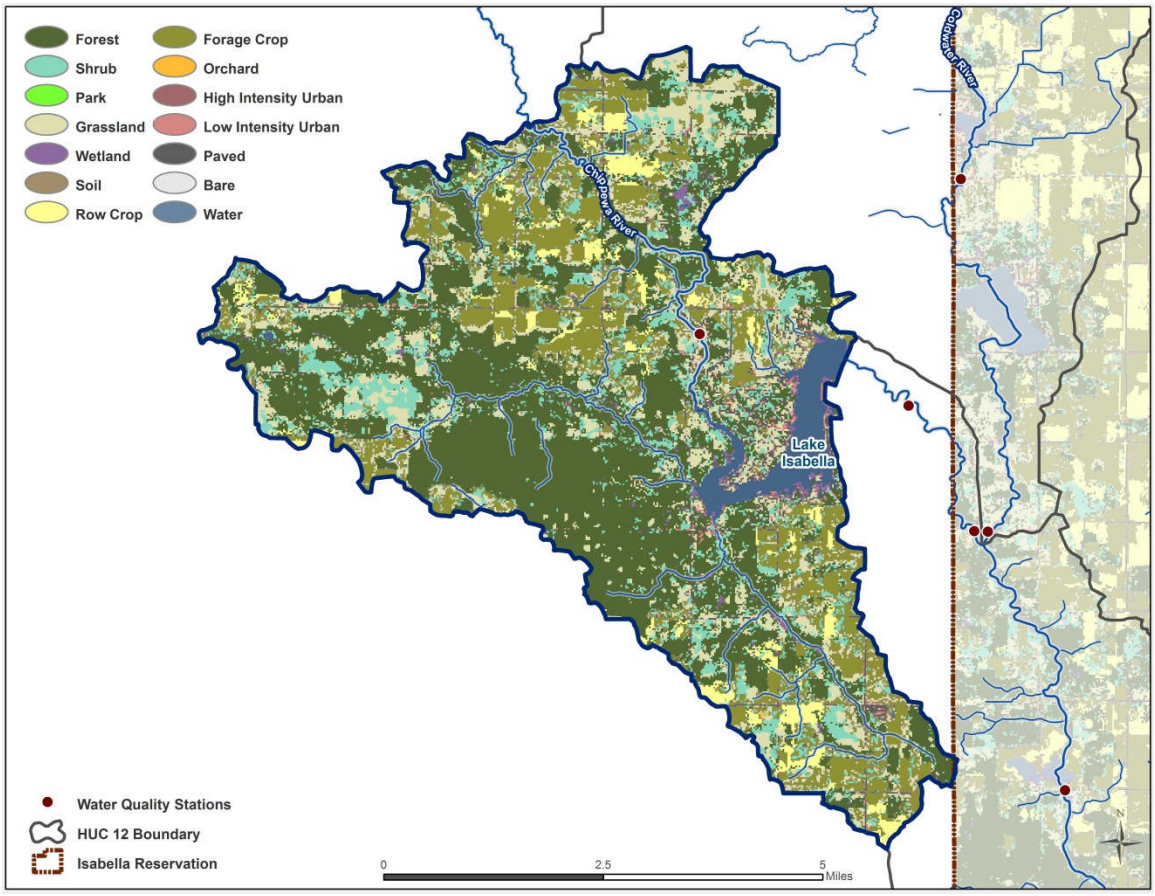
8–digit HUC 04080201 Salt River

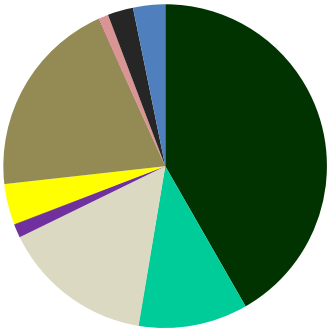
- 040802010501 Spring Creek-South Branch Salt River
- 040802010502 McDonald Drain-North Branch Salt River
- 040802010503 South Branch Salt River
- 040802010504 North Branch Salt River
- 040802010505 Bluff Creek
- 040802010506 Howard Creek-Salt River

Lake Isabella – Chippewa River

The Lake Isabella – Chippewa River 12-digit HUC subwatershed lies outside of the western portion Isabella Reservation, as seen in Figure 15, and drains 21,397 acres. The SCIT samples one site along Chippewa River, just upstream of Lake Isabella.

Forests are the primary land use in the Lake Isabella – Chippewa River subwatershed, constituting 41.7 percent of the area. Combined agricultural uses represent 24.0 percent of the landscape, while shrub and grassland comprise another 26.0 percent. Impervious surfaces cover 3.6 percent of the Lake Isabella – Chippewa River subwatershed.





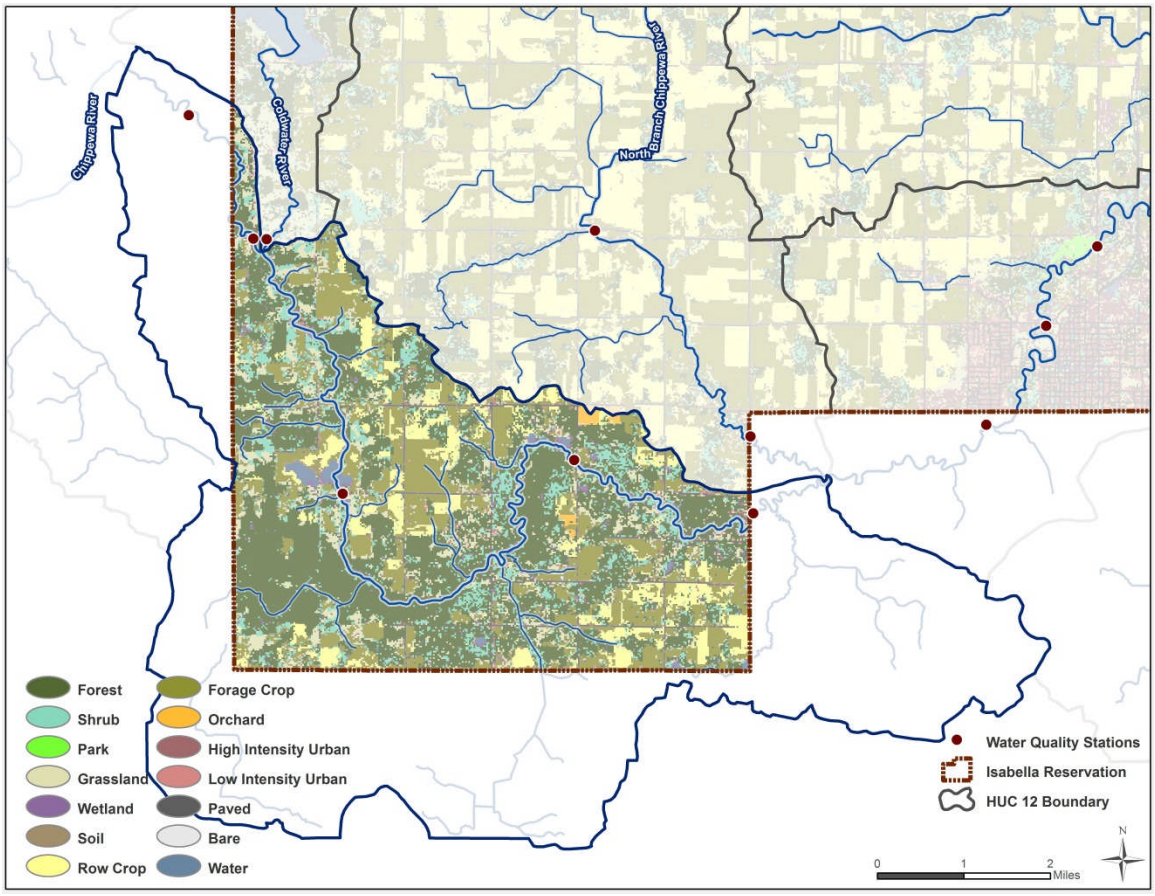
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	8,923	41.70	Forage Crop	4,270	19.96
Shrub	2,335	10.91	Orchard	3	< 1
Park	3	< 1	High Intensity Urban	15	< 1
Grassland	3,237	15.13	Low Intensity Urban	214	1.00
Wetland	291	1.36	Paved	542	2.53
Soil	10	< 1	Bare		0
Row Crop	870	4.06	Water	685	3.20
			Total	**21,397**	

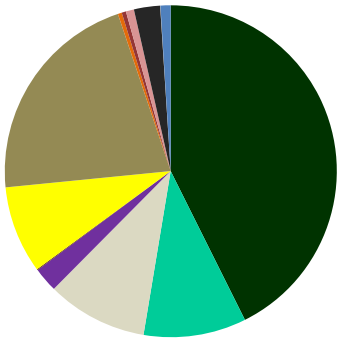
Figure 15. Land Use in the Lake Isabella – Chippewa River 12-digit HUC subwatershed

Johnson Creek –Chippewa River

The Johnson Creek - Chippewa River 12-digit HUC subwatershed lies in the southwestern corner of the Isabella Reservation, as seen in Figure 13, and drains 13,829 acres within the Reservation. The SCIT samples five sites along the Chippewa River. This subwatershed lies in the Cadillac Ecoregion and contains the majority of the Reservations A, A/D, and B soils.

Forests are the primary land use in the Johnson Creek - Chippewa River subwatershed within the Isabella Reservation boundary, as seen in Figure 16. Agriculture constitutes 29.9 percent of all land cover, while shrub and grassland comprise 19.8 percent. Impervious surfaces cover 3.8 percent of the landscape.





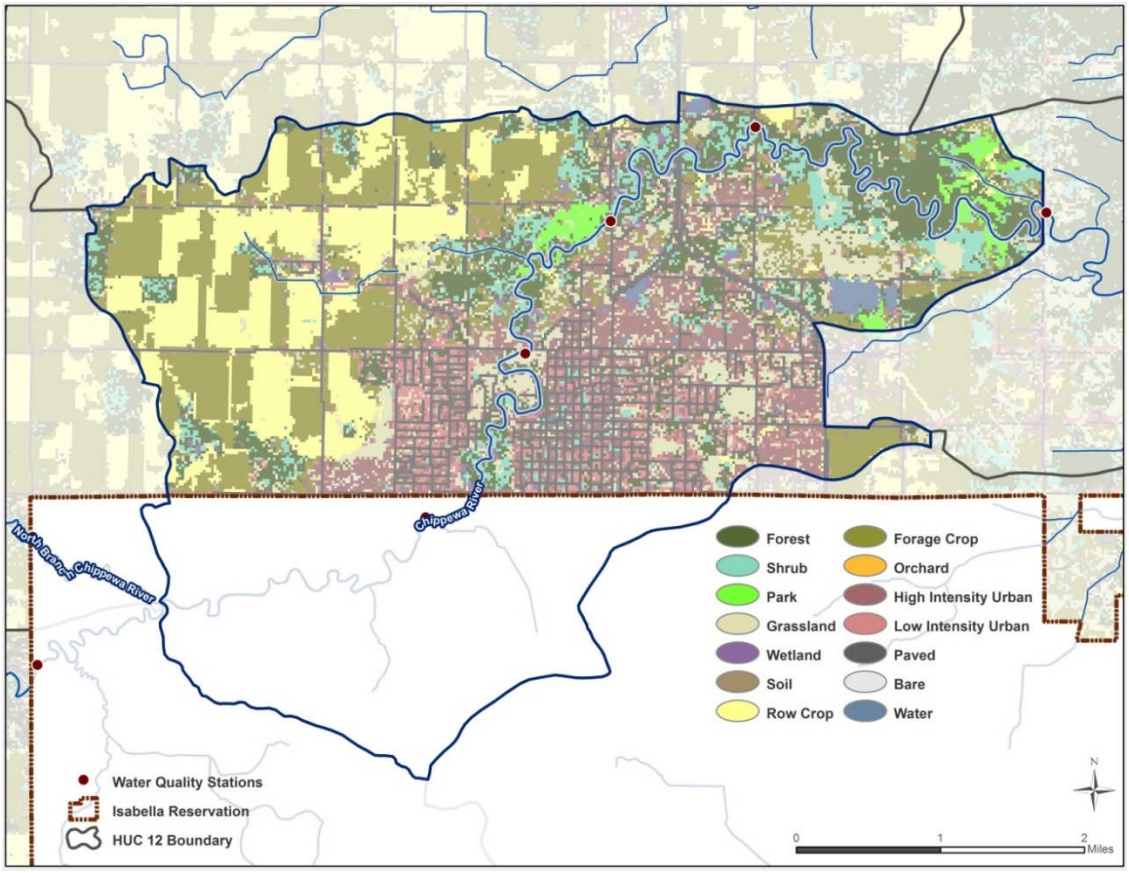
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	5,898	42.65	Forage Crop	2,958	21.39
Shrub	1,381	9.99	Orchard	52	< 1
Park		0	High Intensity Urban	58	< 1
Grassland	1,357	9.82	Low Intensity Urban	110	< 1
Wetland	330	2.39	Paved	350	2.53
Soil	11	< 1	Bare	5	< 1
Row Crop	1,179	8.53	Water	139	1.00
			Total	**13,829**	

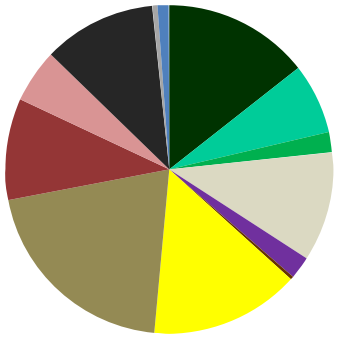
Figure 16. Land use in the Johnson Creek - Chippewa River 12-digit HUC subwatershed.

Mission Creek –Chippewa River

The Mission Creek - Chippewa River 12-digit HUC subwatershed lies in the southeastern portion of the Isabella Reservation, as seen in Figure 17. The 12-digit HUC subwatershed drains 9,122 acres within the Reservation and the SCIT samples 4 sites along the Chippewa River. This Subwatershed contains Mt. Pleasant and the majority of the Reservations population. The subwatershed lies in both the Lansing Ecoregion Saginaw Bay Lake Plain Ecoregion. The subwatershed has many C soils as well as undefined urban soils.

The city of Mount Pleasant lies within the Mission Creek - Chippewa River subwatershed, although forage crops are the primary land use. Together with row crops, agriculture constitutes 35.2 percent of all land cover. Total forested lands comprise 14.5 percent of the area, while shrub and grassland make up another 18.0 percent. Impervious surfaces cover 26.5 percent of the landscape, making it the most developed of all 12-digit HUC subwatershed watersheds within the Isabella Reservation.





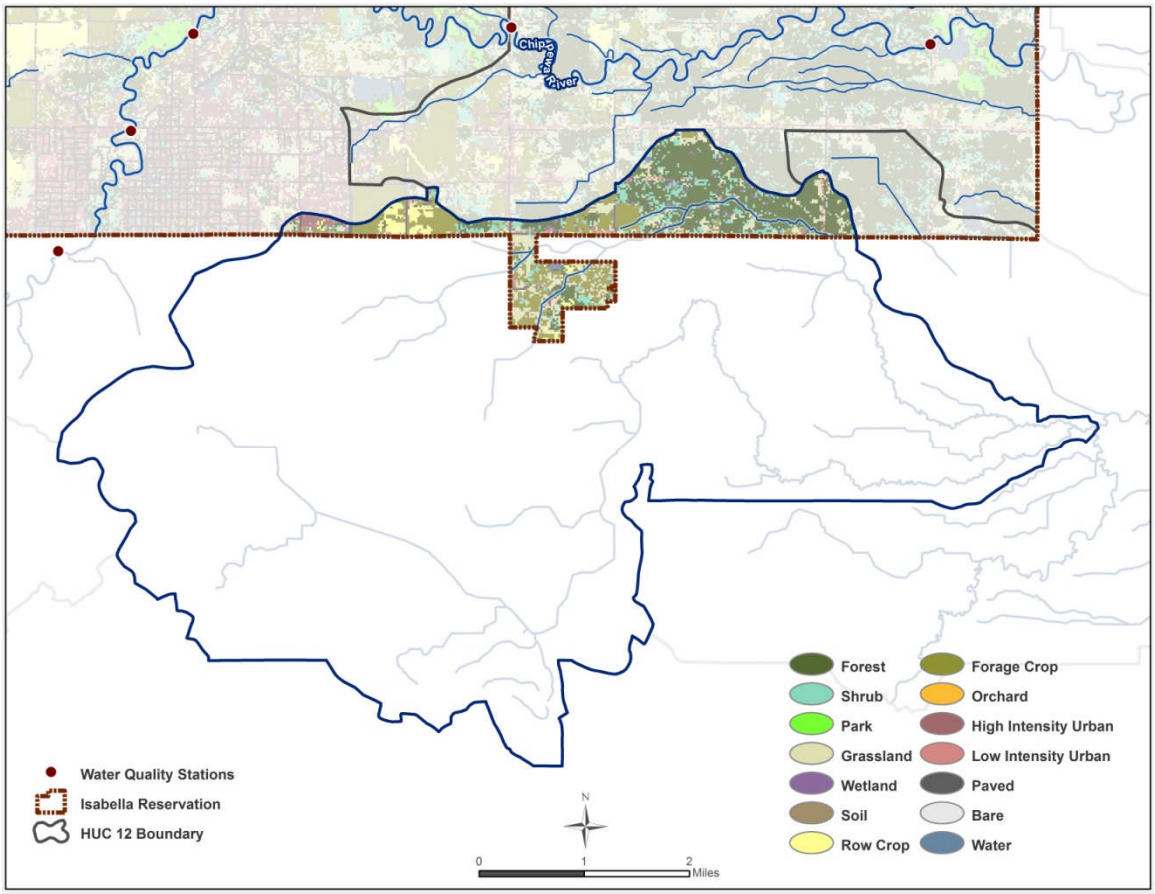
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	1,327	14.54	Forage Crop	1,875	20.55
Shrub	637	6.99	Orchard	2	< 1
Park	160	1.75	High Intensity Urban	920	10.09
Grassland	1,003	10.99	Low Intensity Urban	468	5.13
Wetland	194	2.13	Paved	1,028	11.27
Soil	26	< 1	Bare	37	< 1
Row Crop	1,340	14.69	Water	106	1.16
			Total	**9,122**	

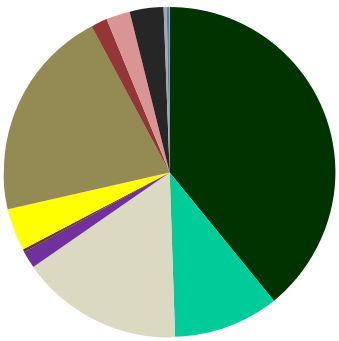
Figure 17. Land use in the Mission Creek – Chippewa River 12-digit HUC subwatershed.

Onion Creek

The Onion Creek 12-digit HUC subwatershed lies in the southeastern corner of the Isabella Reservation, as seen in Figure 18. The 12-digit HUC subwatershed drains 1,795 acres within the Reservation and the SCIT does not currently sample any sites along Onion Creek though it plans to in the future. The subwatershed lies in the Saginaw Bay Lake Plain Ecoregion. The majority of the subwatersheds soils are B. A portion of the subwatershed contains Mt. Pleasant and a higher population density.

Forests are the primary land use in the Onion Creek subwatershed within the Isabella Reservation boundary, constituting 39.06 percent of the area. Agriculture constitutes 24.9 percent of all land cover, while shrub and grassland make up another 26.2 percent. Impervious surfaces cover 7.3 per cent of the landscape.





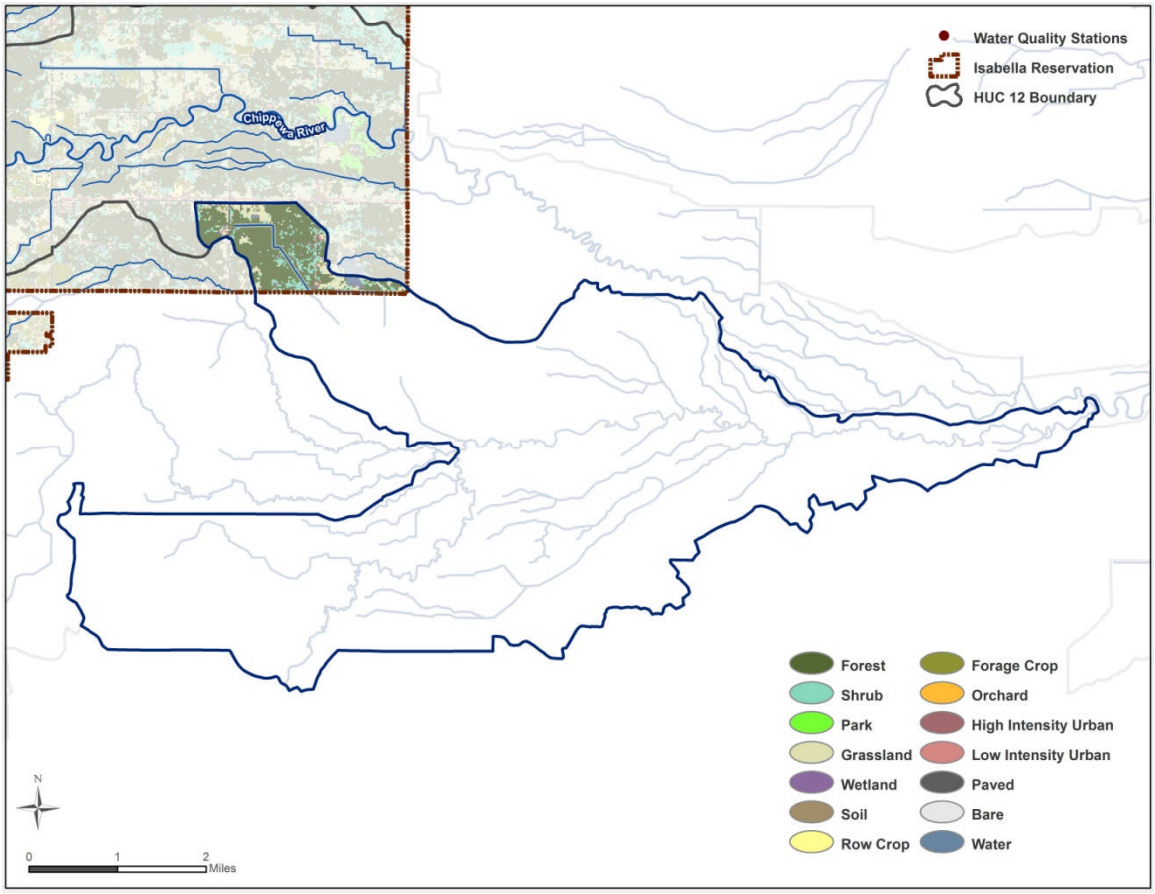
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	701	39.06	Forage Crop	373	20.78
Shrub	187	10.42	Orchard		0
Park		0	High Intensity Urban	29	1.62
Grassland	283	15.80	Low Intensity Urban	38	2.14
Wetland	30	1.70	Paved	63	3.50
Soil	6	< 1	Bare	2	< 1
Row Crop	74	4.15	Water	7	< 1
			Total	**1,795**	

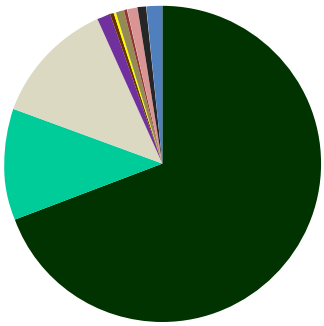
Figure 18. Land use in the Onion Creek 12-digit HUC subwatershed.

Salt Creek

The Salt Creek 12-digit HUC subwatershed lies in the extreme southeastern corner of the Isabella Reservation, as seen in Figure 19. The 12-digit HUC subwatershed drains 807 acres within the Reservation, and the SCIT does not sample any sites along Salt Creek, though it plans to in the future. Salt Creek lies in the Saginaw Bay Lake Plain Ecoregion and has A/D and B soils.

Forests are the primary land use in the Salt Creek subwatershed within the Isabella Reservation boundary, constituting 69.2 percent of the area. Shrub and grassland account for another 24.0 percent, while 1.6 percent is wetland. Impervious surfaces cover 2.3 percent of the landscape.





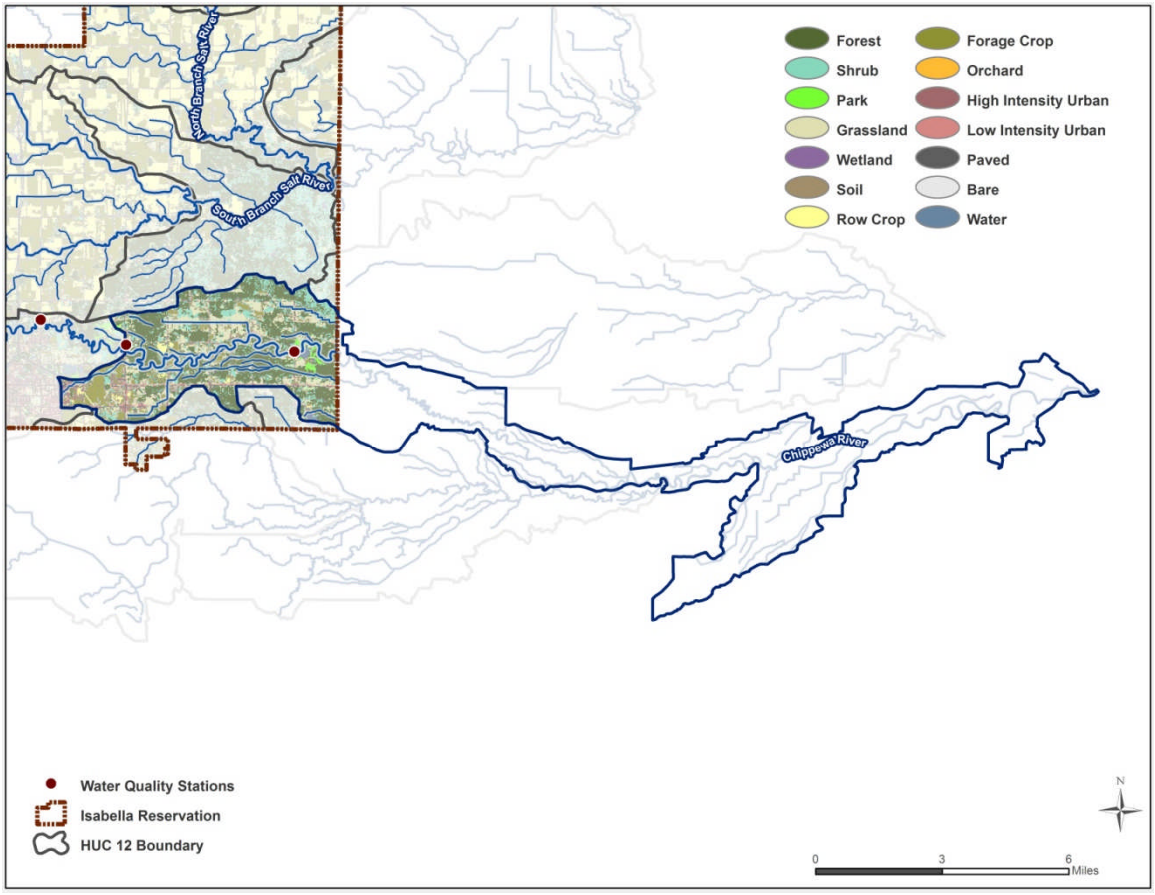
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	559	69.23	Forage Crop	8	< 1
Shrub	92	11.40	Orchard		0
Park		0	High Intensity Urban	1	< 1
Grassland	102	12.64	Low Intensity Urban	10	1.25
Wetland	13	1.59	Paved	7	< 1
Soil	1	< 1	Bare		0
Row Crop	2	< 1	Water	13	1.55
			Total	**807**	

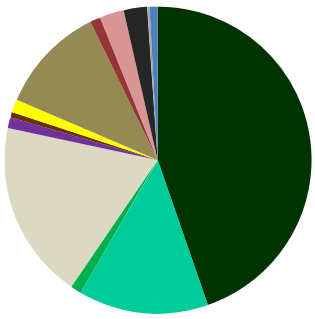
Figure 19. Land use in the Salt Creek 12-digit HUC subwatershed.

Dice Drain - Chippewa River

The Dice Drain - Chippewa River 12-digit HUC subwatershed lies in the southeastern portion of the Isabella Reservation, as seen in Figure 20. The 12-digit HUC subwatershed drains 9,432 acres within the Reservation and the SCIT samples 2 sites along the Chippewa River. The subwatershed lies in the Saginaw Bay Lake Plain Ecoregion and has primarily B soils.

Forests are the primary land use in the Dice Drain - Chippewa River subwatershed within the Isabella Reservation boundary, constituting 44.8 percent of the area. Agriculture comprises 12.8 percent of all land cover, while shrub and grassland make up another 32.4 percent. Impervious surfaces cover 6.2 percent of the landscape.





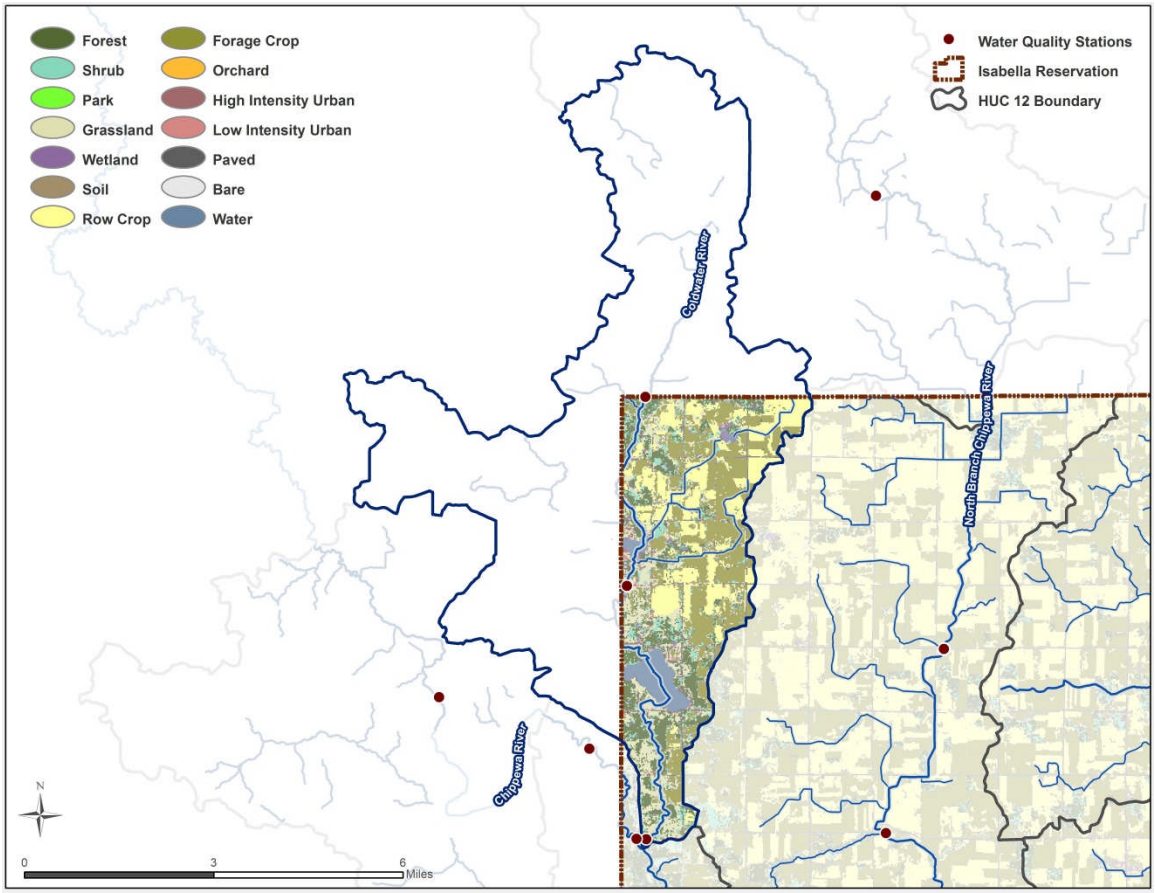
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	4,227	44.81	Forage Crop	1,074	11.39
Shrub	1,282	13.59	Orchard		0
Park	92	< 1	High Intensity Urban	107	1.13
Grassland	1,779	18.86	Low Intensity Urban	217	2.30
Wetland	116	1.23	Paved	257	2.72
Soil	53	< 1	Bare	3	< 1
Row Crop	136	1.44	Water	90	< 1
			Total	**9,432**	

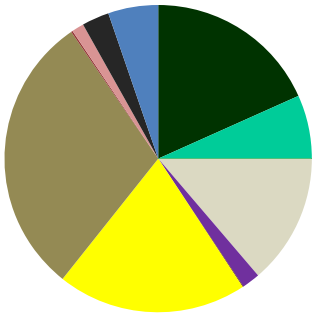
Figure 20. Land use in the Dice Drain - Chippewa River 12-digit HUC subwatershed.

Coldwater River

The Coldwater River 12-digit HUC subwatershed lies in the northwestern corner of the Isabella Reservation, as seen in Figure 21. The 12-digit HUC subwatershed drains 7,777 acres within the Reservation and the SCIT samples 3 sites along the Coldwater River. The subwatershed lies primarily in the Cadillac Ecoregion while the northwestern portion lies in the Lansing Ecoregion. The subwatershed has primarily A and C soils. The subwatershed has denser population in Weidman community.

Forage crops are the primary land use in the Coldwater River subwatershed within the Isabella Reservation boundary. Together with row crops, agriculture constitutes 49.7 percent of all land cover. Total forested lands comprise 18.3 percent of the area, while shrub and grassland make up another 20.4 percent. Impervious surfaces cover 4.3 percent of the landscape.





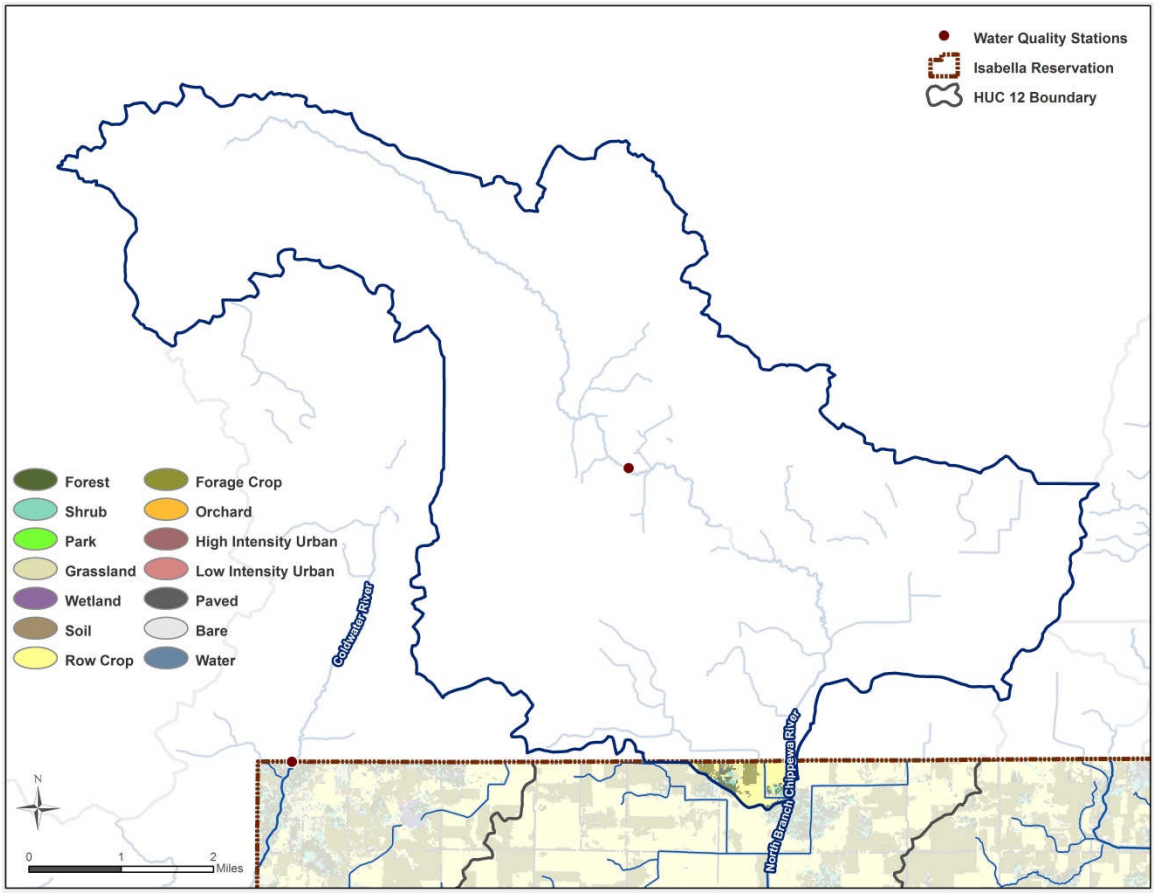
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	1,423	18.30	Forage Crop	2,312	29.72
Shrub	520	6.68	Orchard	1	< 1
Park		0	High Intensity Urban	14	< 1
Grassland	1,069	13.74	Low Intensity Urban	99	1.28
Wetland	149	1.92	Paved	223	2.86
Soil	8	< 1	Bare		0
Row Crop	1,552	19.95	Water	409	5.25
			Total	**7,777**	

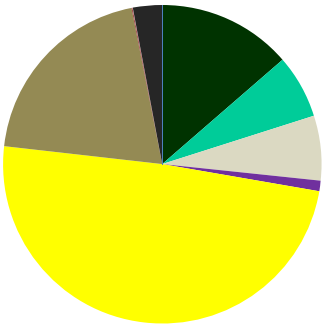
Figure 21. Land use in the Coldwater River 12-digit HUC subwatershed.

Schofield Creek – North Branch Chippewa River

The Schofield Creek – North Branch Chippewa River 12-digit HUC subwatershed lies along the northern border of the Isabella Reservation, as seen in Figure 22. The 12-digit HUC subwatershed drains 259 acres within the Reservation and the SCIT samples 1 site along the North Branch of the Chippewa River, outside of the Isabella Reservation boundary. The subwatershed lies in the Lansing Ecoregion.

Row crops are the primary land use in the Schofield Creek – North Branch Chippewa River subwatershed within the Isabella Reservation boundary. Together with forage crops, agriculture constitutes 69.2 percent of all land cover. Total forested lands comprise 13.6 percent of the area, while shrub and grassland make up another 13.0 percent. Impervious surfaces cover 3.1 percent of the landscape.





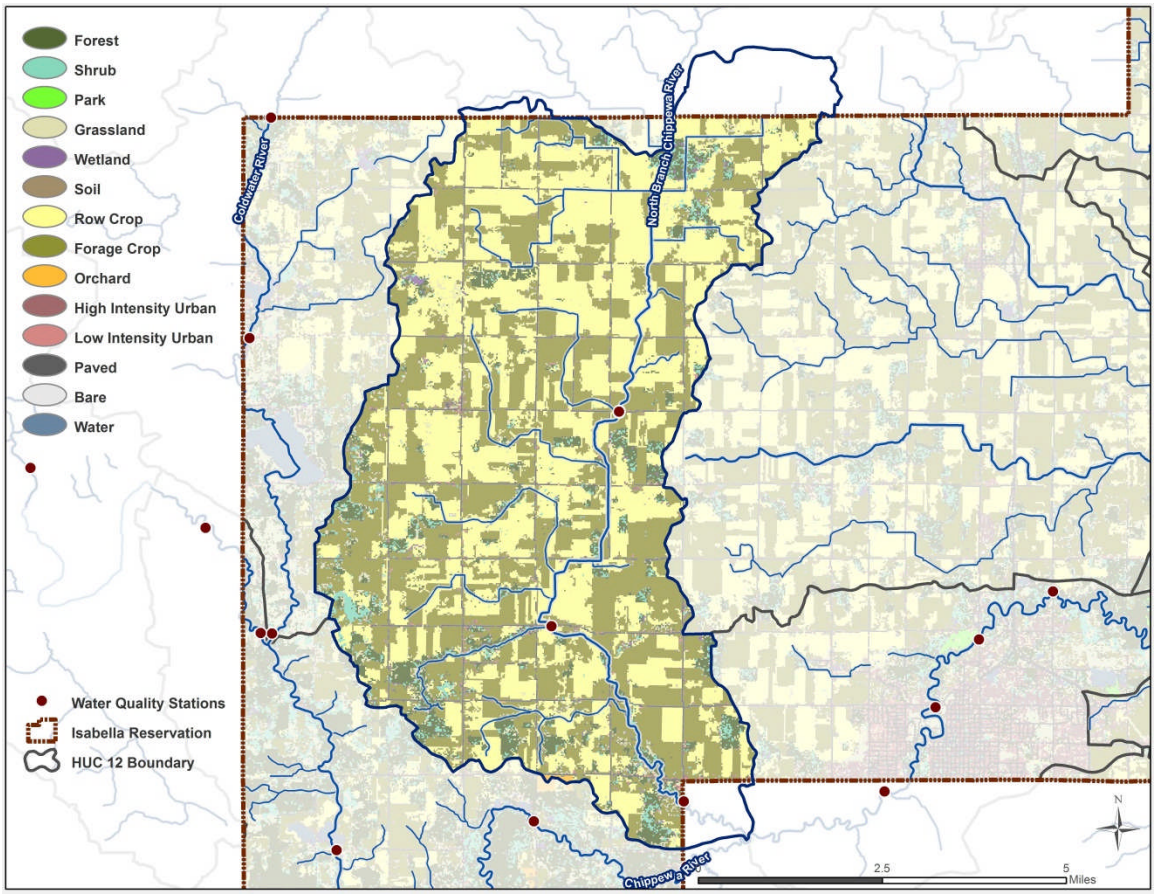
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	35	13.63	Forage Crop	52	20.09
Shrub	17	6.44	Orchard		0
Park		0	High Intensity Urban		0
Grassland	17	6.57	Low Intensity Urban		0
Wetland	3	1.08	Paved	8	2.97
Soil		0	Bare		0
Row Crop	127	49.09	Water		0
			Total	**259**	

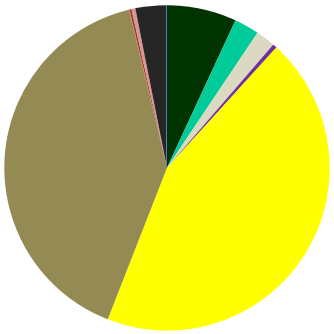
Figure 22. Land use in the Schofield Creek – North Branch Chippewa River 12-digit HUC subwatershed.

Hogg Creek – North Branch Chippewa River

The Hogg Creek - North Branch Chippewa River 12-digit HUC subwatershed lies in the western portion of the Isabella Reservation, as seen in Figure 23. The 12-digit HUC subwatershed drains 26,749 acres within the Reservation and the SCIT samples 6 sites along the North Branch River. The subwatershed lies in the Lansing Ecoregion and has primarily C soils.

Row crops are the primary land use in the Hogg Creek – North Branch Chippewa River subwatershed within the Isabella Reservation boundary. Together with forage crops, agriculture constitutes 84.5 percent of all land cover. Total forested lands comprise 6.9 percent of the area, while shrub and grassland make up another 4.4 percent. Impervious surfaces cover 3.7 percent of the landscape.





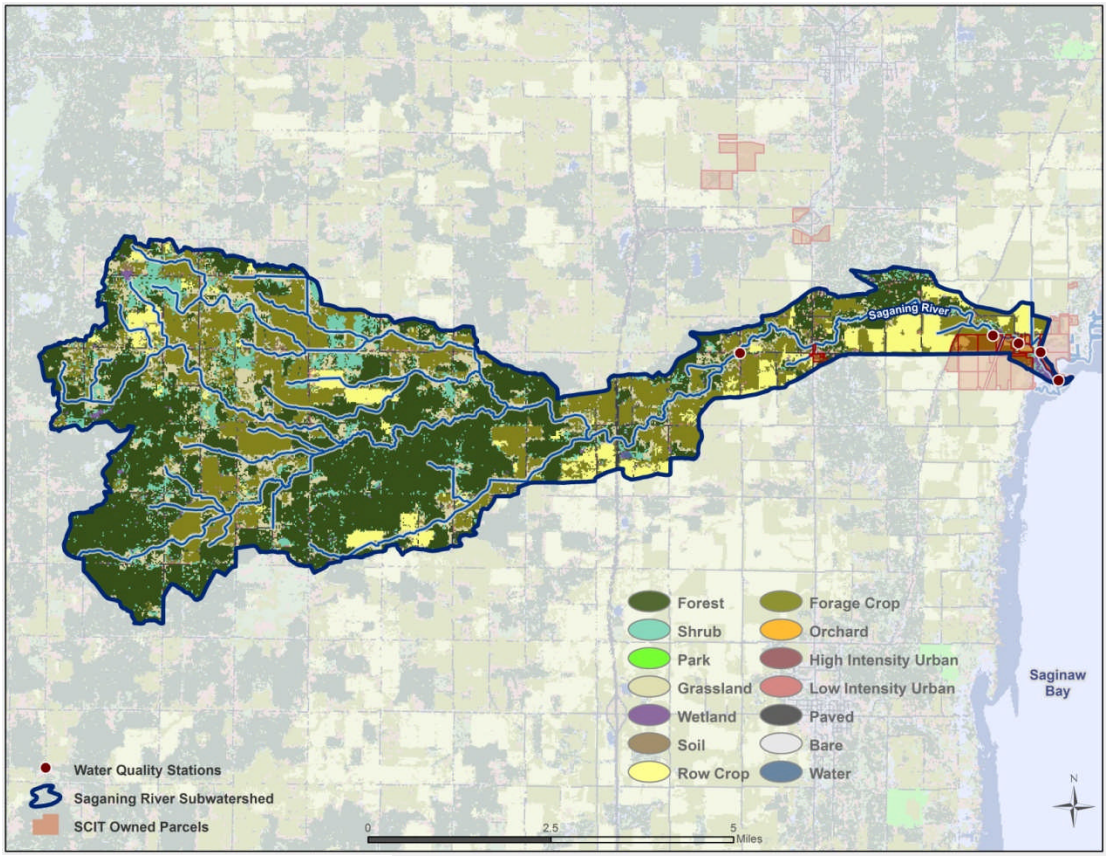
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	1,848	6.91	Forage Crop	10,777	40.29
Shrub	663	2.48	Orchard	18	< 1
Park		0	High Intensity Urban	53	< 1
Grassland	514	1.92	Low Intensity Urban	105	< 1
Wetland	110	< 1	Paved	823	3.08
Soil	8	< 1	Bare	8	< 1
Row Crop	11,819	44.19	Water	2	< 1
			Total	**26,749**	

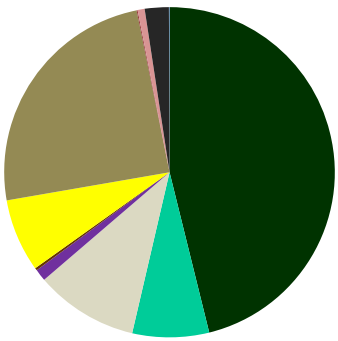
Figure 23.Land use in the Hogg Creek – North Branch Chippewa River 12-digit HUC subwatershed.

Saganing River Parcels

The Saganing River 12-digit HUC subwatershed headwaters lie approximately 22 miles northeast of the Isabella Reservation and drains 19,206 acres of land. The Saganing River SCIT sampling stations lie approximately 45 miles northeast of Mt. Pleasant. The Saganing River empties directly into Saginaw Bay, as seen in Figure 24. The SCIT samples 3 sites along the Saganing River. While there are SCIT Saganing parcels outside of the Saganing River 12-digit HUC subwatershed, land use is summarized for this Saganing HUC alone to help with the source assessment analysis at the 3 SCIT monitoring sites.

Forests are the primary land use in the Saganing River subwatershed, constituting 46.1 percent of the area. Combined agricultural uses represent 31.7 percent of the landscape, while shrub and grassland comprise another 17.6 percent. Impervious surfaces cover 3.1 percent of the Saganing River subwatershed.





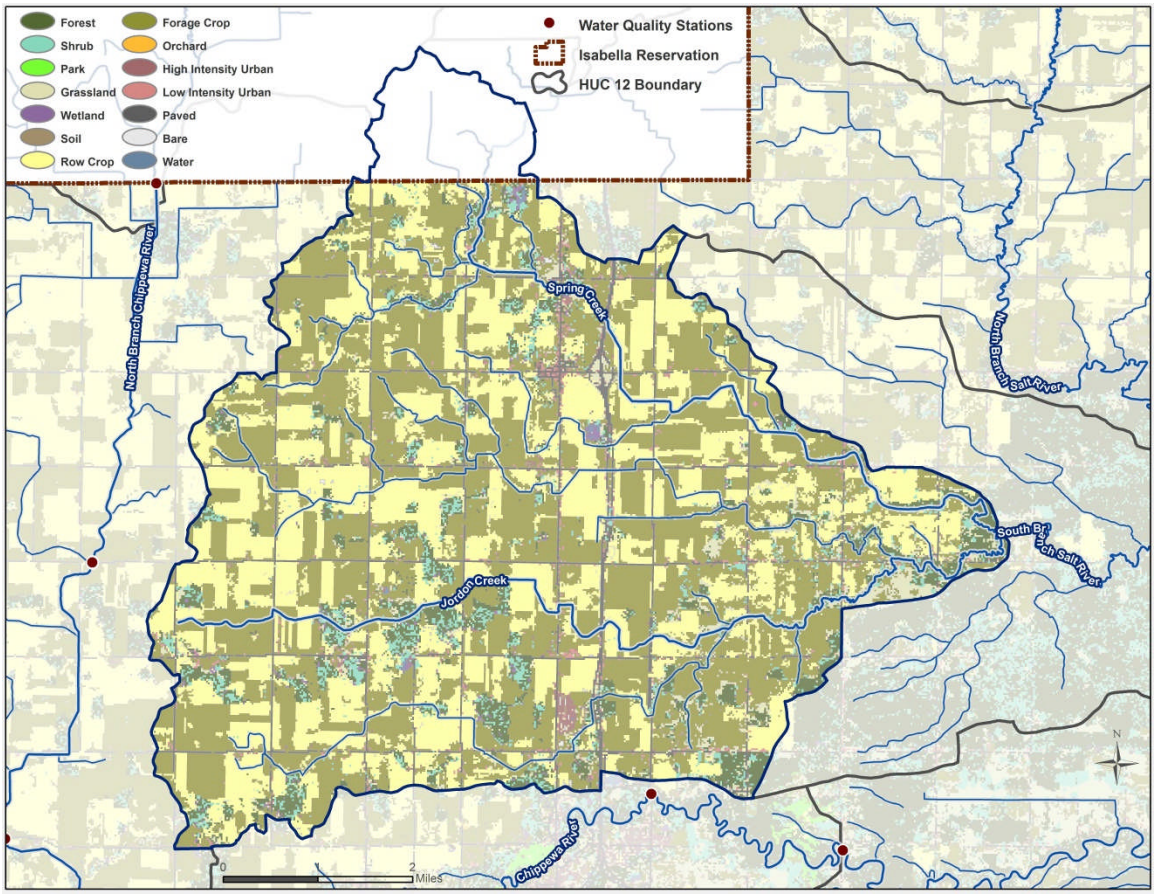
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	8,861	46.14	Forage Crop	4,713	24.54
Shrub	1,438	7.49	Orchard		0
Park		0	High Intensity Urban	17	< 1
Grassland	1,937	10.09	Low Intensity Urban	133	< 1
Wetland	224	1.17	Paved	451	2.35
Soil	49	< 1	Bare		0
Row Crop	1,369	7.13	Water	13	< 1
			Total	**19,206**	

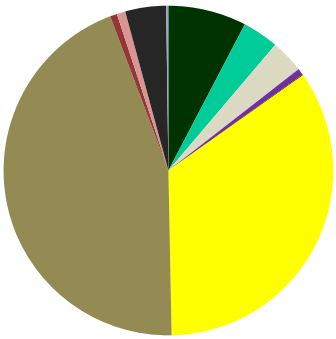
Figure 24.Land use in the Saganing River 12-digit HUC subwatershed.

Spring Creek – South Branch Salt River

The Spring Creek – South Branch Salt River 12-digit HUC subwatershed lies in the central portion of the Isabella Reservation, as seen in Figure 25. The 12-digit HUC subwatershed drains 25,620 acres within the Reservation and the SCIT does not sample any sites along the South Branch of the Salt River. The western portion of the subwatershed lies in the Lansing Ecoregion and the eastern portion lies in the Saginaw Bay Lake Plain Ecoregion. The subwatershed has primarily C soils.

Forage crops are the primary land use in the Spring Creek – South Branch Salt River subwatershed within the Isabella Reservation boundary. Together with row crops, agriculture constitutes 79.1 percent of all land cover. Total forested lands comprise 7.7 percent of the area, while shrub and grassland make up another 6.8 percent. Impervious surfaces cover 5.5 percent of the landscape.





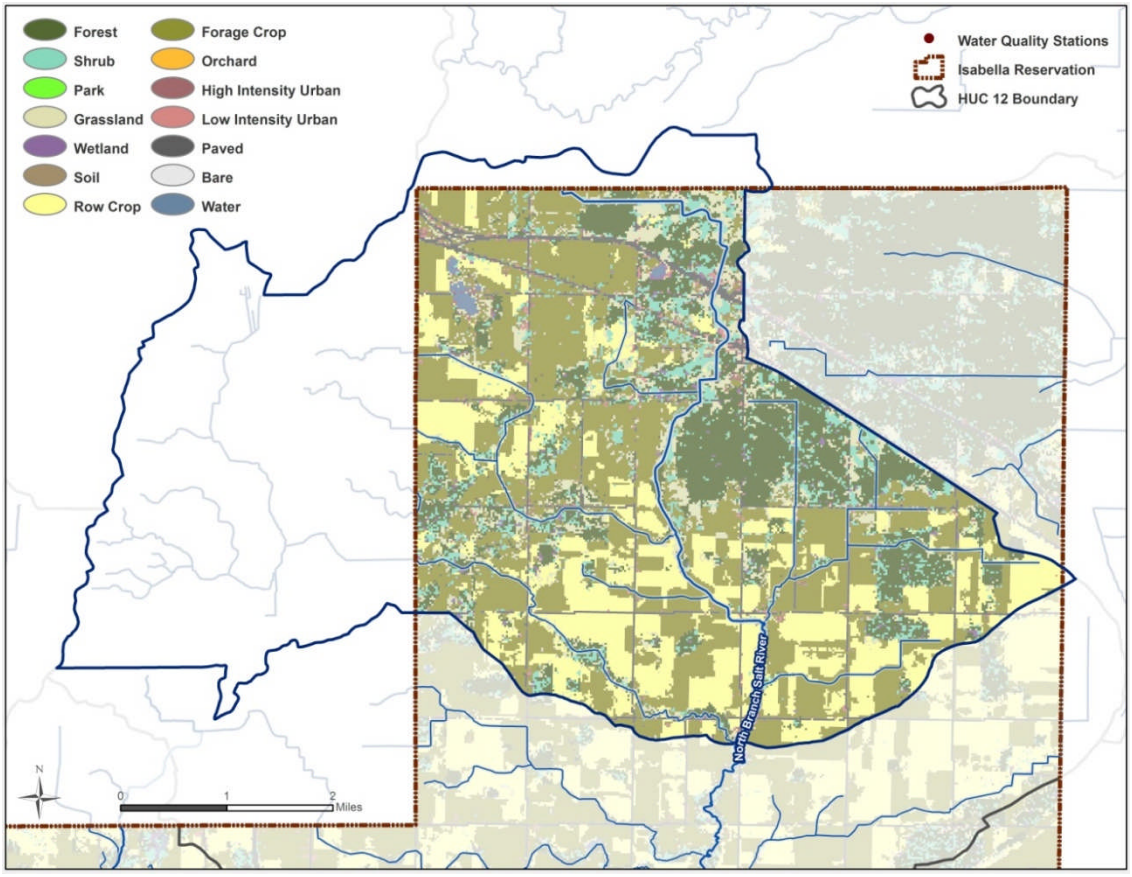
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	1,968	7.68	Forage Crop	11,410	44.54
Shrub	906	3.54	Orchard	2	< 1
Park		0	High Intensity Urban	174	< 1
Grassland	833	3.25	Low Intensity Urban	213	< 1
Wetland	166	< 1	Paved	1,030	4.02
Soil	18	< 1	Bare	33	< 1
Row Crop	8,843	34.52	Water	24	< 1
			Total	**25,620**	

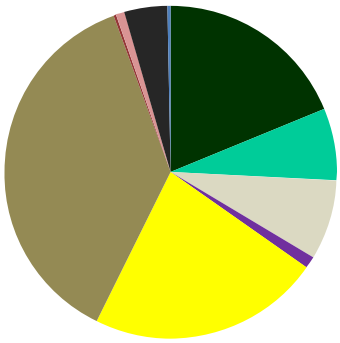
Figure 25. Land Use in the Spring Creek – South Branch Salt River 12-digit HUC subwatershed.

McDonald Drain – North Branch Salt River

The McDonald Drain – North Branch Salt River 12-digit HUC subwatershed lies in the northern portion of the Isabella Reservation, as seen in Figure 26. The 12-digit HUC subwatershed drains 13,566 acres within the Reservation and the SCIT does not sample any sites along the North Branch of the Salt River. The western portion of the subwatershed lies in the Lansing Ecoregion and the eastern portion lies in the Saginaw Bay Lake Plain Ecoregion. The subwatershed has an even mixture of C, B, and B/D soils.

Forage crops are the primary land use in the McDonald Drain – North Branch Salt River subwatershed within the Isabella Reservation boundary. Together with row crops, agriculture constitutes 59.7 percent of all land cover. Total forested lands comprise 18.9 percent of the area, while shrub and grassland make up another 14.8 percent. Impervious surfaces cover 5.2 percent of the landscape.





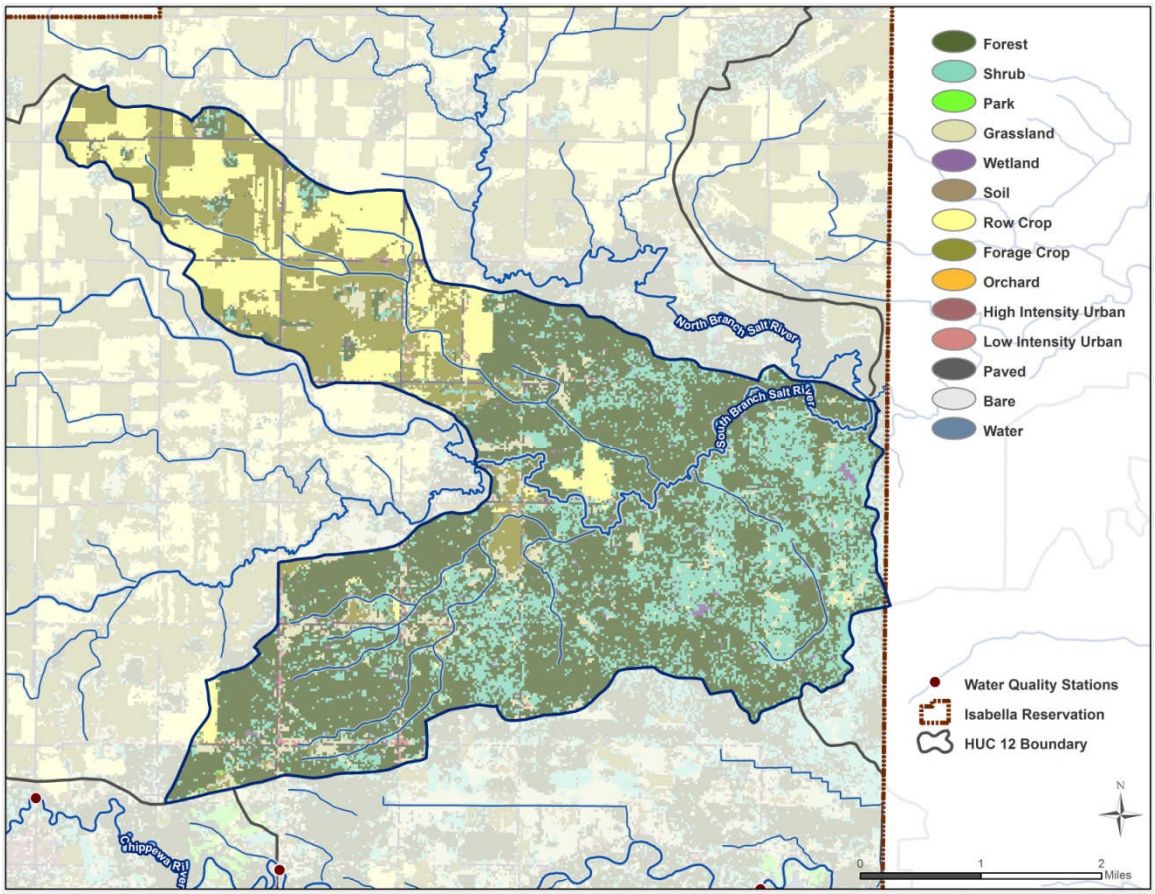
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	2,564	18.90	Forage Crop	5,058	37.29
Shrub	933	6.87	Orchard		0
Park		0	High Intensity Urban	57	< 1
Grassland	1,079	7.95	Low Intensity Urban	112	< 1
Wetland	125	< 1	Paved	543	4.00
Soil	12	< 1	Bare	2	< 1
Row Crop	3,035	22.38	Water	46	< 1
			Total	**13,566**	

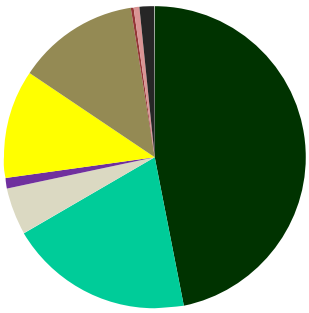
Figure 26. Land use in the McDonald Drain – North Branch Salt River 12-digit HUC subwatershed.

South Branch Salt River

The South Branch Salt River 12-digit HUC subwatershed lies in the eastern portion of the Isabella Reservation, as seen in Figure 27. The 12-digit HUC subwatershed drains 11,201 acres within the Reservation, and the SCIT does not currently sample any sites along the South Branch of the Salt River, though plans to sample the river in 2015 are in place. Michigan DEQ will be doing downstream monitoring of the main branch of Salt River as part of their priority waterbodies program. The subwatershed lies in the Saginaw Bay Lake Plain Ecoregion and has primarily B soils.

Forests are the primary land use in the South Branch Salt River subwatershed within the Isabella Reservation boundary. Agriculture constitutes 25.0 percent of all land cover, while shrub and grassland make up another 24.6 percent. Impervious surfaces cover 2.4 percent of the landscape.





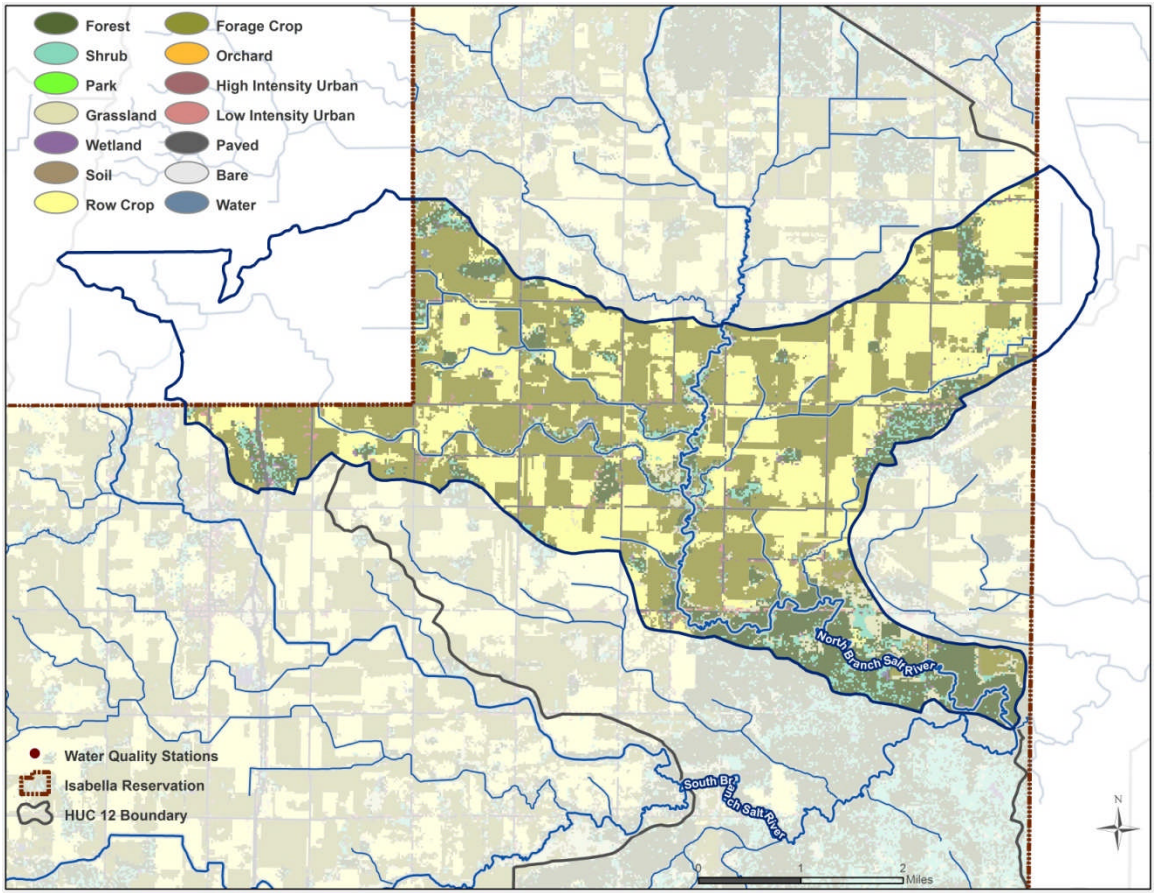
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	5,255	46.92	Forage Crop	1,481	13.22
Shrub	2,206	19.69	Orchard		0
Park	2	< 1	High Intensity Urban	11	< 1
Grassland	552	4.92	Low Intensity Urban	74	< 1
Wetland	122	1.09	Paved	178	1.59
Soil	1	< 1	Bare		0
Row Crop	1,316	11.75	Water	3	< 1
			Total	**11,201**	

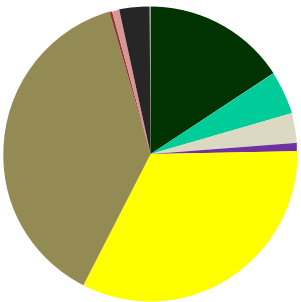
Figure 27. Land Use in the South Branch Salt River 12-digit HUC subwatershed.

North Branch Salt River

The North Branch Salt River 12-digit HUC subwatershed lies in the eastern portion of the Isabella Reservation, as seen in Figure 28. The 12-digit HUC subwatershed drains 11,767 acres within the Reservation and the SCIT does not sample any sites along the North Branch of the Salt River. The subwatershed lies in the Saginaw Bay Lake Plain Ecoregion and has primarily B/D and C soils.

Forage crops are the primary land use in the North Branch Salt River subwatershed within the Isabella Reservation boundary. Together with row crops, agriculture constitutes 70.9 percent of all land cover. Total forested lands comprise 15.8 percent of the area, while shrub and grassland make up another 8.2 percent. Impervious surfaces cover 4.2 percent of the landscape.





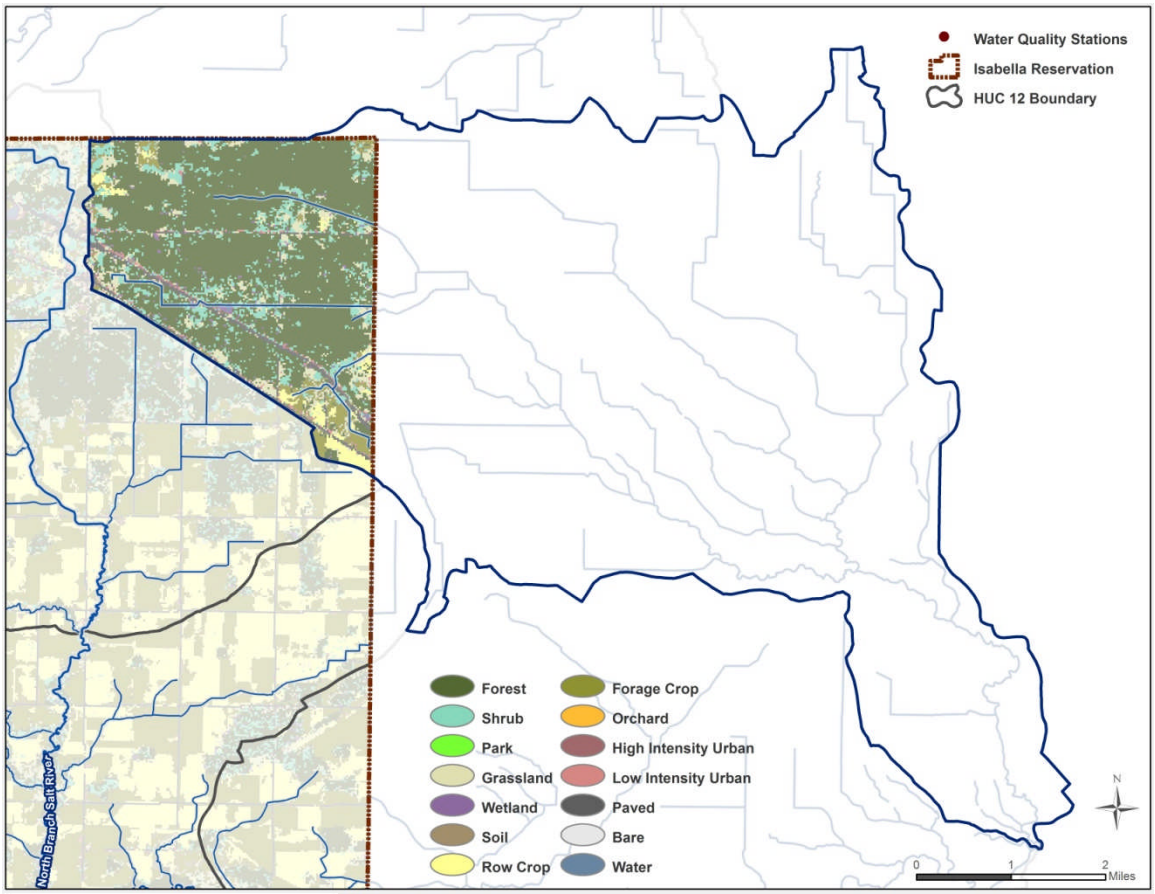
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	1,864	15.85	Forage Crop	4,496	38.21
Shrub	540	4.59	Orchard		0
Park		0	High Intensity Urban	32	< 1
Grassland	419	3.56	Low Intensity Urban	75	< 1
Wetland	75	< 1	Paved	387	3.29
Soil	16	< 1	Bare	4	< 1
Row Crop	3,848	32.70	Water	9	< 1
			Total	**11,767**	

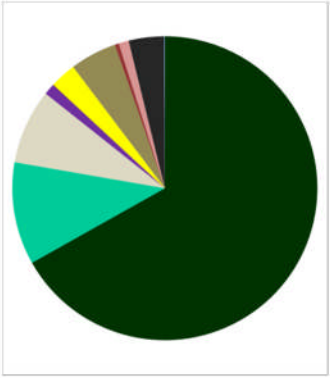
Figure 28. Land Use in the North Branch Salt River 12-digit HUC subwatershed.

Bluff Creek

The Bluff Creek 12-digit HUC subwatershed lies in the northeastern corner of the Isabella Reservation, as seen in Figure 29. The 12-digit HUC subwatershed drains 4,887 acres within the Reservation and the SCIT does not sample any sites along Bluff Creek. The subwatershed lies in the Saginaw Bay Lake Plain Ecoregion and has primarily B soils.

Forests are the primary land use in the Bluff Creek subwatershed within the Isabella Reservation boundary, constituting 66.8 percent of the area. Shrub and grassland make up 18.9 percent of the area, while agriculture accounts for another 7.7 percent. Impervious surfaces cover 5.2 percent of the landscape.





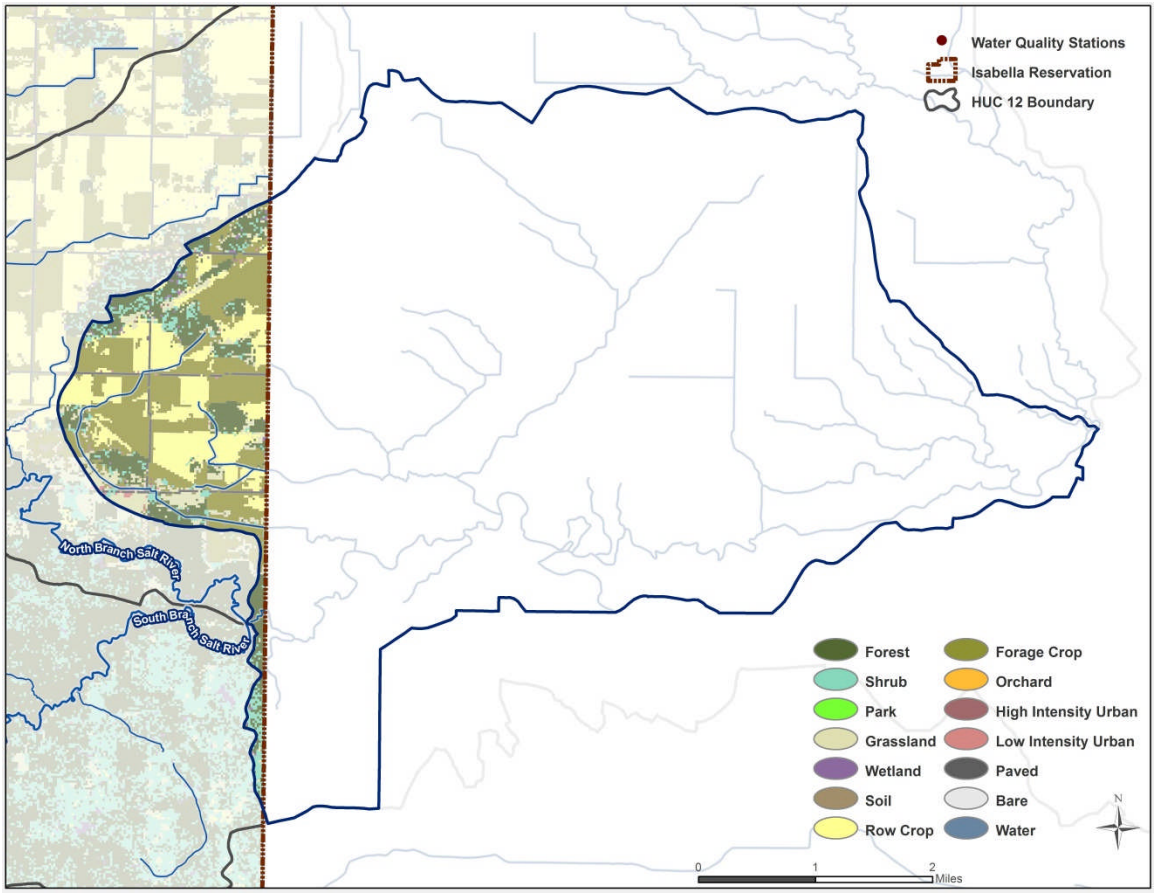
Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	3,267	66.84	Forage Crop	242	4.95
Shrub	533	10.91	Orchard		0
Park		0	High Intensity Urban	22	< 1
Grassland	389	7.96	Low Intensity Urban	52	1.06
Wetland	58	1.18	Paved	183	3.74
Soil	2	< 1	Bare		0
Row Crop	136	2.79	Water	4	< 1
			Total	**4,887**	

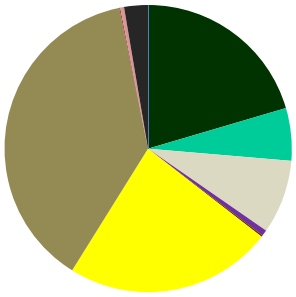
Figure 29. Land Use in the Bluff Creek 12-digit HUC subwatershed.

Howard Creek – Salt River

The Howard Creek – Salt River 12-digit HUC subwatershed lies in the eastern portion of the Isabella Reservation, as seen in Figure 30. The 12-digit HUC subwatershed drains 2,431 acres within the Reservation and the SCIT does not sample any sites along Howard Creek. The subwatershed lies in the Saginaw Bay Lake Plain Ecoregion and has primarily B and C soils.

Forage crops are the primary land use in the Howard Creek - Salt River subwatershed within the Isabella Reservation boundary. Together with row crops, agriculture constitutes 61.3 percent of all land cover. Total forested lands comprise 20.5 percent of the area, while shrub and grassland make up another 14.3 percent. Impervious surfaces cover 3.2 percent of the landscape.





Land Use	Acres	Percent	Land Use	Acres	Percent
Forest	497	20.45	Forage Crop	921	37.90
Shrub	144	5.92	Orchard		0
Park		0	High Intensity Urban	3	< 1
Grassland	202	8.33	Low Intensity Urban	10	< 1
Wetland	16	< 1	Paved	65	2.68
Soil	5	< 1	Bare		0
Row Crop	568	23.36	Water		0
			Total	**2,431**	

Figure 30. Land Use in the Howard Creek – Salt River 12-digit HUC subwatershed.

12-digit HUC subwatershed Land Use Summary

Many of the 12-digit HUC subwatersheds in the Isabella Reservation have similar land use attributes. Most of the subwatersheds are primarily agriculture and forest, though some have significant impervious surfaces. Agricultural land use ranges from 1 to 85 percent of a subwatershed, with an average value of 37 percent. Forest cover ranges from 7 to 70 percent of the land, averaging 35 percent. Impervious surfaces account for 0 to 27 percent of land use, averaging six percent. Park, shrub, and grassland land uses range from 4 to 56 percent of a subwatershed, averaging 20 percent.

SECTION 5 – SURFACE AND GROUND WATER QUALITY

This section summarizes the conditions of surface water and groundwater on the SCIT's Isabella Reservation.

Surface Water

Five major waterbodies lie within the Isabella Reservation: Chippewa River, Coldwater River, North Branch Chippewa River, Salt River, and Saganing River. The Chippewa River watershed drains 288,252 acres and 23.3 percent of that watershed lies within the SCIT tribal boundaries. The Coldwater River drains to the Chippewa River watershed and 7,777 acres of that watershed lie within the Isabella Reservation. The Salt River extends 57.5 miles and drains 64,584 acres of the Isabella Reservation. Table 10 lists all major waterbodies in the Isabella Reservation by 12-digit HUC subwatershed. Water quality and stream characteristics are discussed further in Section 6.

Table 10. Isabella Reservation Waterbodies.

HUC12 ID	HUC12 Name	Waterbody	Area or Length within Reservation Parcel Boundaries	
			Acres	Miles
40802020202	Lake Isabella-Chippewa River	Chippewa River upstream of the Reservation	N/A	N/A
40802020204	Coldwater River	Scott Lake	17.94	
		Coldwater Lake	354.33	
		Unnamed Lake	81.72	
		Coldwater River		8.24
40802020205	Schofield Creek-North Branch Chippewa River	North Branch Chippewa River		0.43
		Schofield Creek		0.68
40802020206	Hogg Creek-North Branch Chippewa River	North Branch Chippewa River		11.82
		Hogg Creek		2.83
40802020207	Johnson Creek-Chippewa River	Chippewa River		14.64
		Stony Brook		2.05
		Johnson Creek		0.28
		Campau Lake	4.94	
		Wing Lake	8.52	
		Peas Lake	6.59	
		Unnamed Lake	40.10	
40802020501	Mission Creek-Chippewa River	Chippewa River		10.45
		Mission Creek		2.39
		Grewes Lakes	50.45	
40802020504	Onion Creek	Onion Creek		2.91
40802020505	Salt Creek	Black Creek		1.35
40802020508	Dice Drain-Chippewa River	Chippewa River		8.81
		Unnamed Lake	23.82	
40801020105	Saganing River	Saganing River		0.31

HUC12 ID	HUC12 Name	Waterbody	Area or Length within Reservation Parcel Boundaries	
			Acres	Miles
		Saginaw Bay	2.30	
40801020102	South Branch Pine River	3 Unnamed Tributaries		0.41
40801020104	White Feather Creek-Frontal Lake Huron	Saginaw Bay	3.62	
		2 Unnamed Tributaries		0.79
40801010502	Big Creek-Frontal Lake Huron	Lake Huron	0.96	
		Unnamed Lake	808.03	
40802010501	Spring Creek-South Branch Salt River	South Branch Salt River		12.16
		Jordon Creek		7.22
40802010502	McDonald Drain-North Branch Salt River	North Branch Salt River		7.90
40802010503	South Branch Salt River	South Branch Salt River		5.97
40802010504	North Branch Salt River	North Branch Salt River		10.08
40802010505	Bluff Creek	Bluff Creek		3.27
		Unnamed Lake	390.11	
40802010506	Howard Creek-Salt River	2 Unnamed Headwater Tributaries		4.75

Chippewa River

The Chippewa River is a major tributary to the Tittabawassee River which drains to the Saginaw River, traveling through the Isabella Reservation and the City of Mt. Pleasant. This waterbody is used for a drinking water supply by tribal members as well as for recreation including fishing, swimming, tubing, canoeing, and ceremonial activities. Figure 31 shows an aerial view of the Chippewa River 12-digit HUC subwatersheds within the Isabella Reservation.

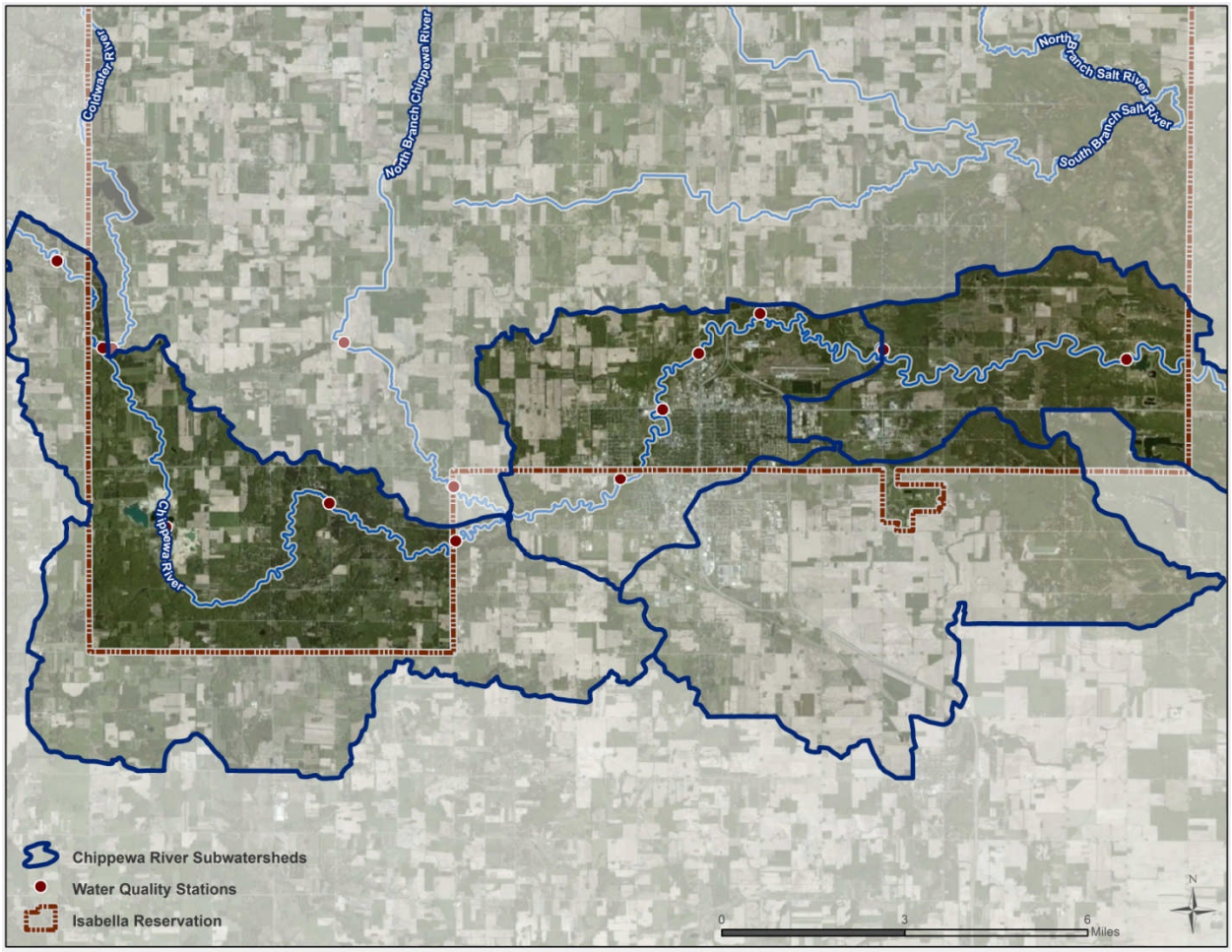


Figure 31. Chippewa River Tribal 12-digit HUC subwatershed Boundaries

Coldwater River

The Coldwater River is a major tributary to the Chippewa River. Before entering Reservation boundaries Coldwater River travels through community of Weidman and an unnamed Lake the SCIT call Mill Pond. An old mill impoundment creates this small reservoir near Weidman. In the past the Coldwater River has been designated as a trout stream though its temperatures have recently exceeded coldwater stream recommendations. Figure 32 shows an aerial view of the Coldwater River 12-digit HUC subwatersheds within the Isabella Reservation.

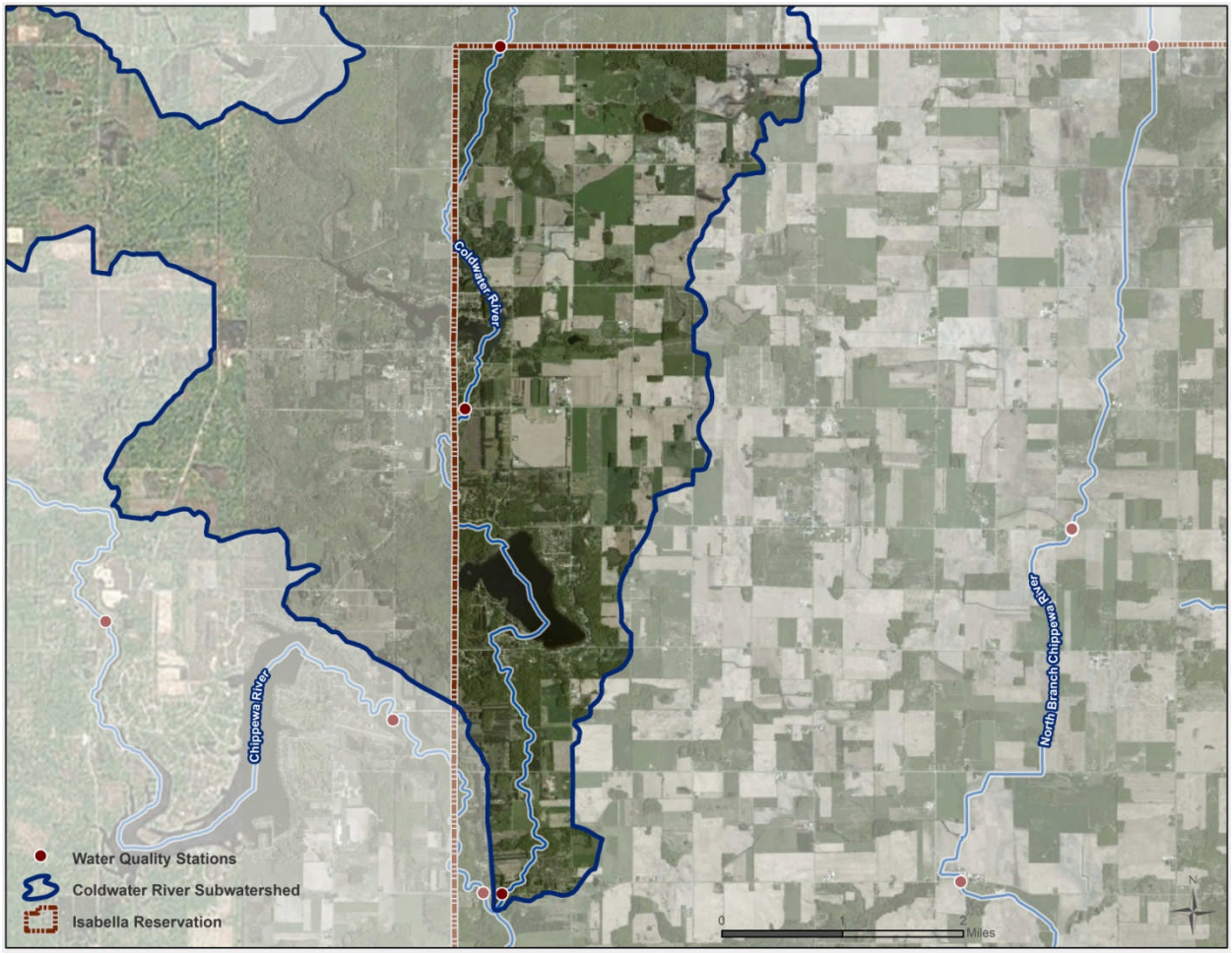


Figure 32. Coldwater River Tribal 12-digit HUC subwatershed Boundaries

North Branch Chippewa River

The North Branch Chippewa River begins in Isabella County and flows south towards Mt. Pleasant. It is a major tributary to the Chippewa River. A previous 319 project (*The North Branch Chippewa River 319 Watershed Project*) in the watershed found that an intensive network of agricultural drainage tiles combined with the subwatersheds clay soils and rolling typography lead to unstable flows and high water velocities on the North Branch Chippewa River (USEPA 2012c). Figure 33 shows an aerial view of the North Branch Chippewa River 12-digit HUC subwatersheds within the Isabella Reservation.

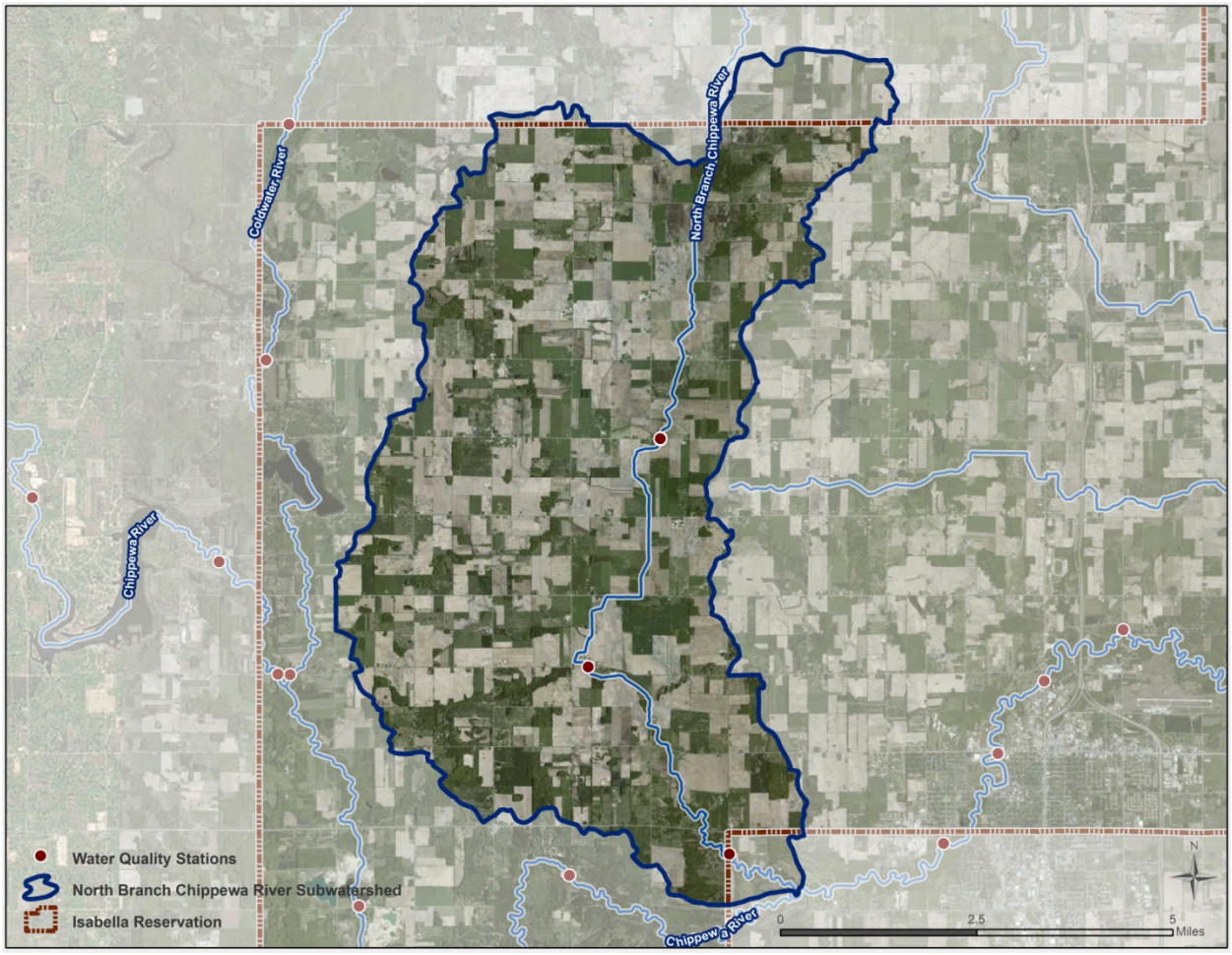


Figure 33. North Branch Chippewa River Tribal 12-digit HUC subwatershed Boundaries

Saganing River

The Saganing River travels through the SCIT Saganing parcels as it flows to the Saginaw Bay and then Lake Huron. The February 25th 2012 State of the Tribe Address by Dennis V. Kequom, Sr. in Mt. Pleasant, Michigan noted that water and waste water treatment facilities were being constructed in Saganing that would serve the tribal community in Standish and the community center and casino. Personal communication with Carey Pauquette indicates that the river has experienced historically low flows in the past decade. Through conversation with USGS, Pauquette was informed that the Saganing River was a good walleye fishery as recent as the late 1990s. The river used to be 4 foot deep and now is wadeable (Carey Pauquette, SCIT Water Quality Specialist, Personal Communication, December 18th, 2012). Additional investigation and research will seek more information as there are many possible causes of low flows. Figure shows an aerial view of the Saganing River 12-digit HUC subwatershed.

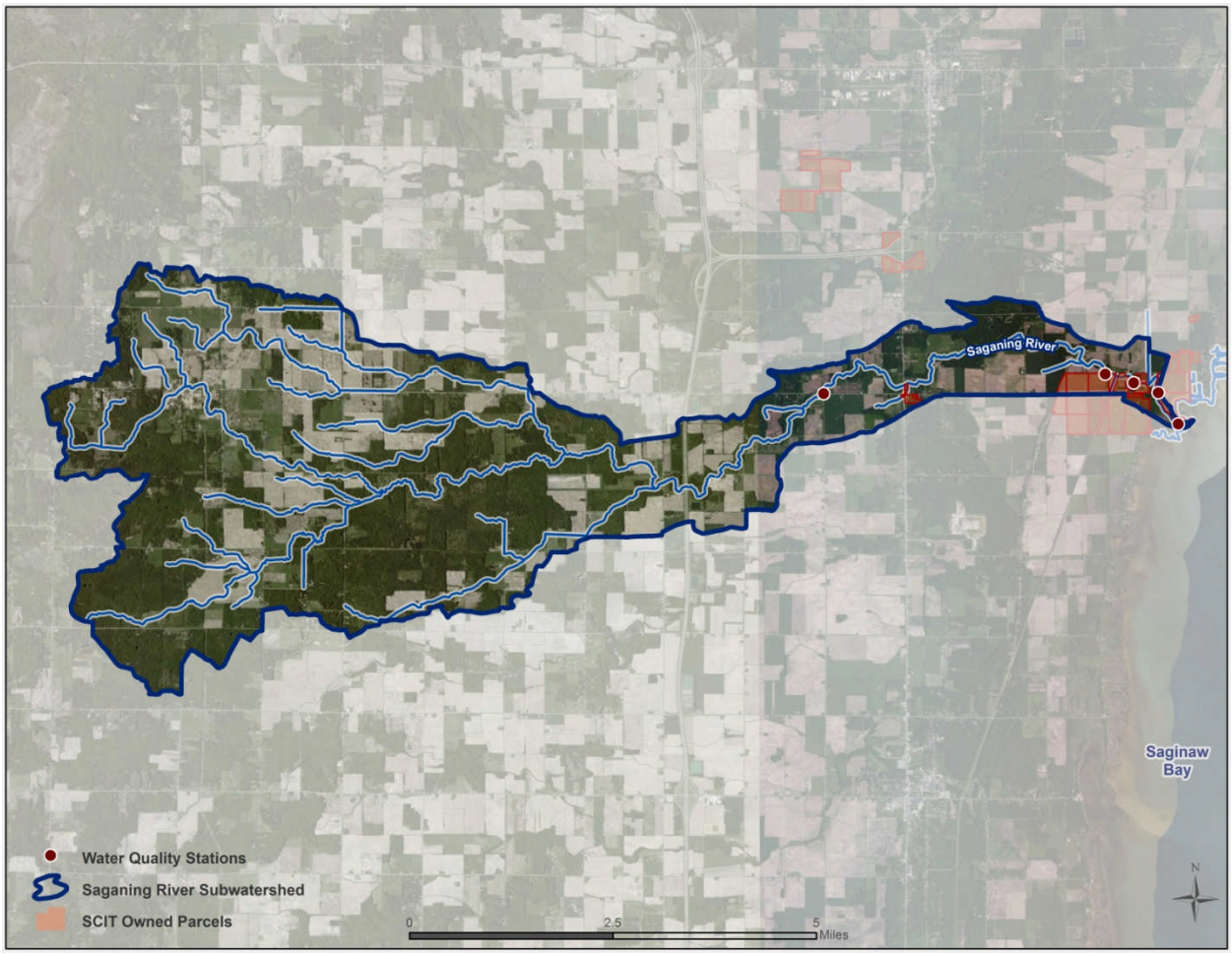


Figure 34. Saganing River Tribal 12-digit HUC subwatershed Boundaries

Salt River

The Salt River watershed drains to the Tittabawassee River outside of the Isabella Reservation boundaries near Midland. The stream is not currently sampled by the SCIT. The Salt River forms from the confluence of the South Branch Salt River and the North Branch Salt River. The South Branch Salt River headwaters are mostly county drains with significant anthropogenic alterations. From 1997 to 2004 the Isabella Conservation District worked on two 319 projects for the North and South Branches of the Salt River. At that time riparian vegetation loss was a primary concern causing significant erosion problems. Figure 35 shows an aerial view of the Salt River watersheds 12-digit HUC subwatersheds within the Isabella Reservation.

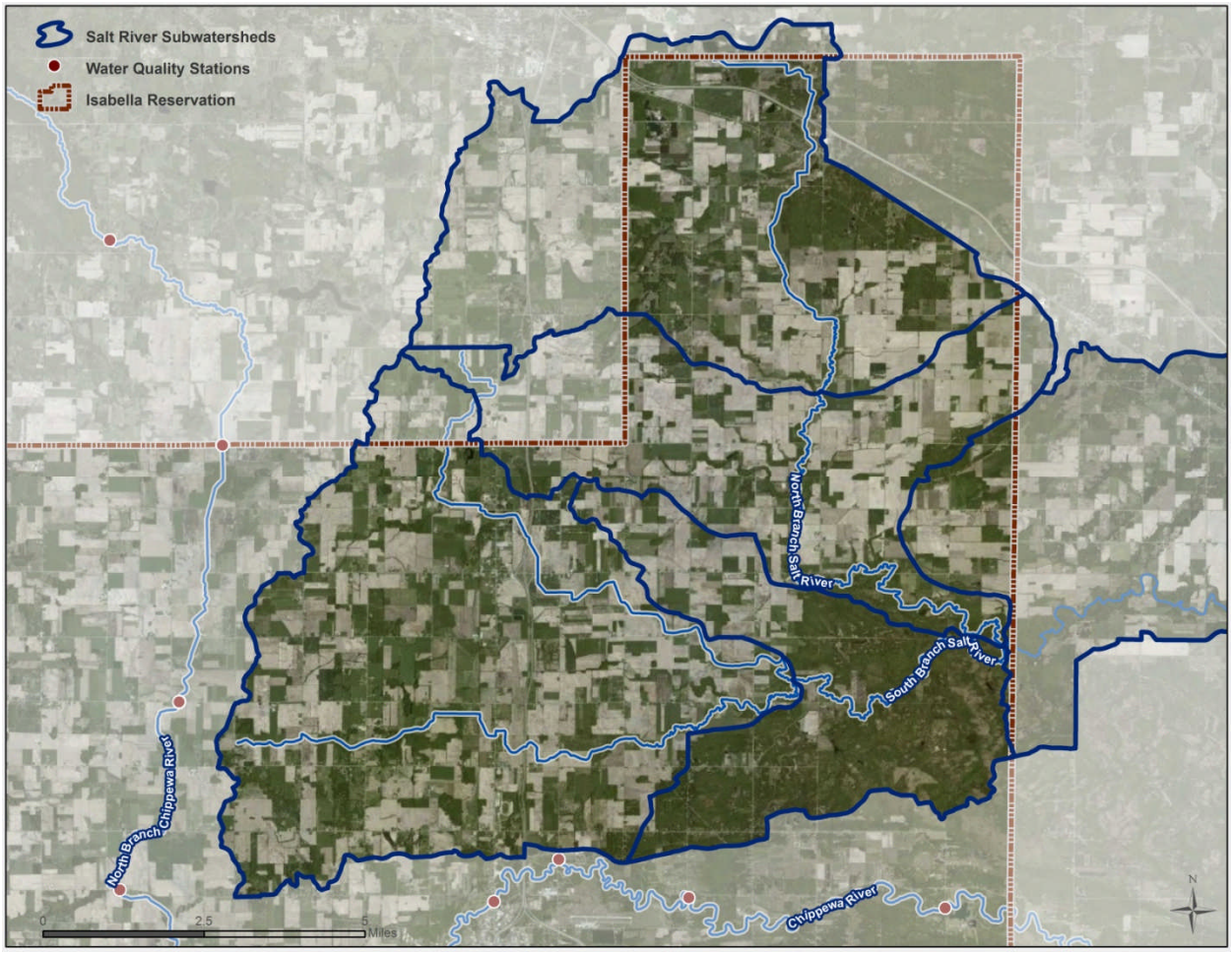


Figure 35. Salt River Tribal 12-digit HUC subwatershed Boundaries

Surface Water Flow Data

There is one active USGS gage on the Chippewa River near Mount Pleasant, MI. The gage has been active since 1931 and drains 416 square miles of the Chippewa River watershed. Figure 36 displays the flow duration curve for the Chippewa River USGS gage. Flow duration curves provide a way to address flow data variability and flow-related water quality patterns. Duration curves describe the percentage of time during which specified flows are equaled or exceeded (Leopold 1994). Flow duration analysis looks at the cumulative frequency of historic flow data over a specified period, on the basis of measurements taken at uniform intervals (e.g., daily average). Duration analysis results in a curve that relates flow values to the percent of time those values have been met or exceeded.

Duration curves provide the benefit of considering the full range of flow conditions (U.S. EPA 2007). Developing a flow duration curve is typically based on daily average stream discharge data. A typical curve runs from high flows to low flows along the x-axis, as illustrated in Figure 36. Note the flow duration interval of 60 associated with a stream discharge of 217 cubic feet per second (cfs) (i.e., 60 percent of all observed stream discharge values equal or exceed 217 cfs).

Flow duration curve intervals can be grouped into several broad categories or zones. Those zones provide additional insight about conditions and patterns associated with water quality degradation where hydrology might play a major role. One common way to look at the duration curve is by dividing it into five zones, as illustrated in Figure 36: one representing high flows (0 to 10 percent), another for moist conditions (10 to 40 percent), one covering mid-range flows (40 to 60 percent), another for dry conditions (60 to 90 percent), and one representing low flows (90 to 100 percent).

This approach places the midpoints of the moist, mid-range, and dry zones at the 25th, 50th, and 75th percentiles, respectively (i.e., the quartiles). The high-flow zone is centered at the 5th percentile, while the low-flow zone is centered at the 95th percentile. Stream discharge from 1931 to 2012 on the Chippewa River near Mt. Pleasant ranges from 19 cfs to 6210 cfs as shown in Figure 36. High flows are typically 593 cfs or above and low flows are typically 136 cfs or below.

There are no long term USGS streamflow gages on the North Branch of Chippewa River, the Saganing River, the Coldwater River, or the Salt River.

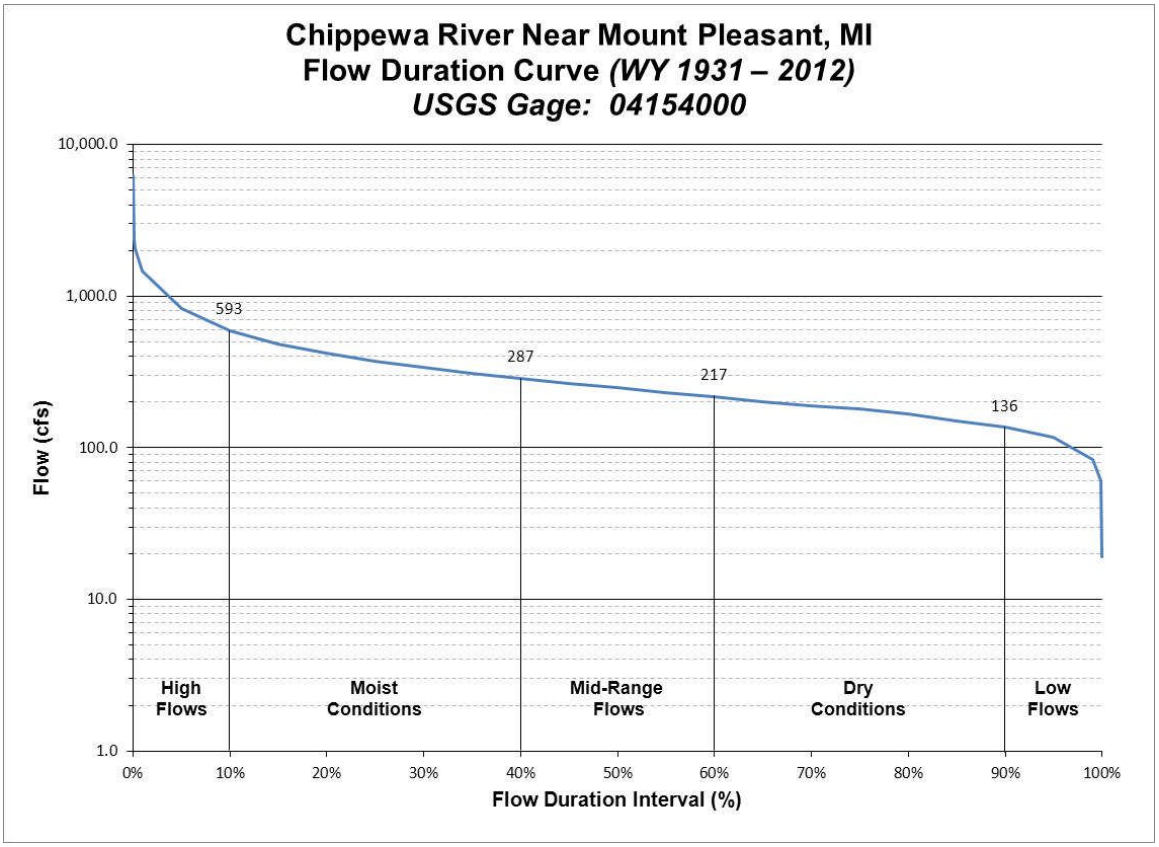


Figure 36. Flow Duration Interval for the Chippewa River near Mt. Pleasant, MI

Designated Beneficial Uses

Tribal waters within the Isabella Reservation are used for drinking water, as well as recreational uses. Groundwater near the Chippewa River in Mt. Pleasant supplies drinking water for the City of Mt. Pleasant, where many members of SCIT live.

Currently the SCIT has not identified the designated beneficial uses of the SCIT's surface water though it is the tribe's goal for tribal waters to support uses identified in the draft motoring plan (see Table 11).

Table 11. SCIT Intended Waterbody Uses and Monitoring Priority

Waterbody and Uses	Intended Uses	Prioritization & Reasoning	Potential Issues to be Addressed
North Branch of Chippewa River	Fishing / Fishery nursery; Agriculture; runs into Main Branch of the Chippewa River – used for Full Body Contact and source water	Elevated E. coli detected. Suspected sedimentation, nutrient, and pathogen source for downstream full body contact location	Monitoring data will be used to assess severity of issues and to assist in planning future restoration projects if necessary.
Saganing River	Fishing / Fishery Nursery; Agriculture	Significant flow reduction over past 2 decades. High suspended solids; signs of eutrophication. Prior reports suggest former diverse fish nursery for species such as smelt, walleye, etc.	Data will be used to assess severity of issues; measure seasonal flow; document if river is meeting State of Michigan Water Quality Standards.
Coldwater River	Fishing / Fishery	Formerly EPA TMDL stream; formerly designated as Coldwater Trout Stream by State of Michigan. Previous issues with sedimentation; high temperatures; and low biodiversity.	Data will be used to assess severity of issues; assess if river is meeting Water Quality Standards.
Salt River	Agriculture; Swimming; Fishing	Baseline data is necessary on River. There is no historical data for this river.	Data will be used to collect baseline for comparison of future data. Also to determine if River is meeting Water Quality Standards.
Main Branch of Chippewa River	Full Body contact swimming; recreational boating; fishing; source water; agriculture	Continued monitoring to compare to historical data to determine if eutrophication is happening.	Data will be used to compare to historical data to evaluate if eutrophication is happening or changes in river system.
Grewes Lakes	Swimming/ Fishing	Direct Tribal Council directive; first beach owned directly by tribe.	Public health and safety relating to pathogens.

For purposes of this NPS Assessment report, the beneficial uses established by the State of Michigan are used to evaluate all tribal waters. These beneficial uses are available in the 'Water Quality and Pollution Control in Michigan, 2010 Sections 303(d), 305(b), and 314 Integrated Report.' Section 4.3 Determination of Designated Use Support:

- At a minimum, all surface waters of the state are designated and protected for all of the following designated uses: agriculture, navigation, industrial water supply, warmwater fishery, other indigenous aquatic life and wildlife, partial body contact recreation, and fish consumption [Rule 100; R 323.1100(1)(a)-(g)] of the Part 4 Rules.

- In addition, all surface waters of the state are designated and protected for total body contact recreation from May 1 to October 1 [R 323.1100(2)].

- Specific rivers and inland lakes as well as all Great Lakes and specific Great Lakes connecting waters are designated and protected for coldwater fisheries [R 323.1100(4)-(7)].

- Several specific segments or areas of inland waters, Great Lakes, Great Lakes bays, and connecting channels are designated and protected as public water supply sources [R 323.1100(8)].

Groundwater

Limited information is available about the quality or quantity of the Isabella Reservation groundwater. In 2011, the SCIT hired a consultant to study a small area north of Pickard Road for potential public water supply. This report gives a brief summary of groundwater quality and quantity on the Reservation. The 2011 *Hydrogeological Study for A Type I Public Water Supply Well* report by Fishbeck et al. suggests that there is hydraulic connectivity between the shallow glacial aquifer and Chippewa River. The study found that there was an overall easterly flow of groundwater to Chippewa River. In 2006 and 2007 well water data was sampled near Saganing Eagles Landing. There were elevated levels of iron, chloride, sulfate, and radium. 2010 sampling showed levels of iron, manganese, and sulfate that exceeded the federal secondary drinking water standards.

A MDEQ/USGS inventory and mapping project indicates that recharge (the amount of water that infiltrates the unsaturated zone to replenish groundwater) near the Pickard Road study area is between 5 to 9 inches a year. The accuracy is estimated to be +-2.44 inches/year (Fishbeck 2011b).

SECTION 6 – RESULTS

This section presents available data for each waterbody and analyzes the status of the tribal waters located within the SCIT's Isabella Reservation. Descriptions of NPSs in the Reservation are provided followed by a discussion of each pollutant and any potential spatial trends. Data for each individual 12-digit HUC subwatershed is then summarized and goal attainment status is determined. This section is organized as follows:

Water Quality Data Analysis
- NPSs or Causes of Concern

Data Presentation and Analysis
- Dissolved Oxygen
- Temperature
- pH
- Specific Conductivity
- Total dissolved solids
- Turbidity
- Total Nitrogen
- Total Phosphorus
- *E. coli*
- Macroinvertebrates

Data Interpretation for each 12-digit HUC subwatershed
- Use Goal Attainment Status Determination
- Chippewa River
- Coldwater River
- North Branch Chippewa River
- Saganing River
- Salt River

Water Quality Data Analysis

In this section the SCIT surface water quality data collected between the years 2004 to 2011 are discussed for the entire Isabella Reservation and then by 12-digit HUC subwatershed. The 12-digit HUC subwatersheds are presented from upstream to downstream. Statistical data for each pollutant, as well as graphs that compare the data to water quality standards selected as interim tribal water quality goals and reference conditions for selected parameters, are shown below.

Interpretations of water quality data were based on the comparison of data to applicable state criteria or ecoregion reference conditions (based on beneficial uses) for each waterbody. State beneficial uses and SCIT intended uses are shown in Table 14 through Table 32 below by 12-digit HUC subwatershed, waterbody, and sampling site.

NPSs or Causes of Concern

Several types of general NPSs are present throughout the Reservation; they are described below. Where specific NPSs were identified for a particular subwatershed, they are identified in the 12-digit HUC subwatershed discussions that follow the general NPS descriptions below.

Agricultural Runoff

Agricultural activities on the Isabella Reservation include pasture land (31 percent of Reservation land use) and row crops (24 percent of Reservation land use).

NPS pollutant issues from agricultural runoff on the Reservation might include the following:

• Pasture land (grazing) (sediment, nutrients, *E. coli*)

  - Streambank erosion from unrestricted livestock grazing in and around streams (sediment)
  - Soil slumping in unrestricted livestock grazing areas (sediment)
  - Destruction of riparian vegetation from unrestricted livestock grazing in and around streams (sediment, temperature)
  - Contaminated runoff and direct deposition of manure to streams (nutrients, pathogens)
  - Animal holding facilities near streams don't always have a buffer
  - Lack of manure storage and poor manure management

• Crop production (sediment, nutrients, pesticides)
  - Tile drainage practices
  - Runoff from cropped or fallow fields
  - Rill and gully erosion from cropland flow
  - Tillage practices
  - Lack of buffers
  - Improper application and management of manure/fertilizers

There is a need for best management practices (BMPs) in some areas to prevent runoff from entering surface waters in addition to protecting streams and riparian areas from the potential harmful effects of grazing. In addition to agricultural NPSs within the Reservation, surface water quality can be adversely affected by agricultural operations upstream of the Reservation boundaries.

On-site wastewater systems (Septic systems)

Improper disposal of domestic sewage due to improperly installed, failing, or nonexistent septic systems or from discharge of redirected gray water can contribute nutrients and pathogens to surface waters. Septic systems that are properly designed and maintained should not serve as a source of contamination to surface waters, however, septic systems do fail for a variety of reasons. Septic system failures result in the release of *E. coli*, total nitrogen, and total phosphorus to surface waters (Horsely and Witten 1996).

Based on an area weighted estimate using 1992 and 1998 census information on septic use approximately thirty four percent of the population on the Reservation are served by individual septic systems. This is a total of approximately 3,300 septic systems. Of these septic systems, 1.4 percent are potentially failing (NESC 1992 & 1998). The SCIT intends to work with the central Michigan health district, the Bureau of Indian Affairs (BIA), the Indian Health Service, and the Intertribal Council of Michigan to identify and address malfunctioning systems in the future.

Stormwater runoff from communities and other developed areas

There are several communities and developed areas within the Isabella Reservation including Mt. Pleasant, Weidman, Beal City, Loomis, and Rosebush. Stormwater runoff from communities and other developed areas flows overland and is channeled toward nearby surface waters. Stormwater runoff from these areas can contribute sediment, oil and grease, solid waste, nutrients, biochemical oxygen demand, toxic substances, and other pollutants to surface waters. Urban runoff can also alter natural stream hydrology and morphology causing increased sediment erosion.

Construction

With economic growth within the SCIT there is potential for urban development and construction projects like the new waste water treatment plant in Arenac County. Any projects over 1 acre will require a stormwater permit, the tribe can use 319 funds to do site inspections or to implement tribal ordinances on these sites but cannot do permit required work with 319 funding. Smaller sites that do not fall under the Phase II stormwater requirements could use construction BMPs to minimize sediment loads from the projects. The SCIT are concerned about the removal or tree canopy and lack of buffers used during new construction on Reservation lands.

Roads

Currently the SCIT has contracted The Isabella Road Commission for a road project on Summerton Road (Broomfield – Remus) on a 1 Mile section of road in Union & Chippewa Township. The project will pulverize, pave, and create gravel shoulders. The project will also replace a culvert at Onion Creek Drain with a Concrete Box Culvert. With grading and other maintenance activities like this project there is potential for delivery of significant sediment loads to surface waters as many roadways drain to surface waters. Improperly designed culverts also have the potential to increase water velocity, impede fish movement, and increase scouring of downstream habitat.

Hydrologic/Habitat Modifications

Streambank erosion, bank cutting, and sedimentation occur throughout the watershed. Loss of riparian vegetation is a contributor to this erosion and sedimentation as well as a potential source of elevated stream temperatures. The watershed is losing ash trees to the invasive ash borer, and the watershed has a history of logging. In addition to the loss of native vegetation, invasive species are crowding out beneficial riparian vegetation. Channelization, tile drainage, and flow regulation are also contributing to modified hydrology and increased sedimentation and erosion.

Other Natural Sources

Background soil conditions on the Reservation could be contributing to elevated nutrient and specific conductivity concentrations in surface waters across the Reservation. Limited information exists, however, on natural background concentrations of pollutants in soil or groundwater.

In addition to natural background soil conditions deer, birds, and other wildlife can also contribute to surface water contamination. Birds and other wildlife that live and feed in riparian areas can contribute to elevated nutrients and fecal coliform bacteria in surface waters.

Point Sources

Point sources could also be contributing to the source load to Reservation waters. Although this is not the focus of the report the following four NPDES permitted facilities are located within the Isabella Reservation Boundaries that discharge to Chippewa River:

- The Isabella County Landfill, Design Flow 0.36 MGD, NPDES Permit Number MI0054003
- Mt. Pleasant Waste Water Treatment Plant, Design Flow 4.14 MGD, NPDES Permit Number MI0023655
- Union Township Waste Water Treatment Plant, Design Flow 1.2 MGD, NPDES Permit Number MI0055808
- SCIT Isabella Reservation Waste Water Treatment Plant, Design Flow 0.58 MGD, NPDES Permit Number MI0054861
- SCIT Saganing Water and Waste Water Treatment Plant, Design Flow 0.4MGD, NPDES Permit Number MI0058582

Isabella County is authorized to discharge a maximum of 0.36 MGD of treated groundwater from its landfill through an outfall via a drainage ditch discharging to the Chippewa River. The Isabella County Landfill is not currently permitted for any of the SCITs pollutants of concern.

The City of Mount Pleasant Waste Water Treatment Plant (WWTP) is responsible for treating all residential and commercial sanitary sewage generated in the City Limits and is permitted to discharge a maximum of 4.14 MGD to Chippewa River. The facility is permitted to discharge total phosphorus at a maximum concentration of 1.0 mg/L, fecal coliform at a maximum of 200 cfu/100 mL as a monthly geo-mean, and 400 cfu/100 mL as a weekly geo-mean, and a minimum of 5.0 mg/L dissolved oxygen.

Union Township WWTP treats sanitary sewage generated by the Charter Township of Union and is permitted to discharge 1.2 MGD with the same pollutant concentration criteria noted above for Mt. Pleasant.

The Isabella Reservation WWTP is permitted to discharge treated sanitary sewage at a maximum of 0.70 MGD, with the same permit phosphorus and dissolved oxygen concentration limits cited above for Mt. Pleasant and Union Township. The current permits pathogen limits are *E. coli* limits, at a maximum of 126 cfu/100 mL as a monthly geo-mean, and 235 cfu/100 mL as a daily maximum.

The Saganing Water and Waste Water Treatment Plant was completed in 2012 and is permitted to discharge up to 0.4 MGD per day. The facility treats waste water from the casino and other tribal developments.

Data Presentation and Analysis

Dissolved Oxygen

Sufficient Dissolved Oxygen is important for growth and reproduction of aerobic aquatic life in surface waters. An increase in urban and agricultural runoff can result in low dissolved oxygen as microorganisms consume oxygen to decompose runoff from these sources. Most measured Dissolved Oxygen concentrations monitored by the SCIT from 2004 to 2011 are meeting the Michigan standards used as interim tribal water quality goals. Five stations have notably low observed dissolved oxygen concentrations as shown in Figure 37. CHIP 8, CHIP 9B, CR2, SC2 and SC1 all have observed concentrations below the Warmwater fisheries standard. CHIP 8 lies within Mt. Pleasant and CHIP9B is just downstream of Mt. Pleasant. CR2 is just downstream of the town of Weidman and while the statistical data are not below the warmwater fishery standard they are below the coldwater fishery standard which could be an issue if this stream is designated for coldwater trout use. SC1 and SC2 lie near the mouth of the Saganing River and are both on the SCIT parcels. Urbanization of an area can increase chemical contaminants, organic material, and nutrients in runoff to surface waters. Increases in these nutrients can lead to excessive algal growths which increase dissolved oxygen during the day, as demonstrated by dissolved oxygen saturation that exceeds 100 percent (Figure 38).

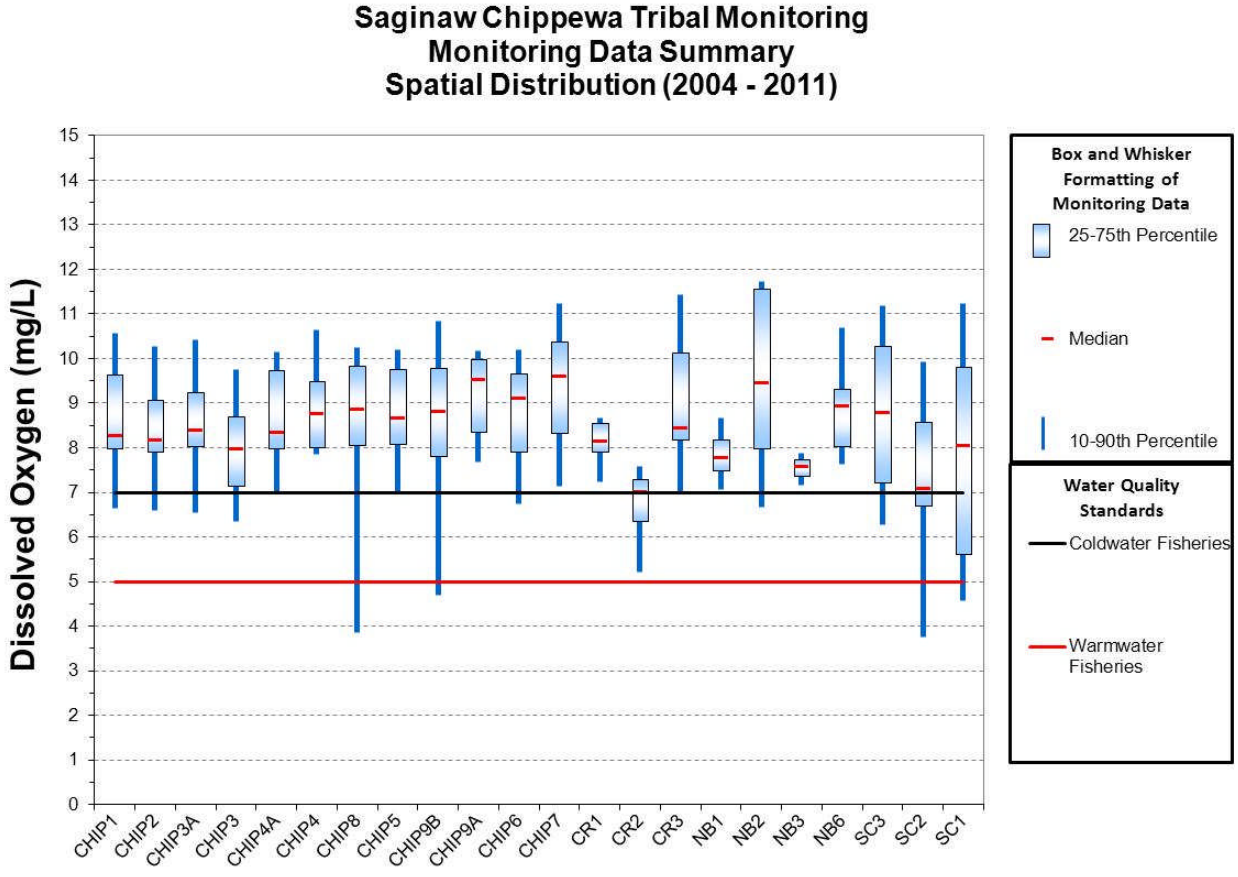


Figure 37. Dissolved Oxygen (mg/L) Spatial Analysis

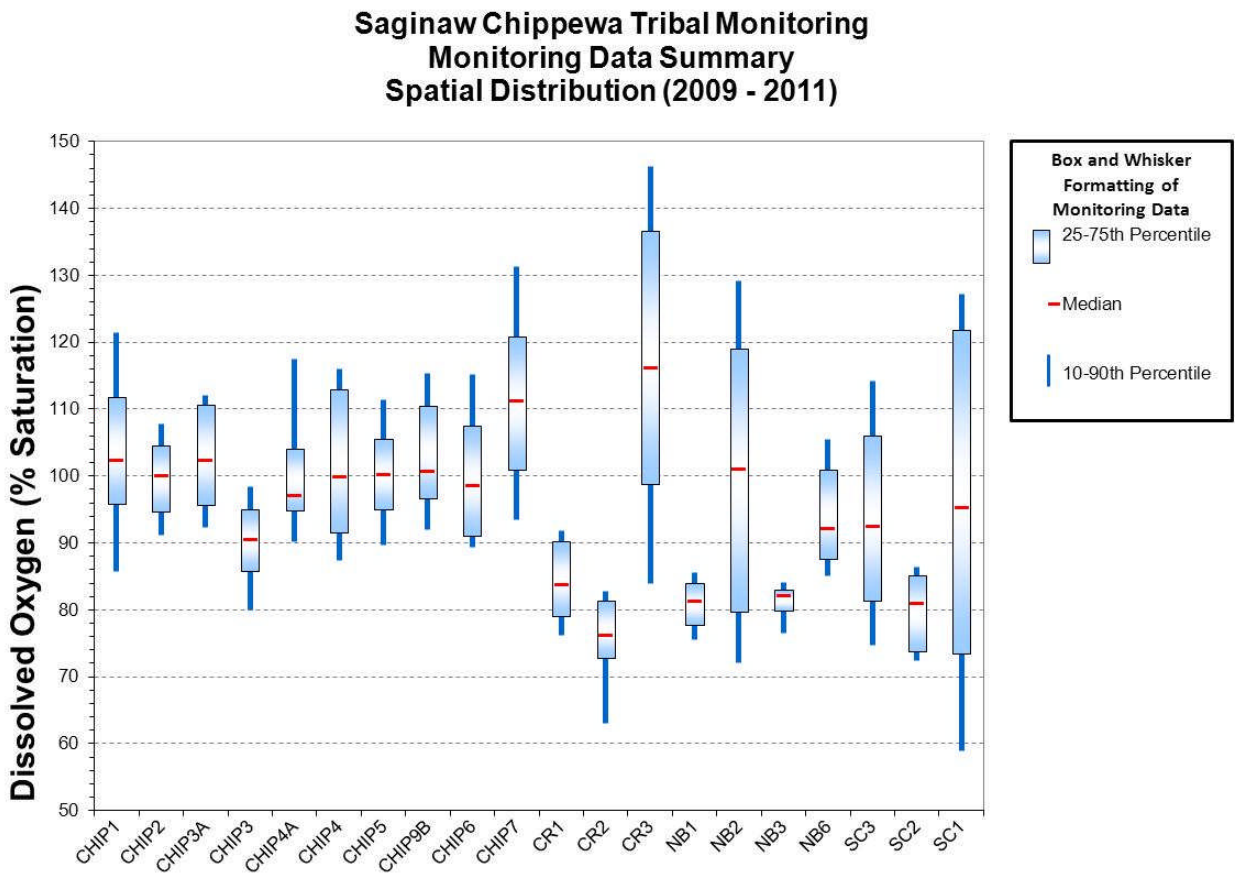


Figure 38. Dissolved Oxygen (% Saturation) Spatial Analysis

Temperature

Temperature is one of the factors that defines the structure and function of aquatic systems. It affects solubility of oxygen and other chemicals and rates of nutrient cycling. Temperature can also determine organism survival, growth reproduction, development, behavior, habitat preference, and competition (USEPA 2012b). Figure 39 shows general temperature trends as sampled by the SCIT from 2004 through 2011. A further analysis of temperature on a monthly basis for each site shows that in April the majority of sites have temperatures above the monthly maximum temperatures expected on warmwater streams. On average 78 percent of the April samples are above the maximum temperature specified in state water quality standards selected to serve as interim tribal water quality goals (Table 3). On average 4.7 percent of samples exceed the maximum temperature in May. There does not appear to be any spatial trend to the temperature exceedances. Coldwater River has been designated for trout use and exceeds the coldwater fishery temperature standards during all sampled months. Past timber harvesting and the removal of tree canopy during new construction may lead to increased temperature. As discussed in Section 5, groundwater interacts with surface water within the Isabella Reservation boundaries, this connectivity year round may be the cause of higher than expected spring temperatures that mimic the summer temperatures in the stream. Higher spring water temperatures may also be related to higher than average air temperatures in recent years. Additional sampling is recommended to determine the cause of early spring temperature exceedances in many of the Reservations streams.

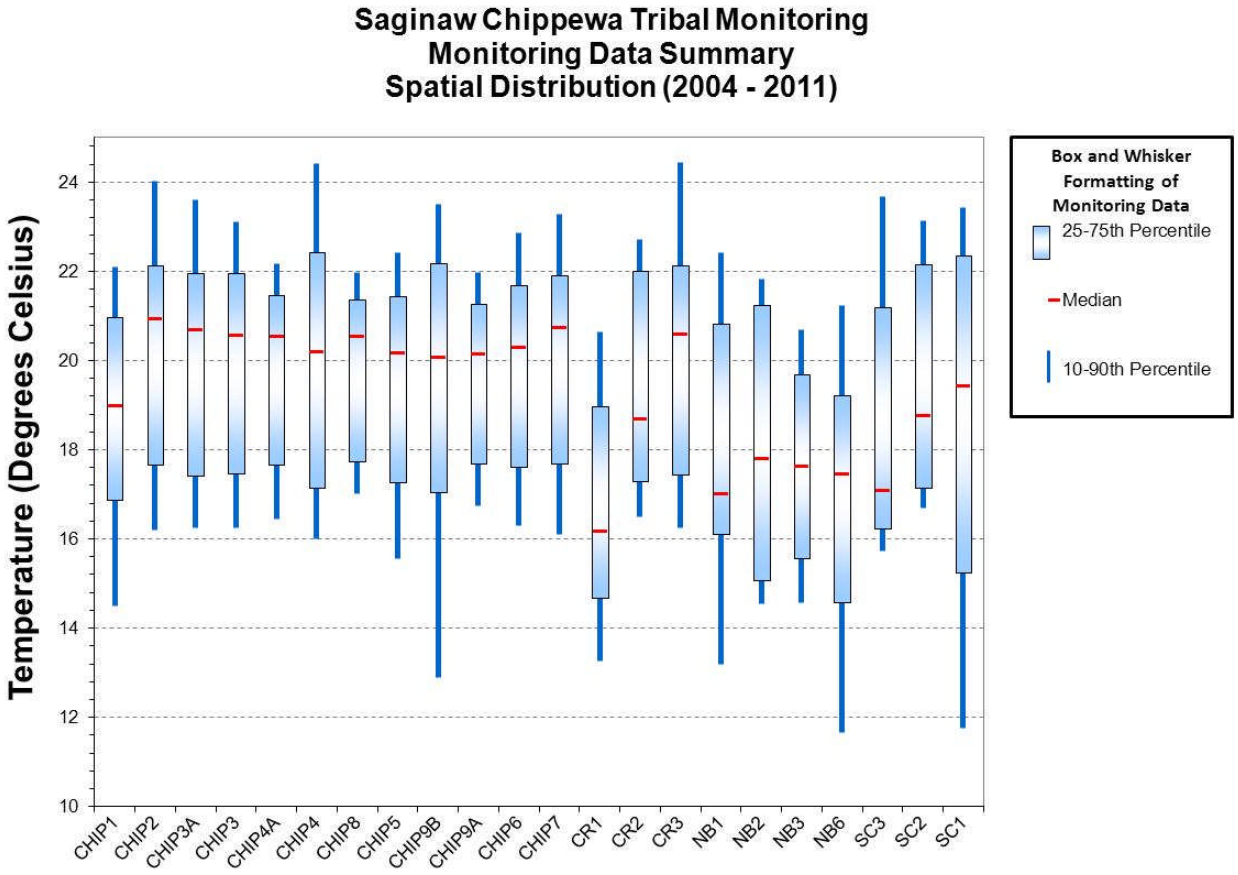


Figure 39. Temperature (C) Spatial Analysis

pH

pH affects most chemical and biological processes in water. pH outside of the 6.5 to 9 range reduces biological diversity in streams by stressing many species, it can result in decreased reproduction, decreased growth, disease, or death (USEPA 2012b). pH sampling by the SCIT does not indicate any issues with pH on tribal waters in the Reservation. One sample on CHIP4A was above 9 and one sample at CHIP7 was below 6.5. In general Chippewa River appears to have slightly higher pH levels than the rest of the rivers sampled by the SCIT, with Saganing River having the lowest pH as shown in Figure 40.

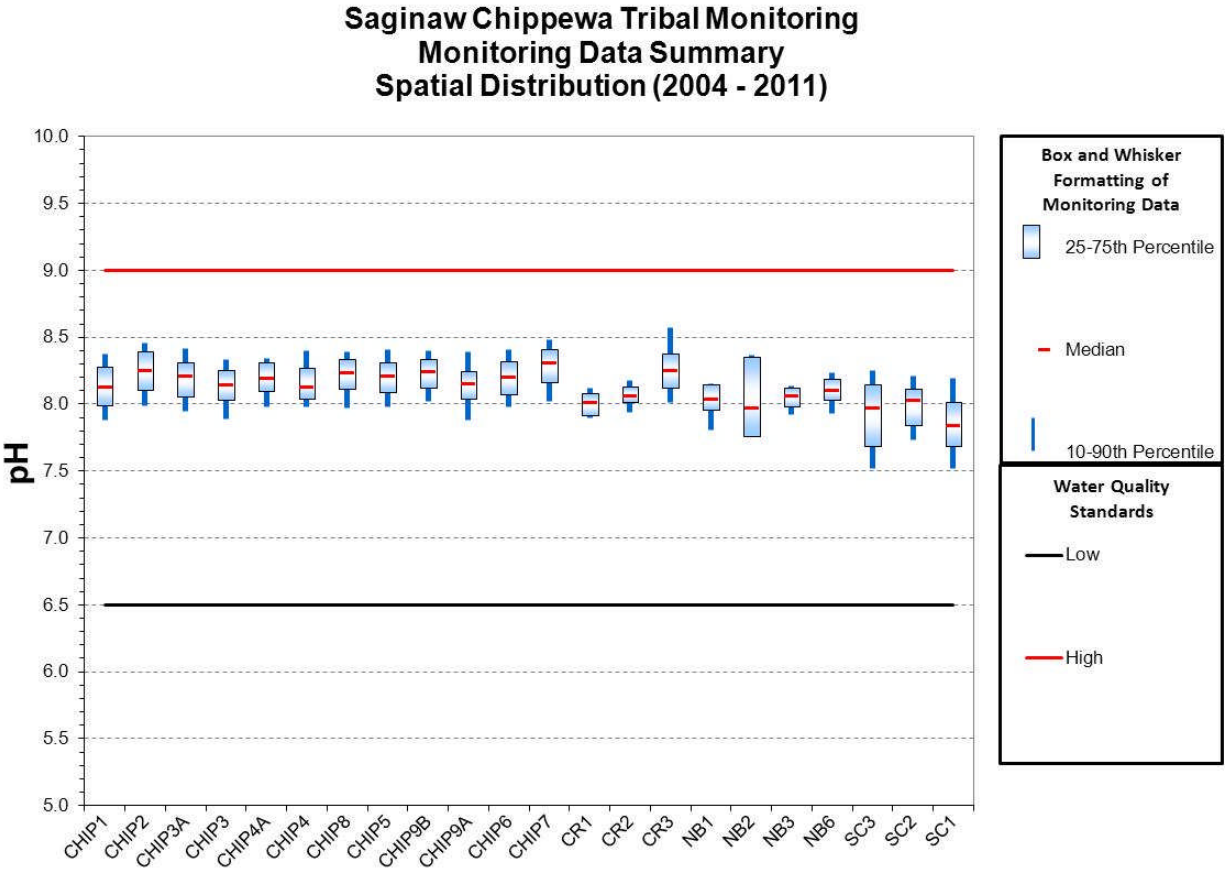


Figure 40. pH Spatial Analysis

Specific Conductivity

Water's ability to pass an electrical current is measured as specific conductivity. Conductivity is affected by dissolved solids in water as well as temperature. In general, geology is the major contributor to surface water conductivity levels. Distilled water conductivity ranges of 0.0005 to 0.003 mS/cm. Conductivity in U.S. rivers generally ranges from 0.05 to 1.5 mS/cm. Inland fresh water studies indicate that streams supporting good mixed fisheries have a range between 0.15 and 0.5 mS/cm. Certain species of fish or macroinvertebrates may have trouble surviving at ranges outside of this. Industrial waters can range as high as 10 mS/cm (USEPA 2012).

Specific conductivity is relatively low and gradually increases moving from upstream to downstream. North Branch Chippewa River was not sampled as often as the Chippewa River but the limited data suggest that specific conductivity increases from a median of 0.38 to 0.62 from upstream NB1 to downstream NB3 and NB6 (Figure 41). Specific conductivity levels are much higher (as high as 1.8 mS/cm) on the Saganing River than the rest of the rivers sampled by the SCIT. TDS levels in Saganing are also high which can lead to increased conductivity (see the next section: Total Dissolved Solids). These higher levels of conductivity and TDS could lead to threatened fisheries.

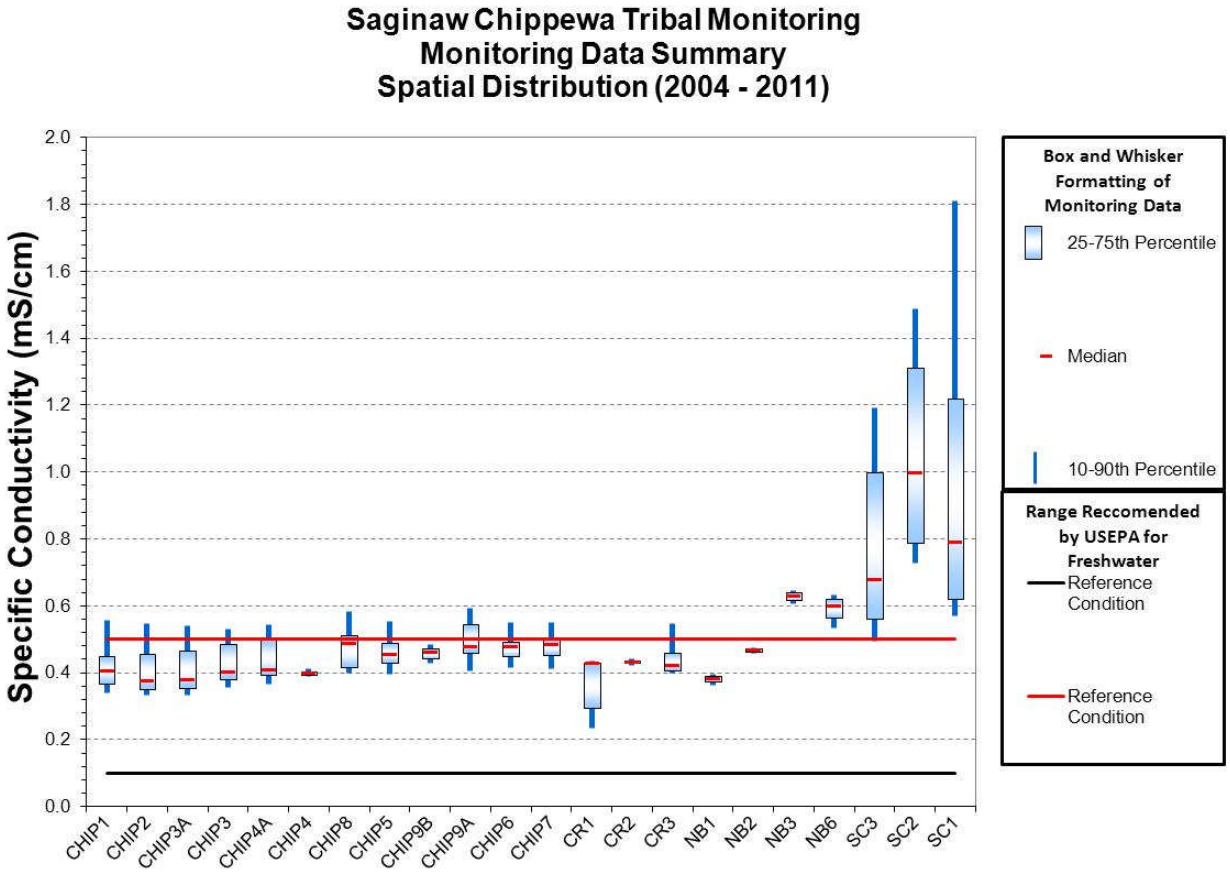


Figure 41. Specific Conductivity (mS/cm) Analysis

Total Dissolved Solids

Total Dissolved Solids are a measure of organic and inorganic components in water including calcium, phosphates, nitrates, sodium, potassium and chloride. Primary sources for TDS in surface waters are agricultural and residential runoff (especially from de-icing agents), leaching of soil contamination and point source water pollution discharge from industrial or sewage treatment plants. Most aquatic life can tolerate TDS values up to 1000 mg/L though spawning fish have been found to be sensitive to lower TDS levels. The SCIT sampling found that most sites in the Isabella Reservation are well below 1,000 m/L TDS, although SC1 on Saganing River has TDS values above 1,000 mg/L (Figure 42).

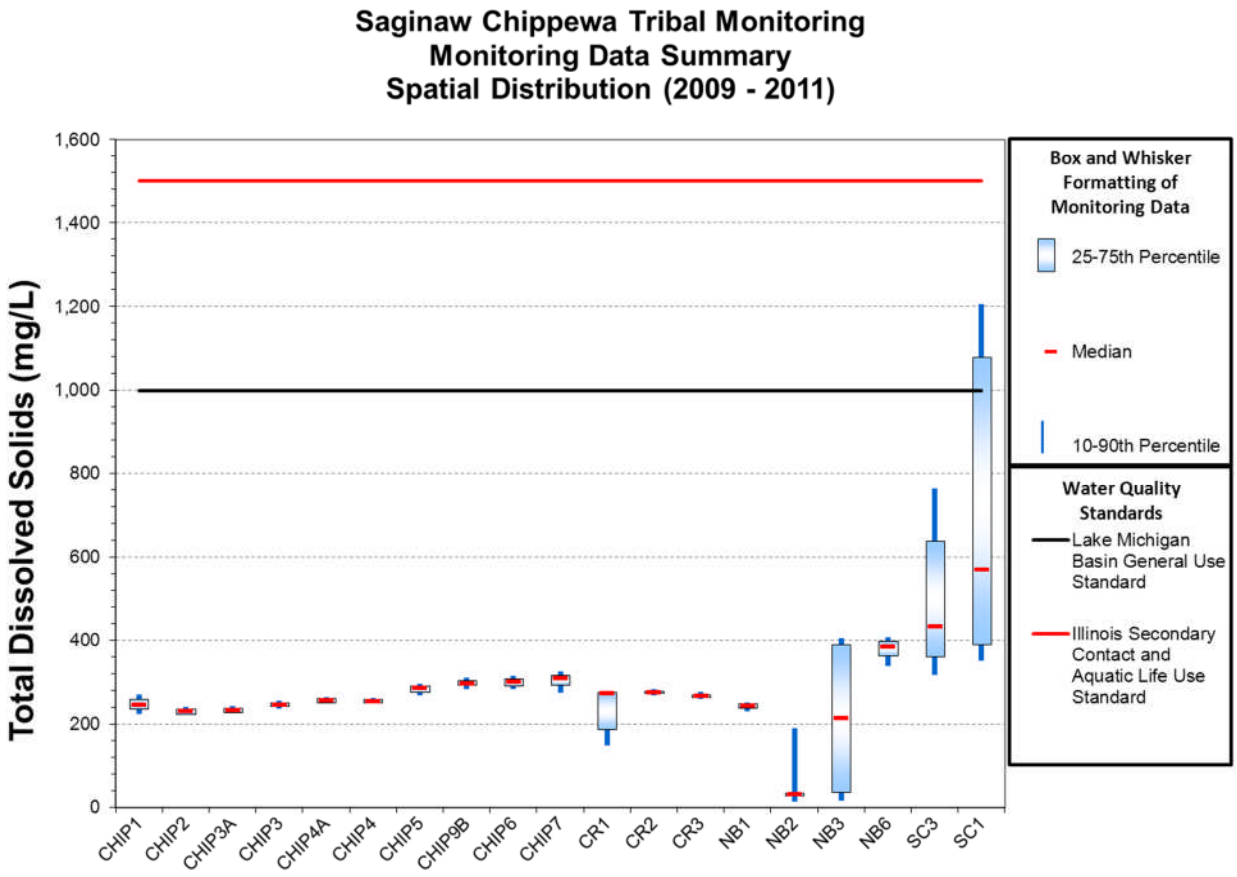


Figure 42. Total Dissolved Solids (mg/L) Analysis

Turbidity

USEPA considers turbidity an early indicator of nutrient enrichment in surface waters (USEPA 2012d). Turbidity can increase due to increases in algal biomass, as well as sedimentation. Turbidity levels sampled by the SCIT from 2004 to 2011 increase moving from upstream to downstream and levels in Saganing River and North Branch Chippewa River are higher than the other rivers. One sample on NB1 was nearly 200 NTU and may have been a sampling error, that outlier was not plotted in the figure below. With higher levels of turbidity it is expected that nutrient levels will also be high in North Branch Chippewa River and Saganing River. Median turbidity values from all the SCIT samples are at 14.5 or below.

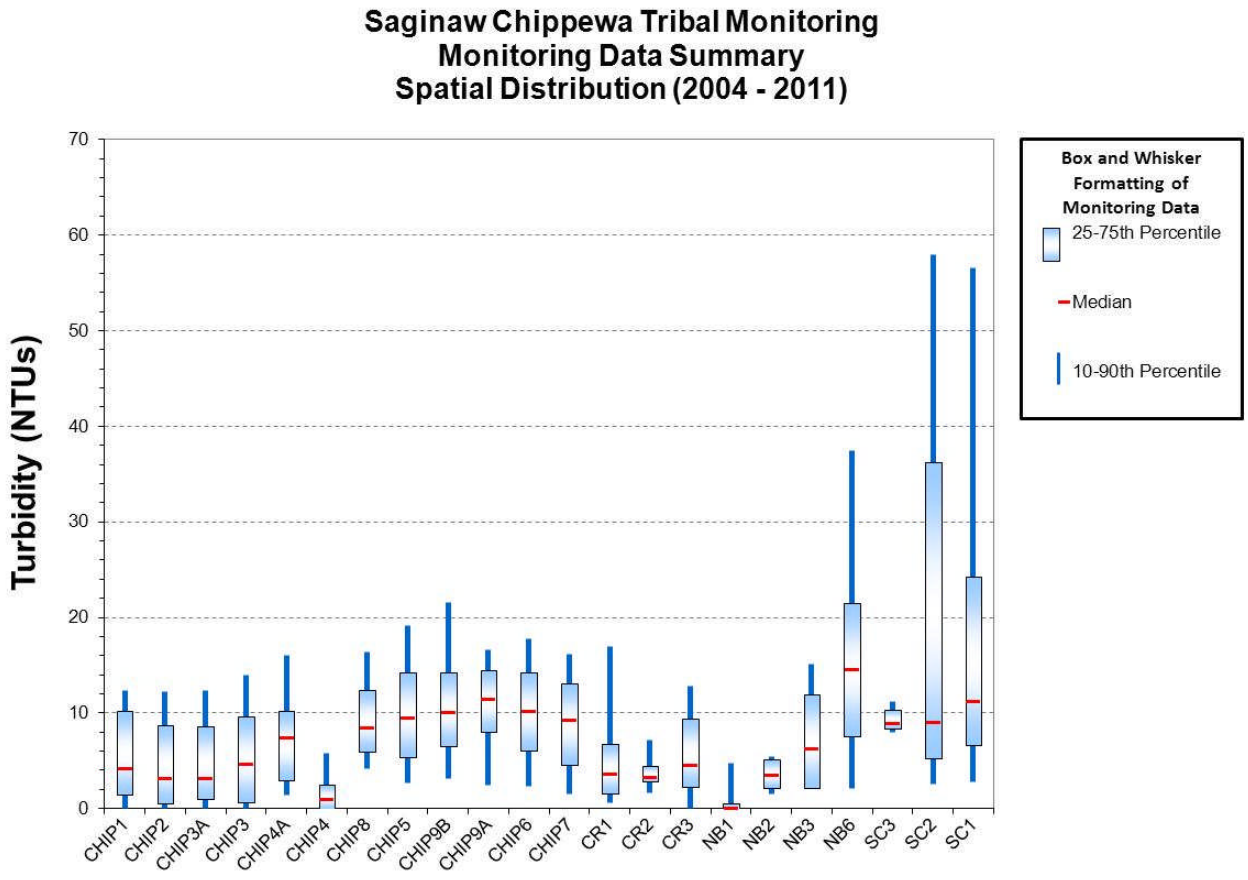


Figure 43. Turbidity (NTUs) Analysis

Total Nitrogen

When nitrogen and phosphorus levels increase in water it can cause algae to grow faster than an ecosystem can handle. High nutrients can harm water quality, food resources and habitats, and it can decrease oxygen needed for aquatic life to survive. Algal blooms can also cause toxicity leading to human illness if in contact with the water or fish that have consumed toxic water. Groundwater nutrient levels can also be harmful to humans as infants are affected by nitrates in drinking water. Excess atmospheric nitrogen can harm the health of soils, waters and forests. Nitrogen sources include atmospheric deposition, domestic effluents, fertilizer, manure runoff, and soil nitrogen.

The SCIT sampled total nitrogen from 2009 through 2011 and trends are not as visible as for the other sampled parameters with only two years of sampling data. In general nitrogen levels appear to increase from upstream to downstream and levels of nitrogen are highest in the North Branch Chippewa River and Saganing River. Median measured nitrogen levels are higher than reference conditions for ecoregion 56 at most sites and above ecoregion 57 reference conditions at sites on North Branch Chippewa River and Saganing River.

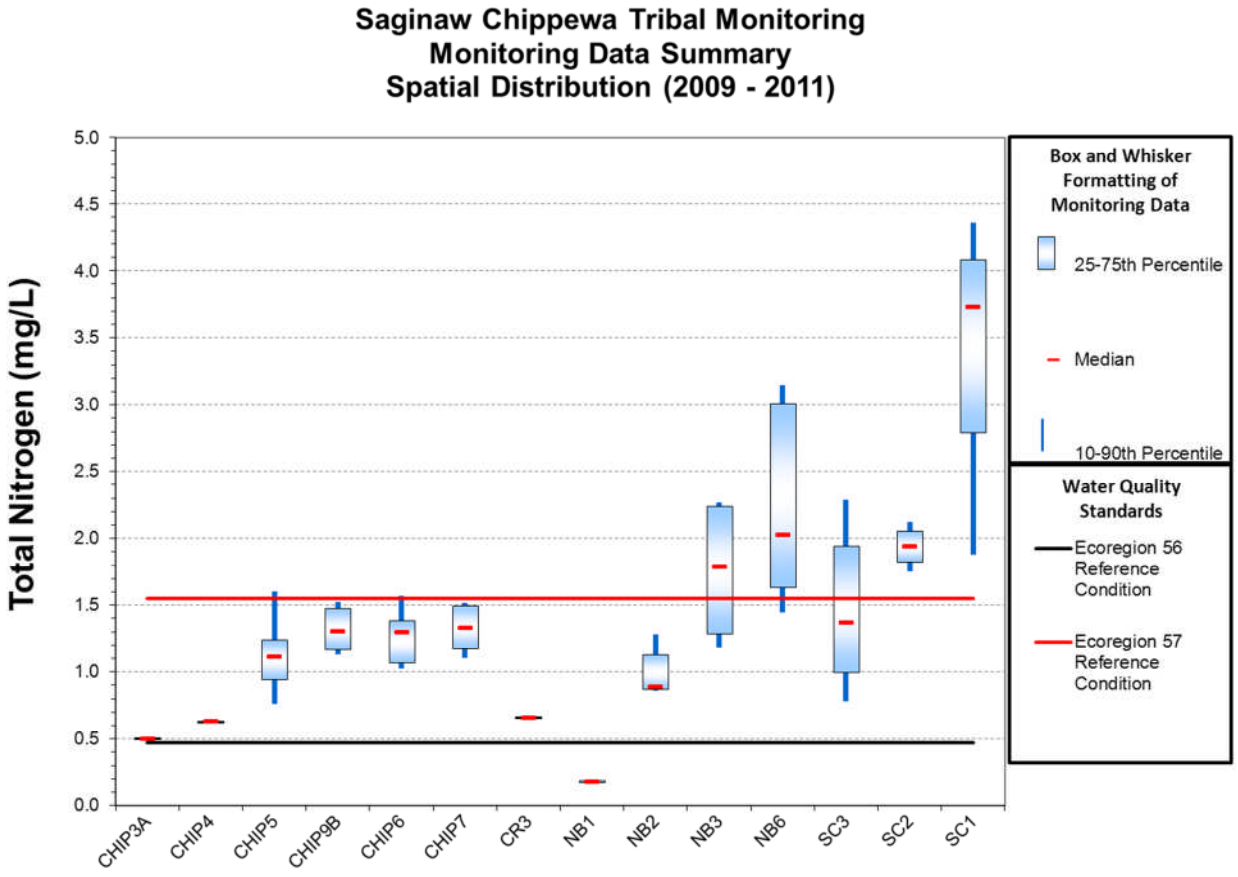


Figure 44. Total Nitrogen (mg/L) Analysis

Total Phosphorus

Increases in phosphorus can result in undesirable plant and algae growth as well as resulting low dissolved oxygen and fish kills. Sources of phosphorus are many and can include waste water and water treatment plants, runoff from fertilized land, failing septic systems, manure storage runoff, drained wetlands, and commercial cleaning preparations. Soil erosion from agricultural fields in Isabella and Arenac Counties could contribute to total phosphorus loads in tribal waters.

The SCIT sampled total phosphorus from 2009 through 2011, and phosphorus was sampled at more sites than total nitrogen. In general phosphorus levels appear to increase from upstream to downstream and levels of phosphorus are highest on Chippewa River near Mt. Pleasant, Coldwater River, downstream North Branch Chippewa River, and Saganing River. Median measured phosphorus levels are higher than reference conditions for ecoregion 56 at sites on Chippewa River, Coldwater River, North Branch Chippewa River, and Saganing River. Median phosphorus levels are below ecoregion 57 reference conditions at all sites.

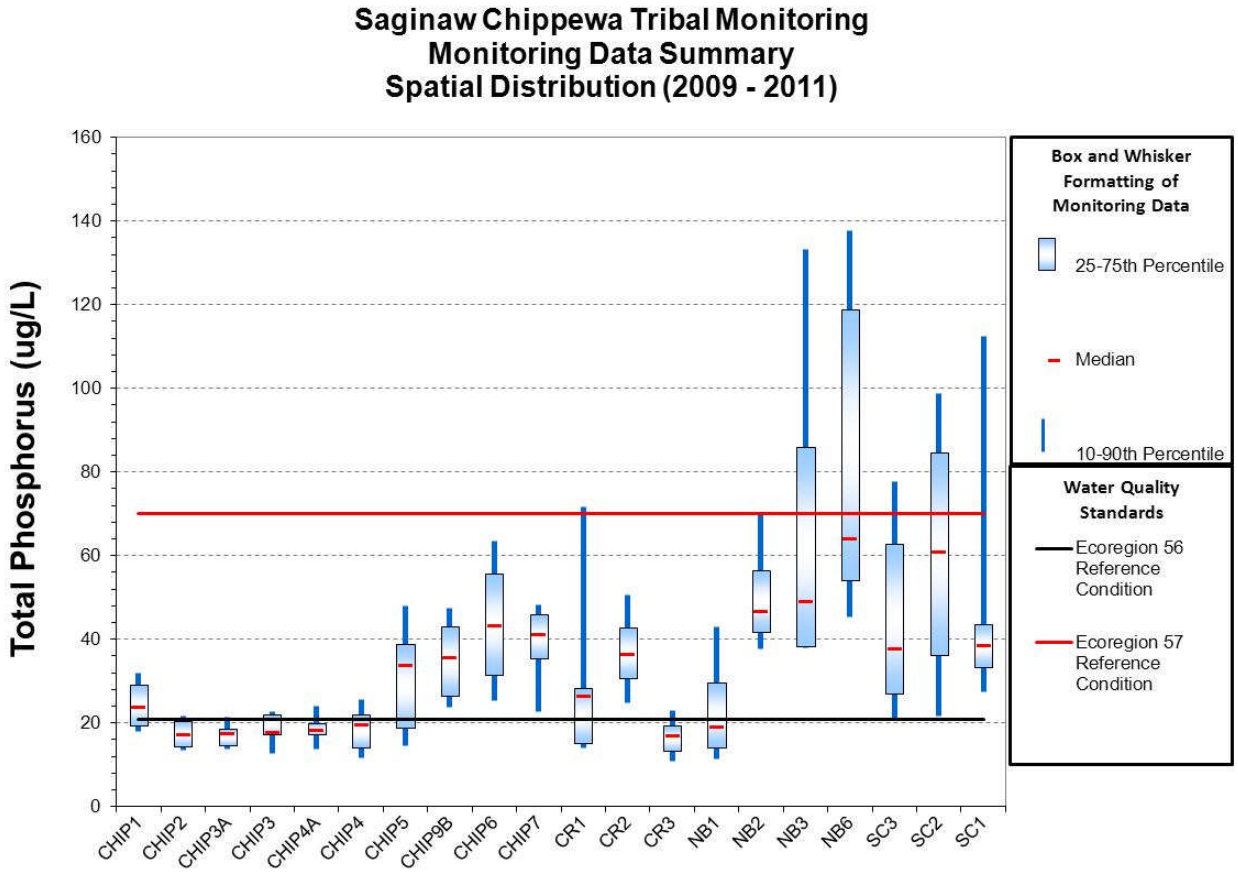


Figure 45. Total Phosphorus (µg/L) Analysis

E. coli

Pathogens in water can cause disease. Though not all forms of *E. coli* cause disease *E. coli* is considered an indicator organism and its presence may indicate other pathogens in the water. Agriculture, failing septic systems, urban runoff, and natural sources of bacteria are potential sources of *E. coli* in the Isabella Reservation. Maximum observed values on all sampled the SCIT waters are above the maximum total body contact standard. Median values on Chippewa River, North Branch Chippewa River, and Saganing River are above the 30 day geometric mean standard.

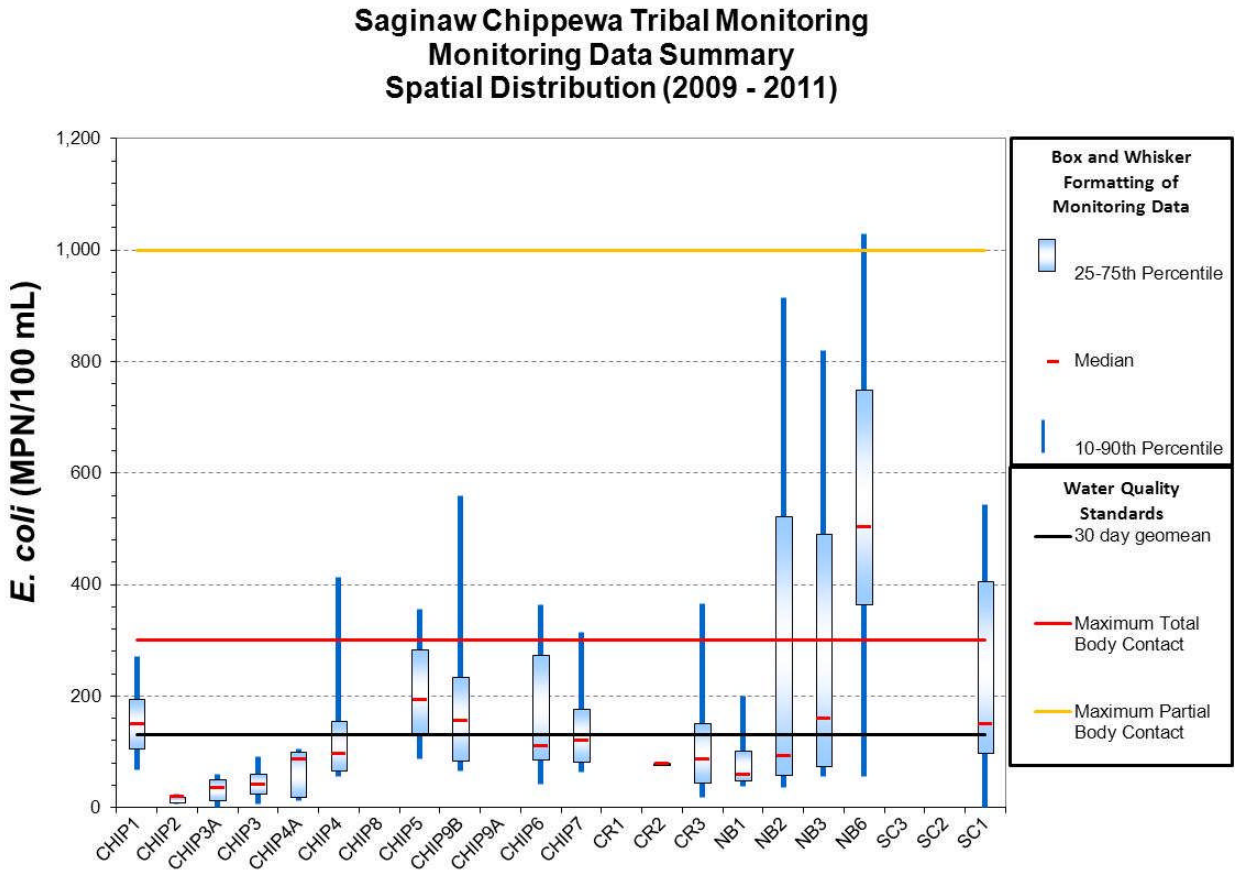


Figure 46. *E. coli* (MPN/100mL) Analysis

Macroinvertebrates

The SCIT has sampled macroinvertebrates at eighteen sites in 2008 and 2010. The SCIT rated these sites as good, fair, or poor based on EPT values listed in Table 12 Using criteria from the *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition* report by Barbour et al. 1999. The macroinvertebrate sampling performed identifies numbers of mayfly, caddisfly, and stonefly larvae which are further described in Table 12. The limited data precludes a detailed water quality analysis. Table 13 displays the EPT scores for each site sampled in 2008 and 2010. Additional sampling is recommended and will be performed on a rotating basin approach once per year in the spring.

Table 12. EPT Metric Descriptions

Metric	Description	Expected Response to Disturbance
Total Number of Mayfly Taxa.	Mayflies are an important component of a high quality stream biota. As a group, they are decidedly pollution sensitive and are often the first group to disappear with the onset of perturbation. Thus, the number of taxa present is a good indicator of environmental conditions.	Decrease
Total Number of Caddisfly Taxa.	Caddisflies are often a predominant component of the macroinvertebrate fauna in larger, relatively unimpacted streams and rivers but are also important in small headwater streams. Through tending to be slightly more pollution tolerant as a group than mayflies, caddisflies display a wide range of tolerance and habitat selection among species. However, few species are extremely pollution tolerant and, as such, the number of taxa present can be a good indicator of environmental conditions.	Decrease
Total Number of Stonefly Taxa.	Stoneflies are one of the most sensitive groups of aquatic insects. The presence of one or more taxa is often used to indicate very good environmental quality. Small increases or small declines in overall numbers of different stonefly taxa are thus very critical for correct evaluation of stream quality.	Decrease

Table 13. Summary of SCIT EPT 2008 and 2010 Data

Year Sampled	Chippewa River														Coldwater River	N. B. Chippewa	Saganing River	
	ST 1	ST 1 Bank & Wood	ST 2 Edge & Wood	ST 2 Run	ST 3 Edge & Wood	ST 3 Run	ST 5	ST 6A	ST 6B	ST 8	ST 9 B E1, W2, R1	ST 10	ST 11	ST 11 Under & Wood	ST 4	ST 7B 1 Edge, 3 Wood, 1 Run	ST 12B E1 and E2	ST 12B Run 7
2008	68			71		82	18	63		54		37	50	17	0	36	38	

Year Sampled	Chippewa River													Coldwater River	N. B. Chippewa	Saganing River	
	ST 1	ST 1 Bank & Wood	ST 2 Edge & Wood	ST 2 Run	ST 3 Edge & Wood	ST 3 Run	ST 5	ST 6A	ST 6B	ST 8	ST 9 B E1, W2, R1	ST 10	ST 11	ST 11 Under & Wood	ST 4	ST 7B 1 Edge, 3 Wood, 1 Run	ST 12B E1 and E2	ST 12B Run 7
2008 Rating	Good			Good		Good	Poor	Good		Good		Fair	Good	Poor	Poor	Fair	Fair	
2010	23	46	18	59	58	72	26		21	35	7				20	6	6	3
2010 Rating	Fair	Good	Poor	Good	Good		Fair		Fair	Fair	Poor				Fair	Poor	Poor	Poor

Rating	**Good**	**Fair**	**Poor**
EPT	>40	20-40	<20

Data Interpretation for each Waterbody

The following section of the report discusses the available water quality data for each 12-digit HUC subwatershed. Data trends and specific NPSs are discussed where applicable. Table 14 through Table 32 site the tribal waterbodies, their beneficial uses, and their goal attainment status. Appendix B provides summary tables of all water quality data sampled by SCIT used in this analysis.

Use Goal Attainment Status Determination

As noted previously in this report, the SCIT has not yet established tribal water quality standards. Until tribal standards are in place, water quality standards developed by the Michigan Department of Environmental Quality will be used as interim tribal water quality goals or targets to guide NPS and other water quality improvement efforts of the SCIT. To determine the areas on the Reservation where goals are not being met, a water quality determination analysis was conducted. Data for each site were compared to applicable state water quality standards, which were based on beneficial uses identified for each site. Reference conditions from national guidance were used when no state standard was available. When 10 percent or more of the samples exceeded the state standard and more than 10 samples were available, a waterbody was designated as “not meeting goals.” If fewer than 10 samples were available in cases where 10 percent or more of the samples exceeded the standard, the waterbody was designated “threatened.” For sites without state water quality standards a waterbody was designated at “threatened” if 10 percent of samples exceeded the least stringent recommended reference condition. Table 15 through Table 30 show the criteria exceeded, goal status, and percent exceedance for each parameter, by subwatershed, for threatened or “not meeting goals” sites.

Waterbodies not meeting the goals were further classified according to degree. Waters were assigned a classification of low, medium, or high goal status on the basis of the percentage of samples that exceeded the standard. If between 0 and 33 percent of the samples exceeded the standard, the waterbody goal status was designated “low”; if between 33 and 66 percent of the samples exceeded the standard, the waterbody goal status was designated “medium”; and if more than 66 percent of the samples exceeded the standard, the waterbody was designated as “high” in terms of not meeting goals. For those waterbodies with less than 10 samples and exceedances further sampling is recommended. For those waterbodies with pollutants that exceed suggested reference conditions further sampling is suggested as well as determining a tribal water quality standard.

Chippewa River

Lake Isabella-Chippewa River (040802020202) (Upstream of the SCIT Reservation)

One station is sampled in the Lake Isabella-Chippewa River HUC upstream of the Isabella Reservation (CHIP1). This station has been sampled from 2004 – 2011 and serves as a baseline of upstream loads from non tribal lands.

In general, concentrations of all parameters sampled at CHIP1 are similar to those downstream at site CHIP2. Total Phosphorus and *E. coli* concentrations are slightly elevated at this site compared to levels downstream at CHIP2 based on sampling from 2004 through 2011 as shown in Figure 45 and Figure 46. Isabella Lake lies between CHIP1 and CHIP2. The lake likely has a diluting effect on nutrient and bacteria concentrations.

Land use draining to CHIP1 is primarily forested though twenty four percent of the land is used for agriculture.

Table 14. Lake Isabella-Chippewa River (040802020202) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Site ID	Beneficial and Intended* Uses
40802020202	Chippewa River upstream of the Reservation	CHIP1	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • **Partial body contact recreation** • **Fish Consumption** • **Total Body Contact Recreation (May 1 – October 1)** • **Public Water Supply Source (In City of Mt. Pleasant)**

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria or reference conditions for the following parameters at the CHIP1 station on the Chippewa River:

- Dissolved Oxygen
- Temperature (April and May)
- Specific Conductivity
- Turbidity
- *E. coli*

The percent exceeding the goal status for most pollutants at CHIP1 is low, although the *E. coli* percent exceeding is medium and the April temperature percent exceeding is high. Additional sampling is recommended for specific conductivity to help the Tribe determine appropriate tribal water quality standards. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures. This sampling should follow the MDEQ frequency protocol so it can be compared to state water quality standards and any future improvements can be documented.

Table 15. Status for the Chippewa River waterbody in the Lake Isabella-Chippewa River (040802020202) subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
CHIP1	Dissolved Oxygen (mg/l)	<5			8
	Temperature (degrees C)	April	>13.3	NMG	83
		May	>21.1		5
	Specific Conductivity (mS/cm)	>0.5		Threatened	19
	Turbidity (NTUs)	>14.5			7
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	57
		Total Body Contact	>300		9

NMG= Not Meeting Goals
*The 2009 and 2010 SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, The 2012 SCIT 106 QAPP for the Water Quality Assessment and Monitoring Program for the Saginaw Chippewa Indian Tribe's Surface Water Resources indicates that *E. coli* samples will be taken weekly from June to October, resulting in 5 sample collections within 30 days to compare to the average geometric mean standard.

Johnson Creek-Chippewa River (040802020207)

Five monitoring locations have been sampled in the Johnson Creek-Chippewa River HUC. These stations have been sampled from 2004 through 2011 though station locations have changed over the sampling history.

CHIP2 lies upstream of the Isabella Reservation. Concentrations at CHIP2 are generally similar to those at the next downstream station (CHIP3A) within the Reservation. TDS, nutrients (Total Nitrogen and Total Phosphorus), and bacteria increase as you move downstream from CHIP2 to CHIP4 within this HUC. Station CHIP3A is upstream of the confluence with Coldwater River while station CHIP3 is downstream. Concentrations at CR3 are similar to those at CHIP3A and CHIP3 and as would be expected there is no drastic increase in parameter concentrations downstream of the confluence with CR3.

Land use in the Johnson Creek-Chippewa River subwatershed is similar to the upstream Lake Isabella subwatershed though there is slightly more agricultural land use.

Table 16. Johnson Creek-Chippewa River (040802020207) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40802020207	Chippewa River		14.64	CHIP2 CHIP3A CHIP3 CHIP4A CHIP4	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • **Partial body contact recreation** • **Fish Consumption** • **Total Body Contact Recreation (May 1 – October 1)**
	Stony Brook		2.05		
	Johnson Creek		0.28		
	Campau Lake	4.94			
	Wing Lake	8.52			
	Peas Lake	6.59			
	Unnamed Lake	40.10			

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the five stations on the Chippewa River:

- Dissolved Oxygen
- Temperature (April, May, and October)
- pH
- Specific Conductivity
- Turbidity
- *E. coli*

The percent exceeding the goal status for most pollutants is low. April temperatures have a high percentage of samples exceeding the goal status. Additional sampling is recommended for turbidity and specific conductivity to help the Tribe determine appropriate tribal water quality standards. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures.

Table 17. Status for the Chippewa River waterbody in the Johnson Creek-Chippewa River (040802020207) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
CHIP2	Dissolved Oxygen (mg/l)	<5			8
	Temperature (degrees C)	April	>13.3	NMG	90
		May	>21.1		6
		October	>17.8	Threatened	20
	Specific Conductivity (mS/cm)	>0.5		Threatened	18
	Turbidity (NTUs)	>14.5			4
CHIP3A	Dissolved Oxygen (mg/l)	<5			7
	Temperature (degrees C)	April	>13.3	NMG	83
		May	>21.1		5
	Specific Conductivity (mS/cm)	>0.5		Threatened	18
	Turbidity (NTUs)	>14.5			4
CHIP3	Dissolved Oxygen (mg/l)	<5			9
	Temperature (degrees C)	April	>13.3	NMG	82
		May	>21.1		5
	Specific Conductivity (mS/cm)	>0.5		Threatened	20
	Turbidity (NTUs)	>14.5			9
CHIP4A	Temperature (degrees C)	April	>13.3	Threatened	88
	pH (upper limit)	>9			1
	Specific Conductivity (mS/cm)	>0.5		Threatened	23
	Turbidity (NTUs)	>14.5		Threatened	12
CHIP4	Dissolved Oxygen (mg/l)	<5		NMG	12
	Temperature (degrees C)	April	>13.3	Threatened	100
		May	>21.1	Threatened	14
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	31
		Total Body Contact	>300	NMG*	19

NMG= Not Meeting Goals
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

Mission Creek-Chippewa River (040802020501)

Four monitoring locations have been sampled in the Mission Creek-Chippewa River HUC. These stations have been sampled from 2004 through 2011 though station locations have changed over the sampling history.

All four stations had low observed dissolved oxygen concentrations in July and August of 2004. Specific Conductivity levels are slightly higher in this subwatershed than upstream. All stations medians are below

the recommended reference criteria of 0.5 mS/cm. Turbidity concentrations increase slightly moving from upstream to downstream from CHIP8 to CHIP9A. CHIP5 and CHIP9B area sampled for total dissolved solids, nutrients, and *E. coli* while the other stations in this subwatershed are not. TDS, *E. coli,* and nutrient levels are higher in this subwatershed than upstream. Median nutrient concentrations were between the recommended ecoregion 56 and ecoregion 57 reference conditions. The City Mt. Pleasant lies within this subwatershed and likely contributes to higher pollutant concentrations. Impervious surfaces make up over 26 percent of the land cover in this subwatershed. This subwatershed is the most developed within the Isabella Reservation and urban NPS management should be a priority.

Table 18. Mission Creek-Chippewa River (040802020501) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40802020501	Chippewa River		10.45	CHIP8 CHIP5 CHIP9B CHIP9A	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • **Partial body contact recreation** • **Fish Consumption** • **Total Body Contact Recreation (May 1 – October 1)**
	Mission Creek		2.39		
	Grewes Lakes	50.45		Will be monitored in the future	

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the four stations on the Chippewa River:

- Dissolved Oxygen
- Temperature (April and May)
- Specific Conductivity
- Turbidity
- Total Nitrogen
- Total Phosphorus
- *E. coli*

The percent of samples exceeding the goal status for most pollutants is low though the percent of April temperature exceedances is high and the percent of *E. coli* exceedances is medium at CHIP9B and high at CHIP5. Additional sampling is recommended for nutrients, specific conductivity, and turbidity to help the Tribe further determine if beneficial uses are being met and to determine appropriate tribal water quality standards for these parameters. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures.

Table 19. Status for the Chippewa River waterbody in the Mission Creek-Chippewa River (040802020501) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
CHIP8	Dissolved Oxygen (mg/l)	<5			7
	Temperature (degrees C)	April	>13.3	Threatened	100
	Specific Conductivity (mS/cm)	>0.5		Threatened	29
	Turbidity (NTUs)	>14.5		Threatened	14
CHIP5	Dissolved Oxygen (mg/l)	<5		Threatened	12
	Temperature (degrees C)	April	>13.3	Threatened	78
		May	>21.1		6
	Specific Conductivity (mS/cm)	>0.5		Threatened	19
	Turbidity (NTUs)	>14.5		Threatened	22
	Total Nitrogen (mg/L)	>1.55		Threatened	17
	Phosphorus (µg/L)	>70			6
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	76
		Total Body Contact	>300	NMG*	19
CHIP9B	Dissolved Oxygen (mg/l)	<5			6
	Temperature (degrees C)	May	>21.1	Threatened	14
	Specific Conductivity (mS/cm)	>0.5			5
	Turbidity (NTUs)	>14.5		Threatened	25
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	58
		Total Body Contact	>300	NMG*	17
CHIP9A	Dissolved Oxygen (mg/l)	<5			7
	Temperature (degrees C)	April	>13.3	Threatened	100
	Specific Conductivity (mS/cm)	>0.5		Threatened	38
	Turbidity (NTUs)	>14.5		Threatened	21

NMG= Not Meeting Goals
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

Dice Drain-Chippewa River (040802020508)

Two monitoring locations have been sampled in the Dice Drain-Chippewa River HUC from 2004 through 2011.

Samples in this subwatershed for dissolved oxygen, turbidity, and specific conductivity mimic those of the stations just upstream. Though this subwatershed has less impervious surface it is likely still affected by Mt. Pleasant runoff effects. Within the Reservation this subwatershed is mostly forested with a relatively small amount of agriculture (12 percent). Nutrient concentrations continue the trend of increasing moving from upstream to downstream. *E. coli* levels actually decrease slightly at these stations.

Table 20. Dice Drain-Chippewa River (040802020508) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40802020508	Chippewa River		8.81	CHIP6 CHIP7	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • **Partial body contact recreation** • **Fish Consumption** • **Total Body Contact Recreation (May 1 – October 1)**
	Unnamed Lake	23.82			

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the two stations on the Chippewa River:

- Dissolved Oxygen
- Temperature (April, May, and August)
- Specific Conductivity
- Turbidity
- Total Dissolved Solids
- Total Nitrogen
- Total Phosphorus
- E. coli

The percent exceedance of the goal status for most pollutants in this subwatershed is low though the percent of *E. coli* exceedances is medium and the percent of April temperature exceedances is high. Additional sampling is recommended for specific conductivity, turbidity, total dissolved solids, and nutrients to help the Tribe determine appropriate tribal water quality standards. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures.

Table 21. Status for the Chippewa River waterbody in the Dice Drain-Chippewa River (040802020508) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
CHIP6	Dissolved Oxygen (mg/l)	<5			7
	Temperature (degrees C)	April	>13.3	NMG	82
		May	>21.1		5
		August	>27.2		3
	Specific Conductivity (mS/cm)	>0.5		Threatened	22
	Turbidity (NTUs)	>14.5		Threatened	19
	Total Nitrogen (mg/L)	>1.55		Threatened	18
	Phosphorus (µg/L)	>70		Threatened	12
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	45
		Total Body Contact	>300	NMG*	27
CHIP7	Temperature (degrees C)	April	>13.3	Threatened	89
		May	>21.1		6
		August	>27.2		4
	Specific Conductivity (mS/cm)	>0.5		Threatened	28
	Turbidity (NTUs)	>14.5		Threatened	19
	Total Dissolved Solids (mg/L)	>1000			3
	Total Nitrogen (mg/L)	>1.55			7
	Phosphorus (µg/L)	>70			6
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	45
		Total Body Contact	>300	NMG*	14

NMG= Not Meeting Goals
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

Onion Creek and Salt Creek

There is no sampling data in the Onion Creek and Salt Creek 12-digit HUC subwatersheds. Currently SCIT does plan to sample Onion Creek in the future. The Onion Creek subwatershed has a high percentage of forest and agriculture and a portion of Mt. Pleasant lies within the subwatershed. The Salt Creek subwatershed is primarily forest, shrubland, and wetlands, a station in this subwatershed might be valuable to provide natural reference conditions for other waterbodies in the Isabella Reservation.

It is assumed that sources of nutrients and *E. coli* are similar within the Onion Creek subwatershed as the other Chippewa River subwatersheds. Based on land use information it is possible that goal exceedances within the Salt Creek subwatershed are less severe or nonexistent.

Table 22. Onion Creek and Salt Creek Subwatershed Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries (Miles)	Beneficial and Intended* Uses
40802020504	Onion Creek	2.91	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • **Partial body contact recreation** • **Fish Consumption** • **Total Body Contact Recreation (May 1 – October 1)**
40802020505	Black Creek	1.35	

**SCIT intended uses are highlighted in bold*

Coldwater River

Coldwater River (040802020204)

The SCIT has sampled three stations on Coldwater River. CR3 has been sampled from 2004 through 2011 while sampling of CR1 and CR2 began in 2011.

CR2 and CR3 lie downstream of the Weidman Community. Concentrations of turbidity, TDS, specific conductivity, and *E. coli* at all three stations are similar to those on the Chippewa River upstream of CHIP8 and Mt. Pleasant. In general temperatures in Coldwater River are lower than those of Chippewa River. Though the data for CR3 is from a different time period than CR1 and CR2 in general observed pollutant concentrations were lower at CR1 and CR2 than CR3 other than total phosphorus which was lower at CR3.

Agriculture makes up nearly 50 percent of land use in this subwatershed. The community of Weidman contributes 4.3 percent impervious surface to the subwatershed.

Table 23. Coldwater River (040802020204) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40802020204	Scott Lake	17.94			• Agriculture • Navigation • Industrial water supply • **Warmwater Fishery** • **Potential Coldwater Fishery** • Other Indigenous aquatic life and wildlife • Partial body contact recreation • **Fish Consumption** • Total Body Contact Recreation (May 1 – October 1)
	Coldwater Lake	354.33			
	Unnamed Lake	81.72			
	Coldwater River		8.24	CR1 CR2 CR3	

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the three stations on the Coldwater River:

- Dissolved Oxygen
- Turbidity
- Total Phosphorus
- Temperature (April)
- *E. coli*

The percent of samples exceeding the goal status for most pollutants is low though the percentage of April temperature exceedances is high. If the tribe determines that Coldwater River should support coldwater trout the stream is exceeding recommended coldwater temperature standards during all sampled months. In addition dissolved oxygen levels at CR2 were below the recommended coldwater fishery target during 50 percent of sampled events. Additional sampling is recommended for turbidity and total phosphorus to help the Tribe determine appropriate tribal water quality standards. Additional total nitrogen sampling is recommended as the dataset is too small for analysis. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures.

Table 24. Status for the Coldwater River waterbody in the Coldwater River (040802020204) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
CR1	Dissolved Oxygen (mg/l) (CWS)	<7		Threatened	17
	Turbidity (NTUs)	>14.5		Threatened	17
	Phosphorus (µg/L)	>70		Threatened	20
CR2	Dissolved Oxygen (mg/l) (WWS)	<5			8
	Dissolved Oxygen (mg/l) (CWS)	<7		Threatened	50
	Warmwater Temperature (degrees C)	April	>13.3	NMG	100
CR3	Dissolved Oxygen (mg/l) (WWS)	<5		Threatened	17
	Dissolved Oxygen (mg/l) (CWS)	<7		Threatened	10
	Warmwater Temperature (degrees C)	April	>13.3	Threatened	78
		May	>21.1		6
	Coldwater Temperature (degrees C)	April-October	See Table 3	Threatened	22-95
	Specific Conductivity (mS/cm)	>0.5		Threatened	17
	Turbidity (NTUs)	>14.5			7
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	30
		Total Body Contact	>300	NMG*	20

NMG= Not Meeting Goals, WWS= Warmwater Fishery Standard, CWS= Coldwater Fishery Standard
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

North Branch Chippewa River

Schofield Creek-North Branch Chippewa River (040802020205) (Upstream of the SCIT Reservation)

Two stations are sampled by the SCIT in the Schofield Creek-North Branch Chippewa River HUC upstream of the Isabella Reservation. Sampling of these two stations began in 2011 and will help to establish baseline conditions for non tribal upstream pollutant concentrations.

The dataset for these two stations is limited though a few trends were observed. In general pollutant concentrations increased moving downstream from NB1 to NB2. The only pollutant with lower concentrations at NB2 was total dissolved solids. In general pollutant concentrations at these two North Branch Chippewa River stations were similar to those on Coldwater River and the Chippewa River stations upstream of CHIP 8 and Mt. Pleasant.

Agricultural use is almost 70 percent of the land use in this subwatershed. There is only 3 percent impervious surface. Due to the high level of agriculture this area not used for swimming or primary contact.

Table 25. Schofield Creek-North Branch Chippewa River (040802020205) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40802020205	North Branch Chippewa River		0.43	NB1 NB2	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • Partial body contact recreation • **Fish Consumption**
	Schofield Creek		0.68		

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the two stations on the North Branch Chippewa River:

- Temperature (April)
- Turbidity
- Total Phosphorus
- E.coli

These stations had less than ten samples for all threatened parameters. Additional sampling is recommended for all parameters to help determine if these stations are actually exceeding goal status versus threatened. The percent of potential goal exceedances for most pollutants is low though the percentage of *E. coli* exceedances is medium and the percentage of April temperature exceedances is high.

Table 26. Status for the North Branch Chippewa River waterbody in the Schofield Creek-North Branch Chippewa River (040802020205) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
NB1	Temperature (degrees C)	April	>13.3	Threatened	100
	Turbidity (NTUs)	>14.5		Threatened	14
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	Threatened*	22
		Total Body Contact	>300	Threatened*	11
NB2	Phosphorus (µg/L)	>70		Threatened	25
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	Threatened*	40
		Total Body Contact	>300	Threatened*	30

NMG= Not Meeting Goals
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

Hogg Creek-North Branch Chippewa River (040802020206)

Two stations have been sampled by the SCIT in the Hogg Creek-North Branch Chippewa River HUC. NB3 sampling began in 2011. NB6 was sampled from 2008 through 2010. Several new stations will be sampled in 2012 in this watershed.

In general these two stations have the highest concentrations of most pollutants in the Reservation. NB6 has the highest observed *E. coli* concentrations. This subwatershed also has the highest observed total phosphorus concentrations. Total nitrogen, TDS, turbidity, and specific conductivity concentrations increase moving from NB3 to NB6 downstream.

Agriculture makes up close to 85 percent of the land use in this subwatershed.

Table 27. Hogg Creek-North Branch Chippewa River (040802020206) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40802020206	North Branch Chippewa River		11.82	NB3 NB6	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • Partial body contact recreation • **Fish Consumption** • Total Body Contact Recreation (May 1 – October 1)
	Hogg Creek		2.83		

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the two stations on the North Branch Chippewa River:

- Temperature (April)
- Specific Conductivity
- Turbidity
- Total Nitrogen
- Total Phosphorus
- E.coli

The percentage of samples exceeding the goal status for most pollutants is low though the percentage of *E. coli* exceedances is high at NB6 and medium at NB3. The percentage of April temperature exceedances is high. Additional sampling is recommended for specific conductivity, turbidity, and nutrients to help the Tribe determine appropriate tribal water quality standards. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures. Additional sampling of all parameters is recommended to increase the size of the dataset to make better goal attainment status determinations.

Table 28. Status for the North Branch Chippewa River waterbody in the Hogg Creek-North Branch Chippewa River (040802020206) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
NB3	Specific Conductivity (mS/cm)	>0.5		Threatened	100
	Turbidity (NTUs)	>14.5		Threatened	25
	Total Nitrogen (mg/L)	>1.55		Threatened	50
	Phosphorus (µg/L)	>70		Threatened	25
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	Threatened*	50
		Total Body Contact	>300	Threatened*	30
NB6	Temperature (degrees C)	April	>13.3	Threatened	67
	Specific Conductivity (mS/cm)	>0.5		Threatened	98
	Turbidity (NTUs)	>14.5		Threatened	49
	Total Nitrogen (mg/L)	>1.55		Threatened	79
	Phosphorus (µg/L)	>70		Threatened	50
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	77
		Total Body Contact	>300	NMG*	77

NMG= Not Meeting Goals
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

Saganing River

Saganing River (040801020105)

The SCIT has sampled three monitoring station on the Saganing River. These three stations were sampled during different time periods and no trend analysis was made. In general specific conductivity, turbidity, and total dissolved solids were much higher on Saganing River than any of the Chippewa River watershed waterbodies. Total nitrogen levels at each site were high, median concentrations of total nitrogen at SC2 and SC1 exceeded the ecoregion 57 reference condition. Median total phosphorus concentrations at each site were between the reference criteria from ecoregions 56 and 57. E. coli was only measured at SC1 and the median concentration exceeded the 30 Day Geometric Mean standard. Historically low flows and poor macroinvertebrate scores were noted by SCIT sampling.

Though SCIT has not sampled groundwater it is important to note that in 2006 and 2007 well water data sampled near Saganing Eagles Landing had elevated levels of iron, chloride, sulfate, and radium. 2010 samples had levels of iron, manganese, and sulfate that exceeded the federal secondary drinking water standards (Fishbeck 2011b).

Land use in the Saganing River 12-digit HUC subwatershed does not appear to vary from land uses in the other Reservation subwatersheds. The 2011 SCIT waterbody assessment report indicates that the Tribe is concerned with the rivers changes over the past twenty years and that the tribe is considering the feasibility of a stream restoration project.

Table 29. Saganing River (040801020105) Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Site ID	Beneficial and Intended* Uses
		Acres	Miles		
40801020105	Saganing River		0.31375	SC3 SC2 SC1	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • Partial body contact recreation • **Fish Consumption** • Total Body Contact Recreation (May 1 – October 1)
	Saginaw Bay	2.30			

**SCIT intended uses are highlighted in bold*

Water Quality exceeded the applicable criteria for the following parameters at least one of the three stations on the Saganing River:

- Dissolved Oxygen
- Temperature (April)
- Specific Conductivity
- Turbidity
- TDS
- Total Nitrogen
- Total Phosphorus

- *E. Coli*

The percentage of samples exceeding the goal status is low for most pollutants, though the percentage of April temperature exceedances is high at SC2. The percentage of *E. coli* exceedances is high at SC1, though further monitoring at additional sampling stations is needed to determine the level of pathogen impairment. The specific conductivity exceedances at all three stations are high as are the total nitrogen exceedances at SC2 and SC1. Additional sampling is recommended for specific conductivity, turbidity, total dissolved solids, and nutrients to help the Tribe determine appropriate tribal water quality standards. Historically low flows in this stream may be contributing to a pooling effect of pollutant loads. Though the tribe does not have a target flow for the Saganing River, the loss of flow to this waterbody is a primary concern. As indicated by the high levels of turbidity and total dissolved solids, erosion is also a primary concern in this watershed. Additional sampling of April and May temperature is recommended to help determine the cause of higher temperatures.

Table 30. Status for the Saganing River waterbody in the Saganing River (040801020105) Subwatershed

Site Number	Parameter	Criteria or Reference Condition Exceeded		Goal Status	Percent Exceedance
SC3	Dissolved Oxygen (mg/l)	<5		NMG	14
	Specific Conductivity (mS/cm)	>0.5		Threatened	67
	Total Nitrogen (mg/L)	>1.55		Threatened	33
	Phosphorus (µg/L)	>70		Threatened	33
SC2	Dissolved Oxygen (mg/l)	<5		NMG	18
	Temperature (degrees C)	April	>13.3	Threatened	100
	Specific Conductivity (mS/cm)	>0.5		Threatened	91
	Turbidity (NTUs)	>14.5		Threatened	36
	Total Nitrogen (mg/L)	>1.55		Threatened	100
	Phosphorus (µg/L)	>70		Threatened	33
SC1	Temperature (degrees C)	May	>21.1	Threatened	14
	Specific Conductivity (mS/cm)	>0.5		Threatened	98
	Turbidity (NTUs)	>14.5		Threatened	32
	Total Dissolved Solids (mg/L)	>1000		Threatened	30
	Total Nitrogen (mg/L)	>1.55		Threatened	83
	Phosphorus (µg/L)	>70		Threatened	23
	E. Coli (CFU/100 mL)	30 Day Geometric Mean	>130	NMG*	69
		Total Body Contact	>300	NMG*	31

NMG= Not Meeting Goals
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

South Branch Pine River, White Feather Creek-Frontal Lake Huron, and Big Creek-Frontal Lake Huron

There is no sampling data for waterbodies on the SCIT parcels in the South Branch Pine River, White Feather Creek-Frontal Lake Huron, and Big Creek-Frontal Lake Huron 12-digit HUC subwatersheds. Land use in these parcels is similar to land use throughout the Reservation and waterbodies draining to these parcels likely are threatened by nutrients, *E. coli*, and sediment issues.

Table 31. South Branch Pine River, White Feather Creek-Frontal Lake Huron, and Big Creek-Frontal Lake Subwatershed Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Beneficial and Intended* Uses
		Acres	Miles	
40801020102	3 Unnamed Tributaries		0.413269	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • Partial body contact recreation • **Fish Consumption** • Total Body Contact Recreation (May 1 – October 1)
40801020104	Saginaw Bay	3.62		
	2 Unnamed Tributaries		0.79	
40801010502	Lake Huron	0.96		
	Unnamed Lake	808.03		

**SCIT intended uses are highlighted in bold*

Salt River

There are no sampling data for the Salt River 12-digit HUC subwatersheds. Goal attainment status and source assumptions can be made based on a land use analysis. Agriculture is the primary land use within the Salt River watershed with agriculture ranging from 61 to 79 percent for most of the subwatershed while the South Branch Salt River subwatershed has 25 percent agriculture and the Bluff Creek subwatershed has 7.7 percent agriculture. The Bluff Creek subwatershed may provide potential for sampling data to represent natural conditions in the Salt River watershed. It is recommended that the SCIT add a station to the downstream sections of South Branch Salt River and North Branch Salt River.

It is expected that the Salt River subwatershed will likely have similar goal exceedances to those subwatersheds upstream of Mt. Pleasant in the Chippewa River watershed. CMU biotic sampling has identified high turbidity and sedimentation issues within the Salt River watershed.

Table 32. Salt River Watershed Waterbodies, Sampling Sites, and Beneficial Uses

HUC12 ID	Waterbody	Area or Distance within Reservation Parcel Boundaries		Beneficial and Intended* Uses
		Acres	Miles	
40802010501	South Branch Salt River		12.16	• **Agriculture** • Navigation • Industrial water supply • **Warmwater Fishery** • Other Indigenous aquatic life and wildlife • Partial body contact recreation • **Fish Consumption** • **Total Body Contact Recreation (May 1 – October 1)**
	Jordon Creek		7.22	
40802010502	North Branch Salt River		7.90	
40802010503	South Branch Salt River		5.97	
40802010504	North Branch Salt River		10.08	
40802010505	Bluff Creek		3.27	
	Unnamed Lake	390.11		
40802010506	2 Unnamed Headwater Tributaries		4.75	

**SCIT intended uses are highlighted in bold*

SECTION 7 – DISCUSSION

This section provides a detailed interpretation of the results section. As discussed in SECTION 6 – Results, several sources of NPS pollution are present on the Isabella Reservation and could be negating beneficial uses.

Table 33 summarizes the goal attainment status for each station reviewed in SECTION 6 – Results. Based on the percent of exceeding samples, parameters were assigned a priority of low, medium, or high goal status. Overall dissolved oxygen, nutrients, specific conductivity, turbidity, and TDS have a low percentage of goal status exceedances on the Reservation. *E. coli* has a medium level of exceedances, and April temperatures have a high level of exceedances.

Additional sampling is recommended for many tribal waters in order to better address NPSs in the future For those waterbodies with less than 10 samples and goal attainment exceedances further sampling is recommended to confirm potential impairment and water quality trends. For those waterbodies with pollutants that exceed suggested reference conditions further sampling is suggested to help determine a tribal water quality standard. Sampling will follow Michigan Protocol for a direct comparison to temperature and bacteria standards. Sampling of all parameters will be consistent with the SCIT's 2012 CWA 106 QAPP on a rotating basin approach. A list of recommended sampling for the Reservation is provided below:

- Continuing the current monitoring program of all parameters is recommended at the current SCIT stations on an annual rotating basin approach.
- Coldwater River would benefit from future total nitrogen sampling to better understand nitrogen trends on this waterbody.
- The addition of monitoring sites to Salt River is recommended to better understand goal attainment status of this waterbody.
- *E. coli* monitoring of at least 5 samples over a 30 day period are recommended to compare to the Michigan state numeric criteria for *E. coli*.
- There are currently no MDEQ numeric criteria for turbidity, total nitrogen, total phosphorus, total dissolved solids, or specific conductivity. It is recommended that follow up sampling is used to help the SCIT adopt tribal water quality standards for these parameters.
- Sampling of Bluff Creek and Salt Creek could be beneficial in use as sample reference conditions as these water bodies are forested headwaters upstream of most agricultural and urban NPSs.

Table 33. Goal Attainment Status Summary

Site Number	D.O. (mg/l)	Temperature (degrees C)			Sp. Cond. (mS/cm)	Turbidity (NTUs)	TDS (mg/L)	TN (mg/L)	TP (µg/L)	*E. Coli* (CFU/100 mL)	
		April	May	Oct						30 day GM	NTE
	<5	**>13.3**	**>21.1**	**>17.8**	**>0.5**	**>14.5**	**>1000**	**>1.55**	**>70**	**>130**	**>300**
CHIP1		NMG			T					NMG*	
CHIP2		NMG		T	T						
CHIP3A		NMG			T						
CHIP3		NMG			T						
CHIP4A		T			T	T					
CHIP4	NMG	T	T							NMG*	NMG*
CHIP8		T			T	T					
CHIP5	T	T			T	T		T		NMG*	NMG*
CHIP9B			T			T				NMG*	NMG*

Site Number	D.O. (mg/l)	Temperature (degrees C)			Sp. Cond. (mS/cm)	Turbidity (NTUs)	TDS (mg/L)	TN (mg/L)	TP (µg/L)	*E. Coli* (CFU/100 mL)	
		April	May	Oct						30 day GM	NTE
	<5	**>13.3**	**>21.1**	**>17.8**	**>0.5**	**>14.5**	**>1000**	**>1.55**	**>70**	**>130**	**>300**
CHIP9A		T			T	T					
CHIP6		NMG			T	T		T	T	NMG*	NMG*
CHIP7		T			T	T				NMG*	NMG*
CR1	T					T			T		
CR2		NMG									
CR3		T			T					NMG*	NMG*
NB1		T				T				T*	T*
NB2									T	T*	T*
NB3					T	T		T	T	T*	T*
NB6		T			T	T		T	T	NMG*	NMG*
SC3	NMG				T			T	T		
SC2	NMG	T			T	T		T	T		
SC1		T			T	T	T	T	T	NMG*	NMG*

NMG = Not Meeting Goals, T= Threatened, GM= geometric mean, NTE= Total body contact not to exceed standard
*The SCIT sampling data is not frequent enough to apply to the 30 Day Geometric Mean standard, though data implies that the goal status is not being achieved, future monitoring is recommended that meets the State of Michigan Standard sampling requirements.

The discussion below ties goal attainment status to the potential NPS categories for each major waterbody. Table 34 summarizes the level of goal exceedances as high (>66% exceeding the goal status), medium (33 to 66% exceeding the goal status), and low (<33 percent exceeding the goal status) for all of the SCIT sampling stations.

Chippewa River

- Pollutants of Concern:
  - Dissolved Oxygen (**Low**: CHIP4, CHIP5)
  - Spring Temperature (**High**: All Chippewa Stations except CHIP9B)
  - Specific Conductivity (**Medium**: CHIP9A; **Low**: All Chippewa Stations except CHIP4, CHIP9B, and CHIP9A)
  - Turbidity (**Low**: CHIP4A, CHIP8, CHIP5, CHIP9B, CHIP9A, CHIP6, CHIP7)
  - Total Nitrogen (**Low:** CHIP5, CHIP6)
  - Total Phosphorus (**Low:** CHIP6)
  - *E. coli* (**Low**: CHIP4; **Medium**: CHIP1, CHIP9B, CHIP6, CHIP7; **High**: CHIP5)

- Recommended Sampling:
  - Temperature to help determine source of high spring values
  - *E. coli* sampling that meets the MDEQ five-day geometric mean criteria
  - Specific Conductivity to help determine tribal standards
  - Total Nitrogen to help determine tribal standards
  - Total Phosphorus to help determine tribal standards

- Dominant NPS Pollution Category and Priority Management:
  - Agricultural Practices and Runoff (Land Use)
  - Failing Septic systems
  - Channelization

Streambank Destabilization
Loss of Riparian Vegetation
Construction
Urban Runoff (Mt. Pleasant)

Coldwater River

- Pollutants of Concern:
  Dissolved Oxygen (**Low**: CR1)
  Spring Temperature (**High**: CR2, CR3)
  Specific Conductivity (**Low**: CR3)
  Turbidity (**Low**: CR1)
  Total Phosphorus (**Low:** CR1)
  E. coli (**Low**: CR3)

- Recommended Sampling:
  Temperature to help determine source of high spring values
  E. coli sampling that meets the MDEQ five-day geometric mean criteria
  Specific Conductivity to help determine tribal standards
  Total Phosphorus to help determine tribal standards

- Dominant NPS Pollution Category and Priority Management:
  Agricultural Practices and Runoff (Land Use)
  Failing Septic systems
  Loss of Riparian Vegetation
  Urban Runoff (Weidman Community)

North Branch Chippewa River

- Pollutants of Concern:
  Spring Temperature (**High**: NB1, NB6)
  Specific Conductivity (**High**: NB3, NB6)
  Turbidity (**Medium**: NB6; **Low**: NB1, NB3)
  Total Nitrogen (**High:** NB6; **Medium**: NB3)
  Total Phosphorus (**Medium**: NB6; **Low**: NB2, NB3)
  E. coli (**High**: NB6; **Medium**: NB2, NB3; **Low**: NB1)

- Recommended Sampling:
  There are less than 10 samples for most parameters sampled on the North Branch Chippewa River at NB1 and NB2; continued sampling of all parameters is recommended to further analyze beneficial use attainment.
  Temperature to help determine source of high spring values
  E. coli sampling that meets the MDEQ five-day geometric mean criteria
  Specific Conductivity to help determine tribal standards
  Total Nitrogen to help determine tribal standards
  Total Phosphorus to help determine tribal standards

- Dominant NPS Pollution Category and Priority Management:
  Agricultural Practices and Runoff (Land Use)
  Failing Septic systems
  Streambank Destabilization
  Loss of Riparian Vegetation
  Channelization

Saganing River

- Pollutants of Concern:
  - Dissolved Oxygen (**Low**: SC3, SC2)
  - Spring Temperature (**High**: SC2)
  - Specific Conductivity (**High**: All stations)
  - Turbidity (**Medium**: SC2; **Low**: SC1)
  - Total Dissolved Solids (**Low**: SC1)
  - Total Nitrogen (**High:** SC2, SC1; **Low**: SC3)
  - Total Phosphorus (**Low**: All stations)
  - *E. coli* (**High**: SC1)

- Recommended Sampling:
  - Flow to help determine historical flow changes in this waterbody
  - Temperature to help determine source of high spring values
  - *E. coli* sampling that meets the MDEQ five-day geometric mean criteria
  - Specific Conductivity to help determine tribal standards
  - Turbidity to help determine tribal standards
  - Total Dissolved Solids to help determine tribal standards
  - Total Nitrogen to help determine tribal standards
  - Total Phosphorus to help determine tribal standards

- Dominant NPS Pollution Category and Priority Management:
  - Agricultural Practices and Runoff (Land Use)
  - Failing Septic systems
  - Channelization
  - Streambank destabilization
  - Loss of Riparian Vegetation
  - Construction
  - Urban Runoff

Salt River

- Likely Pollutants of Concern:
  - Dissolved Oxygen
  - Spring Temperature
  - Specific Conductivity
  - Turbidity
  - Total Nitrogen
  - Total Phosphorus
  - *E. coli*

- Recommended Sampling:
  - Monitor an upstream and downstream site on Salt River for all parameters
  - Monitor a headwater stream with primarily forest land use to create a natural condition reference site

- Dominant NPS Pollution Category and Priority Management (Assumed):
  - Agricultural Practices and Runoff (Land Use)
  - Failing Septic Systems
  - Streambank Destabilization
  - Loss of Riparian Vegetation
  - Channelization

Table 34. Level of Goal Attainment Status Exceedances

Site Number	D.O. (mg/l)	Temperature (degrees C)			Sp. Cond. (mS/cm)	Turbidity (NTUs)	TDS (mg/L)	TN (mg/L)	TP (µg/L)	*E. Coli* (CFU/100 mL)	
		April	May	Oct						30 day GM	NTE
	<5	**>13.3**	**>21.1**	**>17.8**	**>0.5**	**>14.5**	**>1000**	**>1.55**	**>70**	**>130**	**>300**
CHIP1		H			L					M	
CHIP2		H		L	L						
CHIP3A		H			L						
CHIP3		H			L						
CHIP4A		H			L	L					
CHIP4	L	H	L							L	L
CHIP8		H			L	L					
CHIP5	L	H			L	L		L		H	L
CHIP9B			L			L				M	L
CHIP9A		H			M	L					
CHIP6		H			L	L		L	L	M	L
CHIP7		H			L	L				M	L
CR1	L					L			L		
CR2		H									
CR3		H			L					L	L
NB1		H				L				L	L
NB2									L	M	L
NB3					H	L		M	L	M	L
NB6		H			H	M		H	M	H	H
SC3	L				H			L	L		
SC2	L	H			H	M		H	L		
SC1			L		H	L	L	H	L	H	L

H= High, M= Medium, L= Low, GM= geometric mean, NTE= Total body contact not to exceed standard

Though each individual waterbody on the Reservation has its own unique pollutant exceedances there are general trends throughout the Reservation, a summary for each pollutant is provided below.

Dissolved Oxygen:

Low dissolved oxygen levels can result from elevated nutrient levels and elevated temperature which both can be caused by urbanization. The Chippewa River, Coldwater River, and Saganing River all have a low level of goal status exceedances.

April Temperatures:

Possible nonpoint sources of high April temperatures include the removal of tree canopy during construction as well as past timber harvesting and the loss of canopy to invasive species. Water

temperatures from upstream dams, drains, agricultural tiles, and septic systems could also influence river temperatures. There is a high level of April temperature exceedances throughout the Reservation.

Specific Conductivity:

Specific conductivity levels can increase in stream due to streambank disturbance from erosion, grazing activities, and runoff from dirt roads, crop fields, urban areas, and construction activities. The percent of specific conductivity exceedances is low at most sites although it is medium at CHIP9A on the Chippewa River, and high on the North Branch Chippewa River at NB3 and NB6 and the Saganing River at SC3 and SC2.

Turbidity:

Turbidity levels can increase in stream due to streambank disturbance from erosion, grazing activities, and runoff from dirt roads, crop fields, urban areas, and construction activities. Turbidity exceedances are low at most sampled sites though the percent exceedance is medium at NB6 on the North Branch Chippewa River and at SC2 on the Saganing River.

Total Dissolved Solids:

Primary sources for TDS in surface waters are agricultural and residential runoff as well as runoff from dirt roads and streambank erosion. SC1 on the Saganing River is the only site with a low percentage of TDS exceedances.

Total Nitrogen:

Nonpoint sources of nutrients in the Reservation include runoff from cropland, agricultural tile drainage, inadequate or failing septic systems, erosion of soils naturally high in nutrients, and wildlife. Invasive species like phragmites could also be contributing to higher nutrient levels. Two sites on Chippewa River have low levels of total nitrogen exceedances based on sampling (CHIP5 and CHIP6). SC3 on the Saganing River and NB3 on the North Branch Chippewa River have a medium percentage of total exceedances based on current sampling. NB6, SC1, and SC2 had over 66% of samples exceeding the recommended total nitrogen concentration. In general, concentrations of total nitrogen increase moving from upstream to downstream in all sampled Reservation waters.

Total Phosphorus:

Nonpoint sources of nutrients in the Reservation include runoff from cropland, inadequate or failing septic systems, erosion of soils naturally high in nutrients, and wildlife. The Chippewa River downstream of Mt. Pleasant has a low level of total phosphorus exceedances. North Branch Chippewa at NB6 and Saganing River at SC3 and SC2 have a medium level of total phosphorus exceedances. In general, concentrations increase moving from upstream to downstream in all sampled Reservation waters.

E. coli:

E. coli levels in the Reservation are likely high due to erosion from grazing activities, tillage and other cropland practices, inadequate or failing septic systems, recreational waterbody use, and urban runoff. A low level of *E. coli* exceedances is seen on all sampled SCIT waters. CHIP3, NB6, and SC1 have a high level of *E. coli* exceedances.

SECTION 8 – SELECTION OF NPS BMPs

This section discusses the SCIT's process for selecting best management practices (BMPs) to address the nonpoint source water pollution issues discussed in Section 7 of this report. It provides details outlining the SCITs programmatic capability and legal right to manage NPS pollution of tribal waters. It also provides an overview of the core participants in the SCIT's BMP selection process and the approaches for public participation and governmental coordination during the selection process. In addition, this section identifies existing BMPs and the process for selecting BMPs in the future to address nonpoint sources of pollution identified in Section 7. Implementation of BMPs will be addressed in the SCIT's NPS Management Program Plan.

Vision Statement, Boundary Settlement, Memorandum of Understanding, and TAS

The SCITs Vision Statement serves as a basis for the proper management of water resources on the Isabella Reservation.

> The Saginaw Chippewa Indian Tribe of Michigan is committed to be the executive stewards of its national resources as "Administrators of Self Determination," the Tribe will pursue pro-active solutions while integrating our cultural, social, economic and environmental interests. The Saginaw Chippewa Indian Tribe of Michigan will endeavor to strengthen the services provided to Tribal members and enterprise associates through purposeful leadership and quality service while maintaining a commitment to the Seven Teachings of our Ancestors.

In November of 2010 the SCIT approved the settlement of a suit defining the federal recognition of the Isabella Indian Reservation. The federal government approved the settlement. The settlement recognizes the Tribe's Reservation boundaries established by the treaties of 1855 and 1864 as 'Indian Country' and provides certainty with respect to the proper exercise of jurisdiction over Tribal members. These boundaries are comprised of five full and two half townships in Isabella County.

In November of 2010 the SCIT and the State of Michigan signed a Memorandum of Understanding (MOU). The MOU states that both parties have an interested in conserving natural resources within the Isabella Reservation. The MOU details the desire for both parties to encourage cross-jurisdictional communication and the sharing of best practices while maintain the jurisdictional authority of each party (Appendix D).

The MOU acknowledges the right of the SCIT to regulate hunting, fishing, and gathering activities by tribal members within the six-township boundary of the Isabella Reservation. The MOU combined with the SCIT settlement agreement provide a venue for tribal development, coordination, and implementation of water resource protection programs, including nonpoint source pollution management. Both of these documents also provide key support for application by the tribe to USEPA for TAS status.

Core Participants

The SCIT intends to lead a cooperative effort to identify NPS challenges and select BMPs best suited to address nonpoint source pollution on the Isabella Reservation in collaboration with key partners, depending on the nature of the BMP and the geographic location targeted for implementation.

Key partners include local, state, and federal agencies that could provide technical assistance, consultation, aid in education, implement demonstration projects, or provide financial assistance to promote BMP implementation. Table 35 presents the core participants, the mission of these agencies and organizations, and the role during BMP selection and implementation. Figure 47 and Figure 48 show the organizational flow of the SCIT and its non-tribal partnerships for addressing NPS pollution. The process for BMP selection with aid from these participants is described in detail below.

Table 35. Core Participants, Mission, and Associated Role in SCIT NPS BMP Selection

Participant	Mission	Role in BMP Selection
Saginaw Chippewa Indian Tribe		
Tribal Council	Authorizes activities and establishes policies.	Final approval of BMP selection
Planning Department	Oversees environmental protection efforts on lands within tribe's jurisdiction, including surface water monitoring. Designs and manages needed construction projects, conduct and implement strategic and community master planning.	Lead role in final BMP selection, siting, coordination, and implementation
Water Quality and NPS Management Program	The water quality specialist and water resource technician oversee SCIT water quality monitoring and will lead the development and implementations of the NPS pollution control program.	Lead role in final BMP selection, siting, coordination, and implementation
Tribal Construction	Oversees construction planning, design, and execution of construction projects on within tribal boundaries	Participant in BMP selection, siting, and implementation
Utilities Authority	Charged with supplying, treating and maintaining water delivery to the local tribal community; responsible for waste water treatment, wells, hydrants, towers and lift stations. Treats tribal wastewater to meet EPA standards	Participant in BMP selection and implementation, where applicable
Parks and Recreation	Provides recreational opportunities for the entire Tribe with collaboration throughout the community, including operation and maintenance of the Saginaw Chippewa Indian Tribe Campground	Participant in BMP selection and implementation, where applicable
Housing Department	Provides the people of the SCIT Community with quality services, housing opportunities, and community development with the goal of perpetual self-sufficiency.	Participant in BMP selection and implementation, where applicable
Public Relations	Covers the daily events surrounding the Saginaw Chippewa Tribal Community	Participant in providing coverage on activities related to BMP selection and helping to implement BMPs, particularly those related to nonpoint source education
Grants	Oversee grant contracts for grant-funded tribal activities	Coordinate contracts for selected and funded BMPs as necessary
Ziibiwing Cultural Center	Provides cultural and educational information about the history of the Saginaw Chippewa Indian Tribe	Participant in BMP selection and implementation, particularly for BMPs related to nonpoint source education

Participant	Mission	Role in BMP Selection
7th Generation Program	Promotes and perpetuates the Seventh Generation philosophy through ceremonies, cultural knowledge, wisdom and our relationship to the environment	Participant in BMP selection and implementation, particularly for BMPs related to nonpoint source education
Tribal Public Safety	Encompasses tribal fire and police departments	Participant in BMP selection and, as needed, implementation
Information Technology	Supports the varied technological needs of the Saginaw Chippewa Indian Tribe, including GIS mapping	Participant in BMP selection by providing mapping support
Tribal Education	Supports development of educated, confident, competitive, proficient citizens who excel in any venture they pursue while maintaining their rich Anishinaabe culture and language	Participant in BMP selection and implementation, particularly for BMPs related to nonpoint source education
Tribal College	A two year college in Mt. Pleasant that provides access to higher education for the tribal community and expand educational and career opportunities.	Participant in BMP selection and implementation, particularly for BMPs related to nonpoint source education
Non-Tribal Partners		
Environmental Health Division, Central Michigan Health Department	Responsible for evaluating proposed building sites and issuing construction permits for sewage systems; plays a vital role in the planning of building sites. No municipality, township or other governing body shall issue a building permit for a premise requiring a sewage system before obtaining permission from the Health Officer.	Technical assistance
Chippewa Watershed Conservancy	Nonprofit conservation group working to protect open space and natural habitat in the counties of the Chippewa River Watershed in Central Michigan	Technical assistance, BMP education, identification of potential sites/parcels for BMP implementation
Isabella County Drain Commissioner	Administers Michigan laws related to flood protection, stormwater management, and erosion control within Isabella County	Technical assistance, consultation
Isabella County Conservation District	Works in partnership with USDA NRCS to address soil conservation issues	Technical assistance, consultation
City of Mt. Pleasant	Manages land and wastewater generated by the City of Mt. Pleasant within the Isabella Reservation boundary	Technical assistance, potential financial assistance
Arenac County Drain Commissioner	Administers Michigan laws related to flood protection, stormwater management, and erosion control within Arenac County	Technical assistance, consultation
Arenac County Soil Conservation District	Works in partnership with USDA NRCS to address soil conservation issues	Technical assistance, consultation

Participant	Mission	Role in BMP Selection
Saginaw Bay Resource Conservation & Development Council	Includes both Arenac and Isabella counties in service area. Current program objectives focus on improvement of quality of life achieved through natural resources conservation and community development which leads to sustainable communities, prudent use (development), and the management and conservation of natural resources.	Technical assistance, BMP education
Michigan Department of Agriculture and Rural Development (MDARD)	Priorities include assuring food safety, protecting animal and plant health, sustaining environmental stewardship, providing consumer protection, enabling rural development, and fostering efficient administrative operations.	Technical Assistance
Michigan DEQ Nonpoint Source Program	State water agency responsible for addressing NPS issues in areas surrounding SCIT lands. Provides education, technical assistance, coordination, and other services.	Technical assistance, BMP education, consultation
Michigan DEQ NPDES Program	State water agency responsible for issuing permits to point sources of pollution. Regulates industrial and construction site stormwater discharges, conducts education and training programs.	Technical assistance, consultation
Michigan DNR Gladwin Forest Management Unit	Manages 220,000 acres of state land covering six counties including; Clare, Isabella, Gladwin, Midland, Arenac part of Iosco and Bay. These counties are covered by the Harrison, Gladwin, Sanford and Standish Field Offices.	Technical assistance, consultation
Saginaw Bay Watershed Initiative Network	Community-based voluntary initiative working to develop projects focused on agricultural pollution prevention, wildlife stewardship, water resources, and land use.	Potential financial assistance
Saginaw Basin Land Conservancy	Helps to preserve land and water quality across the Saginaw Basin; owns seven preserves and have conservation agreements with 61 private landowners	BMP education
East Michigan Council of Governments	Provides a regional forum for the counties of Arenac, Bay, Clare, Gladwin, Gratiot, Iosco, Isabella, Ogemaw, Roscommon, Sanilac, and Tuscola; including their individual townships, municipal governments, public universities, and the Saginaw Chippewa Indian Tribe to discuss issues of mutual interest and concern, and to develop recommendations and plans to address those issues.	Technical assistance, Education
Bureau of Indian Affairs	The Bureau of Indian Affairs (BIA) appropriates funds to tribes of Michigan under 25 CFR Part 150-250. Funds may be used for resource protection activities including water resources and environmental quality services. The BIA has access to Great Lakes Restoration Initiative funds that may be utilized for suitable SCIT projects.	Technical assistance, funding

Participant	Mission	Role in BMP Selection
Indian Health Service	The Indian Health Service (IHS) provides support to federally recognized tribes related to nonpoint source control. IHS can assist tribes with construction site assessments and septic system installations.	Engineering and technical assistance and funding for septic systems
Inter-Tribal Council of Michigan	The Inter-Tribal Council of Michigan, Inc. (MITC), Environmental Services Division, is organized to provide environmental and environmental health related technical assistance and consultation services. Environmental specialists from the council can work with SCIT on wastewater, municipal water, environmental permitting, and funding issues.	Technical assistance, consultation
U.S. Department of Agriculture, Natural Resources Conservation Service	Works with landowners through conservation planning and assistance designed to benefit the soil, water, air, plants, and animals that result in productive lands and healthy ecosystems. Supports Resource, Conservation, and Development (RC&D) Councils	Technical and financial assistance, consultation
U.S. Environmental Protection Agency Region 5	Oversight of water resources programs under the Clean Water Act in Michigan; administers the Section 319 Nonpoint Source Management program	Technical and financial assistance. Oversight of water resource monitoring and drinking water programs.
U.S. Army Corps of Engineers	Promoting water resource protection and ecosystem restoration in the Saginaw Bay watershed through Western Lake Huron watershed reconnaissance study.	Financial assistance
U.S. Fish and Wildlife	Provide assistance to Tribes for development and implementation of programs that benefit fish and wildlife resources and their habitat, including: planning for wildlife and habitat conservation, fish and wildlife conservation and management actions, fish and wildlife related research, habitat mapping, field surveys and population monitoring, habitat protection, and public education.	Technical and financial assistance

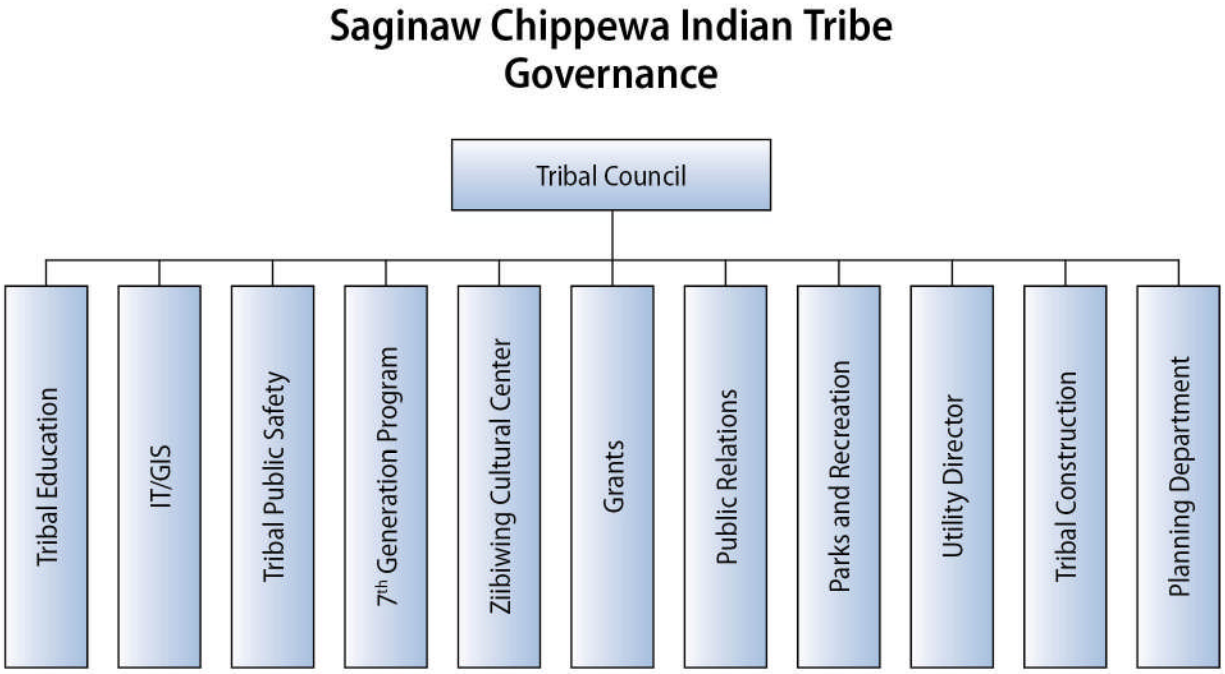


Figure 47. SCIT Organizational Chart

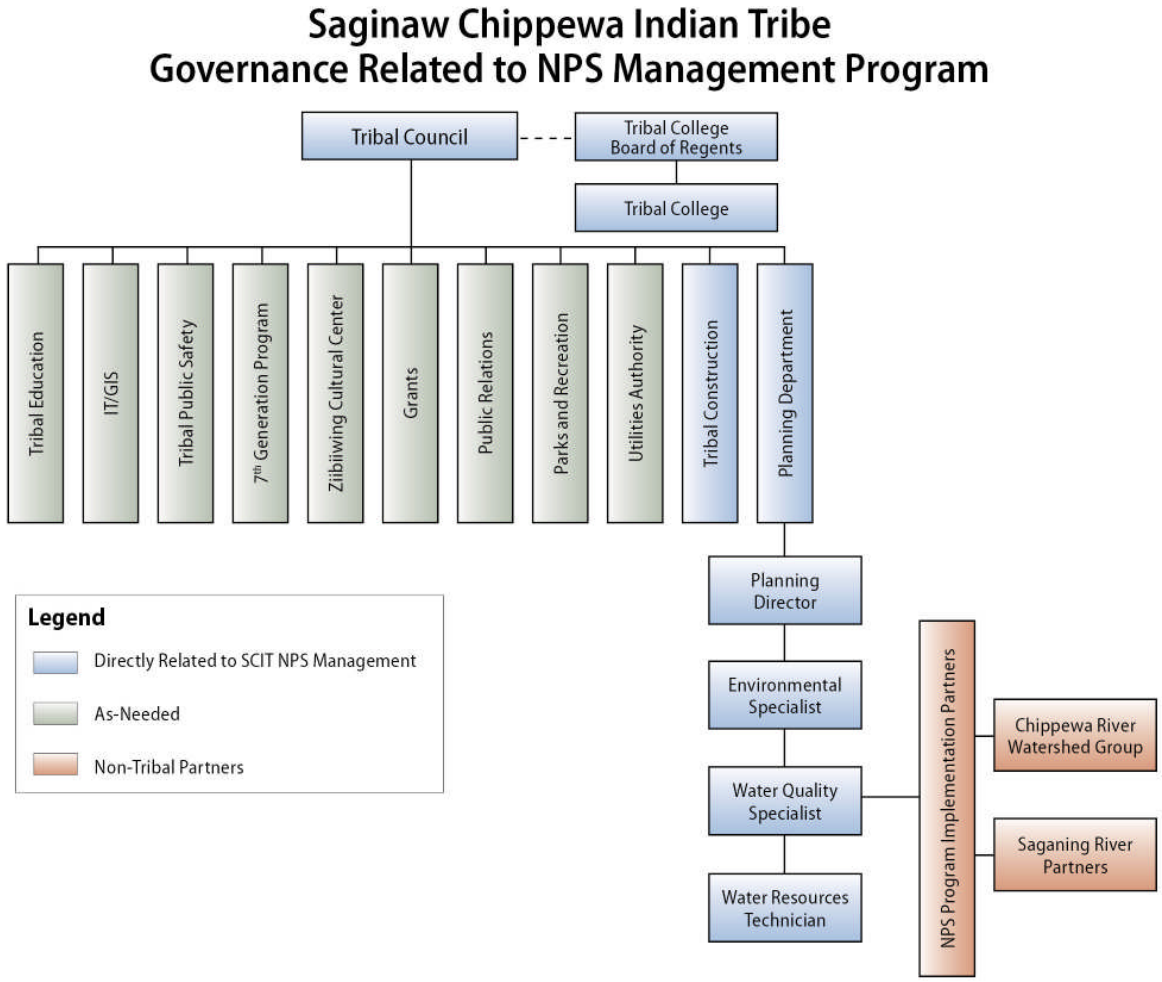


Figure 48. NPS Management Organizational Chart

The list in Table 35 represents key participants, but it by no means captures all of the SCIT's potential partners in addressing NPS pollution on the Isabella Reservation. There are other potential partners working in the greater Saginaw Bay watershed, such as Ducks Unlimited and Trout Unlimited, which might also play a role depending on the nature of the BMP project and the associated goals.

Existing BMPs

Within the Isabella Reservation, several BMPs to address runoff from agricultural and urban sources are already in place through the on-going work of key partners listed in Table 35. This section provides a brief summary of the existing BMPs under the urban, forest, agricultural, and septic system categories. A comprehensive inventory of existing BMPs within the Isabella Reservation has not been compiled to date. This is a task that the SCIT can perform with key partners during the development of the NPS Program Management Plan, the next component necessary to be eligible for Section 319 funding.

Agricultural

As discussed in Section 4, agriculture constitutes approximately 55.2 percent of the land use on the Isabella Reservation. Discussions with the county soil conservation districts for Isabella and Arenac counties, as well as the NRCS offices in each county, indicate that agricultural BMPs are in place on the Isabella Reservation.

Isabella County

In Isabella County, Michigan DEQ funded projects on the North Branch Chippewa in 1991, South Branch Salt in 1997, and North Branch Salt in 2000.

The North Branch Chippewa project is featured in EPA's Nonpoint Source Success Stories (http://water.epa.gov/polwaste/nps/success319/Section319II_MI.cfm). According to the Nonpoint Source Success Story, the project resulted in 49 erosion control structures, over seven miles of fencing, numerous stream crossings, 24 acres of filter strips, a grassed waterway, 0.5 miles of diversions, an agricultural waste management system, over 17 acres of critical area seeding, and 2.7 miles of streambank stabilization that included seven in-stream check dams. All livestock in the North Branch of the Chippewa River are now restricted by fencing from access to the main tributaries. These structural practices have prevented 12,015 tons of sediment from entering the North Branch; they have also saved an estimated 6,248 pounds of phosphorus and 78 pounds of nitrogen.

The North Branch Salt project included 12 grade stabilization structures, 3 erosion control structures, 1 diversion, 9 livestock crossings, 5.5 acres of critical area treatment, and 31,595 feet of animal exclusionary fencing (or 5.98 miles). The South Branch Salt project included BMPs for designated county drains. BMPs included 63 grade stabilization structures, 34,608 feet (or 6.6 miles) of animal exclusionary fencing, 7 animal crossings/watering sites, 3.18 acres of filter strips, and 6 demonstration fields. Additional information from these 319 projects in included in Appendix C.

NRCS staff in Isabella County are working to identify Farm Bill funded BMPs on tribal lands within the county.

The Chippewa Watershed Conservancy has permanent easements in place for 32 acres of agricultural filter strips within the North Branch Chippewa river watershed (Appendix C). The conservancy has an additional 25 acres of preserved land in the reservation.

Arenac County

NRCS staff in Isabella County provided information on tribal lands enrolled in the Conservation Reserve Enhancement Program (CREP). In 2002, 6.7 acres of tribal land in Section 30 of Standish Township was

enrolled in the CREP program, resulting in installation of filter strips, as well as riparian buffer. CREP contracts typically require a 10 to 15 year commitment; therefore, it is possible that the commitment on these practices is near expiration. In 2005, 2.2 acres of tribal land in Section 31 of Standish Township was also enrolled in the CREP program for filter strip installation. The two contracts for these practices, both located on the same farm, last until September 2020. The NRCS office has these areas with filter strips mapped and the SCIT can use these maps to enhance future filter strip projects (Appendix C).

Natural (Forested)

Approximately 22 percent of the land within the Isabella Reservation is forested. The Michigan DNR Gladwin Forest Management Unit is responsible for managing the state forest within Isabella and Arenac counties, as well as five other counties. Within the Isabella Reservation, the Gladwin Forest Management Unit is responsible for 2,300 acres of state forest near Denver Township (Jason Hartman, Unit Manager, Gladwin Forest Management Unit, personal communication, May 15, 2012). The remaining forested lands are privately-owned. MDNR and MDEQ have put forth BMP guidelines for state managed and privately-owned forest lands/operations, found in the document entitled Sustainable Soil and Water Quality Practices on Forest Lands (MDNR and MDEQ 2009).

The Saginaw Basin Land Conservancy has permanently protected 40 acres of land near the mouth of the Saganing River. The conservancy has a phragmites removal program in place on these lands.

The conservation districts have an ash borer program in place that can provide technical assistance, tree sales of seeds and transplants, as well as forest management plans to aid in replacing ash trees lost to ash borer.

Urban

While only 5.9 percent of the Isabella Reservation has impervious cover, concentrated near the City of Mt. Pleasant, urban nonpoint source runoff from these areas has the potential to affect both water quantity and water quality. Construction and roads also contribute to NPS pollution in urban areas. Existing BMPs for urban nonpoint source runoff fall within the jurisdiction of the Isabella and Arenac County Drain Commissioners, as well as the City of Mt. Pleasant's Engineering department.

Isabella County Drains

The Isabella County Drain Commissioner's office uses Michigan's Soil Erosion and Sedimentation Control Guidebook to manage Isabella County drains and related projects. To date, there are no specific projects on tribal lands. However, the Isabella County Drain Commissioner submitted a grant in 2012 for a potential project to clean out the Onion Creek drain, the largest drain on tribal land (Rick Jakubiec, Isabella County Drain Commissioner, personal communication, May 14, 2012).

Arenac County Drains

The Arenac County Drain Commissioner is working on the North Drain, west of the SCIT casino. This effort includes installation of rip-rap and other soil erosion control. Any work done on drains located on tribal lands is coordinated with Don Seals, SCIT Engineering Department (Larry Davis, Arenac County Drain Commissioner, personal communication, May 16, 2012).

City of Mt. Pleasant Stormwater

The City of Mt. Pleasant has mapped the storm sewer outlets and has a stormwater management ordinance in place. The city is a self-permitting soil erosion control agent. As a result, all construction projects have soil erosion control measures in place that are inspected on regular basis. New construction projects retain stormwater onsite and meter it into the storm system, giving sediment time to settle before entering the storm sewer system. The City does a routine cleaning of catch basins to ensure

the sumps and the overall storm sewer system work properly (Bill Brikner, City of Mt. Pleasant Engineering Department, personal communication, May 14, 2012).

Union Township Stormwater

Union Township has had a stormwater management ordinance in place since 1991 that applies to all commercial uses including subdivisions. The township has recently started a wellhead protection plan.

Parks and Recreation

Central Michigan University and the Mt. Pleasant Parks and Recreation have installed vegetative swales in Mt. Pleasant to address streambank erosion.

Septic Systems

Central Michigan Health Department enforces septic system improvements in Isabella and Arenac Counties. Currently improvements are driven by complaints to the health department.

Future BMP Selection to Reduce NPS Pollution

This section discusses the SCIT's process for selecting BMPs to address the sources of NPS pollution on the Isabella Reservation as discussed in Section 6, as well as the process for public participation and governmental coordination.

Proposed BMP Selection Process

The SCIT will undertake a multi-step process for evaluating and selecting BMPs to address NPS pollution from sources discussed in Section 6. The steps are as follows:

- Prioritize subwatersheds based on water quality status (i.e., whether the waterbody meets tribal water quality goals) for each 12-digit HUC subwatershed by pollutant using monitoring data, as presented in Section 6. According to Section 6, April temperatures are a high priority category; *E.coli* is a medium level priority, and dissolved oxygen, nutrients, specific conductivity, turbidity, and TDS are low priority categories for goal attainment. Stakeholder input identified invasive species removal and erosion as high priority categories throughout the reservation. The Saganing River stakeholders identified low flow as a high priority category.

- Consult with tribal partners regarding the prioritization list, key NPS pollutants, relative magnitude in each subwatershed, and possible opportunities for addressing them.

- Identify applicable BMPs appropriate for the type and source of NPS pollution, with the assistance of technical assistance and consultation partners.

- Narrow the list of applicable BMPs using evaluation factors of scale, environmental conditions, and estimated effectiveness.

- Initiate one-to-one discussions with key landowners / land managers, producer groups, and other potentially involved parties to review water quality data and possible BMP implementation opportunities.

- Work with key partners to rank narrowed list of BMPs according to expected performance and feasibility.

- Identify BMPs that have potential for collaborative, coordinated implementation with key partners.

- Present BMP options to tribal council for further refinement.

- Present BMP options approved by tribal council to tribal members and general public for comment.
- Pursue funding for approved suite of BMPs with tribal council, tribal member, and public support.
- Promote BMPs to targeted audiences for possible implementation through private efforts

Public Participation and Government Coordination

As demonstrated in the proposed BMP selection process, the SCIT intends to work closely with the key partners that currently implement both agricultural and urban BMPs on the Isabella Reservation. For agricultural BMPs, the SCIT will consult and coordinate with the Isabella and Arenac county soil conservation districts, as well as NRCS and the Farm Service Agency, as well as with individual producers and land owners/managers. For urban BMPs, the SCIT will consult and coordinate with the Isabella and Arenac county drain commissioners, and managers of large land tracts (e.g., facilities with industrial stormwater permits, large institutions such as schools, hospitals, and commercial areas, etc.).

The SCIT met with some of these public partners in December of 2012 to narrow down the list of desired BMPS. Table 36 provides a summary of potential BMPs the SCIT would like to implement to address NPS pollution within the Reservation.

Table 36. Selected BMPs by NPS Category

BMP Description by NPS Category	Priority		
	High	**Medium**	**Low**
Agricultural	**x**		
Alternative Livestock Watering Systems		**x**	
Filter Strips, Riparian Buffers, Grassed Waterways	**x**		
Educational workshops and outreach materials for agricultural landowners and renters	**x**		
Permanent Easements for Filter Strips	**x**		
Streambank Stabilization	**x**		
BMP demonstration project to study potential use of silt fence and other low-cost BMPs on agricultural lands	**x**		
Cattle Exclusion from Streams/Fencing	**x**		
Grazing Land Management			**x**
Proper Manure Handling, Collection and Disposal		**x**	
Tile Breaks		**x**	
Tile Inventory	**x**		
Riparian ordinance prohibiting removal of native streamside vegetation			**x**
Urban	**x**		
Education and pollution prevention programs	**x**		
Erosion control structures	**x**		
Maintaining and restoring riparian buffers	**x**		
Stormwater Codes and Ordinance Review	**x**		
Identification of recreation access points and non-accessible areas used for recreation to limit streambank erosion	**x**		
Updating local government codes and ordinances based on review findings to encouraging better site design to decrease runoff		**x**	
Establish tribal standards/specifications/policies to promote green infrastructure and LID applicable to future development on the reservation	**x**		
Septic Systems	**x**		
Review existing septic system ordinances and look at Bay County updated ordinance as possible model	**x**		
Identify and inventory antiquated systems	**x**		
Identify high risk areas to prioritize system replacement	**x**		
Septic education for homeowners via pamphlets/folders	**x**		
Create incentives for proper maintenance, reporting of failed systems, and system replacement	**x**		

BMP Description by NPS Category	Priority		
	High	Medium	Low
Infrared camera tracking			x
Caffeine testing/tracking		x	
Hydrologic/Habitat Modifications	x		
Protecting and establishing native vegetation	x		
Inventory and prioritization of eroding streambanks for restoration	x		
Tree Canopy Inventory/ Revegetation Strategy	x		
Acquire critical streamside property		x	
Temperature Monitoring		x	
Tree Planting education	x		
Stream Road Crossing Inventory	x		
Technical and cultural hydrogeologic study of the Saganing River	x		
Dam modification/removal			x
Tribal Organizational BMPs	x		
Establish Tribal water quality standards	x		
Develop and conduct Tribal staff training on NPS pollution and BMPs	x		
Establish standards/specifications/policies to promote green infrastructure and LID applicable to future development on the reservation	x		

SECTION 9 – EXISTING SCIT NPS CONTROL PROGRAMS

This section presents all available programs for controlling NPS pollution that the SCIT can consider and identifies the existing NPS pollution-reduction programs on the Isabella Reservation. The SCIT NPS program will enlist the support of the internal and external programs, resources and entities listed in this section to develop and build upon its NPS management program. Under this approach, environmental and water quality staff from the SCIT Planning Department will use the Assessment Report and Management Program Plan as a guide for organizing available resources to address the NPS challenges identified in this document. The approach involves a coordinated, cooperative effort led by key Planning Department staff and supported by other tribal and non-tribal resources.

Available Programs for Controlling NPS Pollution

A wide range of local, state, and federal programs exist that the SCIT can consider using to help address NPS pollution on the Isabella Reservation. Table 37 presents an overview of these programs and the source of NPS pollution addressed by each program.

Table 37. NPS Related Programs

NPS Related Program Description	NPS Category				
	Agriculture	Land Disposal	Hydrologic/Habitat Modifications	Construction	Urban
SCIT Planning Department. Staff from the SCIT Planning Department includes an environmental specialist, environmental response program specialist, a water quality specialist, and a water resource technician. This staff, under the direction of the tribal council and assisted by other tribal agencies (e.g., parks and recreation, utilities, education) is primarily responsible for developing and implementing the NPS pollution control program.	X	X	X	X	X
SCIT Water Quality and NPS Management Program. The water quality specialist and water resource technician will lead the development and implementations of the NPS pollution control program.	X	X	X		X
Bureau of Indian Affairs Water Resource Grants. This program, funded through the Indian Self-Determination and Education Assistance Act, provides grants for the collection and analysis of baseline data.	X				
Clean Water State Revolving Fund. The Clean Water SRF program was established to provide low-interest loans to governmental entities for clean water and NPS pollution control projects.	X	X	X		
Consolidated Water Facilities Construction Program. This program was established to provide grants and loans for water-related projects. The amount of funds available is dependent on the amount appropriated by the legislature and the amount of funds previously awarded.	X				
Corps of Engineers Section 404 Dredge and Fill Permit Program. This program regulates the discharge of fill or dredged material into lakes, rivers, and wetlands.	X				

NPS Related Program Description	NPS Category				
	Agriculture	Land Disposal	Hydrologic/Habitat Modifications	Construction	Urban
Drinking Water State Revolving Fund. The Drinking Water SRF program was established to provide low-interest loans for drinking water projects. The amount of funds available is dependent on the amount of appropriations from the U.S. Congress and the amount of repayment of funds previously loaned.		X			
Michigan DEQ NPS Program. Michigan DEQ is responsible for addressing NPS issues on non-tribal lands in the areas surrounding SCIT lands. The SCIT has good relationships with state DEQ staff, and will communicate with them as needed to address common interests regarding NPS control measures which affect water quality on tribal lands.	X	X	X	X	X
Michigan DNR Gladwin Management Unit. Manages the 2,300 acres of state forest near Denver Township within the Isabella Reservation according to state requirements for timber sales. MDNR provides guidelines for timber sales on privately-owned forested lands.			X		
Natural Resources Conservation Service Farm Bill Programs. NRCS has several funding programs, including, Wetland Reserve Program, conservation of private grazing lands, the Farmland Protection Program, and the conservation farm option.	X				
USDA, NRCS Conservation Reserve Program (CRP) and the Conservation Reserve Enhancement Program (CREP). The CRP and CREP offer long-term rental payments and cost-share assistance to establish long-term, resource-conserving cover to reduce soil erosion and improve water quality.	X				
USDA, NRCS Environmental Quality Incentives Program. EQIP was created to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible goals. The program offers technical, financial, and educational assistance for approved farm improvement practices	X				
USDA Rural Development Administration. The RDA supports the construction of new water and waste water systems and the improvement of existing systems	X	X			
USDA Sustainable Agriculture Research and Education. In the SARE program, the funding is aimed at reducing the use of chemical pesticides, fertilizers, and toxic materials in agricultural production.	X				
USDA, NRCS Forest Management Plan (FMP). The Environmental Quality Incentives Program (EQIP) has funding available to support the development of site-specific plans that are developed based on landowner's management objectives and professional expertise of a skilled forester to achieve long-term forest management goals.			X		
USEPA Section 106 Program. This program assists in establishing and maintaining adequate measures for preventing and controlling surface and ground water pollution.	X	X	X		X
USEPA Section 319 Program. This program assists in implementing USEPA-approved section 319 NPS management programs.	X	X	X	X	X

Existing NPS Pollution Reduction Programs for Isabella Reservation

Several programs that address NPS pollution, directly or indirectly, are in place on the Isabella Reservation. These projects are implemented through various NRCS programs under the Farm Bill (e.g., CREP), septic system management provided by the Central Michigan District Health Department, Michigan DNR Gladwin Forestry Management Unit for the state forest parcel near Denver Township, and water quality monitoring and land use planning activities conducted by the SCIT Planning Department. These programs are identified in Table 37 above.

Finally, the tribe is working with USEPA to establish an NPS management program funded under Section 319 of the Clean Water Act. This assessment report and the associated NPS Management Program Plan will help to fulfill requirements for funding. The funding will be used to implement the tribe's NPS Management Program. Once this program is in place, the SCIT will have the ability to better coordinate these various ongoing programs to meet the goals of the NPS Management Program.

SECTION 10 – CONCLUSIONS

With the information contained in this NPS Assessment report, the SCIT is better equipped to move forward in developing and implementing a NPS management program for tribal lands.

The NPS pollution issues that affect the SCIT's tribal lands, as described in Sections 6 and 7 of this report, include temperature, *E. coli*, and erosion, as well as low flows in the Saganing River. To a lesser extent, dissolved oxygen, nutrients, specific conductivity, turbidity, and TDS are contributing to water quality impairment of reservation waters. Table 38 provides a summary of the key findings and recommendations by watershed.

Table 38. NPS Assessment Key Findings and Recommendations by Watershed

Watershed	Key Findings	Recommendations
Chippewa River	Both spring temperature and *E. coli* have high ratings (>66% exceeding the goal status)	Focus BMPs on agricultural lands, as well as septic systems. Future sampling of Chippewa River should include temperature to help determine source of high spring values, *E. coli* sampling that meets the MDEQ five-day geometric mean criteria, and specific conductivity, total nitrogen, and total phosphorus to determine tribal standards.
Coldwater River	Spring temperature has high rating (>66% exceeding the goal status)	Focus BMPs on agricultural lands, as well as urban runoff from Weidman community. Investigate septic system performance. Coldwater River would benefit from future total nitrogen sampling to better understand nitrogen trends on this waterbody, as well as temperature to help determine source of high spring values, *E. coli* sampling that meets the MDEQ five-day geometric mean criteria, and specific conductivity and total phosphorus to determine tribal standards.
North Branch Chippewa	Spring temperature, *E. coli*, total nitrogen, and specific conductivity have high rating (>66% exceeding the goal status). Several of these parameters also have a medium rating at many sampling stations.	Focus BMPs on agricultural lands and septic systems. Continued sampling of all parameters on the North Branch Chippewa is recommended to further analyze beneficial use attainment.

Watershed	Key Findings	Recommendations
Saganing River	Spring temperature, *E. coli*, total nitrogen, and specific conductivity have high rating (>66% exceeding the goal status). Turbidity has a medium rating.	Future sampling of Saganing River should include temperature to help determine source of high spring values, *E. coli* sampling that meets the MDEQ five-day geometric mean criteria, and specific conductivity, total nitrogen, and total phosphorus to determine tribal standards. Investigative studies to determine the cause of historically low flows in this watershed are needed.
Salt River	Biotic Sampling by CMU has identified high turbidity and sedimentation as priority issues Past 319 projects identified the loss of riparian vegetation as causing high levels of erosion	The addition of monitoring sites to Salt River is recommended to better understand potential threats to this waterbody.

Based on the key findings for the watersheds, it appears that temperature, *E. coli,* and sedimentation/erosion are the highest priority across tribal lands. The NPS categories that are likely to contribute to elevated temperature include loss of riparian vegetation, streambank destabilization, and construction. Nonpoint sources contributing to elevated *E. coli* levels on tribal lands could include agricultural practices associated with livestock on pasture lands (e.g., access to streams and manure management) and crops (e.g., land application of manure), failing or antiquated septic systems, and urban runoff. Based on the assessment results, priority watersheds for BMP implementation include the North Branch Chippewa River and Saganing River. Salt River is a priority for future monitoring.

As discussed in Section 8, the SCIT is currently working with local, state, and federal partners to support BMP implementation and to develop a NPS Management Program Plan. To date, the SCIT has conducted water quality monitoring of tribal waters necessary to support the development of a NPS Assessment report. Future work will include more collaboration and coordination with local, state, and federal partners on identifying, evaluating, and selecting BMPs to address NPS priorities on tribal lands.

Once a NPS Management Program is in place, the SCIT intends to address erosion, temperature, and *E. coli* issues affecting tribal waters first. Many of the BMPs that the SCIT anticipates would be implemented to address erosion and *E. coli* from agricultural sources and temperature would also help to reduce nutrient contributions, reduce TDS, and increase dissolved oxygen levels.

It should be noted that an overall goal of the SCIT is to identify high quality waters (i.e. those that significantly meet the criteria for their designated use) for protection. Water quality protection measures will include identification of high quality waters, public outreach to raise awareness of where they are and the importance of maintaining existing levels of high water quality, identification of any relevant water quality threats, and the adoption of measures tailored to address any threats identified. Water quality protection measures may include preservation or expansion of vegetated riparian buffers, setbacks for septic systems and other activities, and other practices similar to the BMPs listed in this document intended to reduce nonpoint sources of pollution.

To date, the SCIT has met nearly all eligibility requirements for Section 319 funding. A summary of how these requirements are being fulfilled is provided below.

1. **Be a federally recognized tribe.** The SCIT is a federally recognized tribe.
2. **Complete an approved CWA section 319(a) NPS assessment report.** Once approved by EPA Region 5, this report fulfills this eligibility requirement.
3. **Complete an approved CWA section 319(b) NPS management program.** The SCIT initiated the development of the NPS Management Program Plan in August 2012.
4. **Be CWA section 518(e) approved for treatment similar to a state ("treatment as a state" or TAS).** The SCIT has received TAS status in the past and will compile and provide the necessary documentation to obtain TAS approval by March 2013.

The next step is development of the NPS Management Program Plan that details the activities the SCIT will take with non-tribal partners to protect its valuable water resources from further NPS pollution. The plan will build off of the information contained in this NPS Assessment Report to ensure that SCIT waters support a healthy aquatic ecosystem for current and future community use.

GLOSSARY

Beneficial uses – Designations made by states or tribes regarding how a particular waterbody is expected to be used and for what it is to be managed. Examples: cold water fishery, drinking, swimming.

Best management practices (BMPs) – Practices, measures, or actions that are commonly recommended to prevent, reduce, or mitigate pollution from NPSs.

Cultural issues – Knowledge, belief, behavior, or set of shared attitudes, values, goals, and practices of a specific group. For Native American cultures, some attributes to consider: respect for the natural world, spirituality, elders and children, clans and kinship, leadership and decision-making, history, governance structures, protocols, and laws.

CWA section 303(d) – Section under which states, territories, and authorized tribes are required to develop lists of impaired waters that do not meet water quality standards or use designations that have been set for them. The section requires establishing priority rankings for waters on the lists.

CWA section 305(b) – Requires states and territories to report every two years on the water quality and use designations of all navigable waters, surface waters, and ground water and impacts from both point and NPSs of pollution. (Tribes are not required to submit 305(b) reports.)

CWA section 518 – Establishes that Indian tribes will be treated as states for the purposes of title II (grants for treatment works) and sections 104, 106, 303, 305, 308, 309, 314, 319, 401, 402, and 404.

***E. coli (Escherichia coli)* –** A gram negative bacterium that is commonly found in the lower intestine of warm-blooded animals.

Fee lands – Land parcels that are owned by nontribal individuals or entities and are within the reservation boundaries.

Hydrologic Unit Code (HUC) – A 2- to 12- digit number assigned by the U.S. Geological Survey as part of its surface waterbody classification system.

Indicator – Entity, process, or community whose characteristics show the presence of specific environmental conditions.

Narrative criteria – Statements that describe the desired water quality goal, such as waters being *free from* pollutants or substances that can harm people and fish; an approach used for pollutants for which numeric criteria are difficult to establish because of inherent subjectivity.

NPS pollution – Pollution not discharged from a point source. This generally consists of pollution from diffuse sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land as a result of precipitation events (rainfall, snowmelt).

Nonprofit/nongovernmental organizations – Sometimes seen as NPO or NGO. A group organized for purposes other than generating profit and in which no part of the organization's income is distributed to its members, directors, or officers. This is established at the time of formation, and only approved activities under this designation are allowed; no official governmental representatives are governing members.

Numeric criteria – A number standard for limiting a particular pollutant that protects a specific use designation; can be load- or concentration-based.

Partnership – A cooperative relationship between people or groups that agree to share responsibility for achieving some specific goal.

Point source – A stationary location or fixed facility from which pollutants are discharged through a conveyance system; any single identifiable source of pollution, such as a pipe, ditch, ship, ore pit, or factory smokestack.

Public participation – A principle or practice that seeks out and facilitates the involvement of those potentially affected by or interested in a decision. The full range of actions employed to engage people in current or proposed activities. Implies that the public's contribution will influence the decision-making process.

Riparian areas – Areas adjacent to rivers and streams with a differing density, diversity, and productivity of plant and animal species relative to nearby uplands.

Silviculture - The practice of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values.

Trust lands – Lands held in trust by the U.S. government for a tribe.

Water quality criteria – Levels of water quality expected to render a body of water suitable for its designated use. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, fish production, or industrial processes.

Water quality goal – A long-term perspective on the evaluation of water resource conditions that describes an eventual desired future condition and implies actions toward meeting a targeted improvement in or maintenance of current high quality of the waters.

Water quality standards – State/tribe-adopted and EPA-approved ambient standards for waterbodies. There are four parts to an individual water quality standard: designated use, numeric criteria, narrative criteria, and antidegradation provisions. The standards prescribe the use of the waterbody and establish the water quality criteria that must be met to protect designated uses.

Waterbody – Any surface water resource.

Watershed – The land area that drains into a stream, wetland, lake, or coastal waterbody. The watershed for a major river could encompass a number of smaller watersheds that ultimately combine at a common point.

REFERENCES

Albert, D. A. 1995. *Regional landscape ecosystems of Michigan, Minnesota, and Wisconsin: a working map and classification*. Gen. Tech. Rep. NC-178. St. Paul, MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/1998/rlandscp/rlandscp.htm (Version 03JUN98).

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition.* USEPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

City of Mt. Pleasant. 2011. *Annual Drinking Water Quality Report.*

Fishbeck, Thompson, Hubert, & Carr and Saginaw Chippewa Indian Tribe. 2011. *Tribal Assessment Report for the Saginaw Chippewa Indian Tribe of Michigan*. Prepared for the Saginaw Chippewa Indian Tribe.

Fishbeck, Thompson, Hubert, & Carr and Saginaw Chippewa Indian Tribe. 2011b. *Hydrogeological Study for A Type I Public Water Supply Well*. Prepared for the Saginaw Chippewa Indian Tribe. January 2011. Project No. G090169

Horsely and Witten, Inc. 1996. Identification and evaluation of nutrient and bacterial loadings to Maquoit Bay, New Brunswick and Freeport, Maine. Final Report.

Leopold, L. 1994. *A View of the River*. Harvard University Press. 290p.

MDEQ (Michigan Department of Environmental Quality). 1997. *A Pesticide Screening Study of the Tributaries to Saginaw Bay*. MDEQ Surface Water Quality Division. MI/DEQ/SWQ-95/056

MDNR and MDEQ (Michigan Department of Natural Resources and Michigan Department of Environmental Quality). 2009. *Sustainable Soil and Water Quality Practices on Forest Land*.

National Environmental Service Center (NESC). 1992 and 1998, *Summary of the Status of Onsite Wastewater Treatment Systems in the United States.*

NRCS (Natural Resources Conservation Service). 2002. Soil Survey Geographic (SSURGO) Database. Available online at: http://www.soils.usda.gov/survey/geography/ssurgo/

Pauquette, C. 2012. Personal Communication on December 17th 2012 with Carey Pauquette, Saginaw Chippewa Indian Tribe Environmental Specialist.

USEPA (U.S. Environmental Protection Agency). 2001. *Ambient Water Quality Criteria Recommendations Information Supporting the Development of State and Tribal Nutrient Criteria Rivers and Streams in Nutrient Ecoregion VIII.* Available online at http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/ecoregions/ecoregions_rivers_index.cfm

USEPA (U.S. Environmental Protection Agency).2001b. *Ambient Water Quality Criteria Recommendations Information Supporting the Development of State and Tribal Nutrient Criteria Rivers and Streams in Nutrient Ecoregion VI.* Available online at http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/ecoregions/ecoregions_rivers_index.cfm

USEPA (U.S. Environmental Protection Agency).2001c. *Ambient Water Quality Criteria Recommendations Information Supporting the Development of State and Tribal Nutrient Criteria Rivers*

and Streams in Nutrient Ecoregion VII. Available online at http://water.epa.gov/scitech/swguidance/standards/criteria/nutrients/ecoregions/ecoregions_rivers_index.cfm

USEPA (U.S. Environmental Protection Agency). 2006. *Final Guidance on Awards of Grants to Indian Tribes under Section 106 of the Clean Water Act for Fiscal Years 2007 and Beyond* (EPA 832-R-06-003). Office of Water, Office of Wastewater Management. Available online at http://water.epa.gov/learn/training/tribaltraining/upload/final-tribal-guidance.pdf

USEPA. (U.S. Environmental Protection Agency). 2007. *An Approach for Using Load Duration Curves in the Development of TMDLs.* EPA 841-B-07-006. U.S. Environmental Protection Agency, Watershed Branch (4503T), Office of Wetlands, Oceans and Watersheds.

USEPA (U.S. Environmental Protection Agency). 2009. *National Water Quality Inventory: Report to Congress 2004 Reporting Cycle January 2009 (*EPA 841-R-08-001). United States Environmental Protection Agency Office of Water Washington, DC 20460 http://water.epa.gov/lawsregs/guidance/cwa/305b/2004report_index.cfm. Accessed March 2012.

USEPA (U.S. Environmental Protection Agency). 2010a, *Handbook for developing and Managing Tribal Nonpoint Source Pollution Programs Under Section 319 of the Clean Water Act*. (EPA 841-B-10-001). United States Environmental Protection Agency Office of Water Nonpoint Source Control Branch – 4503(T) 1200 Pennsylvania Avenue, NW Washington, DC 20460. Available online at http://www.epa.gov/owow/NPS/tribal/pdf/tribal_handbook2010.pdf

USEPA (U.S. Environmental Protection Agency). 2010b. *Statistical Software ProUCL 4.1.00 for Environmental Applications for Data Sets with and without Nondetect Observations* (EPA/600/R-07/041). Technology Support Center. User guide available online at http://www.epa.gov/osp/hstl/tsc/ProUCL_v4.1_user.pdf

USEPA (U.S. Environmental Protection Agency). 2012. *Conductivity*. Available online at http://water.epa.gov/type/rsl/monitoring/vms59.cfm

USEPA (U.S. Environmental Protection Agency) 2012b. *CADDIS: The Causal Analysis/Diagnosis Decision Information System*. Available online at http://www.epa.gov/caddis/ssr_do_int.html

USEPA (U.S. Environmental Protection Agency) 2012c. *Michigan: Talking with Farmers - The North Branch Chippewa River 319 Watershed Project*. Available online at http://water.epa.gov/polwaste/nps/success319/Section319II_MI.cfm

USEPA (U.S. Environmental Protection Agency). 2012d. *Turbidity*. Available online at http://water.epa.gov/type/rsl/monitoring/vms55.cfm

SCIT (Saginaw Chippewa Indian Tribe). 2009. *Quality Assurance Project Plan. Prepared For The U.S. EPA, Region 5. Water Quality Assessment And Monitoring Program For The Saginaw Chippewa Indian Tribe's Surface Water Resources*. Saginaw Chippewa Indian Tribe (SCIT). Project Period 10/01/11-9/30/12. Clean Water Act 106 Grant #: I-0057602-0

SCIT (Saginaw Chippewa Indian Tribe). 2012a *History of the Tribe* Accessed on 3/20/2012 Available online at: http://www.sagchip.org/ziibiwing/aboutus/history.htm

SCS. 1986. *Urban Hydrology for Small Watersheds.* Technical Release 55, US Department of Agriculture, Soil Conservation Service, Engineering Division, Washington, DC.

APPENDICES

Appendix A: Soil Properties

Table 39. Soil Hydrologic Group summary within each 12-digit HUC subwatershed

12-digit HUC subwatershed Name	Acres of Soil	Soil Hydrologic Group
Bluff Creek	2.87	
	112.31	A
	1,771.30	A/D
	2,662.47	B
	256.63	B/D
	72.42	C
Coldwater River	323.33	
	2,427.20	A
	1,043.80	A/D
	1,243.83	B
	348.18	B/D
	2,228.81	C
	162.30	D
Dice Drain-Chippewa River	234.87	
	1,435.70	A
	1,848.02	A/D
	4,937.26	B
	659.42	B/D
	316.77	C
Hogg Creek-North Branch Chippewa River	34.42	
	557.34	A
	902.30	A/D
	3,848.36	B
	1,673.20	B/D
	16,140.54	C
	3,592.63	D
Howard Creek-Salt River	4.29	
	114.49	A
	138.46	A/D
	876.74	B
	426.60	B/D
	870.62	C
Johnson Creek-Chippewa River	435.14	
	3,813.88	A
	1,082.76	A/D
	7,672.72	B
	677.52	B/D
	99.35	C
	47.25	D
McDonald Drain-North Branch Salt River	52.37	
	1,252.65	A
	1,312.24	A/D
	3,559.40	B
	3,228.53	B/D
	4,081.62	C
	75.03	D
Mission Creek-Chippewa River	1,768.05	

12-digit HUC subwatershed Name	Acres of Soil	Soil Hydrologic Group
	1,034.61	A
	715.27	A/D
	2,154.47	B
	871.33	B/D
	2,524.58	C
	53.67	D
North Branch Salt River	13.97	
	301.43	A
	93.06	A/D
	2,883.68	B
	4,256.59	B/D
	4,135.58	C
	81.58	D
Onion Creek	239.47	A
	117.81	A/D
	824.60	B
	315.37	B/D
	297.30	C
Salt Creek	0.54	
	462.38	A/D
	343.94	B
Schofield Creek-North Branch Chippewa River	2.80	A
	54.14	A/D
	63.72	B
	5.59	B/D
	36.69	C
	96.06	D
South Branch Salt River	2.97	
	191.98	A
	2,093.26	A/D
	5,797.59	B
	1,174.66	B/D
	1,818.18	C
	122.83	D
Spring Creek-South Branch Salt River	96.85	
	466.89	A
	433.38	A/D
	3,211.81	B
	2,241.79	B/D
	16,922.88	C
	2,246.10	D

Table 40. Soil types constituting greater than 1 percent of the land area in Isabella Reservation.

Map Unit Name	Acres	Percent	Description
Adrian muck	2012.7	1.45	The Adrian soil is very poorly drained. This soil formed in organic deposits 16 to 51 inches thick over sandy material. It is on glacial lake plains and outwash plains. The permeability is moderately slow to moderately rapid in the organic material and rapid in the lower sandy material. The available water capacity is very high. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.
Belleville	1673.5	1.21	The Belleville soil is poorly or very poorly drained. This soil formed in

Map Unit Name	Acres	Percent	Description
loamy sand			sandy deposits 20 to 40 inches thick over loamy material. It is on glacial lake plains and till plains. The permeability is rapid in the upper part of the soil and moderately slow in the lower part. The available water capacity is low to high. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.
Cohoctah fine sandy loam	1922.7	1.39	The Cohoctah soil is poorly or very poorly drained. This soil formed in loamy material on floodplains. The permeability is moderately rapid. The available water capacity is moderate. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding. It is also subject to frequent floodings for brief to long periods.
Coloma sand	3884.8	2.8	The Coloma soil is excessively drained. This soil formed in sandy material with sandy and loamy bands. It is on glacial outwash plains and moraines.
Corunna sandy loam	2275	1.64	The Corunna soil is poorly drained. This soil formed in loamy material. It is on glacial lake plains and till plains. The permeability is moderate or moderately rapid in the upper part of the soil and moderate or moderately slow in the lower part. The available water capacity is high. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.
Covert sand	1508.3	1.09	The Covert soil is moderately well drained. This soil formed in sandy material. It is on glacial till plains, outwash plains, lake plains low moraines, and dunes. The permeability is rapid. The available water capacity is low. The surface runoff is very slow. The seasonal high water table fluctuates between 2 to 3.5 feet of the surface during prolonged wet periods.
Guelph loam	1506.7	1.09	The Guelph soil is well drained. This soil formed in loamy material. It is on glacial moraines and till plains. The permeability is moderately slow. The available water capacity is moderate or high. The surface runoff is medium to very rapid depending on the slope.
Ithaca loam	20291.5	14.65	The Ithaca soil is somewhat poorly drained. This soil formed in loamy and clayey material. It is on glacial till plains and low moraines. The permeability is moderately slow or slow. The available water capacity is moderate or high. The surface runoff is slow or medium depending on the slope. The seasonal high water table fluctuates between 1 to 2 feet of the surface during prolonged wet periods.
Kingsville loamy sand	8259.1	5.96	The Kingsville soil is poorly drained. This soil formed in sandy material. It is on low glacial beach ridges, offshore sand bars and till plains. The permeability is rapid. The available water capacity is low. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.
Londo loam	13127.3	9.48	The Londo soil is somewhat poorly drained. This soil formed in loamy material. It is on low glacial moraines and till plains. The permeability is moderate or moderately slow. The available water capacity is moderate or high. The surface runoff is slow to medium depending on the slope. The seasonal high water table fluctuates between 1 to 2 feet of the surface during prolonged wet periods.
Marlette loam	4323.6	3.12	The Marlette soil is well drained. This soil formed in loamy material and is on glacial moraines. The permeability is moderately slow. The available water capacity is moderate to high. The surface runoff is medium to very rapid depending on slope.
Ormas sand	1840	1.33	The Ormas soil is well drained. This soil formed in sandy deposits 20 to 40 inches thick over loamy deposits over sandy material. It is on glacial outwash or stream terraces. The permeability is rapid in upper part of the soil, moderately rapid in the middle part and very rapid in the lower part. The available water capacity is moderate. The surface runoff is slow to medium depending on slope.
Parkhill loam	7843.7	5.66	The Parkhill soil is poorly or very poorly drained. This soil formed in loamy material. It is on glacial till plains and moraines. The permeability

Map Unit Name	Acres	Percent	Description
			is moderately slow. The available water capacity is moderate or high. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.
Perrinton loam	14245.2	10.28	The Perrinton soil is well drained. This soil formed in loamy and clayey material. It is on glacial till plains and moraines. The permeability is slow. The available water capacity is moderate or high. The surface runoff is slow to rapid depending on the slope.
Pinnebog muck	1892	1.37	The Pinnebog soil is very poorly drained. This soil formed in organic deposits more than 51 inches thick. It is on glacial lake plains, outwash plains, till plains and moraines. The permeability is moderately slow to moderately rapid. The available water capacity is very high. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.
Pipestone sand	15033.8	10.85	The Pipestone soil is somewhat poorly drained. This soil formed in sandy material. It is on glacial outwash plains, lake plains, beach ridges and till plains. The permeability is rapid. The available water capacity is low. The surface runoff is slow or very slow. The seasonal high water table fluctuates between .5 to 1.5 feet of the surface during prolonged wet periods.
Plainfield sand	2034.6	1.47	The Plainfield soil is excessively drained. This soil formed in sandy material. It is on glacial outwash plains, lake basins, stream terraces, and moraines. The permeability is rapid. The available water capacity is low. The surface runoff is slow to medium depending on the slope.
Remus-Spinks complex	1908.7	1.38	The Remus soil is well drained. This soil formed in loamy material and is on glacial moraines. The permeability is moderately slow. The available water capacity is low to high. The surface runoff is medium or rapid depending on the slope. The Spinks soil is well drained. This soil formed in sandy deposits with sandy and loamy bands. It is on glacial moraines, till plains, outwash plains, beach ridges and lake plains. The permeability is moderately rapid. The available water capacity is low. The surface runoff is very slow to medium depending on slope.
Selfridge sand	7008.2	5.06	The Selfridge soil is somewhat poorly drained. This soil formed in sandy deposits 24 to 40 inches thick over loamy material. It is on low sand dunes, glacial lake plains and till plains. The permeability is rapid in the upper part of the soil and moderately slow in the lower part. The available water capacity is low or moderate. The surface runoff is very slow or slow. The seasonal high water table fluctuates between 2 to 3.5 feet of the surface during prolonged wet periods.
Thetford loamy sand	1607.8	1.16	The Thetford soil is somewhat poorly drained. This soil formed in sandy material with bands of sandy and loamy material. It is on glacial moraines till plains, lake plains, outwash plains, terraces, and beach ridges. The permeability is moderately rapid. The available water capacity is low. The surface runoff is very slow or slow. The seasonal high water table fluctuates between 1 to 2 feet of the surface during prolonged wet periods.
Wixom loamy sand	3465.5	2.5	The Wixom soil is somewhat poorly drained. This soil formed in sandy deposits 20 to 40 inches thick over loamy material. It is on glacial till plains, outwash plains and lake plains. The permeability is rapid in the upper part of the soil and moderately slow in the lower part. The available water capacity is low to high. The surface runoff is slow. The seasonal high water table fluctuates between .5 to 1.5 feet of the surface during prolonged wet periods.
Woodbeck-Coloma complex	1455.7	1.05	The Coloma soil is excessively drained. This soil formed in sandy material with sandy and loamy bands. It is on glacial outwash plains and moraines. The permeability is rapid. The available water capacity is low. The surface runoff is slow or medium depending on the slope. The Woodbeck soil is well drained. This soil formed in clayey deposits 20 to 40 inches thick over sandy or gravelly material. It is on glacial ground moraines, outwash plains and lake plains. The permeability is moderately slow in the upper part and rapid in the lower part. The

Map Unit Name	Acres	Percent	Description
			available water capacity is low to high. The surface runoff is medium to rapid depending on the slope.
Ziegenfuss loam	6184.9	4.46	The Ziegenfuss soil is poorly drained. This soil formed in loamy and clayey material. It is on glacial till plains and moraines. The permeability is moderate or moderately slow in the upper part of the soil and slow in the lower part. The available water capacity is moderate or high. The surface runoff is very slow or ponded. The seasonal high water table is at or near the surface during prolonged wet periods. This soil is subject to frequent ponding.

Appendix B: Water Quality Data Summary Tables

Chippewa River

Lake Isabella-Chippewa River (040802020202) (Upstream of the SCIT Reservation)

Table 41. HUC 040802020202 WQ Data Summary

HUC 040802020202	
Station	CHIP1
Dissolved Oxygen (mg/l)	
Max Value	11.86
Min Value	1.56
Median Value	8.26
Average	8.40
No. of Measurements	143.00
Dissolved Oxygen (%) Saturation	
Max Value	131.90
Min Value	78.10
Median Value	102.35
Average	103.50
No. of Measurements	42.00
Temperature (degrees C)	
Max Value	24.19
Min Value	7.16
Median Value	18.99
Average	18.52
No. of Measurements	143.00
pH	
Max Value	8.66
Min Value	7.46
Median Value	8.13
Average	8.13
No. of Measurements	143.00
Specific Conductivity (mS/cm)	
Max Value	432.20
Min Value	0.00
Median Value	0.41
Average	3.45
No. of Measurements	142.00
Turbidity (NTUs)	
Max Value	25.30
Min Value	0.00
Median Value	4.20
Average	5.90

HUC 040802020202	
Station	CHIP1
No. of Measurements	141.00
Total Dissolved Solids (mg/L)	
Max Value	276.60
Min Value	0.10
Median Value	246.90
Average	242.62
No. of Measurements	41.00
Phosphorus (µg/L)	
Max Value	34.02
Min Value	11.23
Median Value	23.66
Average	23.76
No. of Measurements	16.00
***E. Coli* (CFU/100 mL)**	
Max Value	434.00
Min Value	0.00
Median Value	150.00
Average	160.65
No. of Samples	23.00
Velocity (ft/sec)	
Max Value	1.54
Min Value	0.85
Median Value	1.24
Average	1.22
No. of Measurements	10.00

Johnson Creek-Chippewa River (040802020207)

Table 42. HUC 040802020207 WQ Data Summary

HUC 040802020207					
Station	CHIP2	CHIP3A	CHIP3	CHIP4A	CHIP4
Dissolved Oxygen (mg/l)					
Max Value	11.86	12.16	12.80	11.35	11.38
Min Value	1.41	1.45	1.36	1.46	7.00
Median Value	8.17	8.39	7.97	8.35	8.78
Average	8.14	8.29	7.74	8.30	8.91
No. of Measurements	142.00	137.00	138.00	115.00	24.00
Dissolved Oxygen (%) Saturation					
Max Value	113.60	116.70	103.30	121.30	127.10
Min Value	77.70	89.50	67.60	89.70	77.10
Median Value	100.10	102.35	90.55	97.00	99.90

HUC 040802020207					
Station	CHIP2	CHIP3A	CHIP3	CHIP4A	CHIP4
Average	99.25	102.75	89.55	100.88	101.13
No. of Measurements	41.00	36.00	40.00	17.00	24.00
Temperature (degrees C)					
Max Value	27.27	27.38	26.22	26.34	26.29
Min Value	8.94	9.01	9.29	9.44	13.37
Median Value	20.94	20.68	20.56	20.54	20.19
Average	20.13	19.84	19.82	19.42	20.07
No. of Measurements	128.00	137.00	138.00	100.00	38.00
pH					
Max Value	8.89	8.81	8.88	9.08	8.48
Min Value	7.67	7.51	7.33	7.65	7.73
Median Value	8.25	8.21	8.15	8.19	8.13
Average	8.24	8.19	8.13	8.18	8.15
No. of Measurements	128.00	137.00	138.00	101.00	38.00
Specific Conductivity (mS/cm)					
Max Value	0.68	0.69	0.62	0.68	0.43
Min Value	0.25	0.25	0.15	0.27	0.38
Median Value	0.38	0.38	0.40	0.41	0.40
Average	0.41	0.41	0.42	0.44	0.40
No. of Measurements	142.00	137.00	138.00	115.00	24.00
Turbidity (NTUs)					
Max Value	488.00	83.80	33.20	94.50	8.80
Min Value	0.00	0.00	0.00	0.00	0.00
Median Value	3.10	3.10	4.60	7.40	1.00
Average	8.36	5.51	6.03	8.01	1.83
No. of Measurements	140.00	135.00	136.00	113.00	24.00
Total Dissolved Solids (mg/L)					
Max Value	247.80	248.90	261.30	267.80	273.00
Min Value	213.10	215.80	24.70	243.90	246.20
Median Value	231.60	233.80	247.40	258.00	256.10
Average	231.37	233.73	242.63	257.33	256.53
No. of Measurements	41.00	36.00	40.00	17.00	24.00
Total Nitrogen (mg/L)					
Max Value		0.50			0.63
Min Value		0.50			0.63
Median Value		0.50			0.63
Average		0.50			0.63
No. of Measurements		1.00			1.00
Phosphorus (µg/L)					
Max Value	22.73	23.16	26.21	26.58	28.56
Min Value	11.35	12.94	8.43	11.27	8.13

HUC 040802020207					
Station	CHIP2	CHIP3A	CHIP3	CHIP4A	CHIP4
Median Value	17.27	17.33	17.60	18.34	19.59
Average	17.17	17.18	18.24	18.69	18.62
No. of Measurements	17.00	12.00	17.00	5.00	12.00
E. Coli (CFU/100 mL)					
Max Value	31.00	111.00	100.00	111.00	1033.00
Min Value	0.00	0.00	0.00	0.00	31.00
Median Value	20.00	36.50	42.00	87.00	98.00
Average	15.86	36.20	45.63	62.43	191.56
No. of Samples	7.00	10.00	8.00	7.00	16.00
Velocity (ft/sec)					
Max Value	1.28	2.07			2.59
Min Value	0.86	1.69			1.16
Median Value	0.97	1.72			1.52
Average	1.06	1.84			1.69
No. of Measurements	7.00	5.00			11.00

Mission Creek-Chippewa River (040802020501)

Table 43. HUC 040802020501 WQ Data Summary

HUC 040802020501				
Station	CHIP8	CHIP5	CHIP9B	CHIP9A
Dissolved Oxygen (mg/l)				
Max Value	10.92	12.10	12.46	12.24
Min Value	1.59	1.53	1.49	3.51
Median Value	8.87	8.66	8.81	9.54
Average	8.37	8.51	8.38	9.01
No. of Measurements	85.00	138.00	59.00	72.00
Dissolved Oxygen (%) Saturation				
Max Value		118.50	119.90	
Min Value		73.30	85.40	
Median Value		100.20	100.70	
Average		99.92	102.67	
No. of Measurements		40.00	32.00	
Temperature (degrees C)				
Max Value	22.47	25.10	25.49	22.62
Min Value	16.25	8.35	8.78	16.24
Median Value	20.53	20.18	20.08	20.14
Average	19.73	19.20	19.24	19.58
No. of Measurements	71.00	125.00	59.00	72.00
pH				

HUC 040802020501				
Station	CHIP8	CHIP5	CHIP9B	CHIP9A
Max Value	8.79	8.97	8.88	8.47
Min Value	7.67	7.41	7.90	7.45
Median Value	8.23	8.21	8.24	8.16
Average	8.20	8.20	8.23	8.13
No. of Measurements	71.00	125.00	59.00	72.00
Specific Conductivity (mS/cm)				
Max Value	0.65	0.67	0.54	0.61
Min Value	0.21	0.19	0.39	0.25
Median Value	0.49	0.46	0.46	0.48
Average	0.48	0.46	0.46	0.49
No. of Measurements	85.00	139.00	59.00	72.00
Turbidity (NTUs)				
Max Value	35.30	179.30	552.00	25.40
Min Value	1.30	0.00	0.00	1.10
Median Value	8.40	9.50	10.00	11.40
Average	9.41	13.44	23.61	10.85
No. of Measurements	85.00	137.00	57.00	71.00
Total Dissolved Solids (mg/L)				
Max Value	0.00	343.30	347.40	0.00
Min Value	0.00	119.30	277.80	0.00
Median Value	0.00	286.40	297.30	0.00
Average	0.00	276.82	299.74	0.00
No. of Measurements	62.00	41.00	32.00	42.00
Total Nitrogen (mg/L)				
Max Value		1.94	1.53	
Min Value		0.62	1.13	
Median Value		1.11	1.30	
Average		1.16	1.32	
No. of Measurements		6.00	10.00	
Phosphorus (µg/L)				
Max Value		87.96	48.21	
Min Value		8.98	21.41	
Median Value		33.78	35.55	
Average		32.43	35.33	
No. of Measurements		17.00	13.00	
E. Coli (CFU/100 mL)				
Max Value		926.00	2005.00	
Min Value		0.00	0.00	
Median Value		193.00	157.00	
Average		229.19	325.50	
No. of Samples		21.00	12.00	

HUC 040802020501				
Station	CHIP8	CHIP5	CHIP9B	CHIP9A
Velocity (ft/sec)				
Max Value		1.91		
Min Value		1.69		
Median Value		1.78		
Average		1.79		
No. of Measurements		4.00		

Dice Drain-Chippewa River (040802020508)

Table 44. HUC 040802020508 WQ Data Summary

HUC 040802020508		
Station	CHIP6	CHIP7
Dissolved Oxygen (mg/l)		
Max Value	13.64	17.40
Min Value	1.47	1.64
Median Value	9.12	9.60
Average	8.63	9.19
No. of Measurements	139.00	137.00
Dissolved Oxygen (%) Saturation		
Max Value	125.60	170.90
Min Value	84.20	77.20
Median Value	98.50	111.30
Average	100.34	112.09
No. of Measurements	39.00	39.00
Temperature (degrees C)		
Max Value	27.50	27.90
Min Value	8.72	8.59
Median Value	20.29	20.74
Average	19.52	19.82
No. of Measurements	139.00	123.00
pH		
Max Value	8.77	8.84
Min Value	7.57	5.21
Median Value	8.20	8.31
Average	8.20	8.25
No. of Measurements	138.00	123.00
Specific Conductivity (mS/cm)		
Max Value	0.61	1.78
Min Value	0.25	0.25
Median Value	0.48	0.48

HUC 040802020508		
Station	CHIP6	CHIP7
Average	0.47	0.49
No. of Measurements	139.00	137.00
Turbidity (NTUs)		
Max Value	91.90	223.50
Min Value	0.00	0.00
Median Value	10.20	9.30
Average	11.38	11.40
No. of Measurements	135.00	135.00
Total Dissolved Solids (mg/L)		
Max Value	323.80	1137.00
Min Value	3.70	33.40
Median Value	300.90	309.00
Average	286.63	310.82
No. of Measurements	39.00	39.00
Total Nitrogen (mg/L)		
Max Value	1.72	1.59
Min Value	0.98	1.04
Median Value	1.30	1.33
Average	1.28	1.33
No. of Measurements	11.00	14.00
Phosphorus (µg/L)		
Max Value	76.77	88.31
Min Value	21.70	10.92
Median Value	43.35	41.22
Average	44.10	40.35
No. of Measurements	17.00	16.00
E. Coli (CFU/100 mL)		
Max Value	2005.00	1652.00
Min Value	0.00	0.00
Median Value	111.00	120.00
Average	321.27	214.41
No. of Samples	11.00	22.00
Velocity (ft/sec)		
Max Value	1.52	1.20
Min Value	1.37	0.80
Median Value	1.45	0.98
Average	1.45	0.99
No. of Measurements	2.00	4.00

Coldwater River

Coldwater River (040802020204)

Table 45. HUC 040802020204 WQ Data Summary

HUC 040802020204			
Station	CR1	CR2	CR3
Dissolved Oxygen (mg/l)			
Max Value	8.72	7.80	13.56
Min Value	6.57	4.25	1.52
Median Value	8.16	7.01	8.45
Average	8.02	6.60	8.81
No. of Measurements	6.00	6.00	143.00
Dissolved Oxygen (%) Saturation			
Max Value	92.60	83.00	163.90
Min Value	73.60	53.70	81.40
Median Value	83.80	76.25	116.10
Average	83.95	73.98	117.08
No. of Measurements	6.00	6.00	45.00
Temperature (degrees C)			
Max Value	21.70	26.31	28.28
Min Value	11.98	16.42	8.18
Median Value	16.18	18.69	20.58
Average	16.69	19.66	19.98
No. of Measurements	6.00	20.00	129.00
pH			
Max Value	8.15	8.31	8.93
Min Value	7.89	7.93	7.29
Median Value	8.02	8.07	8.25
Average	8.01	8.08	8.25
No. of Measurements	6.00	20.00	129.00
Specific Conductivity (mS/cm)			
Max Value	0.44	0.45	0.68
Min Value	0.22	0.41	0.23
Median Value	0.43	0.43	0.42
Average	0.37	0.43	0.44
No. of Measurements	6.00	6.00	143.00
Turbidity (NTUs)			
Max Value	26.60	9.50	26.80
Min Value	0.00	0.50	0.00
Median Value	3.65	3.20	4.50
Average	7.10	4.00	6.27
No. of Measurements	6.00	6.00	140.00
Total Dissolved Solids (mg/L)			

HUC 040802020204			
Station	CR1	CR2	CR3
Max Value	278.80	285.10	278.60
Min Value	139.90	264.50	250.50
Median Value	275.05	276.10	268.30
Average	234.02	276.23	267.64
No. of Measurements	6.00	6.00	45.00
Total Nitrogen (mg/L)			
Max Value			0.66
Min Value			0.66
Median Value			0.66
Average			0.66
No. of Measurements			1.00
Phosphorus (µg/L)			
Max Value	100.48	55.58	42.13
Min Value	13.28	20.99	7.27
Median Value	26.43	36.38	17.00
Average	36.75	37.33	17.55
No. of Measurements	5.00	4.00	18.00
E. Coli (CFU/100 mL)			
Max Value		79.00	560.00
Min Value		79.00	0.00
Median Value		79.00	87.00
Average		79.00	146.80
No. of Samples		1.00	10.00
Velocity (ft/sec)			
Max Value			1.11
Min Value			0.70
Median Value			0.96
Average			0.92
No. of Measurements			6.00

North Branch Chippewa River

Schofield Creek-North Branch Chippewa River (040802020205) (Upstream of the SCIT Reservation)

Table 46. HUC 040802020205 WQ Data Summary

HUC 040802020205		
Station	NB1	NB2
Dissolved Oxygen (mg/l)		
Max Value	9.08	11.81
Min Value	6.67	5.79

HUC 040802020205		
Station	NB1	NB2
Median Value	7.78	9.45
Average	7.84	9.32
No. of Measurements	6.00	5.00
Dissolved Oxygen (%) Saturation		
Max Value	86.40	135.80
Min Value	74.30	67.10
Median Value	81.25	101.00
Average	80.75	100.52
No. of Measurements	6.00	5.00
Temperature (degrees C)		
Max Value	23.05	22.23
Min Value	12.49	14.19
Median Value	17.02	17.80
Average	17.95	18.11
No. of Measurements	13.00	5.00
pH		
Max Value	8.18	8.38
Min Value	7.77	7.76
Median Value	8.04	7.97
Average	8.02	8.04
No. of Measurements	12.00	5.00
Specific Conductivity (mS/cm)		
Max Value	0.39	0.48
Min Value	0.35	0.45
Median Value	0.38	0.47
Average	0.38	0.47
No. of Measurements	6.00	5.00
Turbidity (NTUs)		
Max Value	234.50	5.60
Min Value	0.00	1.10
Median Value	0.00	3.50
Average	34.86	3.52
No. of Measurements	7.00	5.00
Total Dissolved Solids (mg/L)		
Max Value	252.20	297.00
Min Value	225.80	3.40
Median Value	244.55	32.60
Average	242.62	79.28
No. of Measurements	6.00	5.00
Total Nitrogen (mg/L)		
Max Value	0.19	1.38

HUC 040802020205		
Station	NB1	NB2
Min Value	0.17	0.85
Median Value	0.18	0.89
Average	0.18	1.04
No. of Measurements	2.00	3.00
Phosphorus (µg/L)		
Max Value	51.60	78.67
Min Value	9.64	34.98
Median Value	18.99	46.69
Average	24.80	51.76
No. of Measurements	4.00	4.00
E. Coli (CFU/100 mL)		
Max Value	380.00	1307.00
Min Value	37.00	35.00
Median Value	60.00	94.00
Average	104.44	338.50
No. of Samples	9.00	10.00

Hogg Creek-North Branch Chippewa River (040802020206)

Table 47. HUC 040802020206 WQ Data Summary

HUC 040802020206		
Station	NB3	NB6
Dissolved Oxygen (mg/l)		
Max Value	7.99	12.66
Min Value	7.03	7.18
Median Value	7.57	8.93
Average	7.54	8.93
No. of Measurements	4.00	47.00
Dissolved Oxygen (%) Saturation		
Max Value	84.90	113.10
Min Value	74.40	82.80
Median Value	82.05	92.20
Average	80.85	93.83
No. of Measurements	4.00	35.00
Temperature (degrees C)		
Max Value	21.34	22.51
Min Value	13.91	6.69
Median Value	17.63	17.46
Average	17.63	16.78
No. of Measurements	4.00	61.00

HUC 040802020206		
Station	NB3	NB6
pH		
Max Value	8.15	8.80
Min Value	7.88	7.72
Median Value	8.07	8.10
Average	8.04	8.10
No. of Measurements	4.00	61.00
Specific Conductivity (mS/cm)		
Max Value	0.65	0.66
Min Value	0.60	0.49
Median Value	0.63	0.60
Average	0.63	0.59
No. of Measurements	4.00	47.00
Turbidity (NTUs)		
Max Value	17.20	115.00
Min Value	2.20	0.00
Median Value	6.20	14.50
Average	7.95	20.63
No. of Measurements	4.00	45.00
Total Dissolved Solids (mg/L)		
Max Value	415.80	422.50
Min Value	4.00	310.40
Median Value	215.55	386.60
Average	212.73	379.39
No. of Measurements	4.00	35.00
Total Nitrogen (mg/L)		
Max Value	2.28	5.35
Min Value	1.12	0.89
Median Value	1.79	2.03
Average	1.74	2.34
No. of Measurements	4.00	14.00
Phosphorus (µg/L)		
Max Value	164.67	208.12
Min Value	37.85	32.89
Median Value	49.04	63.89
Average	75.15	88.17
No. of Measurements	4.00	12.00
E. Coli (CFU/100 mL)		
Max Value	1358.00	1445.00
Min Value	35.00	0.00
Median Value	159.50	504.00
Average	350.30	557.08

HUC 040802020206		
Station	NB3	NB6
No. of Samples	10.00	13.00
Velocity (ft/sec)		
Max Value		1.07
Min Value		0.56
Median Value		0.68
Average		0.72
No. of Measurements		5.00

Saganing River

Saganing River (040801020105)

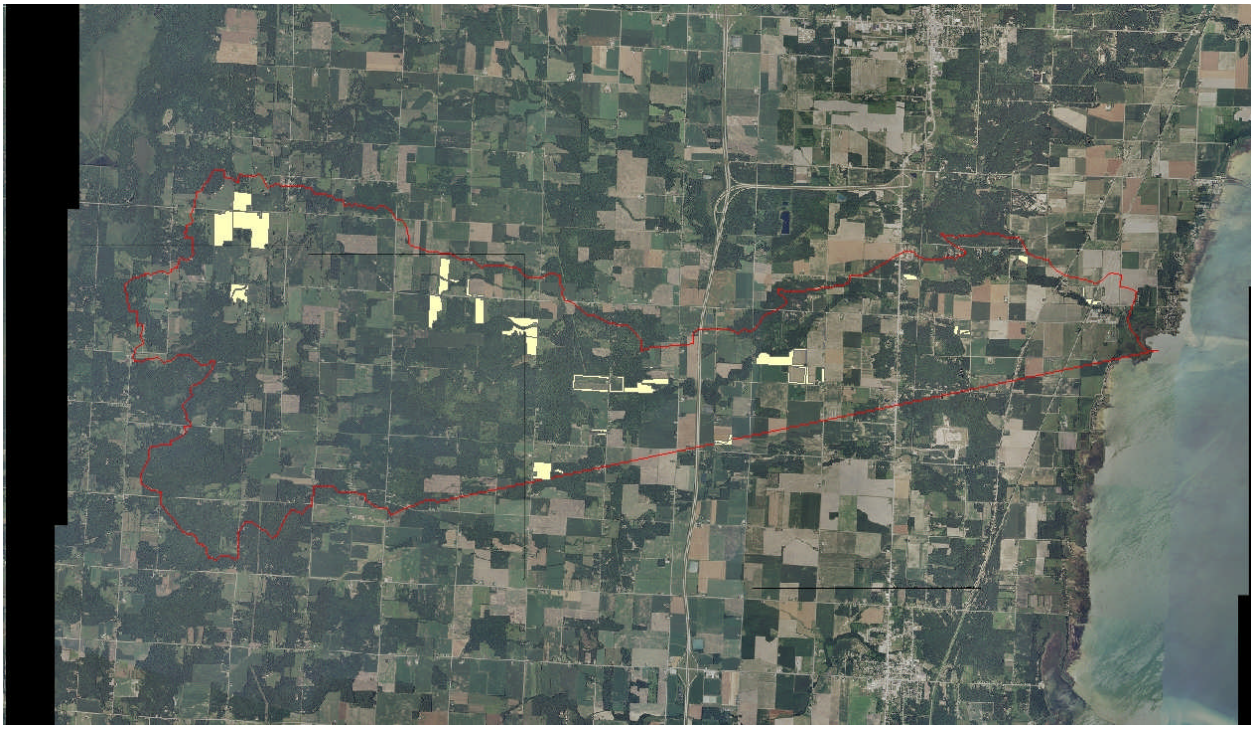
Table 48. HUC 040801020105 WQ Data Summary

HUC 040801020105			
Station	SC3	SC2/SC2A	SC1/SC1A
Dissolved Oxygen (mg/l)			
Max Value	11.78	10.16	19.19
Min Value	5.64	1.93	1.93
Median Value	8.79	7.10	8.05
Average	8.74	7.20	7.96
No. of Measurements	3.00	22.00	49.00
Dissolved Oxygen (%) Saturation			
Max Value	119.60	87.10	186.20
Min Value	70.20	71.40	18.10
Median Value	92.40	80.90	95.30
Average	94.07	79.68	94.85
No. of Measurements	3.00	5.00	37.00
Temperature (degrees C)			
Max Value	25.31	25.28	24.82
Min Value	15.38	12.34	8.46
Median Value	17.08	18.76	19.42
Average	19.26	19.41	18.57
No. of Measurements	3.00	30.00	49.00
pH			
Max Value	8.32	8.55	8.67
Min Value	7.41	7.64	7.08
Median Value	7.97	8.03	7.84
Average	7.90	8.01	7.83
No. of Measurements	3.00	31.00	49.00
Specific Conductivity (mS/cm)			

HUC 040801020105			
Station	SC3	SC2/SC2A	SC1/SC1A
Max Value	1.32	1.66	2.29
Min Value	0.45	0.17	0.38
Median Value	0.68	1.00	0.79
Average	0.82	1.02	1.03
No. of Measurements	3.00	22.00	49.00
Turbidity (NTUs)			
Max Value	11.80	373.10	324.90
Min Value	7.80	2.20	0.00
Median Value	8.90	9.00	11.20
Average	9.50	36.60	26.05
No. of Measurements	3.00	22.00	47.00
Total Dissolved Solids (mg/L)			
Max Value	845.60	869.90	1463.00
Min Value	286.70	0.00	47.00
Median Value	434.10	0.00	570.80
Average	522.13	21.64	689.05
No. of Measurements	3.00	78.00	37.00
Total Nitrogen (mg/L)			
Max Value	2.52	2.17	4.56
Min Value	0.64	1.71	1.22
Median Value	1.37	1.94	3.73
Average	1.51	1.94	3.32
No. of Measurements	3.00	2.00	6.00
Phosphorus (µg/L)			
Max Value	87.72	108.29	174.09
Min Value	16.30	11.86	25.56
Median Value	37.74	60.82	38.54
Average	47.25	60.32	57.05
No. of Measurements	3.00	3.00	13.00
E. Coli (CFU/100 mL)			
Max Value			1298.00
Min Value			0.00
Median Value			150.00
Average			286.38
No. of Samples			13.00

Appendix C: Existing NPS Implementation Efforts

Saganing River CRP Parcels identified by Arenac Conservation District



Summary of 319 Projects in the Salt River Watershed

SOUTH BRANCH OF THE SALT RIVER WATERSHED – APRIL 1, 1997 – MARCH 31, 2000

In 1996, the Isabella Conservation District received funding to conduct a surface water quality inventory of the North and South Branches of the Salt River Watershed. This funding came as a grant under section 319 of the Federal Clean Water Act.

The watershed of the South Branch of the Salt River contains 41,600 acres, located at the western boundary of the Saginaw Bay Watershed. The South Branch of the Salt River Watershed is drained by: Spring Creek, Lewis Drain, Jordan Creek, Welnack Drain, and McKay Drain. These flows are designated as county drains and flow eastward where they join to form the South Branch of the Salt. The last 5 miles is not designated drain and becomes a true river.

The Big Salt River Watershed consists of 79,840 acres in Isabella county It is a fourth order stream formed by the confluence of the third order North Branch Salt River (watershed =37,820 acres) and third order South Branch Salt River (watershed =41,660 acres). The tributaries of the South Branch are designated as county drains and show significant alterations due to human activity. What we found to be a major problem at the time in the South Branch watershed was destruction of streamside vegetation. Row crops and grazing cattle were squeezing the tributary ditches. The lack of “green belt” vegetation allows concentrated gully flow to become highly erosive and destabilizes the cropland adjacent to the stream. Unrestricted cattle access caused an unsightly mess on streambanks and certainly contributed to high fecal and nutrient levels.

A near twin watershed, The North Branch of the Salt River, joins the South Branch 1 ½ miles east of the Isabella/Midland County border. The Big Salt River flows eastward through Midland County to join the

Tittabawassee River just below Sanford. The drainage ditches through our intensive agricultural watershed find their way to the Saginaw Bay.

A Water Quality Survey of the Salt River System was conducted by Dr. Robert H. King, CMU. A final report dated May, 1996 was included with the South Branch of the Salt's Final Report. The Salt River Sampling Stations were the following:

North Branch Salt River
- Loomis Drain (Battle Road)
- McDonald Drain (Battle Road)
- Killenbeck Drain (Shepherd Road)
- North Branch Salt River (Chippewa Road)

South Branch Salt River
- Spring Creek (Shepherd Road)
- Lewis Drain (Leaton Road)
- Jordan Creek (Leaton Road)
- South Branch Salt River (Chippewa Road)

Main Branch Salt River
- Main Branch Salt River (Coleman Road)

All of the Best Management Practices were installed on designated county drains.

Best Management Practices Installed	Quantity
Grade Stabilization Structures	63
Animal Exclusionary Fencing	34,608 feet or 6.6 miles
Animal Crossings/Watering Sites	7
Filter strips	3.18 acres
Demonstration Fields	6

The 63 grade stabilization structures were a variety of: berm and tube, geotextile vegetated chutes, cinderblock chutes, and cinderblock chutes, and sheet piling weir structures. The 34,608' of fence installed included 9 farms.

NORTH BRANCH OF THE SALT RIVER WATERSHED – APRIL 1, 2000 – JUNE 30, 2004

The North Branch of the Salt River Watershed is one of many "Head Watersheds" of the Saginaw River and Saginaw Bay. It has 6 designated county drains in the watershed: Killenbeck, Sharps, McDonald, Lamphere, Loomis, and the Curtis. The pollutants of concern were; sediment, nutrients, and fecal pathogens. This 37,820 acre watershed is relatively steep and the soils are primarily Londo-parkhill-Wixom associations, which are moderately erosive. At the time agriculture involved with both animal husbandry and cash cropping was the primary land use; 80% agriculture, 1: urban and 19% forested.

NORTH BRANCH BMP's INSTALLED

LANDOWNER	TOWNSHIP	SECTION	BEST MANAGEMENT PRACTICE
Clarend Methner	Denver	6	1 Grade Stabilization Structure
Weltkamp	Denver	9	1,600' Fencing
Mike Pasch	Denver	10	1 Grade Stabilization Structure
Dale Brecht	Denver	10	1 Erosion Control Structure
Dennis Grim	Denver	10	1 Diversion
			1 Grade Stabilization Structure
Lawrence Rabideau	Denver	21	1,200' Fencing
Dennis Grim	Wise	7	1 Grade Stabilization Structure
Chris Reger	Wise	7	1 Livestock Crossing
	Wise	7	5,702' Fencing
Wayne Callison	Wise	14	1 Livestock Crossing

David Moore	Wise	16	2 Livestock Crossings
	Wise	16	3 Grade Stabilization Structures
	Wise	16	2 Erosion Control Structures
	Wise	16	10,149' Fencing
James Zinser	Wise	20	2,741 Fencing
	Wise	20	1 Livestock Crossing
Roger Drake	Wise	21	5 Livestock Crossings
	Wise	21	10,203' Fencing
	Wise	21	5.5 ac. Critical Area Treatment
	Wise	21	5 Grade Stabilization Structures

TOTAL BMP'S INSTALLED ON NORTH BRANCH OF THE SALT

12 Grade Stabilization Structures
3 Erosion Control Structures
1 Diversion
9 Livestock Crossings
5.5 acres of Critical Area Treatment
31,595' of Animal Exclusionary Fencing or 5.98 miles

Isabella County Chippewa River Conservation Projects

Site Num	Soil Sheet	GPS Lat	GPS Lon	Work Description
1	19	N 43° 43.342	W 85° 4.670	Open middle of man made rapids. Close both ends.
2	19	N 43° 43.166	W 85° 4.976	Cut 6' opening and protect bank
3	19	N 43° 43.119	W 85° 4.990	Cut 6' opening and protect bank
4	19	N 43° 43.089	W 85° 4.948	Cut 6' opening and protect bank
5	19	N 43° 42.926	W 85° 5.126	Open middle of man made rapids. Close both ends. Need ~ 5 yd^3 stone.
6	19	N 43° 42.884	W 85° 4.869	Cut 6' opening and protect bank
7	19	N 43° 42.719	W 85° 4.574	Cut 6' opening and protect bank
8	19	N 43° 42.538	W 85° 4.493	Cut 6' opening and protect bank
9	19	N 43° 42.451	W 85° 4.375	Cut 6' opening and protect bank
10	19	N 43° 42.350	W 85° 4.330	Cut 6' opening and protect bank
11	19	N 43° 42.394	W 85° 4.271	Cut 3 ash trees and use as a revetment
12	19	N 43° 42.333	W 85° 4.250	Cut and pull large maple and protect the bank
13	19	N 43° 42.296	W 85° 4.221	Large oak jam; cut to 6' opening and protect bank
14	19	N 43° 42.267	W 85° 4.155	Cut 6' opening and protect bank
15	19	N 43°	W 85°	Build 4 J - Hooks; river access only

Site Num	Soil Sheet	GPS Lat	GPS Lon	Work Description
		42.167	4.130	
16	19	N 43° 41.818	W 85° 3.953	Rip/Rap site ~70' Power company right of way.
17	25	N 43° 41.656	W 85° 4.034	Cut 6' opening and protect bank
18	25	N 43° 41.613	W 85° 4.031	Cut 6' opening and protect bank
19	25	N 43° 41.616	W 85° 4.027	Cut 6' opening and protect bank
20	25	N 43° 41.605	W 85° 3.901	Cut and cable 2 oaks and use as revetment; add other woody debris.
21	25	N 43° 41.534	W 85° 3.886	Cut 6' opening and protect bank
22	25	N 43° 41.465	W 85° 3.887	There are 2 logjams here; cut 6' openings and protect bank
23	25	N 43° 41.472	W 85° 3.804	Cut 6' opening and protect bank
24	25	N 43° 41.428	W 85° 3.739	Cut 6' opening and protect bank
25	25	N 43° 41.424	W 85° 3.692	Cut 6' opening and protect bank
26	25	N 43° 41.429	W 85° 3.615	Cut 6' opening and protect bank
27	25	N 43° 41.459	W 85° 3.546	There are 2 logjams here; cut 6' openings and protect bank
28	25	N 43° 41.430	W 85° 3.471	Cut 6' opening trim 2 sweepers and protect bank
29	25	N 43° 41.336	W 85° 3.391	There are 5 logjams here; cut them to a 6' opening and protect bank
30	25	N 43° 41.182	W 85° 3.261	Cut 6' opening and protect bank
31	25	N 43° 40.337	W 85° 2.232	Cut 6' opening and protect bank
32	25	N 43° 40.273	W 85° 2.101	Cut and cable 3 cedars; use as revetment, clear debris and protect bank
33	25	N 43° 40.229	W 85° 1.492	Cut and pull deflector on inside right bank.
34	31	N 43° 39.943	W 85° 1.610	Cut 6' opening (Hubscher)
35	31	N 43° 39.889	W 85° 1.656	Cut 6' opening (Hubscher)
36	32	N 43° 38.545	W 84° 58.445	Noisy outflow; check fecal count
37	32	N 43° 38.487	W 84° 58.363	Build 3 - J Hooks; good access at a house
38	38	N 43° 38.238	W 84° 57.910	Cut 3 ash trees and use as a revetment
39	38	N 43° 37.672	W 84° 58.097	Trim inside bank; use wood as revetment on opposite bank.
40	44	N 43° 36.159	W 84° 56.566	Build 2 - J Hooks; house access.
41	44	N 43° 35.494	W 84° 56.479	Plant shrubs and seed
42	44	N 43° 35.409	W 84° 56.454	Plant shrubs and seed

Site Num	Soil Sheet	GPS Lat	GPS Lon	Work Description
43	50	N 43° 34.890	W 84° 56.527	Plant shrubs and seed
44	51	N 43° 33.998	W 84° 54.894	Build 1 - J Hook and pull deflector
45	51	N 43° 34.263	W 84° 54.318	Rip/Rap site ~100' Private yard good access.
46	51	N 43° 34.371	W 84° 54.314	Rip/Rap site ~30' (canoe landing at School Forest Park)
47	51	N 43° 34.567	W 84° 54.039	Build 2 - J Hooks; cut large deflector
48	51	N 43° 34.690	W 84° 53.968	Pull inside deflectors and secure to outside bank.
49	51	N 43° 34.673	W 84° 54.167	Build 2 - J Hooks
50	51	N 43° 34.860	W 84° 54.035	Build steps at Beaver Lodge Camp.
51	45	N 43° 34.963	W 84° 54.106	Build 3 - J Hooks; river access only
52	45	N 43° 35.042	W 84° 54.007	Build 5 - J Hooks; river access only
53	45	N 43° 35.192	W 84° 53.999	Eroding bank from drain pipe needs stilling basin.
54	45	N 43° 35.307	W 84° 53.388	Build 3 - J Hooks; plant shrubs and seed (Deerfield Park)
55	45	N 43° 35.159	W 84° 52.953	Pull debris that is blowing out left bank
56	45	N 43° 35.072	W 84° 52.881	Build 4 - J Hooks and plant shrubs (river access only)
57	45	N 43° 34.986	W 84° 52.273	Cut and cable 5-4" cedar as a revetment on left outside bank
58	51	N 43° 34.910	W 84° 52.103	Build 3 - J Hooks; plant shrubs and seed. Good access at house.
59	51	N 43° 34.746	W 84° 51.858	Eroding bank from drain pipe needs stilling basin.
60	51	N 43° 34.661	W 84° 51.163	Pull debris that is deflecting current onto opposite bank.
61	52	N 43° 34.934	W 84° 50.562	Rip/Rap site ~325" (Meridian Park)
62	46	N 43° 35.000	W 84° 50.449	Build 5 - J Hooks; plant shrubs and seed.
63	46	N 43° 35.019	W 84° 50.229	Plant shrubs and seed
64	46	N 43° 35.007	W 84° 50.152	Remove inside snag and add to outside left bank.
65	46	N 43° 35.111	W 84° 49.942	Rip/Rap site ~210' (sharp right bend with river access only)
66	46	N 43° 35.053	W 84° 49.862	Cut part of 12" black willow that deflects water and erodes outside bank
67	46	N 43° 35.274	W 84° 48.558	Cut 6' opening and protect the bank
68	46	N 43° 35.476	W 84° 47.653	Drop and cable 4 small oaks to control whirl pooling on right bank
69	46	N 43° 35.592	W 84° 47.644	Drop and cable 3 small oaks and use as a revetment on right bank
70	40	N 43°	W 84°	Build 7 - J Hooks (access from landfill) Deep water

Site Num	Soil Sheet	GPS Lat	GPS Lon	Work Description
		36.973	46.740	needs more stone
71	40	N 43° 37.063	W 84° 46.868	Cut 6' opening and protect the bank. Collect trash.
72	41	N 43° 37.893	W 84° 45.752	Cut 6' opening and protect the bank. Collect trash.
73	41	N 43° 37.795	W 84° 45.359	Drop and cable 3 ash trees to control whirl pooling
74	41	N 43° 37.794	W 84° 45.209	Build a series of check dams at gullied outlet of stream
75	41	N 43° 38.004	W 84° 44.946	Heavy logjam; cut to 6' opening and protect the bank.
76	41	N 43° 38.077	W 84° 44.940	Cut 6' opening and protect the bank
77	41	N 43° 37.883	W 84° 44.762	Trim inside deflector; blowing out opposite bank
78	41	N 43° 37.963	W 84° 44.654	Cut 6' opening and protect the bank
79	41	N 43° 37.835	W 84° 44.308	Build 2 J - Hooks and trim inside bank deflector
80	41	N 43° 37.767	W 84° 44.028	Open to 6' opening at this oxbow
81	41	N 43° 37.683	W 84° 43.764	Build a series of 7 J - Hooks. Right bank is eroding. Land access.
82	41	N 43° 37.740	W 84° 43.774	Trim inside deflector on right bank.
83	41	N 43° 37.553	W 84° 43.518	Drop and cable 4 - 15" trees and use as a revetment.
84	41	N 43° 37.266	W 84° 42.097	Build 3 - J Hooks (access at house)
85	41	N 43° 37.275	W 84° 41.386	High sandy left bank; plant shrubs and seed.
86	42	N 43° 37.141	W 84° 41.000	Build 2 - J Hooks (good house access)
87	42	N 43° 37.763	W 84° 38.935	Drainage ditch outlet is gullied; build series of check dams.
88	42	N 43° 37.399	W 84° 38.182	Build 2 - J Hooks on right bank (river access only)
89	42	N 43° 37.461	W 84° 37.465	Build 1 - J Hook and seed (golf club access)
90	42	N 43° 37.412	W 84° 37.034	Build 2 - J Hooks and trim 3 deflectors collect trash (golf club access)

CWC Isabella County Easement and Preserve Legal Descriptions as of 12/1/2012

Isabella County 4H Camp Easement
Lot 15 of Hyslop's Coldwater Lake Addition, according to the plat recorded in Liber 4 of Plats, Page 189; AND the NW ¼ of the SW ¼ of Section 29, T15N, R5W, EXCEPT commencing 951.92 feet South of the W ¼ corner, thence N 24^0 17' E, 98 feet; S 88^0 34' E, 665.8 feet; S 1^0 44' E to the South line of the NW ¼ of SW ¼, thence West to the West line, and North to the point of beginning; AND EXCEPT beginning at a point which is S 0^0 07' 30" W, along the West line of said Section 29, 940.60 feet and N 28^0 48' 00" E, 98.00 feet, and S 84^0 07' 30" E, 665.39 feet from the West ¼ corner of said Section 29; thence N 49^0 42' 30" E, 50.0 feet; thence S 29^0 31' 15" E, 493.09 feet to a point on the South 1/8 line of said Section 29; thence along said 1/8 line S 89^0 32' 36" W, 300.00 feet; thence N 2^0 42' 30" E, 399.59 feet to the point of beginning. (40 acres).

Audubon Woods Preserve
The SE ¼ of the NE ¼ of Section 32, T14N, R5W, Deerfield Township, Isabella County, Michigan. (40 acres). (**Tax I.D. Number 05-032-20-008-00**).

Ball Preserve
That part of the NW ¼ of the NW ¼ of Section 33, T14N, R5W, Deerfield Township, Isabella County, Michigan, which lies south of the centerline of the Chippewa River. (5 acres). (**Tax I.D. Number 05-033-10-003-00**).

Carter Easement
In Section 18 of Gilmore Township (Township 16 North, Range 5 West), Isabella County, Michigan. Described as follows: the NW ¼ of the NW ¼. (40 acres)

Hiawatha Hills Preserve
Lots 35, 36, 37, 38, 39, 40 and 41 of Hiawatha Hills, according to the Plat recorded in Liber 7 of Plats, Page 417, Isabella County Register of Deeds, Deerfield Township, Isabella County, Michigan. ((5 acres). **(Tax ID Numbers 05-201-00-035-00, 05-201-00-036-00, 05-201-00-037-00, 05-201-00-038-00, 05-201-00-039-00, 05-201-00-040-00 and 05-201-00-041-00).**

Kabana Preserve (Signed purchase agreement and close on this in January 2013)
Part of the SW ¼ of Sec 20, T14N R6W, Broomfield Township, Isabella County, Michigan described as: Beginning at the South ¼ Corner of said Sec 20; thence N 89^0 49' 54" West, along the South Section line of said Section 20, 1,405.32 feet to the Shore Line Traverse of Hall's Lake; thence along said Shore Line Traverse of Hall's Lake on the following fourteen courses: North 32^0 20' 51" West, 93.66 feet; thence N 08^0 38' 49" West, 241.43 feet; thence North 34^0 58' 42" West, 246.50 feet; thence North 55^0 50' 52" West, 3,16.07 feet; thence North 34^0 30' 35" East, 330.66 feet; thence North 18^0 45' 12" East, 189.11 feet; thence North 64^0 52' 02" West, 74.36 feet; thence North 09^0 13' 37" West, 131.82 feet; thence N 89^0 06' 43" East, 175.20 feet; thence N 25^0 00' 21" East, 151.27 feet; thence North 08^0 42' 10" East, 155.57 feet; thence North 15^0 43' 11" East, 256.31 feet; thence North 48^0 19' 10" West, 534.37 feet; thence 40^0 47' 53" West, 541.42 feet to the East-West ¼ line; thence N 89^0 18' 11" East, along said East-West ¼ line, 2,136.23 feet to the interior ¼ Corner of said Section 20; thence South 00^0 25' 28" East, along the North-South ¼ line, 2,646.16 feet back to the place of beginning. Said property extends Westerly to the water's edge of Hall's Lake along the described Shore Line Traverse. This property is subject to an easement for the installation and maintenance of public utilities. Containing 99.73 acres, more or less, and being subject to restrictions, reservations, easements, rights-of-way, zoning, governmental regulations, and matters visible, if any, upon or affecting said lands. (100 acres). **Tax ID No. 01-020-30-001-01**.

Kjolhede's Kove Preserve
Government Lot 2 of Section 30, T15N, R5W, excepting the following parcels:
(1) A parcel of land beginning 59^0 45' West 50 feet from the SW corner of Hyslop's Coldwater Lake Addition #3 running thence N 30^0 15' West 130 Feet, thence North to the Section line, thence Easterly along Section line to the Northeast corner of Government Lot 2, thence South along Easterly line of Government Lot 2, thence South along Easterly line of Government Lot 2 to a point on Southerly line of Lot 38 of Hyslop's Coldwater Lake Addition #3, South 59^0 45' West to place of beginning, all in Township 15 North, Range 5 West, Michigan
(2) A parcel of land beginning at a point on the North Section line which is S 86^0 59' W 151.21 Feet from N ¼ corner of Section 30, thence S 89^0 59' W 190 Feet, thence South 307.42 feet, thence S 30^0 15' E, 163.68 feet, thence North 59^0 45' E 200 feet, thence N 30^0 15' W, 130 feet to a point which is S 59^0 45' W, 50 feet FM NW corner of the

recorded plat of Hyslop's Coldwater Addition #3, Liber 4 of Plats, Page 193, thence North 245.76 feet to point of beginning. All in Township 15 North, Range 5 West, Michigan. (25 acres total)

McNeel Preserve
The N ½ of the SW ¼ of the NW ¼ lying East of the centerline of the Chippewa River, EXCEPT a parcel twenty (20) rods N and S by forty (40) rods E and W out of the NW Corner of Section 27, T14N, R5W, Deerfield Township, County of Isabella, Michigan.

The NW ¼ of the SW ¼ of the NW ¼ of Section 27, T14N, R5W, Deerfield Township, Michigan, w/Chippewa River Centerline as East boundary, and West boundary extending S/N commencing 765 feet due East from SW (1/8) corner, thence due North approximately 274.7 feet to the Centerline of the Urie Drain (as described and recorded by the Isabella County Drain Commission) at its Northerly turn, thence following the Centerline of the said Urie Drain and Easterly to the point where it crosses the ¼ Section Line. (8 acres total). (**Tax I.D. number 05-027-10-003-01 and Tax I.D. number 05-027-10-003-01).**

Meridian Road Preserve
Outlot A of Hiawatha Hills, according to the Plat recorded in Liber 7 of Plats, Page 417, and all that part of the E ½ of the NE ¼ of Section 25, T14N, R5W, lying South of the Chippewa River and East of Meridian Road, Deerfield Township, County of Isabella, Michigan. (1 acre). (**Tax ID Number 05-201-00-063-00)**.

Neely Preserve
Part of the NW ¼ of Section 29, T14N, R6W, Broomfield Township, Isabella County, Michigan and described as: Beginning N $89^0$49'54" West, along the North Section line, 381.11 feet from the North ¼ Corner of said Section 29; thence along the Northwesterly right-of-way line of Old State Road on the following two courses: S $38^0$13'44" West, 2142.91 feet; thence S $54^0$48'12" West, 260.00 feet; thence N $02^0$07'59" East, 546.02 feet; thence N $01^0$06'04" West, 377.63 feet to the Shore Line Traverse of Hall's Lake; thence along said Shore Line Traverse of Hall's Lake on the following seven courses: N $86^0$32'33" East, 165.84 feet; thence S $80^0$59'41" East, 161.89 feet; thence N $52^0$31'31" East, 228.54 feet; thence N $26^0$29'53" East, 234.15 feet; thence N $02^0$44'08" East, 325.11 feet; thence N $25^0$08'06" West, 241.89 feet; thence N $32^0$20'51" West, 42.65 feet to the North Section line of said Section 29; thence S $89^0$49'54" East, along said North Section line, 1024.21 feet back to the place of beginning. Said property extends Westerly to the water's edge of Hall's Lake along the described Shore Line Traverse. (22 acres) (**Tax ID Number 01-029-10-001-06)**.

Neyer Preserve
In the Township of Deerfield, of the County of Isabella, and State of Michigan, Lot 29 and Lot 30, Rivercrest, as recorded in the Book of Plats, Liber 8, Page 447, Isabella County, Michigan, except that part of the E ½ of the NE ¼ lying North of the Chippewa River and SWLY of Lot 11 of the Plat of Hiawatha Hills. (2 acres) **Tax ID Number 05-301-00-030-00**.

Riverbank Preserve
T13N, R06W, Section 16, Township of Rolland, Isabella County, Michigan, described as a strip of land 100 feet wide being parallel with and adjacent to the Northerly bank of the South Branch of the Pine River AND a strip of land 100 feet wide being parallel with and adjacent to the Southerly bank of the South Branch of the Pine River. (3 acres). (**Tax ID Number 12-016-40-002-02)**.

Seldom Seen Farm Easement
In Section 27 of Gilmore Township (Township 16 North, Range 5 West), Isabella County, Michigan. Described as follows: The Northwest Quarter (1/4) of the Southeast Quarter (1/4) (40 acres).

Severson Easement
In Section 35 of Coldwater Township (Township 16 North, Range 6 West), Isabella County, Michigan. Described as follows: the E ½ of the W ½ of the SE ¼. (40 acres).

Sponseller Easement
The E 442.46 feet of the NE ¼ of the NW ¼, T14N, R4W, Section 31, Union Township, Isabella County, Michigan. (13 acres). **Parcel Number 14-031-10-001-00**.

Swetz Easement

Parcel 1 (Filterstrip)

A parcel of land in the North 120 acres of the Southeast ¼ and the South ½ of the South ½ of said Southeast ¼ of Fractional Section 30, Township 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the East ¼ corner of Said Section; thence N.89^0-58'-58" W., on the East and West ¼ line of said Section, 843.44 feet; thence S.00^0-01'-02" W., perpendicular to said East and West ¼ line, 132.00 feet to the South line of the North 8 rods of the Southeast ¼ of said Section also being the point of beginning of this description; thence S.01^0-09'-07" W., 533-11 feet; thence N.88^0-43'-40" W., 338.76 feet to the Easterly top-of-bank of the Miser Drain (so called); thence N.41^0-10'-43" E., on said top-of-bank, 462.10 feet; thence N.01^0-52'-47" W., on said top-of-bank, 177.78 feet to said South line of North 8 rods of Southeast ¼, thence S.89^0-58'-58" E., on said South line of North 8 rods of Southeast ¼, 50.97 feet to the point of beginning, containing 1.74 acres of land.

Parcel 2 (Filterstrip)

A parcel of land in the North 120 acres of the Southeast ¼ and the South ½ of the South ½ of said Southeast ¼ of Fractional Section 30, Township 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the East ¼ corner of Said Section; thence N.89^0-58'-58" W., on the East and West ¼ line of said Section, 930.96 feet, thence S.00^0-01'-02" W., perpendicular to said East and West ¼ line, 132.00 feet to the South line of the North 8 rods of the Southeast ¼ of said Section also being the point of beginning of this description; thence S.01^0-51'-04" E., on the Westerly top-of-bank of the Miser Drain (so called) , 164.40 feet; thence S.41^0-44'-42" W., on said top-of-bank, 469.14 feet; thence N.88^0-54'-03" W., 50.46 feet; thence N.00^0-25'-16" E., 229.98 feet; thence S.89^0-49'-36" E., 204.37 feet, thence N.00^0-51'-28" E., 284.10 feet to said South line of the North 8 rods of Southeast ¼; thence S.89^0-58'-58"E., on said South line of North 8 rods of Southeast ¼, 147.19 feet to the point of beginning, containing 1.66 acres of land.

Parcel 3 (Filterstrip)

A parcel of land in the North 120 acres of the Southeast ¼ and the South ½ of the South ½ of said Southeast ¼ of Fractional Section 30, Township 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the East ¼ corner of Said Section; thence N.89^0-58'-58" W., on the East and West ¼ line of said Section, 1536.92 feet; thence S.00^0-01'-02" W., perpendicular to said East and West ¼ line, 673.40 feet to the point of beginning of this description; thence S.88^0-31'-03" E., 296.72 feet to the Westerly top-of-bank of the Miser Drain (so called); thence S.18^0-06'-02" W., on said Westerly top-of-bank, 222.74 feet; thence S.03^0-45'-10" W., on said Westerly top-of-bank, 432.85 feet; thence S.16^0-59'-01" W., on said Westerly top-of-bank, 206.50 feet; thence S-07^0-37'-03" W., on said Westerly top-of-bank, 463.95 feet; thence Southeasterly, on the arc of a 22.81 foot radius non-tangential curve to the left, 68.92 feet, said arc being subtended by a chord bearing and distance of S.85^0-40'-33" E., 45.53 feet to the Easterly top-of-bank of said drain; thence N.06^0-32'-59" E., on said Easterly top-of-bank, 460.97 feet; thence N.19^0-18'-23"E., on said Easterly top-of-bank, 201.50 feet; thence N.02$_0$-15'-07" E., on said Easterly top-of-bank, 415.32 feet; thence N.16^0-26'-55" E., on said Easterly top-of-bank, 241.39 feet; thence S.87^0-24'-58" E., 32.16 feet; thence S.00^0-16'-04" E., 1375.83 feet; thence N.89^0-03'-10" W., 323.20 feet; thence N.01^0-43'-44" W., 1390.01 feet to the point of beginning, containing 9.66 acres of land.

Sylvan Solace Preserve

All of the SW ¼ of the NW ¼ lying East of the Chippewa River and the E ½ of the NW ¼ except the E 660 feet of the S 660 feet of the NW ¼ and the E 132 feet of the E ½ of the NW ¼ except the S 660 feet of Section 17, T14N, R5W, Deerfield Township, Isabella County, Michigan. (78 acres total).

Van Acker Easement

A parcel of land in the West half of the Southeast ¼ of Section 29, T16N, R4W, Vernon Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the Southeast corner of said Section: thence S 89^0 41' 06"W., on the South line of said Section, 1824.03 feet; thence N 00^0 18' 54"W., perpendicular to said South Section line, 33.00 feet to the point of beginning of this description; thence S 89^0 41' 06"W., 280.67 feet; thence N 00^0 32' 19"W., 1446.31 feet; thence S 85^0 46' 43" E., 168.64 feet; thence N 00^0 17' 54" W., 458.27 feet; thence N 45^0 42' 15" E., 332.15 feet; thence N 00^0 26' 15"W., 455.60 feet; thence S 89^0 57' 15"E., 299.73 feet; thence S 00^0 08' 57" W., 580.40 feet; thence S 45^0 10' 52"W., 328.83 feet; thence S 00^0 22' 25"E., 327.91 feet; thence N89^0 12' 28"E., 151.22 feet; thence S 03^0 41' 01"W., 301.56 feet; thence S 89^0 32' 29"W., 300.57 feet; thence S 00^0 12' 38"W., 1136.53 feet to the point of beginning, containing 20.19 acres of land, together with an easement, for ingress and egress, described as follows: Beginning at a point 1560.30 feet, S 89^0 41' 06"W. of said

Southeast corner of said Section; thence continuing S 89^0 41' 06" W., 808.26 fe3et; thence N 00^0 23' 55"E., 33.00 feet; thence N 89^0 41' 06"E., 808.17 feet; thence S 00^0 14' 51"W., 33.00 feet to the point of beginning. (19 acres). **(Tax ID Number 37-150-029-400-0002-00).**

Williams-Blackburn Preserve
Parcel 1: The Northeast 1/4 of the Northeast 1/4 of Section 7, T14N, R3W, EXCEPT Lots 1 to 9 inclusive of Riverside Beach, according to the plat recorded in Liber 7 of Plats, Page 413, AND EXCEPT commencing at the Southwest comer of Lot 1 of Riverside Estates in the Northeast 1/4 of the Northeast 1/4 of Section 7, T14N, R3W, running thence South 33 feet, thence West along the 1/8 line 442 feet, thence North 33feet, thence East parallel to said 1/8 line to the place of beginning, AND EXCEPT commencing 100 feet West of the Southwest corner of Lot 1 of Riverside Estates in the Northeast 1/4 of the Northeast 1/4 of Section 7, T14N, R3W, thence North at right angles 263 feet, thence S 52° 05' W 126.71 feet to a point, thence South 185 feet to a point, thence East 100 feet to place of beginning, including all land northerly of said parcel to the Chippewa River, AND EXCEPT commencing at the Northwest corner of Lot 3 of Riverside Estates, a part of the Northeast *1/4* of Section 7, T14N, R3W, thence N 0° 48' W 39.86 feet to the true place of beginning, thence N 80° 33' 30" W 33 feet, thence N 2° 07' 37" W 455.20 feet, thence N 73° 13' 42" E 84.70 feet, thence S 24° 49' 44" E 247.71 feet, thence S 19° 00' 50" W 129.45 feet, thence S 1° 12' 54" W 153.16 feet, thence N 80° 12' 03" W 91.50 feet to the point of beginning, AND EXCEPT commencing at the Northwest corner of Lot 3 of Riverside Estates, a part of the Northeast 1/4 of the Northeast 1/4 of Section 7, T14N, R3W, thence N 0° 48' W 39.86 feet, thence N 80° 33' 30" W 33 feet to the true place of beginning, thence N 80° 33' 30" W 319.53 feet, thence N 45° 09' 04" E 222.04 feet, thence N 26° 36' 38" E 267.86 feet, thence N 73° 13' 42" E 21.91 feet, thence S 2° 07' 37" E 455.20 feet to the point of beginning, AND EXCEPT commencing 50 feet West of the Southwest corner of Lot 1 of Riverside Estates in the Northeast *1/4* of Section 7, T14N, R3W, thence West 50 feet, thence North at right angles 263 feet, thence N 67° 08' E 54.355 feet to a point, thence South to the place of beginning, including all land Northerly of said parcel to the Chippewa River, AND EXCEPT a parcel of land commencing at the Northeast corner of Section 7, T14N, R3W, thence South 444.22 feet, West 210 feet to the center line of the Chippewa River, Northwesterly along said center line to the North line of Section 7, East 442 feet to the point of beginning, AND EXCEPT commencing 300 feet West of the Southwest corner of Lot 1 of Riverside Estates in the Northeast 1/4 of the Northeast *1/4* of Section 7, T14N, R3W, thence North at right angles 113 feet, thence S 73° W 148.23 feet, thence South 69.7 feet to a point 142 feet West of the place of beginning, thence East 142 feet to the place of beginning, including all land Northerly of said parcel to the Chippewa River, AND EXCEPT commencing at the Southwest corner of said Lot 10f Riverside Estates, thence North 305 feet to a monument, thence S 67° 08' W, 54.355 feet to a point, thence South parallel with the West line of said Lot 1 to a point which is 50 feet West of the point of beginning, thence East to the point of beginning, AND EXCEPT commencing 200 feet West of the Southwest corner of Lot 1 of Riverside Estates in the Northeast *1/4* of the Northeast *1/4* of Section 7, T14N, R3W, thence West 100 feet, thence North at right angles 113 feet, thence Northeasterly 123.3 feet to a point 185 feet North of the place of beginning, thence South 185 feet to the place of beginning, including all land Northerly of said described premises to the Chippewa River, measured within the North and South boundary lines, as extended. Chippewa Township.

Parcel 2: Lot 7 of Riverside Estates according to the plat recorded in Liber 7 of Plats, Page 413, EXCEPT the West 5 feet of the South 63.59 feet of said Lot 7, measured at right angles to the West line thereof, Chippewa Township.

Parcel 3: Commencing at the Northeast corner of Lot 7 of Riverside Estates, according to the plat recorded in Liber 7 of Plats, Page 413, thence Easterly along the North line of said Lot 7 as extended to the East line of Section 7, T14N, R3W, thence Northerly 390 feet along the East line of Section 7, thence West, 210 feet to the centerline of Chippewa River, thence Southeastly along the centerline of Chippewa River 413.32 feet, more or less, to a point on the centerline of the Chippewa River lying West of and along the North lot line of said Lot 7 as extended, thence Easterly along the North lot line of said Lot 7 to the point of beginning, Chippewa Township (25 acres total). (**Tax I.D. Numbers 02-007-20-001-00, 02-110-00-007-00, and 02-007-20-001-06**).

Winawa Preserve
The following described premises situated in Section 35, T14N, R5W, of the Township of Deerfield, of the County of Isabella, and State of Michigan, to-wit: part of the S ½ of the NE ¼ Beg at the E ¼ Cor Th N 334 FT Th W 418 Ft Th S 70 Ft Th E 165 Ft Th S 264 Ft Th E 253 Ft to POB. (2 acres).

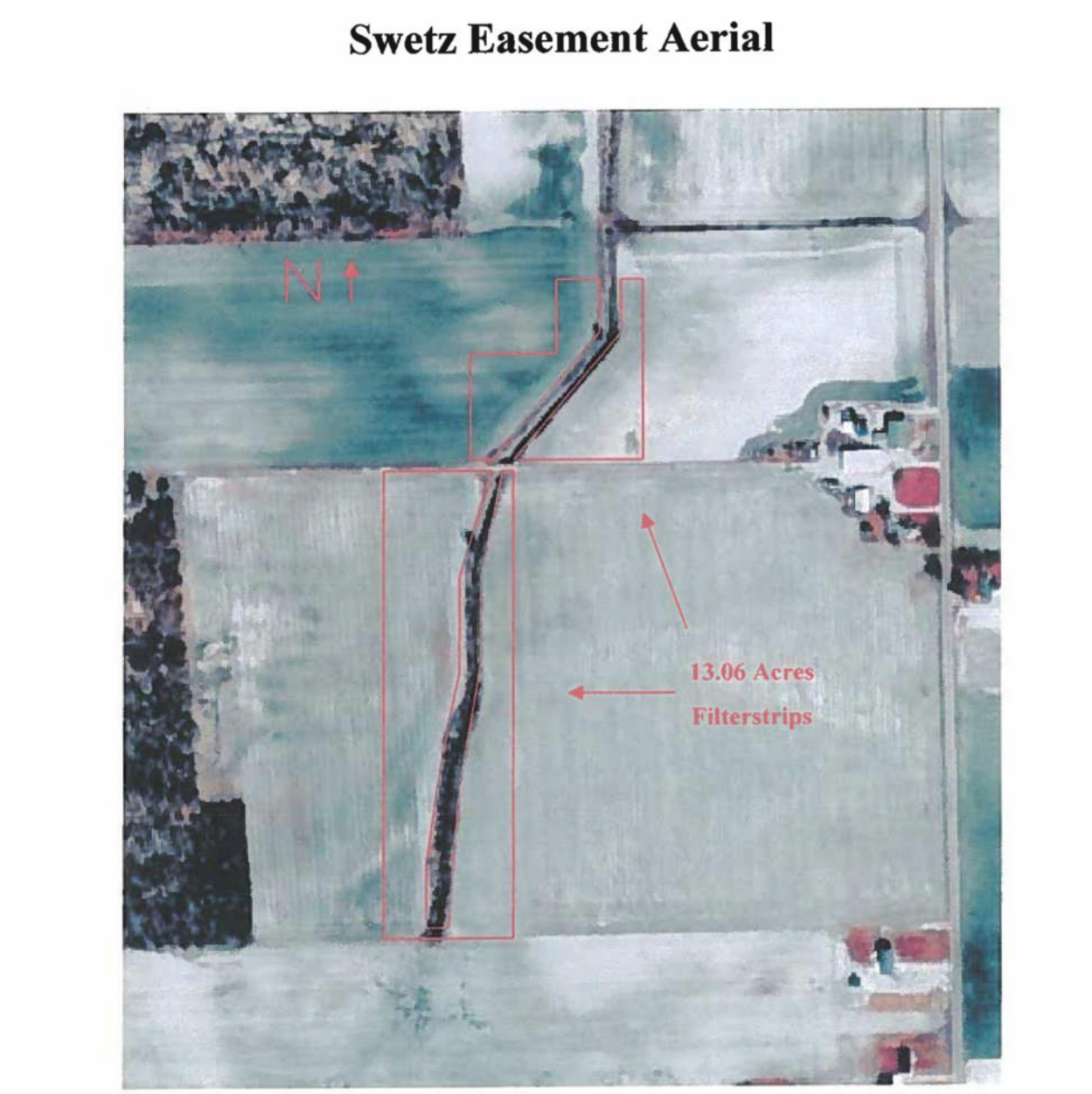
Winnie Easement
A parcel of land in part of the West ½ of the Fractional Northeast ¼ of Fractional Section 3, T.13 N. - R.5 W., Fremont Township, Isabella County, Michigan, being described as follows: To fix a point of beginning, commence

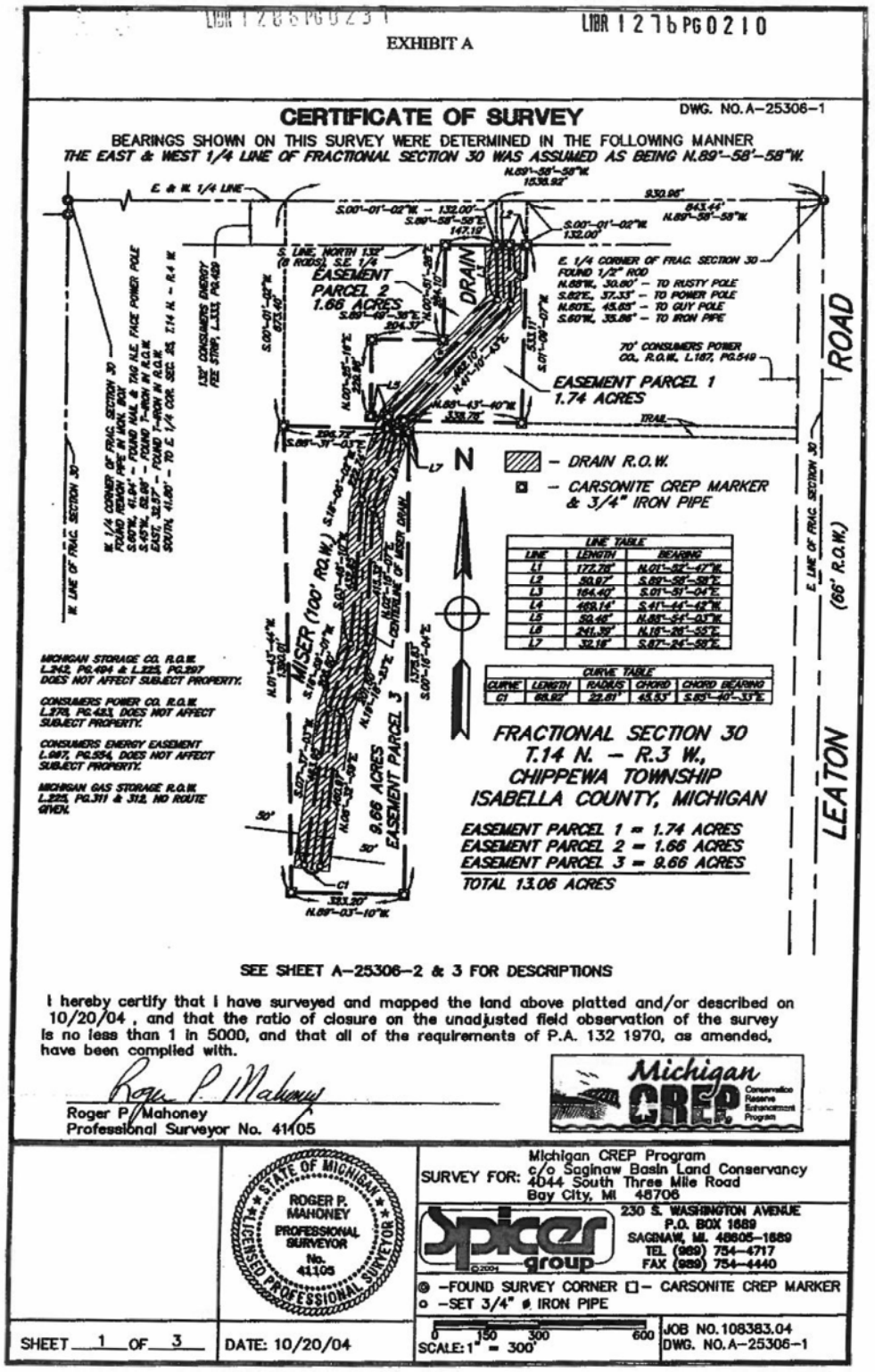
at the North ¼ corner of said Section, thence S.89^0-50'-37"E., on the North line of said Section, 121.94 feet; thence S.00^0-09'-23"W., perpendicular to said North Section line; 39.28 feet to the point of beginning of this description; thence S.88^0-37'-31"E., 428.52 feet; thence S.08^0-44'-48"E., 1352.71 feet; thence S.06^0-17'-56"E., 553.07 feet; thence S.05^0-10'-55"W., 29.12 feet; thence S.21^0-31'-46"W., 295.00 feet; thence S.26^0-05'-01"W., 418.35 feet; thence N.85^0-15'-20"W., 394.64 feet; thence N.23^0-48'-00"E., 726.66 feet; thence N.08^0-56'-56"W., 1901.73 feet; to the point of beginning, containing 24.62 acres, together with a 20.00 foot wide strip of land, for ingress and egress, in the West ½ of the Fractional Northeast ¼ of Fractional Sectional Section 3, T.13 N. - R.5 W., Fremont Township, Isabella County, Michigan, the sidelines of said strip of land to be 10.00 feet, measured at right angles, each side of the following described centerline, which is 10.00 feet, S.89^0-50'-37"E. of the North ¼ corner of said Section; thence S.02^0-22'-18"E., 651.12 feet; thence S.46^0-54'-35"E., 251.01 feet; thence S.87^0-58'-42"E., 25.42 feet and there end. The sidelines of said strip of land to be extended or shortened so as to meet at their respective intersections and said ingress egress easement to terminate at the Westerly line of said Easement Parcel. (22 acres).

Preserves are owned fee simple by the Chippewa Watershed Conservancy. Easements are permanently held on behalf of individual landowners. If locating easement lands on public maps, please identify easement properties as (Permanent conservation easement, without landowner names. Easement lands are not accessible by the public and we want to maintain landowner privacy and prevent unauthorized public access as much as possible).

Contact:
Stan Lilley
Executive Director
Chippewa Watershed Conservancy
P.O. Box 896
Mt. Pleasant, MI 48804-0896
stan@ChippewaWatershedConservancy.org
989-644-5045

Permanent CREP Easements in Isabella County




LIBR 1276PG0210
EXHIBIT A
CERTIFICATE OF SURVEY
DWG. NO. A-25306-1
BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE EAST & WEST 1/4 LINE OF FRACTIONAL SECTION 30 WAS ASSUMED AS BEING N.89°-58'-58"W.
EASEMENT PARCEL 2
1.66 ACRES
EASEMENT PARCEL 1
1.74 ACRES
EASEMENT PARCEL 3
9.66 ACRES
DRAIN
MISER (100' R.O.W.)
LEATON ROAD
(66' R.O.W.)
TRAIL
70' CONSUMERS POWER CO. R.O.W. L.167, PG.549
- DRAIN R.O.W.
- CARSONITE CREP MARKER & 3/4" IRON PIPE
LINE TABLE
CURVE TABLE
FRACTIONAL SECTION 30
T.14 N. - R.3 W.,
CHIPPEWA TOWNSHIP
ISABELLA COUNTY, MICHIGAN
EASEMENT PARCEL 1 = 1.74 ACRES
EASEMENT PARCEL 2 = 1.66 ACRES
EASEMENT PARCEL 3 = 9.66 ACRES
TOTAL 13.06 ACRES
MICHIGAN STORAGE CO. R.O.W. L.342, PG.494 & L.225, PG.297 DOES NOT AFFECT SUBJECT PROPERTY.
CONSUMERS POWER CO. R.O.W. L.378, PG.483, DOES NOT AFFECT SUBJECT PROPERTY.
CONSUMERS ENERGY EASEMENT L.847, PG.594, DOES NOT AFFECT SUBJECT PROPERTY.
MICHIGAN GAS STORAGE R.O.W. L.225, PG.311 & 312, NO ROUTE GIVEN.
SEE SHEET A-25306-2 & 3 FOR DESCRIPTIONS
I hereby certify that I have surveyed and mapped the land above platted and/or described on 10/20/04, and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.
Roger P. Mahoney
Roger P. Mahoney
Professional Surveyor No. 41105
Michigan CREP
STATE OF MICHIGAN
ROGER P. MAHONEY
PROFESSIONAL SURVEYOR
No. 41105
LICENSED PROFESSIONAL SURVEYOR
SURVEY FOR: Michigan CREP Program
c/o Saginaw Basin Land Conservancy
4044 South Three Mile Road
Bay City, MI 48706
spicer group
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (989) 754-4717
FAX (989) 754-4440
-FOUND SURVEY CORNER -CARSONITE CREP MARKER
-SET 3/4" ø IRON PIPE
SHEET 1 OF 3
DATE: 10/20/04
SCALE: 1" = 300'
JOB NO. 108383.04
DWG. NO. A-25306-1

LIBR 1216 PG 0211

LIBR 1286 PG 0238

CERTIFICATE OF SURVEY

DWG. NO. A-25306-2

BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE EAST & WEST 1/4 LINE OF FRACTIONAL SECTION 30 WAS ASSUMED AS BEING N.89°-58'-58"W.

Parent Parcel

The North 120 acres of the Southeast 1/4 of Section 30 and the South 1/2 of the South 1/2 of the Southeast 1/4 of said Section, Town 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, with the exception of the surface of that parcel conveyed to Consumers Power Company as described in the Warranty Deed recorded in Liber 333, Page 429.

Easement Parcel 1 (Filterstrip)

A parcel of land in the North 120 acres of the Southeast 1/4 and the South 1/2 of the South 1/2 of said Southeast 1/4 of Fractional Section 30, Town 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the East 1/4 corner of said Section; thence N.89°-58'-58"W., on the East and West 1/4 line of said Section, 843.44 feet; thence S.00°-01'-02"W., perpendicular to said East and West 1/4 line, 132.00 feet to the South line of the North 8 rods of the Southeast 1/4 of said Section also being the point of beginning of this description; thence S.01°-09'-07"W., 533.11 feet; thence N.88°-43'-40"W., 338.76 feet to the Easterly top-of-bank of the Miser Drain (so called); thence N.41°-10'-43"E., on said top-of-bank, 462.10 feet; thence N.01°-52'-47"W., on said top-of-bank, 177.78 feet to said South line of North 8 rods of Southeast 1/4, thence S.89°-58'-58"E., on said South line of North 8 rods of Southeast 1/4, 50.97 feet to the point of beginning, containing 1.74 acres of land.

Easement Parcel 2 (Filterstrip)

A parcel of land in the North 120 acres of the Southeast 1/4 and the South 1/2 of the South 1/2 of said Southeast 1/4 of Fractional Section 30, Town 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the East 1/4 corner of said Section; thence N.89°-58'-58"W., on the East and West 1/4 line of said Section, 930.96 feet; thence S.00°-01'-02"W., perpendicular to said East and West 1/4 line, 132.00 feet to the South line of the North 8 rods of the Southeast 1/4 of said Section also being the point of beginning of this description; thence S.01°-51'-04"E., on the Westerly top-of-bank of the Miser Drain (so called), 164.40 feet; thence S.41°-44'-42"W., on said top-of-bank, 469.14 feet; thence N.88°-54'-03"W., 50.46 feet; thence N.00°-25'-16"E., 229.98 feet; thence S.89°-49'-36"E., 204.37 feet; thence N.00°-51'-28"E., 284.10 feet to said South line of the North 8 rods of Southeast 1/4; thence S.89°-58'-58"E., on said South line of North 8 rods of Southeast 1/4, 147.19 feet to the point of beginning, containing 1.66 acres of land.

I hereby certify that I have surveyed and mapped the land above platted and/or described on 10/20/04, and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Roger P. Mahoney
Professional Surveyor No. 41105

Michigan CREP Conservation Reserve Enhancement Program

STATE OF MICHIGAN — ROGER P. MAHONEY — PROFESSIONAL SURVEYOR — No. 41105 — LICENSED PROFESSIONAL SURVEYOR

SURVEY FOR: Michigan CREP Program
c/o Saginaw Basin Land Conservancy
4044 South Three Mile Road
Bay City, MI 48706

Spicer group
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (989) 754-4717
FAX (989) 754-4440

● -FOUND SURVEY CORNER □- CARSONITE CREP MARKER
○ -SET 3/4" ø IRON PIPE

SHEET 2 OF 3 | DATE: 10/20/04 | SCALE: 1" = 300' (0, 150, 300, 600) | JOB NO. 108383.04 | DWG. NO. A-25306-2

LIBR 1276 PG 0212

LIBR 1286 PG 0239

CERTIFICATE OF SURVEY

DWG. NO. A-25306-3

BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE EAST & WEST 1/4 LINE OF FRACTIONAL SECTION 30 WAS ASSUMED AS BEING N.89°-58'-58"W.

Easement Parcel 3 (Filterstrip)

A parcel of land in the North 120 acres of the Southeast 1/4 and the South 1/2 of the South 1/2 of said Southeast 1/4 of Fractional Section 30, Town 14 North, Range 3 West, Chippewa Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the East 1/4 corner of said Section; thence N.89°-58'-58"W., on the East and West 1/4 line of said Section, 1536.92 feet; thence S.00°-01'-02"W., perpendicular to said East and West 1/4 line, 673.40 feet to the point of beginning of this description; thence S.88°-31'-03"E., 296.72 feet to the Westerly top-of-bank of the Miser Drain (so called); thence S.18°-06'-02"W., on said Westerly top-of-bank, 222.74 feet; thence S.03°-45'-10"W., on said Westerly top-of-bank, 432.85 feet; thence S.16°-59'-01"W., on said Westerly top-of-bank, 206.50 feet; thence S.07°-37'-03"W., on said Westerly top-of-bank, 483.95 feet; thence Southeasterly, on the arc of a 22.81 foot radius non-tangential curve to the left, 68.92 feet, said arc being subtended by a chord bearing and distance of S.85°-40'-33"E., 45.53 feet to the Easterly top-of-bank of said drain; thence N.06°-32'-59"E., on said Easterly top-of-bank, 460.97 feet; thence N.19°-18'-23"E., on said Easterly top-of-bank, 201.50 feet; thence N.02°-15'-07"E., on said Easterly top-of-bank, 415.32 feet; thence N.16°-26'-55"E., on said Easterly top-of-bank, 241.39 feet; thence S.87°-24'-58"E., 32.16 feet; thence S.00°-16'-04"E., 1375.83 feet; thence N.89°-03'-10"W., 323.20 feet; thence N.01°-43'-44"W., 1390.01 feet to the point of beginning, containing 9.66 acres of land.

I hereby certify that I have surveyed and mapped the land above platted and/or described on 10/20/04, and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Roger P. Mahoney

Roger P. Mahoney
Professional Surveyor No. 41105

Michigan CREP Conservation Reserve Enhancement Program

STATE OF MICHIGAN * LICENSED PROFESSIONAL SURVEYOR * ROGER P. MAHONEY PROFESSIONAL SURVEYOR No. 41105

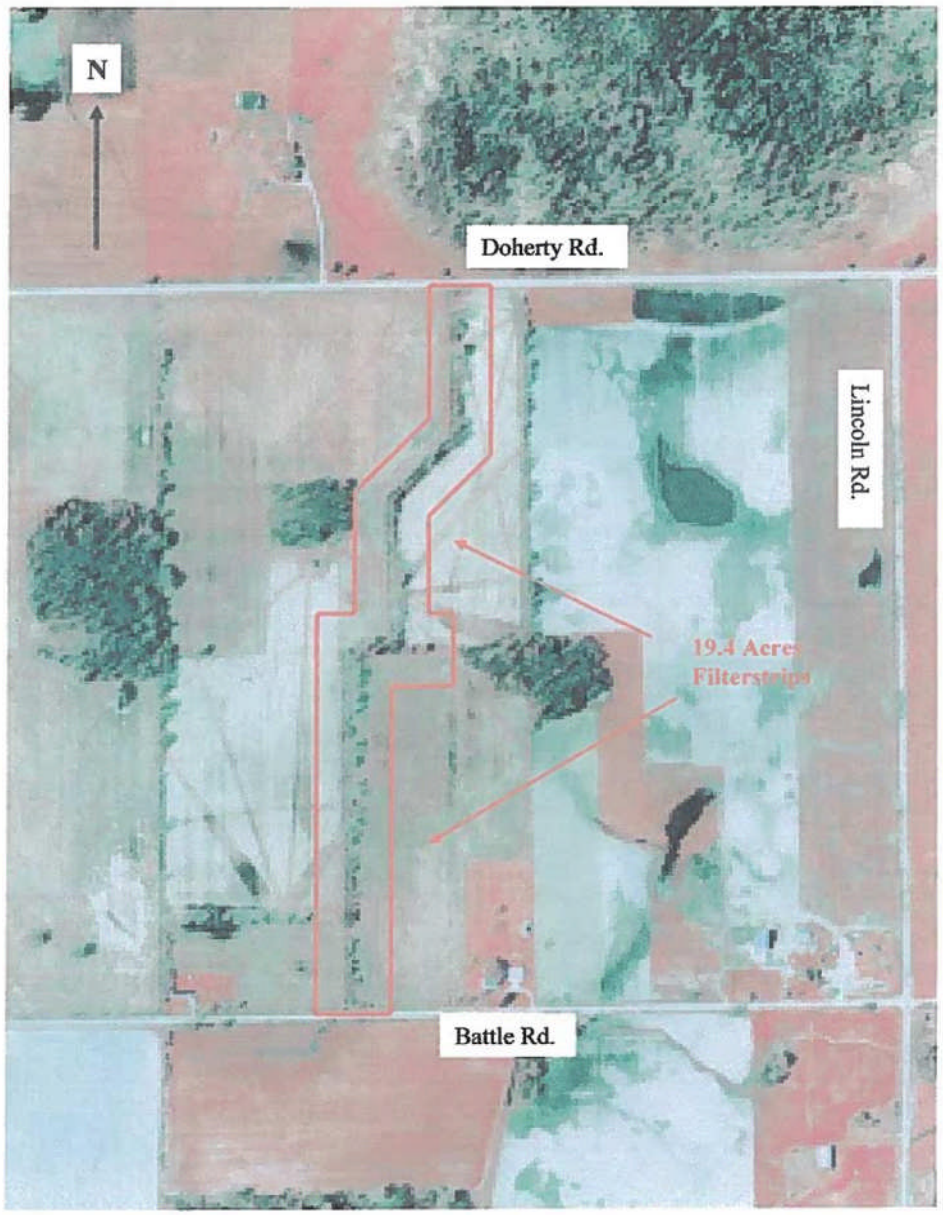
SURVEY FOR: Michigan CREP Program
c/o Saginaw Basin Land Conservancy
4044 South Three Mile Road
Bay City, MI 48706

Spicer group
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (989) 754-4717
FAX (989) 754-4440

● -FOUND SURVEY CORNER □- CARSONITE CREP MARKER
o -SET 3/4" ø IRON PIPE

SHEET 3 OF 3 | DATE: 10/20/04 | SCALE: 1" = 300' (0, 150, 300, 600) | JOB NO. 108383.04 | DWG. NO. A-25306-3

Van Acker Easement Aerial

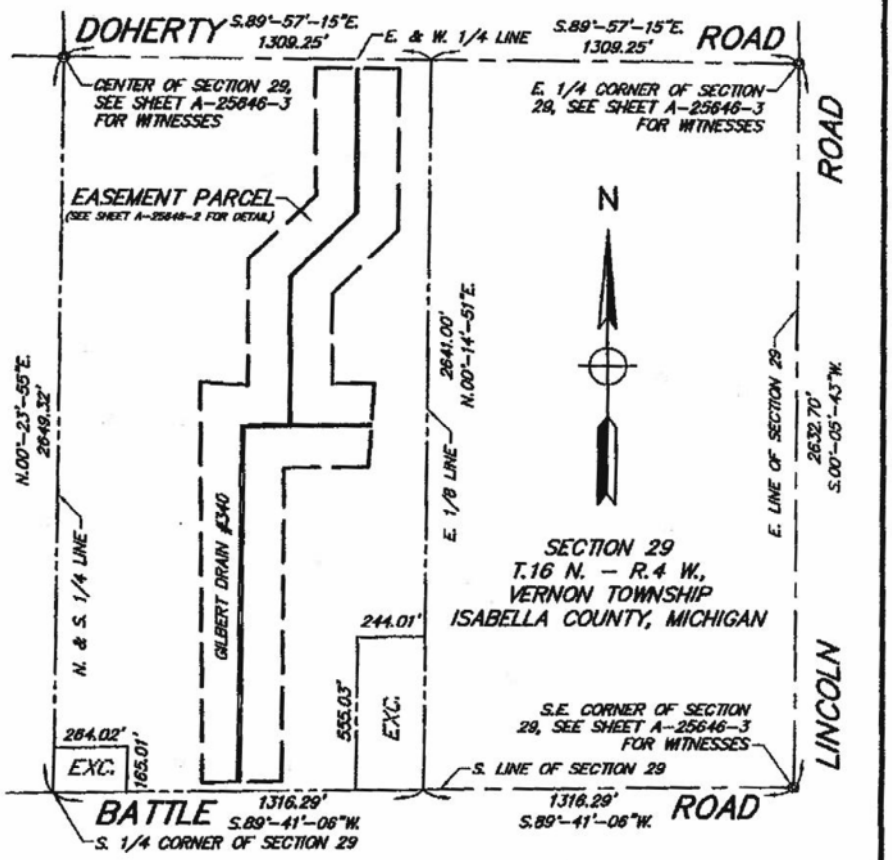


LIBER 1342 PG 0056

APPENDIX C

CERTIFICATE OF SURVEY DWG. NO. A-25646-1

BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE SOUTH LINE OF SECTION 29 WAS ASSUMED AS BEING S.89°-41'-06"W.



SEE SHEET A-25646-3 FOR DESCRIPTIONS

I hereby certify that I have surveyed and mapped the land above platted and/or described on 9/29/05 , and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Roger P. Mahoney
Professional Surveyor No. 41105

Michigan CREP Conservation Reserve Enhancement Program

STATE OF MICHIGAN * LICENSED PROFESSIONAL SURVEYOR * ROGER P. MAHONEY PROFESSIONAL SURVEYOR No. 41105

SURVEY FOR: Michigan CREP Program c/o Saginaw Basin Land Conservancy 4044 South Three Mile Road Bay City, MI 48706

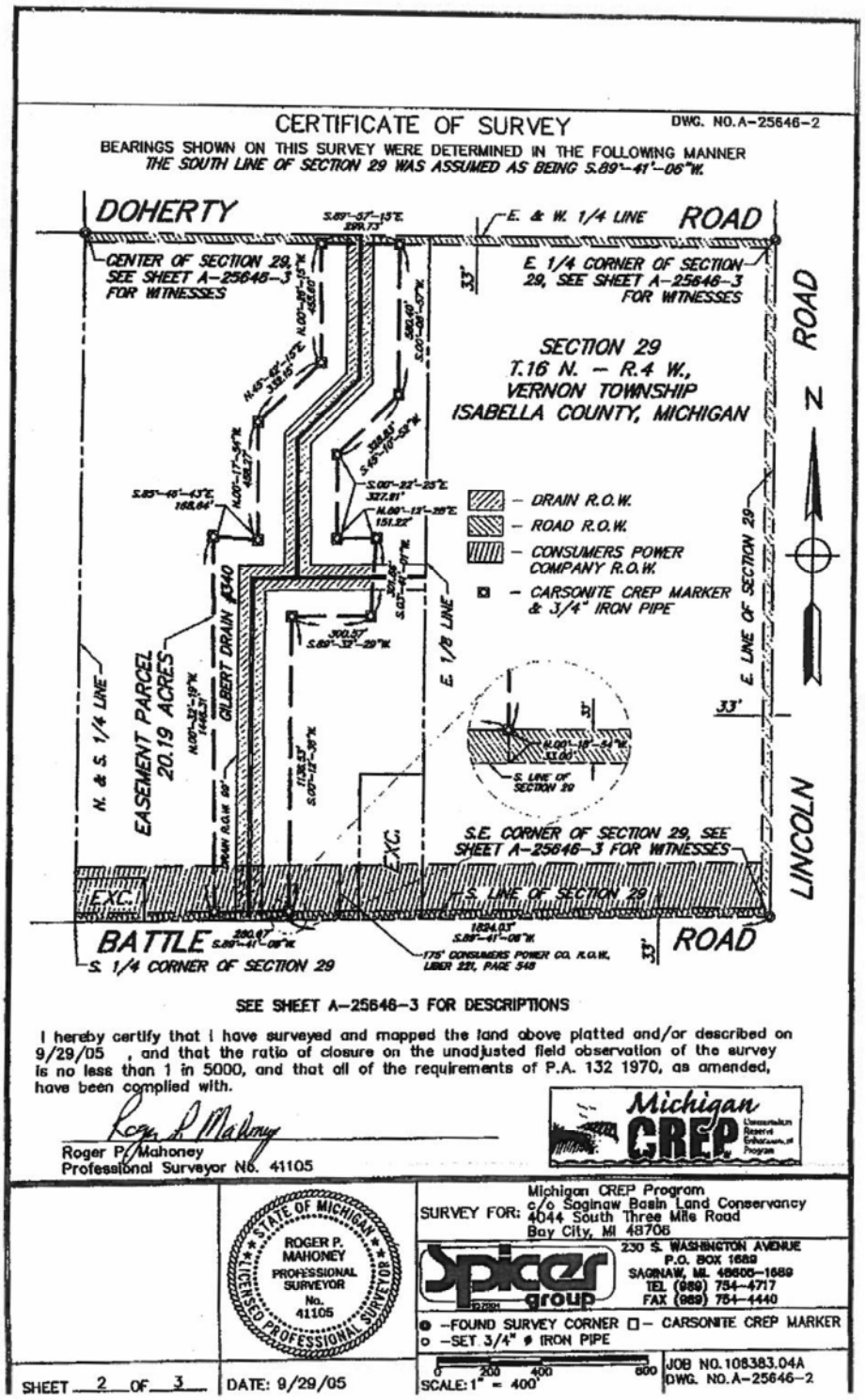
Spicer group
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (989) 754-4717
FAX (989) 754-4440

● -FOUND SURVEY CORNER □- CARSONITE CREP MARKER
o -SET 3/4" ø IRON PIPE

250378

SHEET 1 OF 3 | DATE: 9/29/05 | SCALE: 1" = 400' (0, 200, 400, 800) | JOB NO. 108383.04A | DWG. NO. A-25646-1

LIBR 1342 PG 0057



SEE SHEET A-25646-3 FOR DESCRIPTIONS

I hereby certify that I have surveyed and mapped the land above platted and/or described on 9/29/05 , and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Roger P. Mahoney
Professional Surveyor No. 41105

Michigan CREP

STATE OF MICHIGAN LICENSED PROFESSIONAL SURVEYOR
ROGER P. MAHONEY
PROFESSIONAL SURVEYOR
No. 41105

SURVEY FOR: Michigan CREP Program
c/o Saginaw Basin Land Conservancy
4044 South Three Mile Road
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SAGINAW, MI. 48605-1689
TEL (989) 754-4717
FAX (989) 754-4440

● -FOUND SURVEY CORNER □- CARSONITE CREP MARKER
○ -SET 3/4" ø IRON PIPE

SHEET 2 OF 3 | DATE: 9/29/05 | SCALE: 1" = 400' (0, 200, 400, 800) | JOB NO. 108383.04A | DWG. NO. A-25646-2

LIBER 1342 PG 0058

CERTIFICATE OF SURVEY

DWG. NO. A-25646-3

BEARINGS SHOWN ON THIS SURVEY WERE DETERMINED IN THE FOLLOWING MANNER
THE SOUTH LINE OF SECTION 29 WAS ASSUMED AS BEING S.89°-41'-06"W.

PARENT PARCEL

TITLE COMMITMENT 250378

The West ½ of the Southeast ¼ of Section 29, T.16 N.- R.4 W., Vernon Township, Isabella County, Michigan, except the South 165 feet of the West 264 feet and except the South 555 feet of the East 244 feet.

Easement Parcel:

A parcel of land in the West ½ of the Southeast ¼ of Section 29, T.16 N.- R.4 W., Vernon Township, Isabella County, Michigan, described as follows: To fix a point of beginning, commence at the Southeast corner of said Section: thence S.89°-41'-06"W., on the South line of said Section, 1824.03 feet; thence N.00°-18'-54"W., perpendicular to said South Section line, 33.00 feet to the point of beginning of this description; thence S.89°-41'-06"W., 280.67 feet; thence N.00°-32'-19"W., 1446.31 feet; thence S.85°-46'-43"E., 168.64 feet; thence N.00°-17'-54"W., 458.27 feet; thence N.45°-42'-15"E., 332.15 feet; thence N.00°-28'-15"W., 455.80 feet; thence S.89°-57'-15"E., 289.73 feet; thence S.00°-08'-57"W., 580.40 feet; thence S.45°-10'-52"W., 328.83 feet; thence S.00°-22'-25"E., 327.91 feet; thence N.89°-12'-28"E., 151.22 feet; thence S.03°-41'-01"W., 301.58 feet; thence S.89°-32'-29"W., 300.57 feet; thence S.00°-12'-38"W., 1136.53 feet to the point of beginning, containing 20.19 acres of land, together with an easement, for ingress and egress, described as follows: Beginning at a point 1560.30 feet, S.89°-41'-06"W. of said Southeast corner of said Section; thence continuing S.89°-41'-06"W., 808.26 feet; thence N.00°-23'-55"E., 33.00 feet; thence N.89°-41'-06"E., 808.17 feet; thence S.00°-14'-51"W., 33.00 feet to the point of beginning.

WITNESSES

CENTER SECTION 29
FOUND 3" IRON PIPE
N.60°W. 24.15' - SET 3/4" PIPE
N.75°E. 28.15' - SET 3/4" PIPE
S.85°E. 30.70' - SET 3/4" PIPE
S.60°W. 27.07' - SET 3/4" PIPE

E. 1/4 CORNER SECTION 29
RECORDED LIBER 1, PAGE 29
FOUND REMON CAP IN MONUMENT BOX
N.30°E. 30.85' - 24" MAPLE
S.70°E. 42.45' - "X" IN 24" C.M.P.
N.51°E. 34.81' - NAIL & L.S.C. TAG IN MULTI TRUNK MAPLE
N.54°E. 25.30' - NOTCH TOP NORTH END 24" C.M.P.
S.47°W. 39.35' - CABLE BOX

S.E. CORNER SECTION 29
RECORDED LIBER 2, PAGE 608
FOUND REMON CAP IN MONUMENT BOX
N.51°W. 70' - NAIL & L.S.C. TAG IN POWER POLE
N.48°W. 37.87' - NAIL & L.S.C. BRS' - CABLE BOX POST
N.74°E. 25.03' - SOUTH LEG - DIRECTIONAL SIGN
S.47°E. 41.25' - NAIL & L.S.C. TAG - 14" BOX ELDER

I hereby certify that I have surveyed and mapped the land above platted and/or described on 9/29/05, and that the ratio of closure on the unadjusted field observation of the survey is no less than 1 in 5000, and that all of the requirements of P.A. 132 1970, as amended, have been complied with.

Roger P. Mahoney
Professional Surveyor No. 41105

Michigan CREP Conservation Reserve Enhancement Program

STATE OF MICHIGAN
ROGER P. MAHONEY
PROFESSIONAL SURVEYOR
No. 41105
LICENSED PROFESSIONAL SURVEYOR

SURVEY FOR: Michigan CREP Program
c/o Saginaw Basin Land Conservancy
4044 South Three Mile Road
Bay City, MI 48706

Spicer group
230 S. WASHINGTON AVENUE
P.O. BOX 1689
SAGINAW, MI. 48605-1689
TEL (989) 754-4717
FAX (989) 754-4440

● -FOUND SURVEY CORNER □- CARSONITE CREP MARKER
○ -SET 3/4" ø IRON PIPE

SHEET 3 OF 3 | DATE: 9/29/05 | SCALE: | JOB NO. 108383.04A | DWG. NO. A-25646-3

Appendix D: 2010 MOU between the State of Michigan and SCIT

MEMORANDUM OF UNDERSTANDING REGARDING CONSERVATION
BETWEEN
THE STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENT
AND
THE SAGINAW CHIPPEWA INDIAN TRIBE OF MICHIGAN

Introduction

State and tribal departments and agencies engaged in natural resource and environmental management increasingly face issues that transcend jurisdictional boundaries and involve multiple stakeholders, both public and private. In order to reduce conflict and coordinate conservation efforts, many states and tribes have adopted a cooperative approach to resolving resource issues through collaborative engagement.

The State of Michigan and the Saginaw Chippewa Indian Tribe of Michigan (collectively, the "Parties") have a mutual interest in conserving natural resources within the Isabella Reservation, and in limiting cross-cultural conflicts regarding hunting, fishing, and other uses of natural resources within the Reservation. The Parties further believe that they can mutually benefit from enhanced cross-jurisdictional communication and by sharing best practices. This MOU seeks to address future cross-jurisdictional issues and challenges in natural resource and environmental management while preserving the jurisdictional authority and autonomy of each Party.

Additional communication is particularly important to the Parties in light of the consent agreement and proposed court order in *Saginaw Chippewa Tribe of Michigan v. Granholm, et al.*, E.D. Mich, Case No. 05-10296-BC (the "Court Order"), recognizing the six-township boundary of the Isabella Reservation, and further recognizing that the Isabella Reservation is Indian country, as that term is defined by 18 U.S.C. § 1151 and other applicable federal law.

Though entry of the Court Order does not affect the State's jurisdiction over non-members within the Isabella Reservation, recognition of the Isabella Reservation reaffirms the Tribe's jurisdiction over its members within the Reservation. This MOU is not intended to abrogate, alter, or reallocate the jurisdiction of either Party or of the United States under existing tribal, state, or federal law. To the extent that this MOU addresses hunting, fishing or other usufructuary rights, it only concerns the rights of the Tribe and its members acting within the six-township boundary of the Isabella Reservation. It does not address off-reservation usufructuary rights of the Tribe or its members, or the rights of non-members within the Isabella Reservation.

Agreements

The Parties agree:

1. To initiate, within 90 days after the entry of both a stipulated order and judgment in this case, good-faith negotiations to identify mutually agreeable resolution of the State's concerns regarding:

A. Tribal regulation of hunting, fishing, and gathering activities by tribal members on the Isabella Reservation; and

B. Regulation of other activities on the Isabella Reservation by the Tribe or its members that may have significant environmental or natural-resource impacts including the drilling and operation of oil and gas wells.

2. To manage and fund their own activities, personnel, and other resources, while pursuing the goals of this MOU;

3. That nothing in this MOU authorizes either Party to obligate or transfer funds. Specific projects or activities that involve the transfer of funds, services, or property between the parties require execution of separate agreements that must be independently authorized by the Parties;

4. That this MOU does not alter, limit, or expand the jurisdictional authority of either Party;

5. That this MOU is not intended to and does not create any right, benefit, or liability, substantive or procedural, enforceable at law or equity, against either Party; and

6. That this MOU takes effect on the date that: 1) the MOU is fully executed; and 2) the Court Order is entered by the United States District Court for the Eastern District of Michigan, provided that the Court enters the Court Order as it was approved by the State and Tribe. Changes to the form of the Court Order (e.g., pagination, fonts, margins, etc.) do not affect the effective date of this MOU, but this MOU is not effective and does not bind the parties if the language of the Court Order is not identical to the language approved by the State and Tribe. The MOU will expire five years from its effective date, but may be extended or amended by written agreement of the Parties.

SAGINAW CHIPPEWA INDIAN TRIBE OF MICHIGAN

Dennis Kequom, Sr., Tribal Chief

11-9-10
Date signed

STATE OF MICHIGAN

Rebecca A. Humphries, Director of the Department of Natural Resources and Environment

11/08/10
Date signed

The United States District Court for the Eastern District of Michigan entered the Order for Judgment in Case No. 05-10296 on _____, 2010.