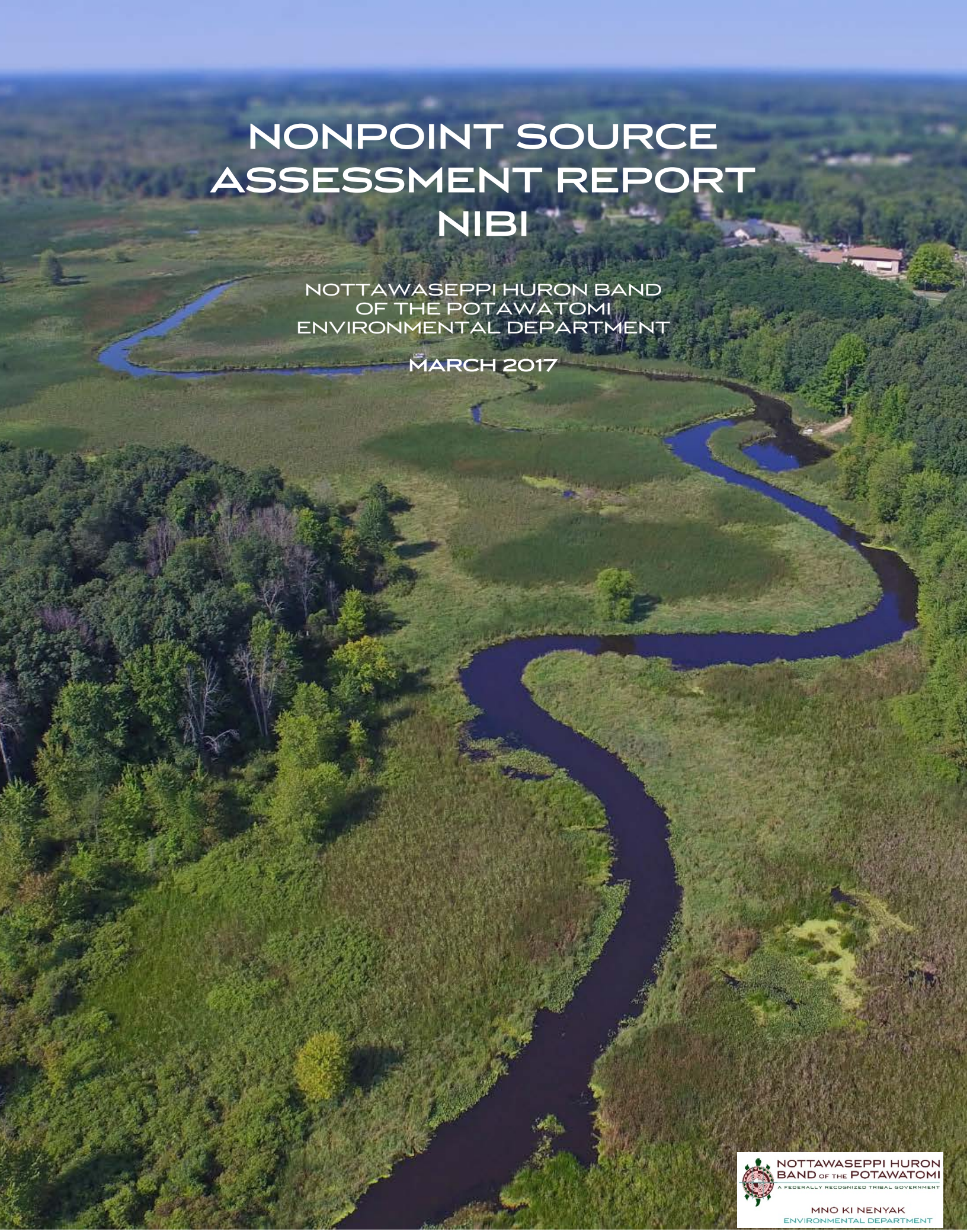

NONPOINT SOURCE ASSESSMENT REPORT NIBI

NOTTAWASEPPI HURON BAND
OF THE POTAWATOMI
ENVIRONMENTAL DEPARTMENT

MARCH 2017

NOTTAWASEPPI HURON BAND OF THE POTAWATOMI
A FEDERALLY RECOGNIZED TRIBAL GOVERNMENT
MNO KI NENYAK
ENVIRONMENTAL DEPARTMENT

NONPOINT SOURCE ASSESSMENT REPORT NIBI

NOTTAWASEPPI HURON BAND OF THE POTAWATOMI ENVIRONMENTAL DEPARTMENT

FINAL DRAFT
UPDATED MARCH 2018

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NOTTAWASEPPI HURON BAND OF THE POTAWATOMI
A FEDERALLY RECOGNIZED TRIBAL GOVERNMENT

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ENVIRONMENTAL DEPARTMENT

Table of Contents

List of Figures

List of Tables

1. OVERVIEW

Non-Point Source (NPS) contamination, polluted runoff, occurs when rainfall, snowmelt, or irrigation water runs over land or through the ground, picks up pollutants, and transports them into surface waters or ground water. Though the relative impact from a few nonpoint pollution sources might be small, the cumulative effect from many nonpoint sources degrades water quality. NPS pollution is the leading source of water quality problems in the United States, and major nonpoint sources of pollution often include agricultural practices; unrestricted livestock grazing; poor siting and design of roads, highways, and bridges; forestry; urban runoff; abandoned mines; construction sites; channelization of streams; and hydro-modification, such as building and maintaining dams and levees. Other sources include lawn and garden maintenance, malfunctioning septic systems, constructing marinas, boating, and storm drain dumping. Atmospheric deposition of pollutants is also considered NPS pollution (USEPA, 2010).

This NPS assessment report for the Nottawaseppi Huron Band of the Potawatomi (NHBP) analyzes NPS problems for tribal waters on NHBP Tribal lands, and waters that drain to or effect direct Tribal interests. 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:

1. Be a federally recognized Tribe
2. Compile an approved CWA section 319(a) NPS Assessment Report
3. Complete an approved CWA section 319(b) NPS Management Plan
4. Be CWA section 518€ approved for Treatment As State (TAS).

The Huron Potawatomi Tribe land base is primarily in Calhoun County, with Tribal Members scattered throughout a southwest Michigan seven county service area. After inhabiting the 10,000 acre Nottawaseppi Reservation near Mendon in the early 1800's, our ancestors escaped forced removal and returned to the area of the Pine Creek Reservation in 1840. The Pine Creek Reservation is located in the St Joseph River Basin, and the Tribe owns properties in the Kalamazoo and Grand River Watersheds (Figure 1.1). Agriculture is the dominant Land Use in the 4685 mi^2 St. Joe Watershed, comprising over 70%, though 1.5 million people live in urbanized areas clustered in the west such as South Bend, Benton Harbor, Goshen & Niles. Over 50% of its wetlands have been drained or developed, which historically provided numerous water and habitat functions (Degraves, 2005).

The St Joseph River has been identified by the USEPA as being the biggest contributor of atrazine to Lake Michigan, in addition to contributing quantities of mercury and PCBs. Other major impairments are pathogens due to agricultural and urban sources, and several TMDLs for pathogens have been developed in Michigan and Indiana (Degraves, 2005). Nutrient contributions from sediment loading are also a major concern, as is the large scale hydrologic modification and channelization that has occurred (Wesley & Duffy, 1999).

NHBP is currently monitoring the Pine Creek which flows through the Reservation, and the Nottawa Creek which the Pine flows into just south of Tribal Properties. The Tribe has conducted 4 years of surface water monitoring, and also collaborated with the USGS in 2004 on a report assessing surface and ground water quality. NHBP Staff have detected large spikes in turbidity after storm events in small tributaries, elevated E. coli levels, and are concerned about the effects of pesticides residues and hydrologic alterations on mnomen, wild river rice. As development and impervious surfaces increase on the Reservation, the Tribe will continue to pursue runoff management to so that our waters are not negatively impacted.

This Assessment report builds on the NHBP Water Quality Assessment of 2014 (NHBP, 2014), NHBP GIS analysis of water quality and drainage areas, the St Joseph River Watershed Management Plan (Degraves, 2005), The MDNR Fisheries Assessment (Wesley & Duffy, 1999), and extensive partnerships that have been established amongst agencies, organizations, and Tribes. Figure 1 below shows the location of the Pine Creek Reservation in southern Michigan, other Tribal properties, and the primary waterbodies of interest, The Pine & Nottawa Creek Watersheds.

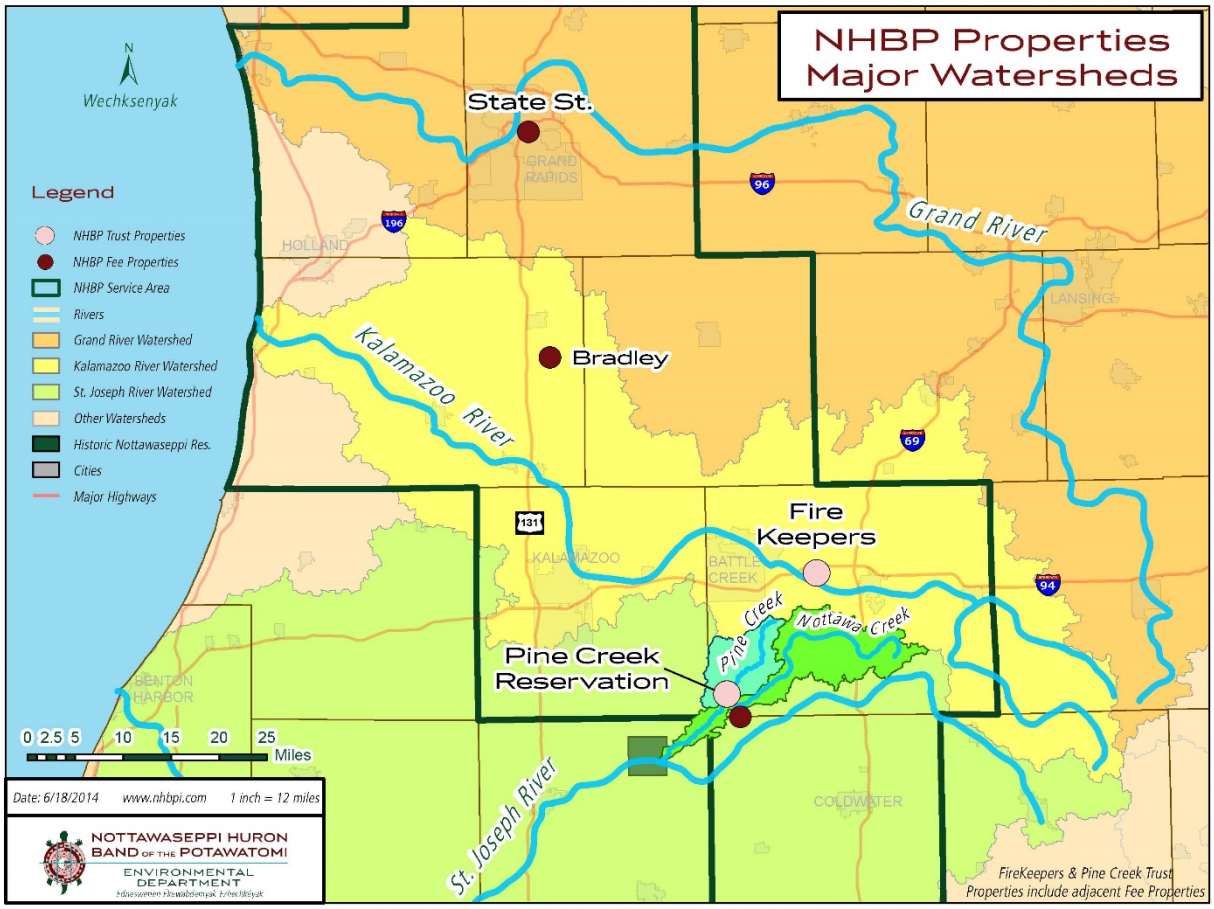


Figure 1. NHBP Properties and Major Watersheds

2. INTRODUCTION

The Huron Potawatomi Tribe is centered in southwestern Michigan with a land base primarily in Calhoun County. Over 1200 Tribal members are located throughout western Michigan in urban and rural areas. Tribal government offices are primarily located at the Pine Creek Reservation, with a satellite Health Department office located in Grand Rapids, Michigan. Tribal Trust lands include the Pine Creek Reservation at 120 acres and the FireKeepers gaming parcel at 79 acres. The Tribe owns an additional 385 acres of Fee lands, and much of this land is in the process of the Fee to Trust application. Our Health Department also serves a 7 county area of Allegan, Barry, Branch, Calhoun, Kalamazoo, Kent and Ottawa Counties and assists members from other recognized tribes in these counties.

Our Bodéwadmi heritage has always been closely linked to lakes, rivers, wetlands, and the plants, fish, and animals that inhabit them. From harvesting mnomen (wild rice), creating baskets with wisgak (Black Ash), and collection of sweet grass and other medicine plants, water and wetlands have been at the core of our culture. The Tribal government and membership continue efforts to revive Bodéwadmi culture and language after years of repressive government policies. The goal of the Environmental Department is to support our cultural heritage and self-sufficiency, and incorporate traditional knowledge into Environmental Stewardship.

The area of the Pine Creek Reservation was not considered prime farmland, mostly consisting of wetlands and floodplains. This has proven to be an asset to the Tribe with high quality ecological areas, although difficult for developing the infrastructure for a growing Tribal Government. Hydrologic modification of many streams and drains has severely altered its pre settlement conditions by allowing exotic species to flourish, while displacing important resources such as wild rice and waterfowl. Over 50% of the wetlands in the St Joseph River Watershed have been lost, and with them the ability to filter polluted runoff from anthropological activities.

Before being converted to primarily agricultural lands, much of the St. Joseph Basin was covered in deciduous forests dominated by maples, ask, oak, elm, prairies several miles across, and of course streams, lakes, and wetlands (Degraves, 2005). As the Tribe continues to develop in and around the Reservation, we are also conscious of potential impacts to surface and ground water quality. The last decade has seen the construction of a Community Center, Health Center, Police Station, Government Center, Public Works Building, Head Start, numerous housing units, and the FireKeepers Casino/Hotel & Event Center in Emmett Township on Interstate 94.

Water quality monitoring by NHBP staff and USGS have shown preliminary results that indicate our waters are impaired by sediments & nutrients, pathogens, temperature spikes & low flows, and pesticide residues. Several of these factors will likely become more problematic due to

Climate Change. The St. Joseph River Watershed Management Plan also found impairments throughout the watershed due to E. coli, sedimentation, and pesticides (Degraves, 2005), and the MDNR Fisheries Assessment found altered stream temperature regimes and decreased flow stability as a result of channelization and wetland drainage (Wesley & Duffy, 1999).

The objective of the NHBP Environmental Department is to establish a Non-Point Source assessment and control program to address polluted runoff, and quality for funding under CWA Section 319. The Tribe is interested in the minimization of Tribal and Non-Tribal water impacts to the Pine and Nottawa Creek Watersheds. This can be accomplished by tracking the ongoing conditions of waters on and flowing through Tribal Lands. Through continued monitoring and enhancement of our Tribal waters, NHBP will develop our own Tribal specific Water Quality Standards as an extension of our sovereignty.

The primary objectives for this program are as follows:

- Targeted sampling to determine if Tribal Waters are meeting adopted standards to support recreation, hunting & fishing, and healthy ecosystems.
- Identify the most significant non-point source problem areas in the Pine Creek Watershed, and in sub-watersheds that impact Tribal Lands & Waters.
- Monitor water quality and conditions adjacent to culturally significant wild rice beds.
- Install discharge monitoring stations to understand flow fluctuations in the Pine and Nottawa Creeks, connections between hydrologic modification, wetlands, groundwater, and irrigation withdrawals.
- Better understand and evaluate impacts from increased development on Tribal lands, and enhancing the ecosystem benefits of NHBP stormwater systems.

The purpose of this NPS Assessment Report is to identify existing and potential water quality problems caused by Non-Point Source pollution in the Pine and Nottawa Creek Watersheds, which supports the NHBP'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, as well as the sources of such pollution. The assessment evaluates water quality monitoring data and information from various sources, four consecutive years of Tribal water monitoring, reports conducted with the USGS, data from State and County agencies, Watershed documents and assessments, and information from Tribal and community members. 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 NHBP will identify best management practices (BMPs) needed to control NPS pollution affecting Tribal Waters. 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.

3. METHODOLOGY

3.1. Program Area Summary

The Pine Creek Reservation and most of the Tribe's land holdings are located in the St. Joseph River Watershed, in southwestern Calhoun County Michigan. The FireKeepers Trust Property is located near the city of Battle Creek, and lies in the Kalamazoo River Watershed, one mile from the River. We also own offices in the city of Grand Rapids which house health and administrative staff, and this resides in the Grand River Basin. The NHBP Service Areas includes seven counties located throughout these 3 major watersheds, and our Tribal Households are scattered throughout these counties. Our primary Sub-Watersheds of focus are the Pine and Nottawa Creeks, where Tribal properties and wild rice beds are located. Table 1 summarizes the 8 and 12 HUC Watersheds where Tribal Properties are located.

HUC 8	HUC 12	Primary Waterbody	Waterbodies
St. Joseph River 04050001	Pine Creek 040500010304	Pine Creek	Pine Creek
			Snyder Creek Drain
			Indian Creek Drain
			Unnamed Tributary
	Mud Lake-Nottawa Creek 040500010306	Nottawa Creek	Nottawa Creek
Kalamazoo River 04050003	Willow Creek-Kalamazoo River 040500030411	Kalamazoo River	Dickinson Creek
			Kalamazoo River
	Pigeon Creek-Kalamazoo River 040500030408	Kalamazoo River	Pigeon Creek
	Buckhorn Lake-Kalamazoo River 040500030407	Kalamazoo River	Kalamazoo River
	Fales Drain-Rabbit River 040500030802	Rabbit River	Rabbit River
Grand River 4050006	Lamberton Creek-Grand River 040500060507	Grand River	Grand River

Table 1. 8 and 12 Digit NHBP HUC Watersheds

The Nottawaseppi Huron Band of Potawatomi has collected four consecutive years (2011-2014) of physical water quality parameters on Tribal Waters. There has also been collection of a limited number of nutrient and pathogen samples in surface water. The results of the first three years are summarized and graphed in the NHBP Water Quality Assessment Report of 2014 (NHBP, 2014). There is currently no other yearly surface water monitoring occurring within the Pine or Nottawa Creek Watersheds by the State or other local governmental entities. A decommissioned gaging station on the Nottawa Creek also was the only measure of water quantity in these watersheds, with the next closet being the St. Joseph River at Burlington (USGS 04096405).

Table 2. NHBP Surface Water Sampling Stations

RIVER BASIN	HUC 12 ID	WATERBODY	STATION ID	STATION NAME	DO	TEMP	TURB	SC	pH	TP	TN	E. coli
12 St. Joseph River 04050001	Pine Creek 040500010304	Pine Creek	PNC-ST-20	Pine Creek at K Drive South Crossing	X	X	X	X	X			
		Pine Creek	PNC-ST-30	Pine Creek at O Drive South Crossing	X	X	X	X	X			
		Pine Creek	PNC-ST-40	Pine Creek at S Drive South Crossing	X	X	X	X	X			
		Pine Creek	PNC-ST-50	Pine Creek at Reservation Boardwalk	X	X	X	X	X			X
		Pine Creek	PNC-ST-60	Pine Creek at Mike Mandoka Dock	X	X	X	X	X	X	X	X
		Pine Creek	PNC-ST-70	Pine Creek just upstream of Nottawa Confluence	X	X	X	X	X			
		Indian Creek Drain	ICD-ST-20	Indian Creek Drain at 1 Mile Road Crossing	X	X	X	X	X			
		Indian Creek Drain	ICD-ST-40	Indian Creek Drain at Community Center Bridge	X	X	X	X	X	X	X	X
		Indian Creek Drain	ICD-ST-60	Indian Creek Drain at Mishkoswen Crossing	X	X	X	X	X	X	X	X
		Indian Creek Drain	ICD-ST-65	Indian Creek Drain at 1301 T Dr Property	X	X	X	X	X			
		Indian Creek Drain	ICD-ST-70	Indian Creek Drain at T Drive South Crossing	X	X	X	X	X			
		Snyder Creek Drain	SCD-ST-20	Snyder Creek Drain at 1 Mile Road Crossing	X	X	X	X	X			
		Snyder Creek Drain	SCD-ST-40	Snyder Creek Drain at T Dr South Property	X	X	X	X	X	X	X	
		Snyder Creek Drain	SCD-ST-50	Snyder Creek Drain at 1500 T Dr Culvert	X	X	X	X	X			
		Untitled Tributary	UNT-ST-10	Unnamed Tributary at Q Dr North Property	X	X	X	X	X			
		Untitled Tributary	UNT-ST-20	Unnamed Tributary at 1 1/2 Mile Road Crossing	X	X	X	X	X			
		Harvey Creek	HVC-ST-20	Harvey Creek at 1 1/2 Mile Road Crossing	X	X	X	X	X			
		Q Drive Pond	QDP-LA-10	Q Dr North Property Wetland Pond	X	X	X	X	X			
		S Drive Pond	SDP-LA-10	S Drive Pond	X	X	X	X	X			

St. Joseph River 04050001	Mud Lake-Nottawa Creek 040500010306	Nottawa Creek	NOT-ST-30	Nottawa Creek at M Drive South Crossing	X	X	X	X	X			
		Nottawa Creek	NOT-ST-40	Nottawa Creek at Q Drive South Crossing	X	X	X	X	X			
		Nottawa Creek	NOT-ST-50	Nottawa Creek at 4 Mile Road Crossing	X	X	X	X	X			
		Nottawa Creek	NOT-ST-60	Nottawa Creek upstream of Pine Confluence	X	X	X	X	X			
	Mud Lake-Nottawa Creek 040500010306	Nottawa Creek	NOT-ST-70	Nottawa Creek at V Drive South	X	X	X	X	X			
		Nottawa Creek	NOT-ST-80	Nottawa Creek near Schoolhouse Rice Beds	X	X	X	X	X			
		Nottawa Creek	NOT-ST-90	Nottawa Creek upstream Marl Bridge, no Rice site	X	X	X	X	X			
		Nottawa Creek	NOT-ST-110	Nottawa Creek at Marl Lake Bridge	X	X	X	X	X			
		Nottawa Creek	NOT-ST-115	Nottawa Creek at Mud Lake	X	X	X	X	X			
		Nottawa Creek	NOT-ST-120	Nottawa Creek at Shorts Road Bridge	X	X	X	X	X			
		Nottawa Creek	NOT-ST-130	Nottawa Creek at Correll Road Bridge	X	X	X	X	X			
		Nottawa Creek	NOT-ST-140	Nottawa Creek at Fulton Road Bridge	X	X	X	X	X			
Kalamazoo River 04050003	Willow Creek-Kalamazoo River 040500030411	Dickinson Creek	DKC-ST-20	Dickinson Creek at Verona Bridge Crossing	X	X	X	X	X			
		Dickinson Creek	DKC-ST-25	Dickinson Creek at H Drive North Crossing	X	X	X	X	X			
		Dickinson Creek	DKC-ST-30	Dickinson Creek near Interstate 94								
		Dickinson Creek	DKC-ST-50	Dickinson Creek at Historic Bridge Park								
		Kalamazoo River	KAR-ST-200	Kalamazoo River at 9 1/2 Mile Bridge	X	X	X	X	X			
	40500030407	Kalamazoo River	KAR-ST-100	Kalamazoo River at Kalamazoo St, Marshall	X	X	X	X	X			
	40500030408	Pigeon Creek	PGC-ST-30	Pigeon Creek at E Drive North Crossing								

Figure 2. St. Joseph River Watershed Sampling Sites

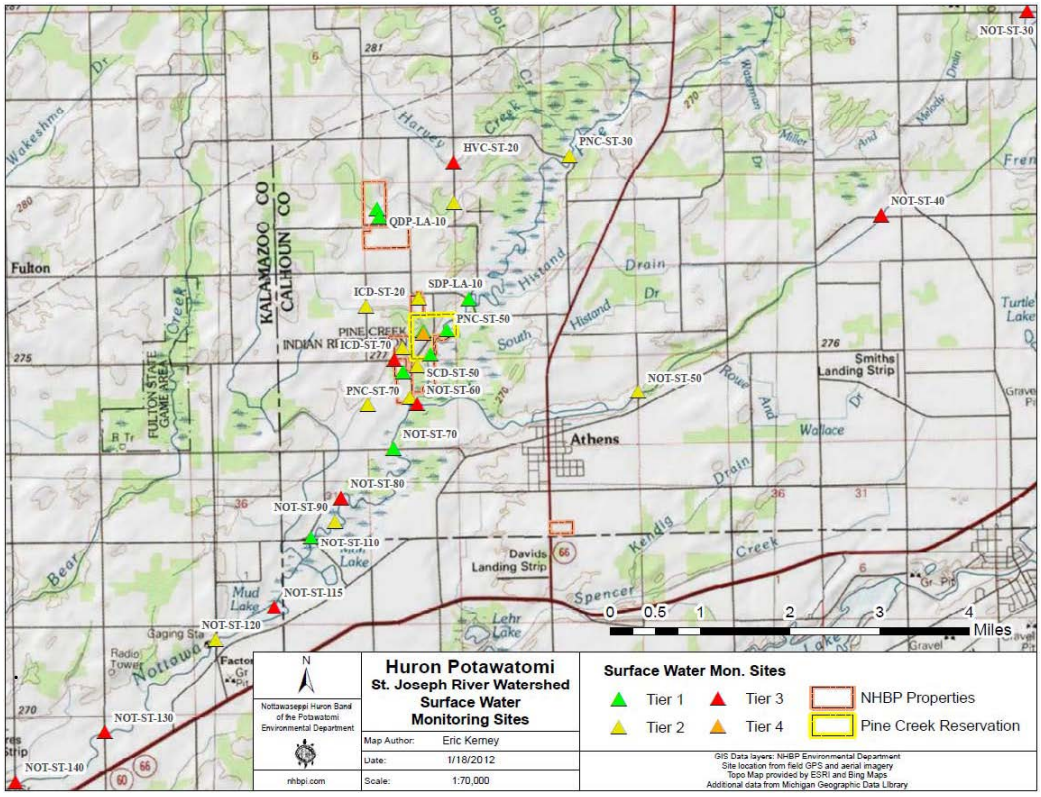
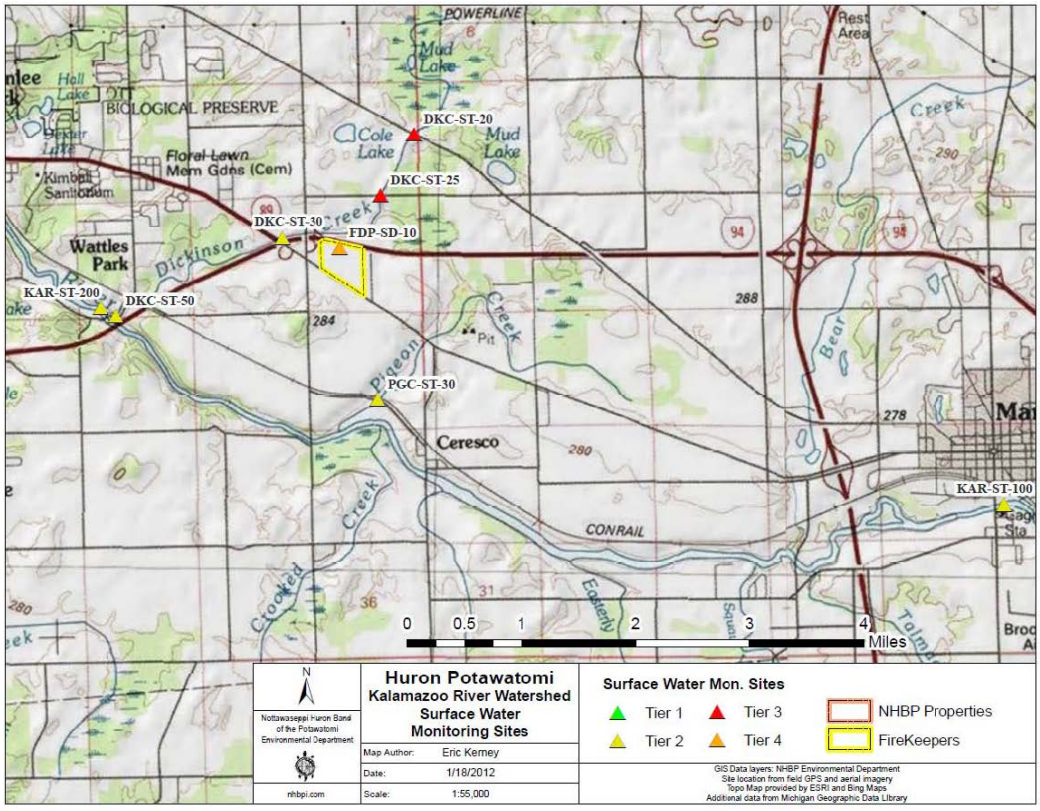


Figure 3. Kalamazoo River Watershed Sampling Sites



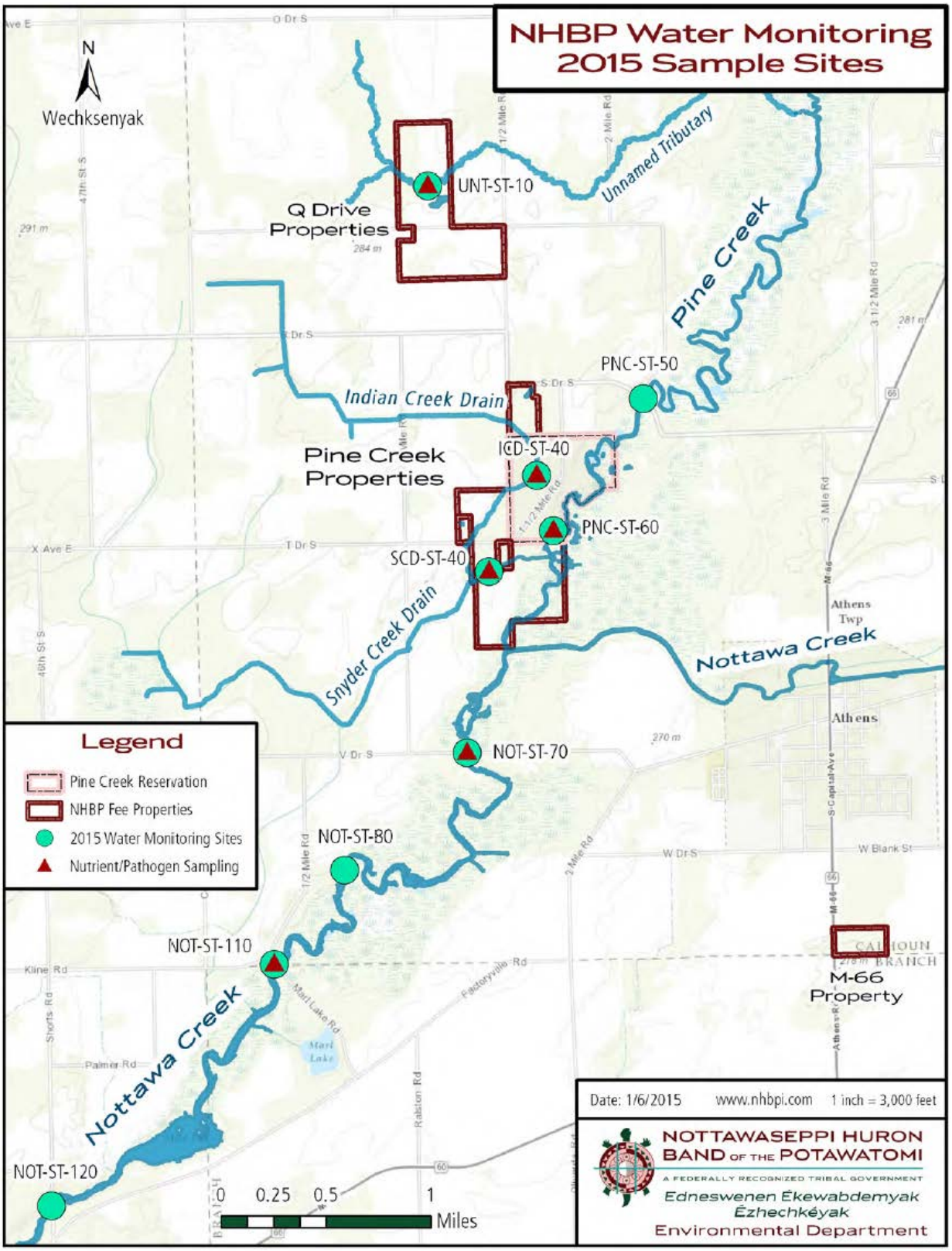


Figure 4. NHBP 2015 Water Sampling Sites

3.2. Water Data Collection Methods

In response to concerns about surface & ground water quality and quantity, and hydrologic changes in wetlands and watersheds, the Environmental Department looked to investigate these issues through the development of a Tribal Water Program. As mentioned in the previous section, the Tribe collaborated with the USGS to collect surface and ground water quality data for several years (USGS, 2004). In 2010 the Tribe obtained Treatment As State (TAS) from the USEPA for the CWA 106 Program. A Water Resources Specialist was hired that year, and the Tribe began collecting regular surface water data in the summer of 2011 with the completion of a Quality Assurance Program Plan (QAPP). The QAPP was revised and approved in June of 2012 to meet the needs of the monitoring program, and is part of the NHBP PPG Grant # BG-96580009-1. The initial round of sampling was conducted using a 6820 V2 water quality sonde and has been conducted at targeted locations both on and off of tribally owned properties. Water samples are also submitted to one of several local, certified water quality labs to test for additional core water quality parameters.

Surface water data sampling has continued in 2012 and 2013, although not as many samples were taken as in 2011. Additionally we have begun to conduct delineation of Tribal wetlands using the Army Corps of Engineers method along with guidance from the new Regional Supplements (USACE, 2012). The Water Quality Assessment Report covers the years of 2011-2013, and provides a brief status report on Tribal wetlands.

3.3. Adopted Surface Water Quality Reference Values

The Tribe is actively pursuing the creation of Water Quality Standards specific to the Huron Potawatomi Tribe. While there is considerable interest in the Tribal Environmental Advisory Council (TEAC) in the development of these standards, the Tribe has not yet had the capacity and resources to develop its own standards. In the interim the Tribe will adopt the water quality reference values specified by the US Environmental Protection Agency and the State of Michigan. If there is a difference between the reference values, the Tribe will opt for the more protective of the two agencies. The NHBP Nibi program is working towards formal adoption by the Tribal Council of the federal and state reference values as provisional standards.

In the effort to monitoring the health of its waters, the Tribe is collecting data on a number of parameters. The USEPA has listed nine core parameters that every Tribe or State is recommended to monitor as their programs are developed. In 2011 the Tribe monitored 6 of the 9 core parameters and also monitored for Conductivity. Four of the core parameters were monitored regularly, while only a few stations were sampled for the two additional parameters, Total Phosphorus & Total Nitrogen. The Tribe is planning to collect data for each of the core parameters by 2015 as stated in the Tribal Water Monitoring Strategy.

Table 1. Surface water quality parameters and reference values for comparison					
Parameter	**Reference Value**	**Sampling Method**	**Source**	**Current Program**	**Core Indicator**
Dissolved Oxygen	Coldwater fishery 7 mg/L Warmwater fishery 5 mg/L	In-Situ YSI Sonde	Michigan DEQ	**Yes**	**Yes**
pH	Between 6.5 and 9.0	In-Situ YSI Sonde	Michigan DEQ	**Yes**	**Yes**
Water Temperature	Coldwater Fishery Not to exceed May:65 Jun:68 Jul:68 Aug:68 Sep:63 Warmwater Fishery Not to exceed May:76 Jun:84 Jul:85 Aug 85 Sep: 79	In-Situ YSI Sonde	Michigan DEQ	**Yes**	**Yes**
Turbidity	1.70 NTU (0.84 – 14.50 NTU)	In-Situ YSI Sonde	USEPA CWA 304(a)	**Yes**	**Yes**
Conductivity	No rule under Michigan Water Quality Standards. (Can fluctuate seasonally based on impacts from road salt at crossings)	In-Situ YSI Sonde	Michigan DEQ	**Yes**	No
Total Phosphorus	33.0 ug/L (ppb) Reference Value	Laboratory Analysis Kar Labs	USEPA CWA 304(a)	Yes Limited Sites	**Yes**
Total Nitrogen	0.54 mg/L (ppm) Reference Value	Laboratory Analysis Kar Labs	USEPA CWA 304(a)	Yes Limited Sites	**Yes**
Macro-invertebrates	MDEQ WB-SWAS-051 Qualitative Biological & Habitat Survey Protocols for Wadeable Streams & Rivers	Michigan DEQ Water Bureau WB-SWAS-051	Michigan DEQ	No	**Yes**
E. Coli (pathogens)	No greater than 1000 E. Coli per 100 ml Partial Body Contact Standard	Laboratory Analysis Kar Labs	Michigan Rule 323.1062(1)	Yes Limited Sites	**Yes**
Habitat Information	MDEQ WB-SWAS-051 Qualitative Biological & Habitat Survey Protocols for Wadeable Streams & Rivers	Michigan DEQ Water Bureau WB-SWAS-051	Michigan DEQ	Basic Info during 2015	**Yes**
Discharge	N/A	USGS	USGS	No	No

Figure 5. Adopted NHBP Water Quality Standards

4. WATERSHED CHARACTERIZATION & LAND USE SUMMARY

4.1. Program Area Description

Section 4 of the NPS Assessment will break down the land use of Trust & Fee lands owned by the Nottawaseppi Huron Band of the Potawatomi, and the Pine & Nottawa Creek Watersheds. Ecological conditions will also be discussed for NHBP lands and these Watersheds. Also the Watersheds that drain The NHBP Seven County Service Area will be briefly discussed. Land Use Maps, charts, and summaries will be provided for each area covered. Land Use Data was provided through the Michigan Center for Geographic Information (http://www.mcgi.state.mi.us/mgdl/).

4.2. General Setting

The Trust and Fee Lands of NHBP are scattered throughout south and western Michigan, as shown in Figure 1 in Section 1. Due to settlement pressure, misleading Treaties, and forced removal, our land holdings have been critically reduced from pre-contact amounts. The Tribe currently owns 584 total acres in Calhoun, Allegan, and Kent Counties, with 200 acres in Trust and 384 Fee simple lands. We also serve a seven County Service Area that also includes Kalamazoo, Branch, Ottawa and Barry Counties in southwest Michigan. Table 3 shows the breakdown of these lands, and Table 4 shows which communities the Tribal Properties are located within.

NHBP Land Holdings	
Trust	200 ac
Fee	384 ac
Total	584 ac
7 County Service Area	4684 mi^2

Table 3. NHBP Land Holdings

Seven County Service Area	**Communities**	**NHBP Property Acreage**
Calhoun County	Athens Township	483
	Emmett Township	88
Allegan County	Wayland Township	12
Kent County	City of Grand Rapids	1
Branch County		
Kalamazoo County		
Ottawa County		
Barry County		

Table 4. Community Location of NHBP Tribal Properties

4.3. General Land Use

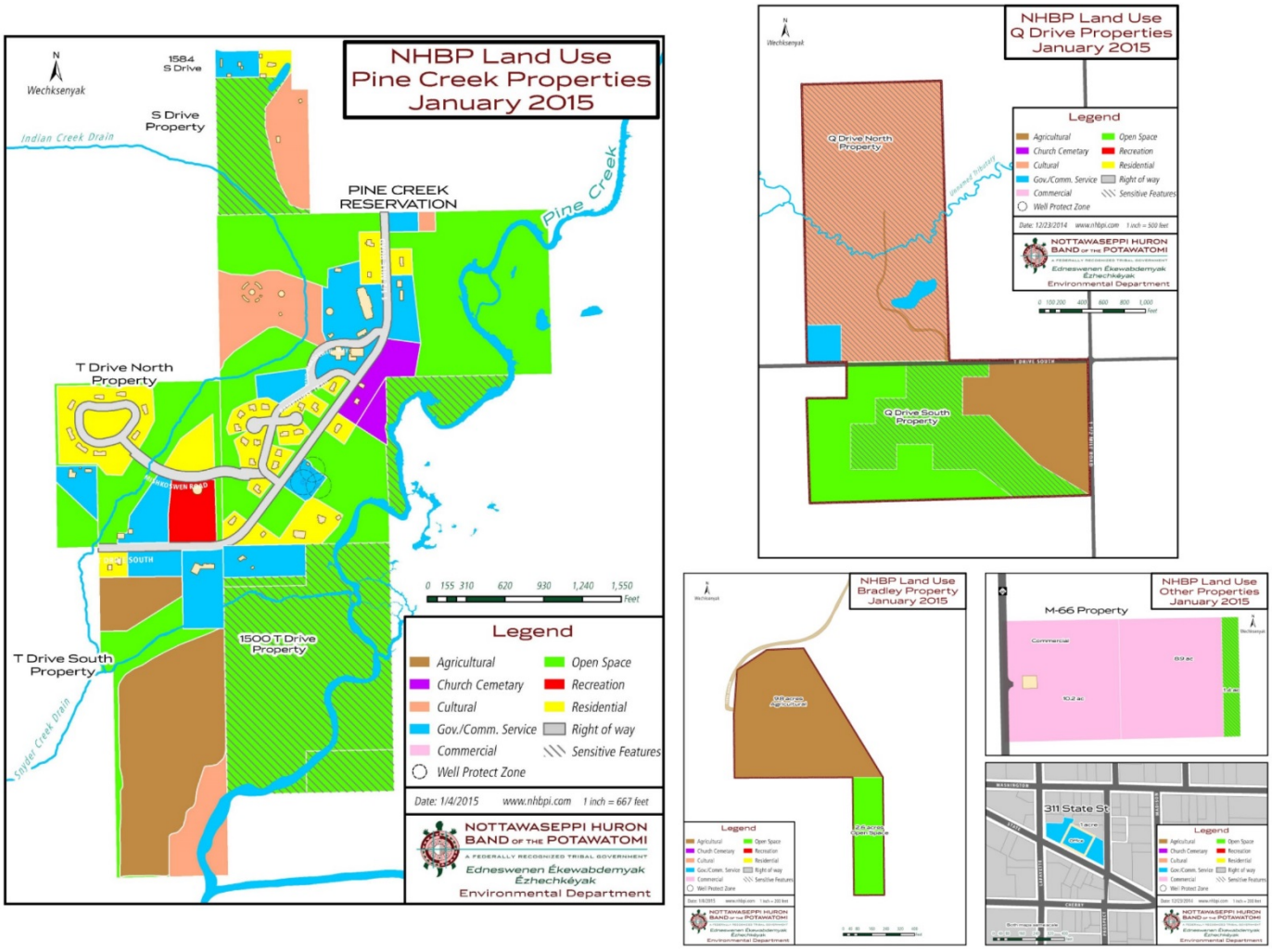
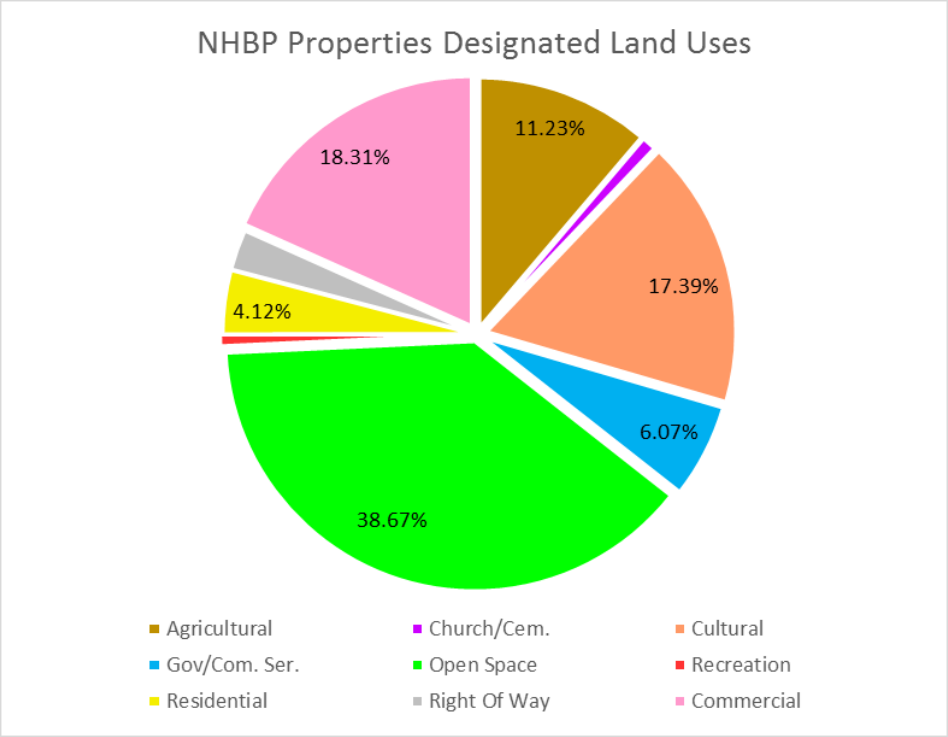


Figure 6. Land Use Maps for NHBP Properties

The Nottawaseppi Huron Band of the Potawatomi has developed a Master Plan and Land Use Designations passed by Tribal Council Resolution, for most of its properties. Land Use maps were updated in 2016 by the PLUC Committee, and final maps were approved at the Tribal Council Meeting in April. Areas in and around the Pine Creek Reservation have a high ground water table and many are not suitable for building. The Tribe is utilizing open and upland areas around the Government Campus for the construction of Tribal infrastructure and member housing. The Current breakdown is 33% of all lands are designated for Government, Housing, and Commerce, 56% are in either Cultural or Open Space, and 11% are listed as Agricultural. Open Space is non-paved or developed greenspace, and agricultural lands typically are in row crops, though some fields are fallow. In the Pine and Nottawa Creek Watersheds the primary use is agriculture, and there are still a considerable amount of wetlands that remain in areas too wet to farm. This program will not cover Land Uses in the entire 7 County NHBP Service Area or explore the larger Kalamazoo or Grand River Watersheds. There are currently a number of Watershed and Sub-Watershed Plans within the Kalamazoo and Grand River Basins. Figure 5 below shows Land Use Designations for NHBP Properties. See Appendix 2.



LAND USE	ACRES	PERCENT		LAND USE	ACRES	PERCENT
Agricultural	65.55	11.23%		Recreation	4.18	0.72%
Church/Cem.	5.33	0.91%		Residential	24.04	4.12%
Cultural	101.53	17.39%		Right Of Way	15.19	2.60%
Gov/Com. Ser.	35.45	6.07%		Commercial	106.90	18.31%
Open Space	225.79	38.67%				

Figure 7. NHBP Land Use Chart & Table

4.4. Pine Creek & Lower Nottawa Creek Watershed

The Pine Creek and Lower Nottawa Creek Watersheds primarily drain land in the southwest corner of Calhoun County, MI, also catching smaller portions of Kalamazoo, St. Joseph, and Branch Counties. The Pine Creek is a major tributary of the Nottawa, and flows into this River immediately south of Reservation Properties in Athens Township. Channelization of the Nottawa Creek as a County Drain changed the historic location of the confluence, lowering water levels, and removing inundation of Reservation wetlands (Drain Office). Using ArcGIS 10.0 with the ArcHydro Tools, watersheds were delineated with the Pine draining 47.5 mi^2, and the lower Nottawa 40.4 mi^2, then flowing into the 4,685 mi^2 St. Joseph Watershed, emptying into Lake Michigan (Degraves, 2005). The Upper Nottawa Basin also drains 69.6 mi^2 of land. The Pine Creek runs through the Pine Creek Reservation, and any upstream impacts effect Tribal Waters and Resources. Almost all of the remnant, culturally significant mnomen (wild rice) stands are on the portion of Nottawa Creek between the Reservation and the Correll Road Bridge. Some wild river rice exists on the Reservation, and restoration is also occurring there. The Environmental Department has a permit to collect the State Threatened Zizania aquatica (MNFI).

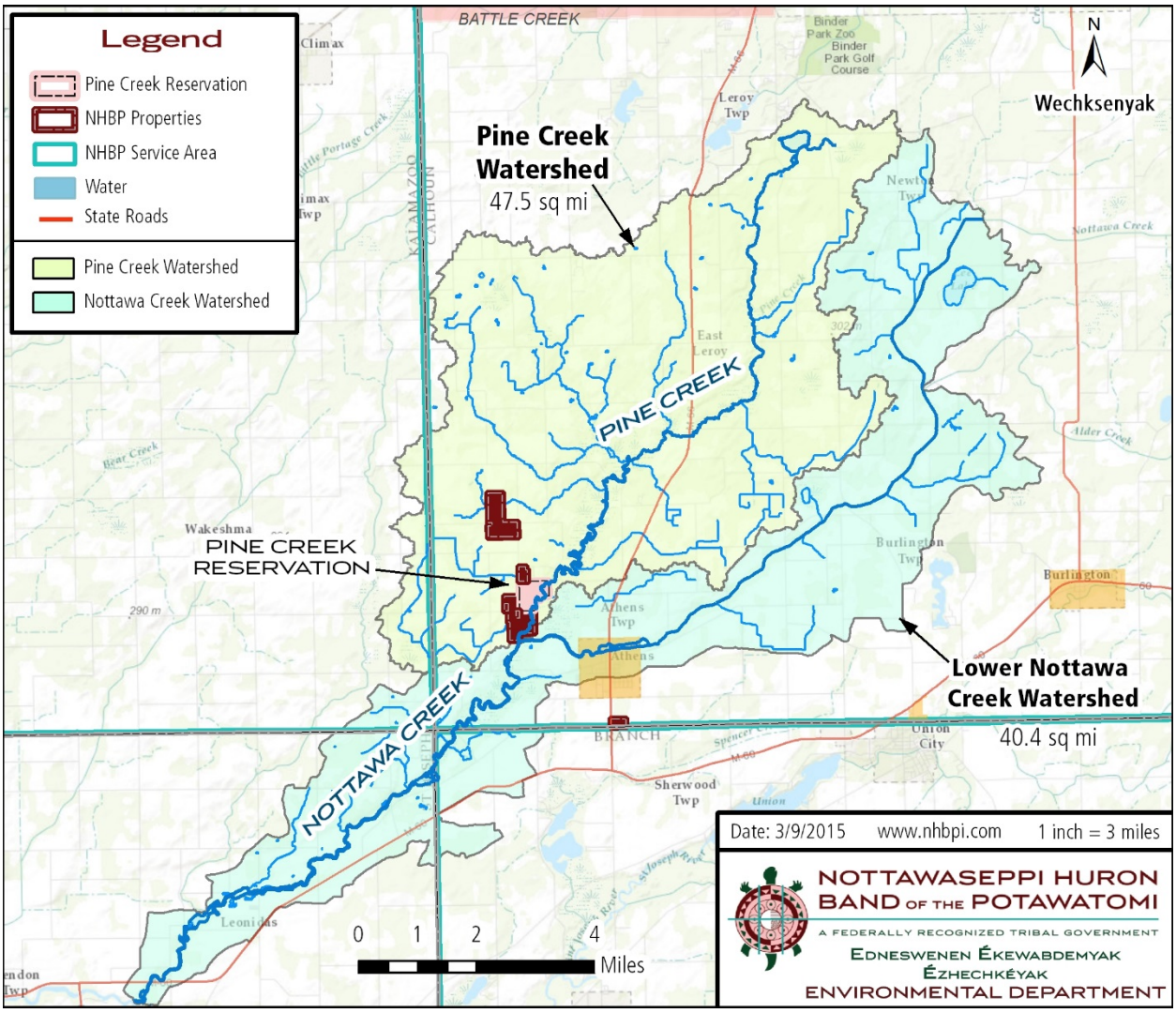
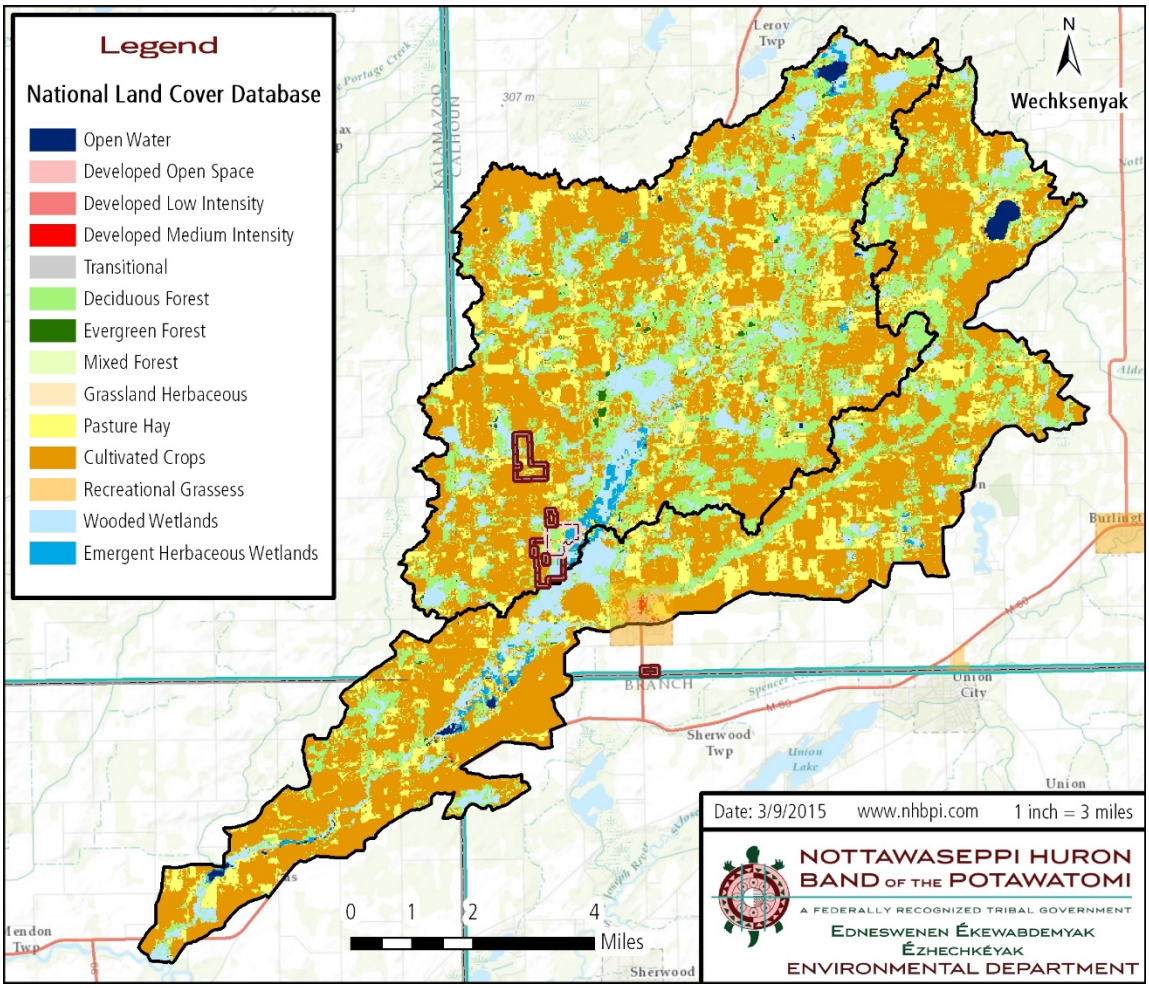


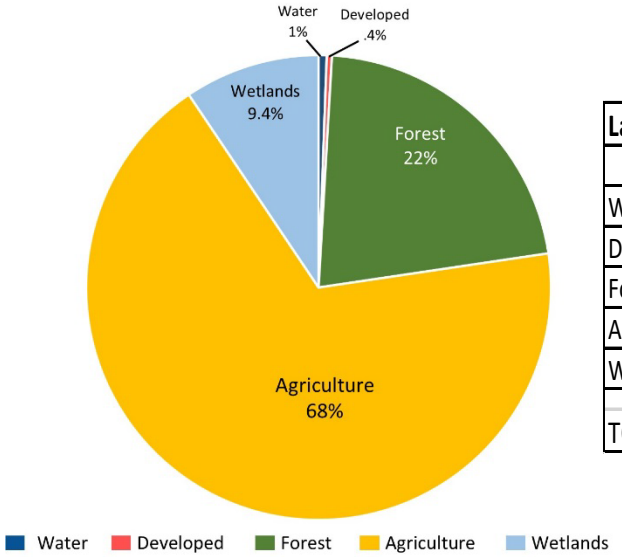
Figure 8. Pine Creek & Lower Nottawa Creek Watersheds

4.5. Pine Creek & Lower Nottawa Creek Watershed – Land Cover

Southwest Calhoun County is predominately rural, and agriculture is the dominant Land Cover in the Pine and Nottawa Creek Watersheds. Agriculture is dominated by large to medium sized fields of monoculture row crops, primarily corn and soybeans. Due to the expansive and difficult to access wet areas, the Basin still features 9.4% wetland coverage. While channelization and straightening has caused significant harm, the Nottawa has only lost 17% of pre-settlement wetlands (FotSJR, 2016), compared with 53% loss in the larger St. Joseph Watershed (Zbiciak, 2015). There are also some remaining forest stands, which become less common southward to Indiana, where very few forests or wetlands remain. Primary Non-Point Source impacts are agriculture related such as sediment, fertilizer, pathogen, and chemical runoff into waterways. There are only isolated developed areas in the Watershed, with the exception of the Village of Athens (pop. 1024 as of US Census 2010), and recent developments on the Pine Creek Reservation.



Pine & Lower Nottawa Creeks Watershed Land Cover



Land Cover Type	Acres	Percent
Water	318	0.56%
Developed	201	0.36%
Forest	12225	21.73%
Agriculture	38216	67.92%
Wetlands	5305	9.43%
TOTAL	56265	100.00%

Figure 9. Land Cover Map, Chart, & Table of Pine & Nottawa Creek Watersheds

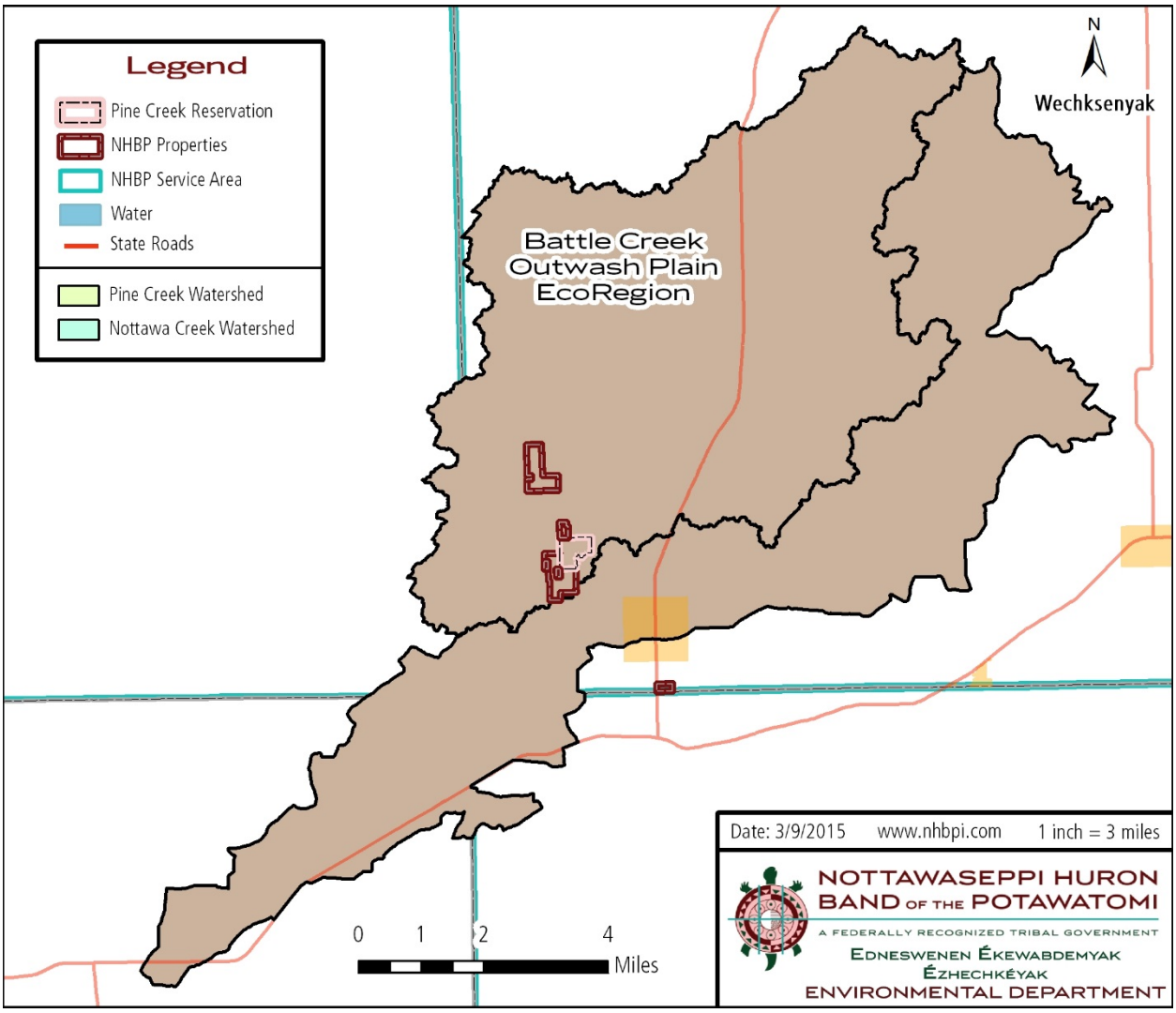


Figure 10. EcoRegions of the Pine & Nottawa Creek Watersheds

4.6. Pine Creek & Lower Nottawa Creek Watershed – EcoRegions

The study areas lies within the (56) Southern Michigan Northern Indiana Drift Plains Level III EcoRegion. This type is characterized by many lakes and marshes, and a diversity of landforms, soils, and land uses. Wide till plains and thick drift deposits, moraines, kames, drumlins, and kettles all occur. Low to medium gradient streams are most common, and many of the soils formed under oak-hickory forests, beech or northern swamp forests (USEPA, 2007).

The entirety of these watersheds is situated in the (56b) Battle Creek Outwash Plain Level IV EcoRegion. This generally broad flat plain was a major drainage way for receding glaciers in the Pleistocene epoch. Presently rivers and streams occupy some of the main outwash channels, and a few minor moraines are located across the plain. While much permeable sand and gravels underlie the plain providing stable streamflows, poorly drained soils are also presented in depressions, which have been drained for crop production. Pre-settlement vegetation was diverse including tallgrass and wet prairies, and oak savanna on sloping terrain (USEPA, 2007).

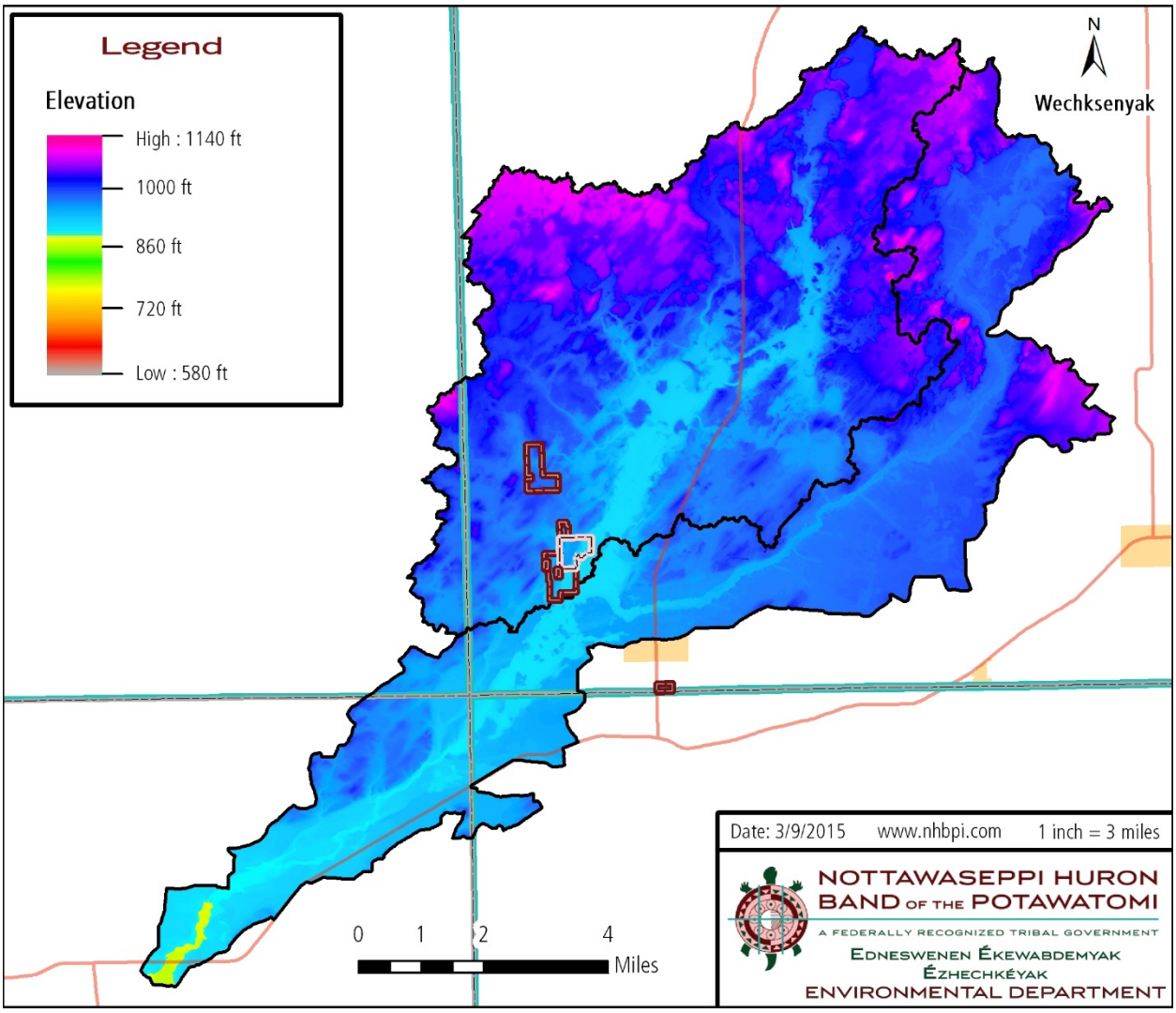


Figure 11. Topography of the Pine & Nottawa Creek Watersheds

4.7. Pine Creek & Lower Nottawa Creek Watershed – Topography

Throughout the larger St. Joseph Watershed, the topography is flat to gently rolling. The elevation along end moraines near the St. Joe headwaters exceed 550 feet above Lake Michigan. The most recent glacial movements during the Wisconsin stage altered the flow of the St. Joe, which had previously headed south to the Kankakee and Mississippi Rivers (Degraves, 2005). Other glacial relics include drumlins and kames. A very low relief plain runs from southwest to northeast across the study area, with wetlands and shallow impoundments impeding development there. The Nottawa Creek arises northwest of Homer to flow 46 miles southwest to its confluence with the St. Joe, picking up the Pine near the Village of Athens. The gradient of the Nottawa Creek begins at 2 ft./mi, increasing to 5 ft./mi near the Pine confluence. The Pine generally has a very low meandering gradient and morphological character (MDNR, B. Gunderman , 2013).

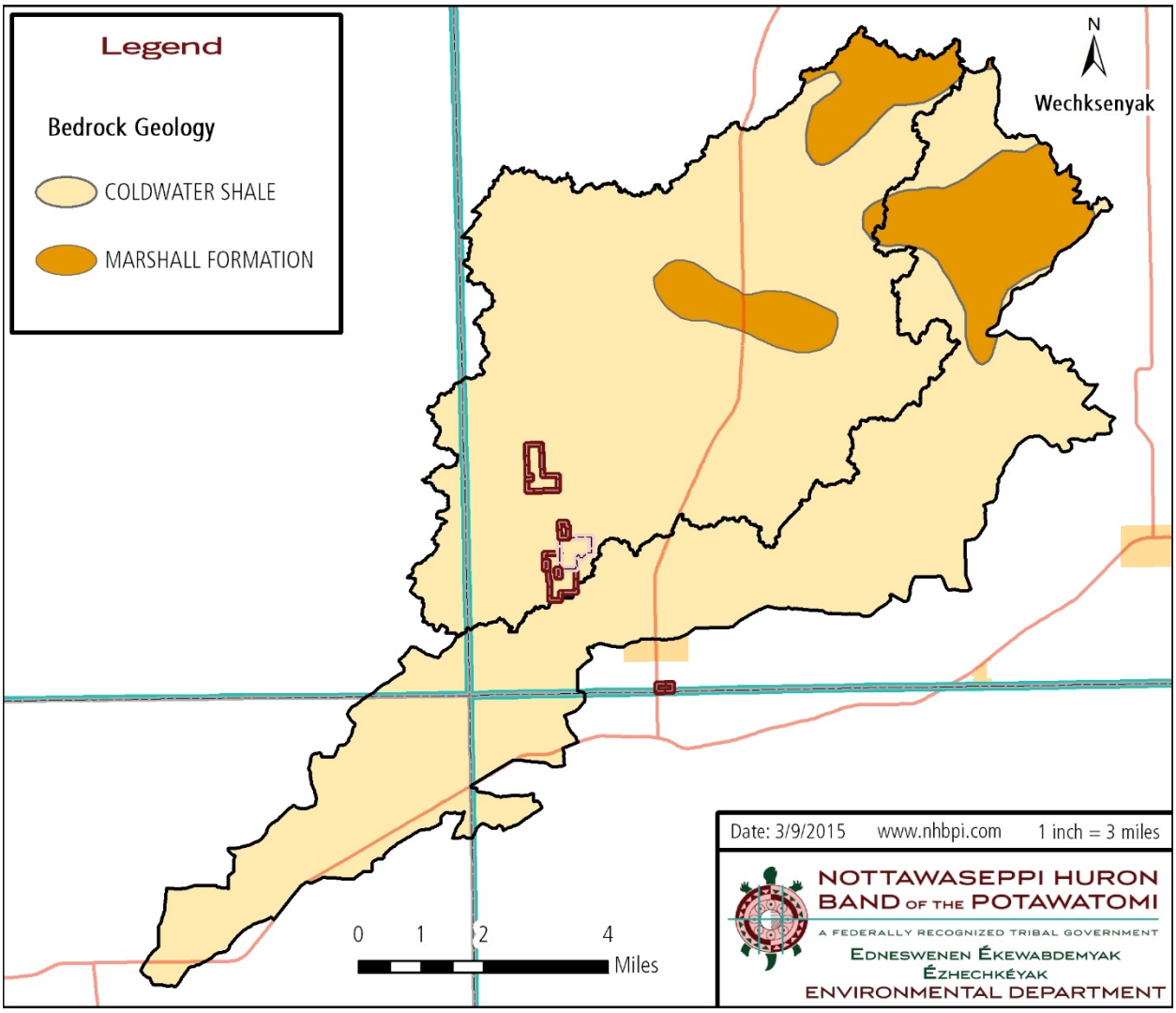


Figure 12. Bedrock Geology of the Pine & Nottawa Creek Watersheds

4.8. Pine Creek & Lower Nottawa Creek Watershed – Bedrock Geology

Most of the Lower Peninsula of Michigan is underlain by Paleozoic bedrock beneath glacial drift, which is called the Michigan Basin (Albert, 1994). The primary underlying bedrock in the study area is the Coldwater Shale, a Mississippian Shale, approximately 800 ft above mean sea level, and generally slopes east to west (WMU, 1981). There is also small amount of another Mississippian bedrock, the Marshall Sandstone occurring in the northeast portion of the Watershed. Unconsolidated deposits in the areas have been mapped at a thickness of between 50 to 100 feet (Prein & Newhof, 2010). Driller's logs of wells indicate that portions of the underlying Shale can be as close as 23 ft below the surface (USGS, 2004)

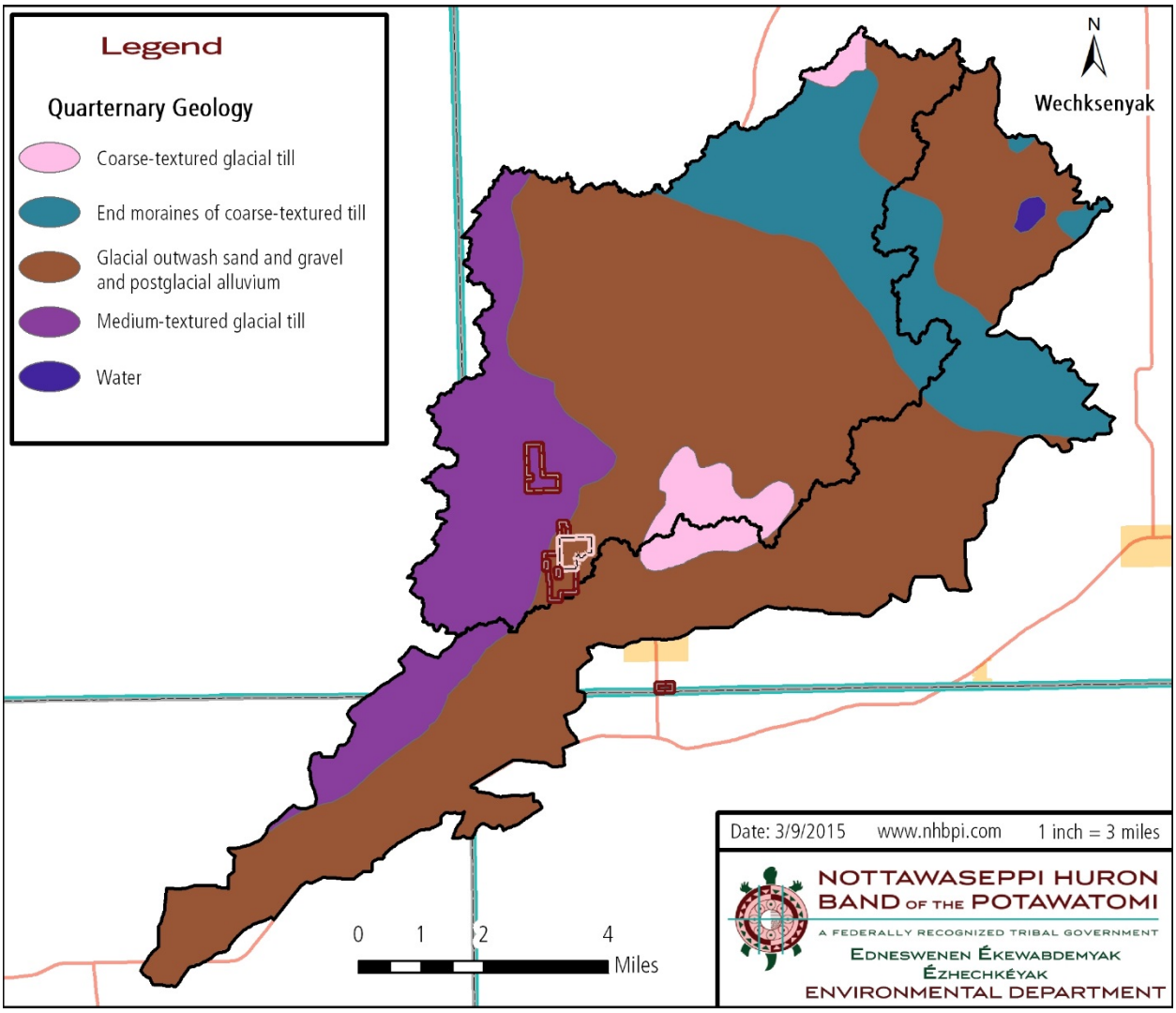


Figure 13. Quaternary Geology of the Pine & Nottawa Creek Watersheds

4.9. Pine Creek & Lower Nottawa Creek Watershed – Quaternary Geology

10,000 years ago glaciers retreated across Michigan to shape the landscape and leave surficial deposits in the state (Wesley & Duffy, 1999). These materials are characterized as glacial outwash sand and gravel, and post-glacial alluvium near the Reservation, and medium textured glacial till to the east (Prein & Newhof, 2010). Moraines with moderate elevation and pervious materials occur more often in the headwaters area of the St. Joseph Watershed, although there is an end moraine in the northeast section of this study area. These landforms have high water infiltration and head pressure to produce high groundwater yields. Overall the larger St. Joseph Basin has moderately high groundwater deliveries due to this glacial outwash and coarse textured glacial till (Wesley & Duffy, 1999).

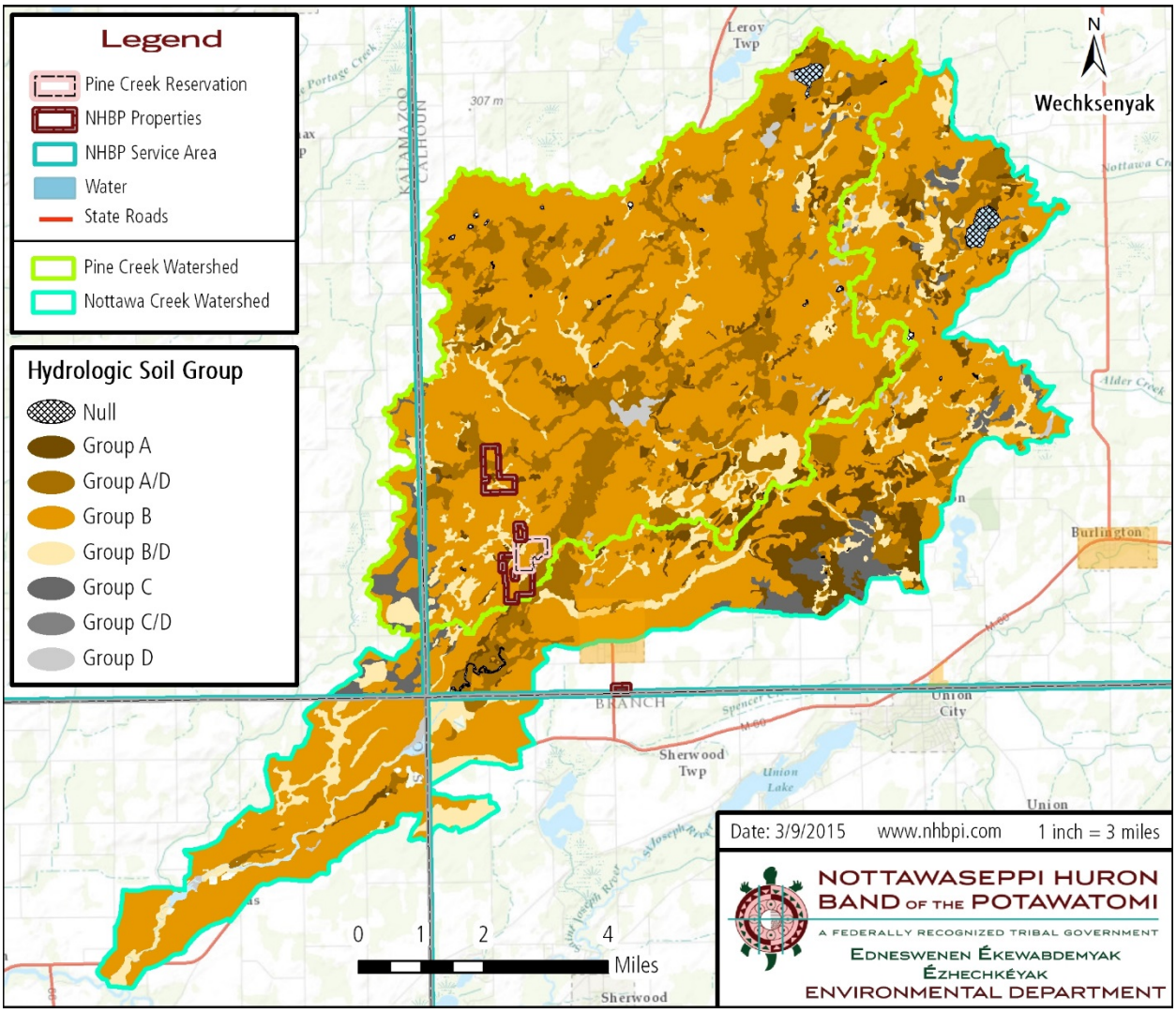


Figure 14. Hydrologic Soil Groups of the Pine & Nottawa Creek Watersheds

4.10. Pine Creek & Lower Nottawa Creek Watershed – Hydrologic Soil Groups

Throughout the Pine and Lower Nottawa Creek Watersheds Group B is the dominant Hydrologic Soil Group. These soils display moderate infiltration and transmission rates and runoff volume, and are moderately to well drained. The textures are typically loams such as sandy and silt, with moderately fine to moderately coarse in texture. There are also a number of areas with clay loams that exhibit a much slower infiltration and transmission rate. Many of these Group C, D or C/D soils occur in inundated areas in the study area. Group A/D Type Soils occur in some of the expansive wetlands, and feature high water tables, but may fall in Group A if effectively drained. Soil types are important factors in locating and selecting which Non-Point Source Management Practices will be most effective, due to the effect of soil on runoff (NRCS, 2007).

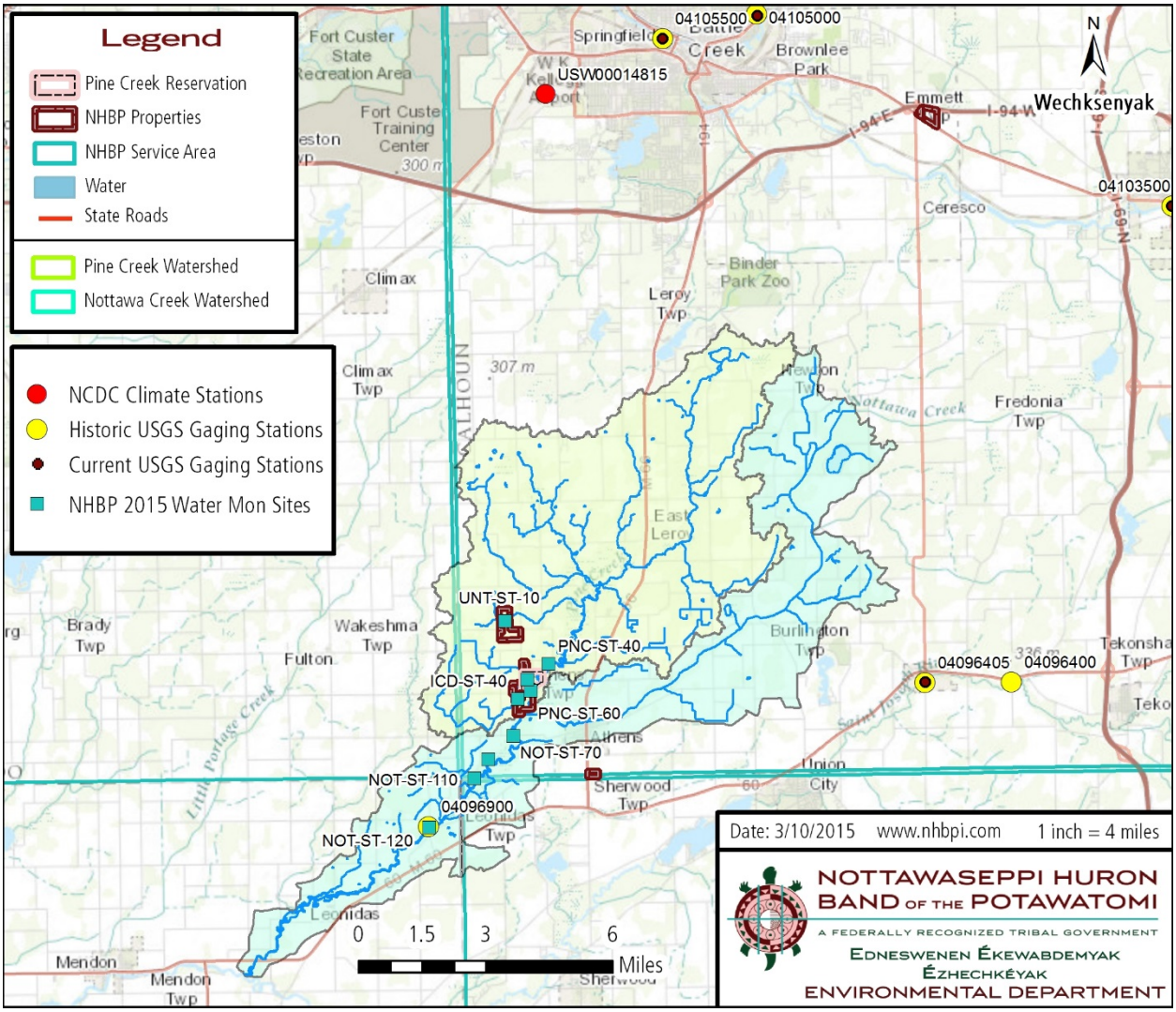


Figure 15. NHBP, USGS, and NCDC Stations Near the Pine & Nottawa Creek Watersheds

4.11. Pine Creek & Lower Nottawa Creek Watershed – Climate & Monitoring

The study areas is partially located in the 6a and 5b USDA Plant Hardiness Zones. This is a difference of -5 to -10, and -10 to -15 average annual extreme minimum Temperature. The further west one travels in the St. Joe Basin, the more that low temperatures are moderated by Lake Michigan. Latitude of course accounts for seasonal changes that are the most important feature of the state's climate. Mean air temperature is 49 F, and precipitation is 34 inches per year. It has a long growing season at 151 days, and most precipitation is associated with passing cold fronts in June and July (Wesley & Duffy, 1999). There are no operating USGS stations in the study watershed, though a USGS gaging station operated on the Nottawa from 1967 to 1997 (USGS, 2004). There is an operating USGS gaging station on the St. Joseph River near Burlington, and both a USGS and NCDC Climate Station in the Battle Creek Area. The Tribal Environmental Department has a number of water sampling stations throughout the Pine and Nottawa Watersheds as shown in Figure 14 above. A summary climate chart for the Battle Creek Airport Station is shown below in Figure 15.

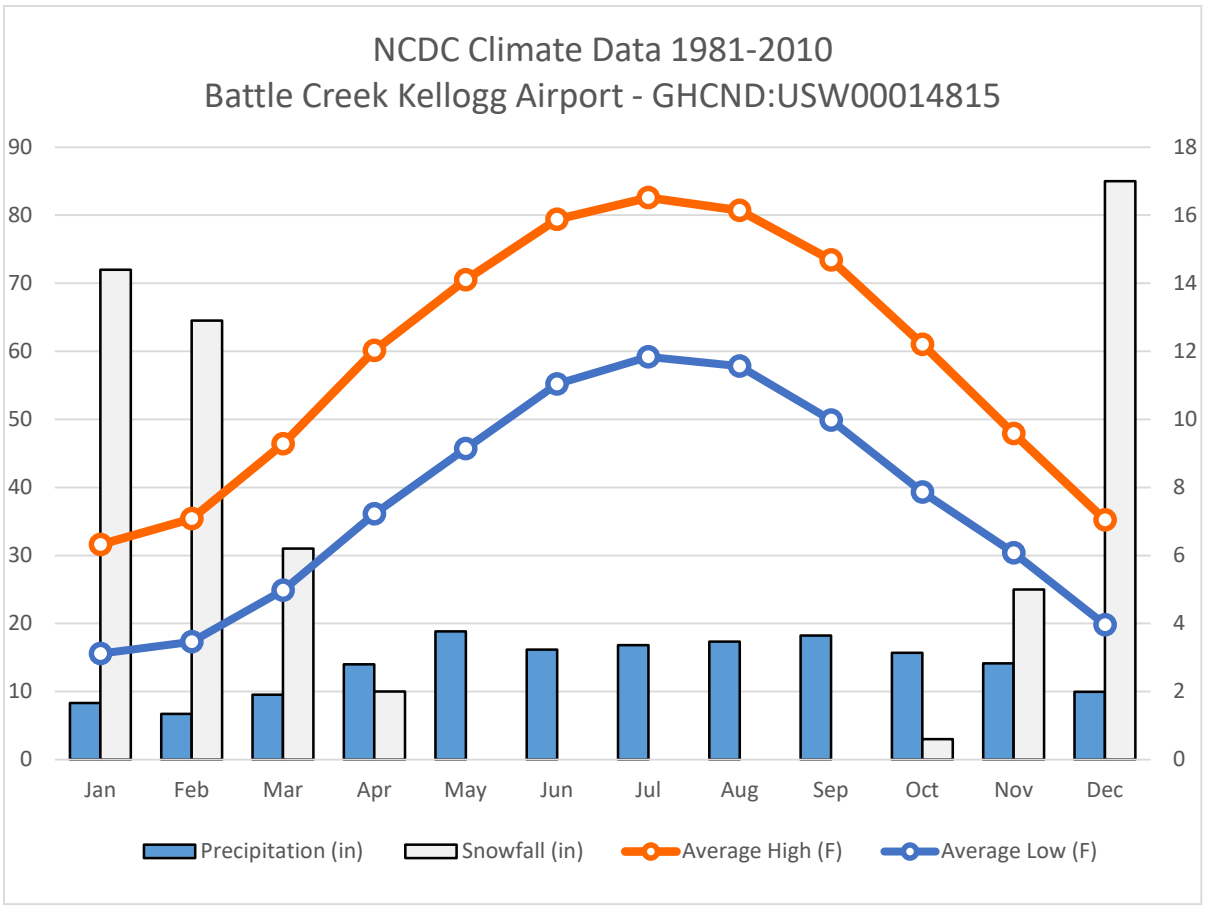


Figure 16. Summary Climate Chart for Battle Creek Kellogg Airport 1981-2010.

4.12. Snyder Creek Sub-Watershed

The Snyder Creek Sub-Watershed is a much smaller tributary of the Pine Creek at only 3060 acres. The Snyder Creek confluence with the Pine is on Tribal Property, and much of the Reservation and NHBP Properties are in this watershed. The Indian Creek Watershed drains into the Snyder before it flows into the Pine Creek. It also flows through our Pow-Wow Grounds and Residential areas, and attracts children to wade in its shallow waters. Both of these Creeks are designated County Drains, and coordination with the County Water Resources Commissioner will be helpful. The flow is generally from west to east in this area, and includes part of Kalamazoo and Calhoun Counties. The Snyder Creek has a length of just over 4 miles while the Indian Creek is near 3 miles long. The NHBP GIS program used ArcGIS 10.0 with updated USGS elevation data to accurately delineate these smaller watersheds. NHBP Water Monitoring will occur on both the Indian and Snyder Creeks in 2015. The size of this sub-watershed makes it easier to manage, and the potential for improvement is on a more local scale. Figure 16 below shows the Snyder Creek Sub-Watershed.

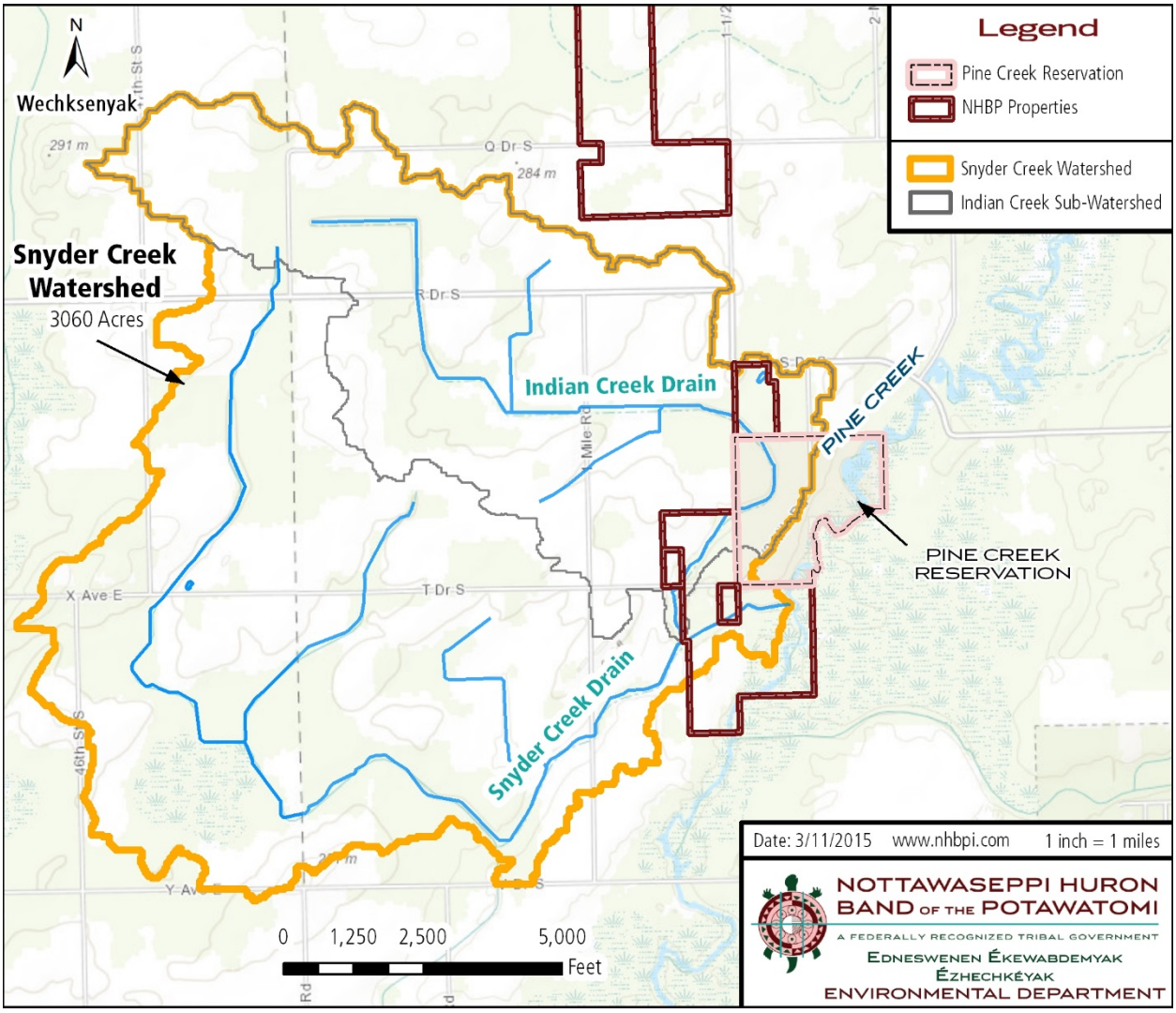
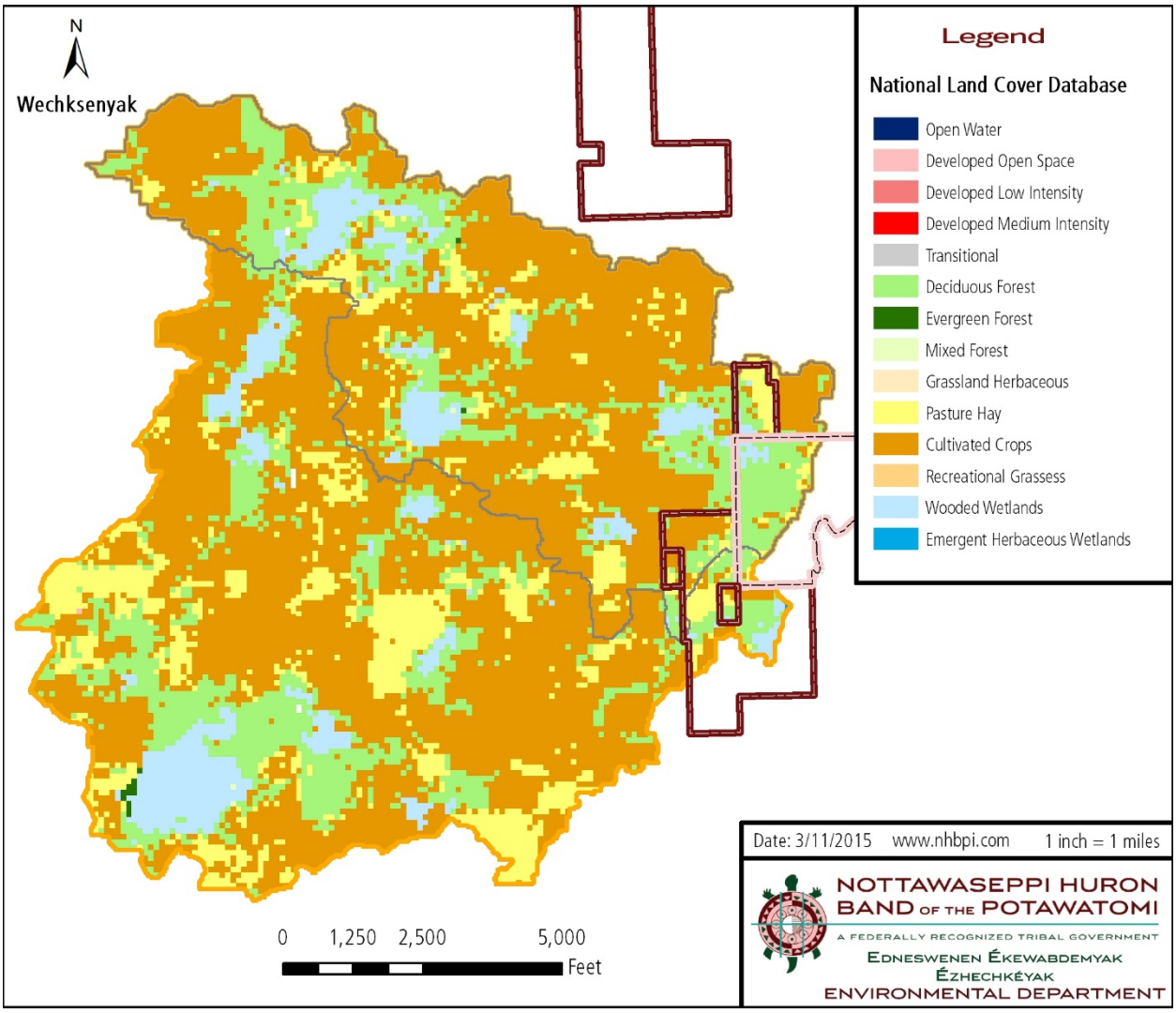


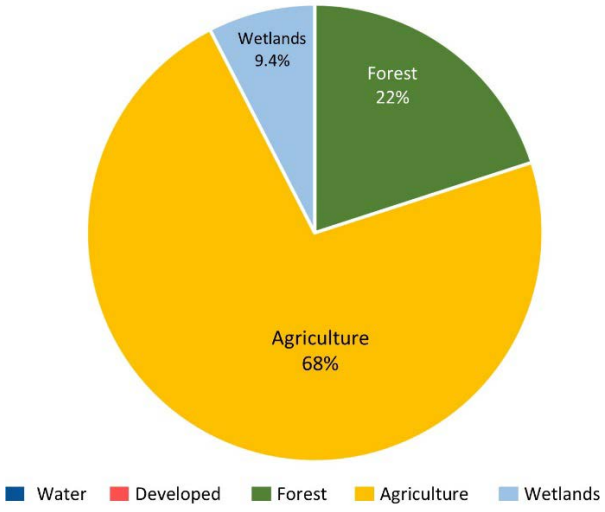
Figure 17. Snyder Creek Sub-Watershed

4.13. Snyder Creek Sub-Watershed – Land Cover

The Snyder Creek Watershed is of similar composition to the generally rural areas in southwest Calhoun County. The only recent development is occurring in the far eastern part of the Watershed on NHBP Properties. All Tribal developments utilize stormwater retention areas, and do not drain directly to waterways. Nearly 70% of this small watershed is agricultural, with 22% forested lands, followed by 9% wetlands. Corn, soybeans, and some winter wheat are predominate, with Large Animal Operations in and near the catchment. Manure from these operations is applied to nearby fields, and has flowed into these small streams. The primary Non-Point Source reductions practices will be addressing polluted runoff from large agricultural operations. Figure 17 below shows the National Land Cover Database 1992 with accompanying chart and table detailing the breakdown of Land Cover.



Snyder Creek Sub-Watershed
Land Cover



Land Cover Type	Acres	Percent
Water	0	0.00%
Developed	0	0.00%
Forest	613	20.02%
Agriculture	2215	72.39%
Wetlands	232	7.59%
TOTAL	3060	100.00%

Figure 18. Land Cover Map, Chart, & Table of the Snyder Creek Sub-Watershed

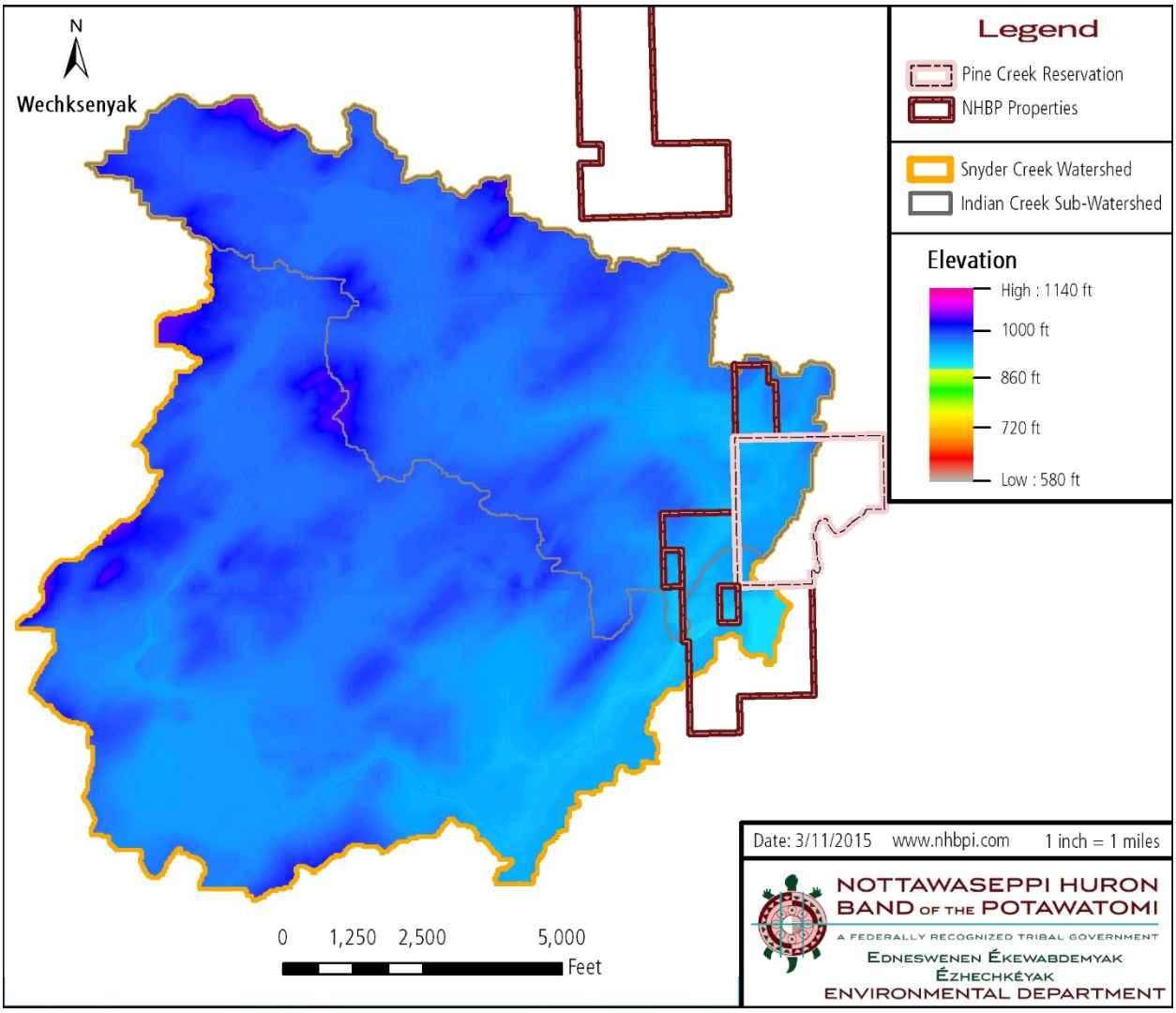


Figure 19. Topography of the Snyder Creek Sub-Watershed

4.14. Snyder Creek Sub-Watershed –Topography

As shown in Figure 17 above, the terrain in this sub-watershed is gently rolling with occasional glacial drumlin features running northeast to southwest. Both streams cut a west to east path towards the Pine Creek, and empty into the low relief wetland at the confluence. The elevation ranges from 942 ft in the northwest to 860 ft near the eastern edge. Glacial deposits are primarily medium-textured till, though hydraulic conductivity may be lower in this basin where clay units are present (USGS, 2004). Streamflow tends to be moderately stable in the Snyder Creek, while the Indian Creek has been known to dry up entirely during excessively hot summers. Both of these streams have been channelized and excavated 5-10 ft below the original streambed to facilitate the removal of water from agricultural fields. This alteration moves water more quickly to the Pine Creek and results in less stable groundwater flows.

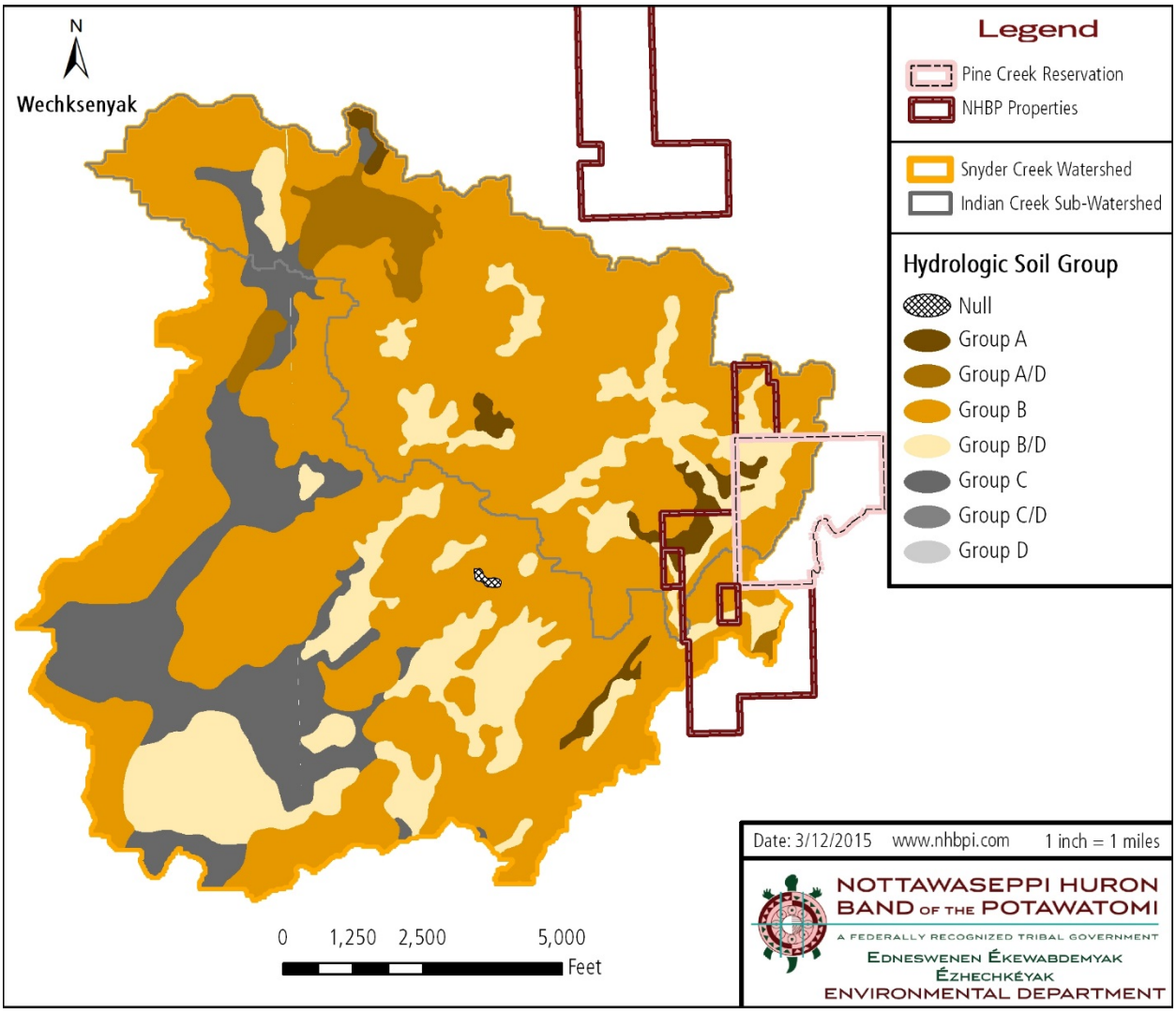


Figure 20. Hydrologic Soil Groups of the Snyder Creek Sub-Watershed

4.15. Snyder Creek Sub-Watershed – Hydrologic Soil Groups

As discussed in the previous section, soils in this sub watershed are generally medium textured, and feature moderate infiltration rates and are well drained. This corresponds with Hydrologic Soil Group B, seen predominately in Figure 19 above. The soil underlying much of the Snyder Creek bed is Group C, more finely textured clays with lower infiltration rates (NRCS, 2007). Increased turbidity is seen most frequently in these smaller tributary streams, becoming diluted in the major rivers. Understanding the soil characteristics of this study area will be important for the Tribe to select appropriate BMPs on and upstream of Tribal Properties to protect the designated uses for Tribal Waters.

5. SURFACE & GROUND WATER QUALITY

5.1. Surface Water

Two major streams are included in the area of interest for this Tribal 319 Program, the Pine Creek and the Nottawa Creek. Only the Lower Nottawa will be considered for this program. Using ArcGIS we delineated the Pine Creek Watershed (04050010304) as containing 47.5 mi^2, with the Lower Nottawa Creek Watershed (040500010306) draining 40.4 mi^2 of land. These are part pf the larger 4,685 mi^2 St. Joseph Watershed (04050001) which drains land from Michigan and Indiana into Lake Michigan (Degraves, 2005). Two smaller tributaries of the Pine, the Snyder Creek Drain and Indian Creek Drain run through about 6000 ft of NHBP Property, while the Pine stretches through 9070 ft of Tribal Lands. The Pine Creek features about 7 miles of water that contain mnomen (wild rice), and the Nottawa also has 7 miles that feature wild rice beds of interest to the Tribe. NHBP maintains water quality monitoring adjacent to these wild rice stands, and water quality will be discussed further in Section 6.

HUC 8	HUC 12	Primary Waterbody	Waterbodies	Stream Length NHBP Properties (ft)	Wild Rice Waters Length (mi)
St. Joseph 4050001	Pine Creek 040500010304	Pine Creek	Pine Creek	9070	7.1
			Snyder Creek Drain	1820	
			Indian Creek Drain	4150	
			Unnamed Tributary	2300	
	Mud Lake-Nottawa Creek 040500010306	Nottawa Creek	Nottawa Creek		7.0

[UE1]**Table 5. NHBP Waters of Concern**

5.2. Pine Creek

As described in previous sections, the Pine Creek is a major Tributary of the Nottawa Creek, which flows into the St. Joseph River near Mendon. The Reservation gets its name from the Creek where our Tribe has resided since 1840, and Bodéwadmi peoples occupied the southern portion of the state for many years before then. Our people are closely connected to this waterway and its wetlands, harvesting culturally significant wild rice, hunting for waterfowl and other mammals, fishing for pike and bass, and using medicines found along its banks. An inactive historic artisan well near the Creek is remembered fondly by Tribal Elders. There are several access points on the Reservation where the Creek is still used for swimming, canoeing, hunting & fishing, research, outdoor immersion, and collecting wild rice. The Pine Creek is also considered a second quality coldwater stream, though the fish community is mostly characteristic of a transitional warmwater stream (Wesley & Duffy, 1999). The scar from work on the Enbridge Line 6B Pipeline is also visible in the northern portion of the Watershed. Figure 21 is an aerial map of the Pine Creek Watershed using mostly NHBP 2014 imagery from Applied Ecological Services.

Figure 21. Pine & Lower Nottawa Creeks Aerial Imagery

5.3. Lower Nottawa Creek

As discussed in Chapter 4, the Lower Nottawa Watershed is primarily agricultural with flat to gently rolling terrain. Most of the local mnomen stands are located on the Nottawa Creek downstream of the Pine Creek confluence. The character of the Nottawa also changes considerably downstream of the confluence, from a higher gradient designated county drain above, to a slower, wider, meandering channel below. Channelization of the main channel, tributaries, and the tiling and draining of wetlands has dramatically altered stream morphology, groundwater flow, and large woody cover. The Nottawa also transitions from a second quality coldwater stream to a top quality warm water stream after the confluence. MDNR has stocked brown trout in the Calhoun County portion of the Nottawa Creek nearly every year since 1948, though success has been limited due to borderline water temperatures and lack of habitat (MDNR, B. Gunderman , 2013). Figure 20 shows an aerial map of this watershed.

5.4. Snyder Creek Sub-Watershed

Section 4.12 gives a general description of the Snyder Creek Sub-Watershed. The Indian Creek Drain is a small stream that flows into the Snyder Creek Drain in this 3060 acre sub-watershed. Both of these Creeks are designated county drains, and most of the land is agricultural, although some wetlands and forests are present. Tribal members and youth use these waterways to forage, collect medicines, and for direct contact recreation. Stream channels have been noticeably excavated and channelized, reducing stream stability in hot summer months. NHBP has aerial imagery coverage from 2014 of the Snyder Creek Sub-Watershed.

5.5. Surface Water Flow Data

The larger St. Joseph River channel has reasonably stable flow throughout the year, with a range of stabilities contained on its tributaries. There are 23 USGS streamflow gages throughout the Basin, and some of these go back 68 years. The discharge at the mouth of the St Joe at 4,598 cfs makes it the third largest River in Michigan. The gaging station at Burlington, which is closest to the Reservation, is the most stable on the mainstem (Wesley & Duffy, 1999).

The USGS operated a continuous record streamflow station 5.5 miles downstream from the Reservation on Nottawa Creek from 1967-1997. The USGS/NHBP report conducted on the Water Resources on and near NHBP lands in 2004 provides additional streamflow analysis for the Pine & Nottawa Creeks, and other small tributaries.

5.6. Wetlands

Over 25% of the lands owned by the Huron Potawatomi Tribe are wetland areas. Wetlands comprise one of the most significant water resources of the Tribe, and provide some of its best habitat areas. Wetland buffers have allowed the Pine Creek and several of its tributaries to be buffered by agriculture and other development activities. While these wetlands do perform several important functions, most are comprised of non-native species and have experience some form of hydrologic modification. In order to better protect these wetlands, the Tribe is

working towards mapping, delineating, and evaluating their ecological integrity as part of our ongoing CWA 106 program. We hope to finish delineating the Indian Creek Wetlands in 2015.

Using GIS, the Tribe has been able to map the National Wetland Inventory (NWI) areas on all of its properties. Additionally, updated aerial imagery can be reviewed to improve on the NWI classified areas. New aerial imagery of Tribal properties and extended portions of the Pine Creek and Nottawa Creek watersheds was flown in September of 2011. GIS analysis is the first level of classification used for characterizing Tribal wetland areas.

In 2011, Environmental Department staff began to conduct delineation of Tribal wetlands following the US Army Corps of Engineers manual. Army Corps staff assisted in training the department to use the Army Corps methods, and reference the new regional Northcentral wetland delineation guide (USACE 2011). The west side of the Pine Creek wetland on the Reservation was delineated in 2011, along with a portion of the Indian Creek Drain wetland. Staff will continue to delineate the remaining wetlands on the Reservation and adjacent Fee Properties in 2014 and into future years. Below this section is an updated chart that shows progress in wetlands delineations and the amount and percentage of Tribal wetlands still in need of delineation. The preliminary numbers are determined using National Wetland Inventory data layers from the Michigan Center for Geographic Information.

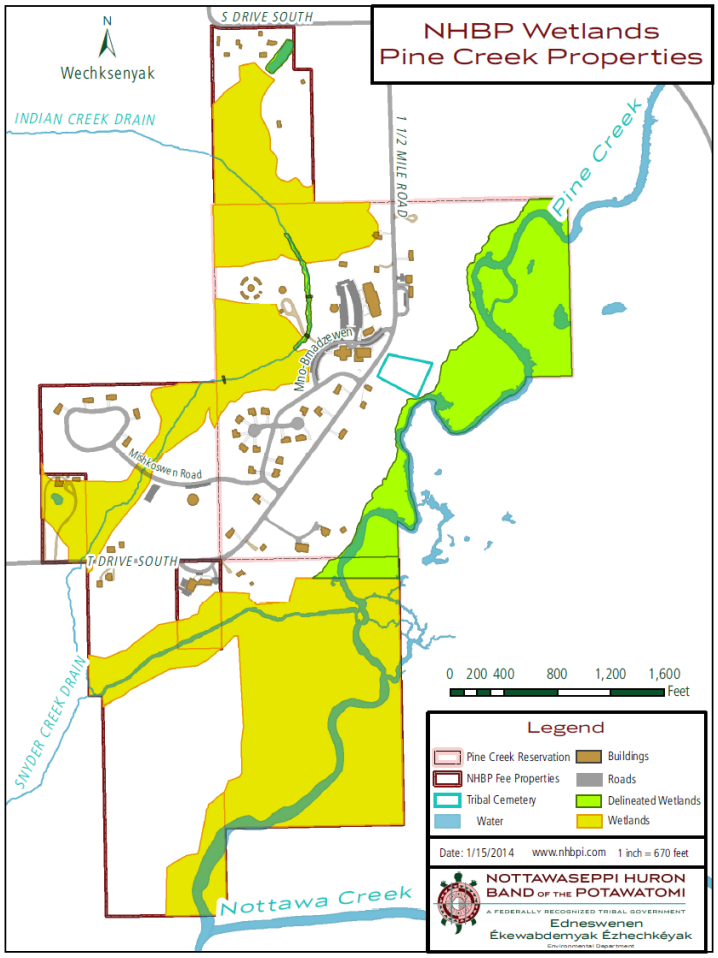


Figure 22. NHBP Pine Creek Wetlands

5.7. Groundwater Data

While there is generally an abundance of surface and ground water in southwest Michigan, irregular geologic formations result in aquifers of unpredictable size and location. Almost all of the drinking water in the area is taken from underground, and the Tribe also gets all of its potable water from ground water. The availability and quality of groundwater has been a major limiting factor in the development of Tribal government facilities and housing. A community water system constructed in 2011 may alleviate some of these issues, though it currently only serves a new 5 unit housing development.

While a USGS study in 2004, and a study by Prein and Newhof in 2010, examined some of the groundwater issues of the Tribe, there is no active monitoring of groundwater quality in the area. The Prein & Newhof Report reviews the published hydrogeological information in the area and this will provide a basis for the future program (Prein & Newhof 2010). Well logs and water tests from household wells will provide additional information and baseline data for the program. With the addition of two systems now designated as Public Water Supplies, analysis for Safe Drinking Water Act contaminants can also be drawn from for groundwater quality. Existing monitoring wells and additional wells may be needed to monitor potential sources of contamination. All information from this program will be organized in the NHBP GIS system, and spatial data layers will be created to analyze ground water data. The Tribe will need to develop a groundwater protection plan to ensure that its limited aquifers are not damaged by future Tribal developments.

While ground water quality is a significant concern due to nearby agricultural operations, ground water location and quantity has been more problematic for the Tribe than quality issues. As discussed above, the hydrogeology of the Pine Creek Reservation can make it difficult to find sufficient quantities of ground water to support Tribal operations. The number of users for the community water system will also dramatically increase over the next 2 years with the construction of new facilities designed for 250 employees. The community water system will continue to stress the limited aquifer for the Reservation, and will need to be monitored to determine if levels are remaining stable.

Tribal and community members are concerned that high capacity agricultural wells throughout the watershed could be negatively affecting ground table levels. Surface water intakes could also potentially affect ground water levels through drawing additional groundwater during times of low water during the summer months. Ground water quality and quantity monitoring can be conducted simultaneously at monitoring wells, although household well testing does not necessarily provide water level information. The monitoring will be targeted at areas where groundwater quantity is most problematic, such as adjacent to water supply wells. This program is planned to begin during the next few years, and will be coupled with the ground water quality program.

5.8. Designated Beneficial Uses

The Huron Potawatomi Tribe has initiated a water quality monitoring program to assess and inventory the health of its waters and aquatic ecosystems. While these systems are important to sustain the natural environment, Indigenous Americans also view water systems (nibi) as the life blood that flows through the Earth. Harm done to the aquatic ecosystem, is directly connected to the personal health of people, and sustainability of Tribal cultural practices. Nearly every Potawatomi settlement, large or small, is situated near a source of water such as rivers, lakes, wetlands, or The Great Lakes. In this way nibi is vital in the provision of traditional food, game, and ceremonial activities. Surface water should meet quality levels specified in applicable reference values [UE2]set by state and federal agencies, but also be supportive of cultural specific activities such as subsistence fishing or sweat lodge ceremonies. These draft designated uses are included in the NHBP Water Quality Monitoring Strategy. The draft uses table is drawn from best known current and historical uses of these resources by Environmental Staff, through conversations and presentations with Tribal Elders. The current Environmental Director, John Rodwan, has been with the Tribe for over 10 years, and has compiled a number of historic records and interviews with Elders.

Draft Designated & Desired Uses for Tribal Waters[UE3]		
WATERBODY NAME	TYPE	DESIGNATED & DESIRED USES
Indian Creek Drain	Stream	Aquatic Habitat, Partial Body Contact Recreation, Subsistence Hunting/Fishing/Foraging,
Kalamazoo River	Stream	Warmwater Fishery, Partial Body Contact Recreation, Subsistence Hunting/Fishing/Foraging
Nottawa Creek	Stream	Wild Rice Habitat, Coolwater Fishery, Subsistence Hunting/Fishing/Foraging
Pine Creek	Stream	Subsistence Hunting/Fishing/Foraging, Wild Rice Habitat, Full Body Contact Recreation, Warmwater Fishery
Snyder Creek Drain	Stream	Aquatic Habitat, Partial Body Contact Recreation, Subsistence Hunting/Fishing/Foraging
St. Joseph River	Stream	Full Body Contact Recreation, Warmwater Fishery, Subsistence Hunting/Fishing/Foraging
Unnamed Tributary	Stream	Aquatic Habitat, Partial Body Contact Recreation, Subsistence Hunting/Fishing/Foraging
Wetlands	Wetland	Wetland Habitat, Subsistence Hunting/Fishing/ Foraging, Noncontact Water Recreation

Table 6. Draft Designated Uses

6. RESULTS

6.1. Water Quality Data Analysis

This section presents available data for each waterbody and analyzes the status of the tribal waters within the program area of interest. Descriptions of polluted runoff on and near Tribal Properties are provided, followed by a discussion of each pollutant and notable trends. Data for each individual 12-digit HUC sub-watershed is then summarized and compared to desired Beneficial Uses for that waterbody. NHBP will continue to collect surface water data at our base sampling stations to improve our evaluation of these waterbodies, and in future years to determine effectiveness of BMPs.

The primary source of data for this analysis is provided from NHBP water monitoring for the years of 2011-2013, and the associated Water Quality Assessment Report created in 2014. There are several secondary sources which have been incorporated as the basis for our program, and to provide additional information on the status of Tribal waters. NHBP and USGS collaborated on a study to measure surface and ground water resources from 2000-2003 (USGS, 2004). Some other key sources include the St. Joseph River Watershed Management Plan by the Friends of the St Joe River (Degraves, 2005), MDNR Fisheries Division St. Joseph River Assessment (Wesley & Duffy, 1999), and the Nottawa Creek Watershed Project which does not include the Pine Creek (CCD, 1998). The state of Michigan conducts periodic biological and chemical monitoring, including the Biological Survey of Sites in the Upper St. Joseph River (MDEQ, 2011), and a status of the Nottawa Creek Fishery (MDNR, B. Gunderman , 2013). We have also closely reviewed a TMDL for E. coli in the Little Portage Creek which is an adjacent and very similar type of watershed (MDEQ , 2012). The Portage Creek TMDL provides a limited implementation recommendations, mostly regarding existing grants and USDA funded programs. In late 2016 the Watershed Management Plans for both the Little Portage and Portage Creek, by the Calhoun Conservation District, were approved by the MDEQ.

6.2. Non-Point Sources and Causes of Concern

Non-Point Sources (NPS) in both the Pine and Lower Nottawa Creek Watersheds are fairly similar with a high amount of land in large scale agriculture, and a limited amount of urbanization. The most significant NPSs are described below.

6.2.1. Agricultural Impacts

Nearly 68% of land in the combined Pine/Nottawa Creek Watersheds is in some type of agricultural usage (see Figure 9). The St Joseph Basin is one of the most heavily cultivated areas in the Lake Michigan Basin, with 58% of the this larger watershed dominated by agriculture (Wesley & Duffy, 1999). The Management Plan for the St Joseph River lists several agricultural practices as the source of many impairments to the river system (Degraves, 2005). Conventional farming practices near the Reservation include leaving fields with bare soil through the winter, spreading of liquid manure near waterbodies, cutting of trees and vegetative filter strips along drains, application of fertilizers and pesticides on an annual basis, and draining of wetland areas through added field tiles. These practices result in numerous NPS impairments such as excess sediments and nutrients, high levels of

disease causing pathogens, introduction of chemicals to surface waters, and a lack of natural areas and wetlands to help filter polluted runoff.

6.2.2. Livestock Operations Impacts

In the mostly rural Pine/Nottawa Creek Watersheds, livestock manure is a known source of contamination of pathogens to surface waters. Numerous large animal feeding operations are found throughout all of the smaller drainages to these streams. These operations can be a direct source of contamination through piling of manure and overflowing ponds upgradient of waterbodies. Significant quantities of this waste are stored and then applied in the spring, fall, and winter to nearby agricultural fields. Some of this waste may come across watershed boundaries to be spread in the area of interest. In the adjacent Portage River/Little Portage Creek watershed, 69 livestock farms were documented in the TMDL for E. coli (MDEQ , 2012). A thorough survey of similar operations will be conducted as part of this 319 Project. Additionally, livestock grazing can result in added nutrients and sediments into the river system through grazing on and around stream banks.

6.2.3. Hydrologic Modifications

Both the larger St Joseph Watershed and the Pine/Nottawa system have been highly modified from human activities. Creating drainage away from saturated farm fields and populated areas have been the two primary goals of these hydrologic changes. In Calhoun County, 25% of pre European settlement wetlands have been lost largely to these types of modifications (MDEQ, 2014). The Nottawa Creek has been highly channelized through the reaches where it is designated as a county drain, which has severely degraded fish habitat and natural stream dynamics. The Nottawa channel was moved in the 1970's at its confluence with the Pine Creek, which has lowered water levels and reduced the amount of wild rice and waterfowl on the Reservation. Both the Indian Creek and Snyder Creek which run through Tribal land were excavated well below grade to facilitate drainage from surrounding farmlands. This has also lowered groundwater and reduced the amount of recharge after storm events.

6.2.4. Wetland Degradation

Wetlands protect and filter pollutants from entering the Pine and Nottawa Creeks. They also serve as a recharge point for groundwater and a slow release of water to streams. Primarily, wetlands have been drained through agricultural tiles to be made accessible for growing crops. The overall Nottawa Creek watershed has lost around 5000 acres of wetlands, although at 17% total loss it is much less than the Coldwater River (49%), or the Little Portage Creek (45%). Wetlands have also been filled in, and are becoming more occupied with non-native plant species. Some of these plants have displaced food and medicine plants such as wild rice that have been used for many generations by Potawatomi People. Development in and around Tribal Properties may also have some impacts on wetlands, though NHBP has practiced good land and water stewardship in its government construction projects.

6.2.5. Landscaping Practices

This is primarily applicable to land management on the Pine Creek Reservation. The amount of land regularly maintained by NHBP Grounds Staff has increased significantly in the last 5 years. As pressure for development increases, landscape staff are mowing and cutting areas that had been previously left unmanaged, including riparian corridors. These areas contribute sediment through erosion in smaller streams, and could also provide increased nutrients and pesticide contamination from turf applications.

6.2.6. Stormwater from Developed Areas

With only 4% of developed area in the Pine/Nottawa Basin, this is not as serious an issue as runoff from other sources. The watershed does however contain the Village of Athens (pop. 1000), and the Pine Creek Reservation which is a developing government campus. Stormwater from these areas can deliver pollutants to waterways during high level storm events, such as a major series of rainfalls that occurred in June 2015.

6.2.7. On-Site Wastewater Systems

In 2012 the Pine Creek Reservation was moved to a community wastewater treatment system which is located on adjacent Fee Land permitted by MDEQ. Most of the housing in the Pine/Nottawa Watershed is served by individual septic systems, and the Village of Athens does not have a wastewater treatment plant. The Portage Creek 319 identified failing or poorly located systems as another potential contributor of pathogens to surface waters.

6.2.8. Road and Trail Crossings

While this is not a major issue on the Reservation, there are a number of road/stream crossing throughout the watershed which may not be properly designed to prevent runoff and sediment from entering the waterway. There are several misaligned or undersized culverts on the reservation that are causing changes to the hydrology of small streams, resulting in stream bank erosion (NHBP ICD Report 2014). Most of these small tributary streams are designated as county drains and have been historically channelized and excavated below the floodplain level, causing a disconnect from the stream and adjacent habitat. Wild Rice is also present at some of the major stream crossings such as V Drive South, where a bridge is scheduled to be replaced in 2016.

6.2.9. Construction Site Runoff

As discussed in previous sections on land use, these are not heavily urbanized watersheds, nor are they experiencing heavy pressure for construction and development. These activities are most likely on NHBP property on the Government Campus and housing areas, or expansion of CAFO related barns and waste ponds. The NHBP Environmental Department site plans with planning staff to address potential erosion that could occur at construction sites, and best practices such as sediment fencing are utilized. We will however continue to ensure that this development does not cause any undo impacts to the watersheds, and that stormwater is not directly discharged to surface waters. NHBP Water staff will expand existing partnerships with the Calhoun Conservation District, MDEQ, and Township Planning boards to advocate for actions that consider water quality effects.

6.2.10. Removal of Forested and Vegetative Cover

Continual clearing of forested and vegetated land for agriculture reduces the filtering effects of these natural buffers. While the Michigan Department of Agriculture and Rural Development is working with farmers to encourage the Michigan Agriculture Environmental Assurance Program (MAEAP), many farms in the Basin are not MAEAP certified. The Conservation District staff can also assist in educating agricultural producers about the MAEAP program.

6.2.11. Existing Contaminated Sediments

While this is not the primary pollutant of concern in the Pine/Nottawa Watersheds, it is listed as an impairment in the Nottawa Creek under the St. Joseph River Management Plan. These existing contaminated sediments may be impacted the quality of the fishery and other aquatic wildlife. These may be investigated in the future if determined the extent of impact.

6.2.12. Urban and Developed Area Impacts

6.3. Data Presentation & Analysis

6.3.1. Dissolved Oxygen

Dissolved Oxygen (DO) is the amount of oxygen that is freely available in the water column. It can be expressed as a concentration of milligrams per liter (mg/L) or ppm, or as a percent saturation, depending on the water temperature (Kal County, 2009). Plentiful DO is crucial to the growth and reproduction of many aquatic lifeforms. Michigan Water Quality Standards state that in coldwater streams the dissolved oxygen shall drop below 7 mg/L during the warm season, and that warmwater streams will not drop below 5 mg/L as a daily average (MDEQ, 2006). Dissolved oxygen tells a mixed story in the Pine Creek Watershed, with small tributaries being supportive of coldwater fish communities, and the mean DO of the mainstem hovering around 5 mg/L, the bottom limit for Warmwater fish. During summers of extreme heat such as 2012, some of the smaller streams have been reduced to isolated stagnant pools, which are devastating to the benthic community, fish, and amphibians (NHBP, 2014).

The mainstem of the Nottawa Creek overall has more consistently good levels of dissolved oxygen. It generally shows less fluctuation in quality than the Pine Creek, and stays more consistently cool than the Pine. Mean dissolved oxygen is generally above the 7 mg/L threshold for a coldwater fishery. Several of the stations do exhibit readings lower than 7 mg/L, which may inhibit the reproduction and success of brown trout and other coldwater fish (MDNR, B. Gunderman , 2013). Starting at the NOT-ST-120 station, mean DO drops well below the coldwater fishery limit. This trend is generally followed throughout this Creek, with DO levels decreasing the further downstream one goes. The NOT-ST-140 site is located in a man-made impoundment of the Nottawa, and reported a particularly low 3.67 mg/L of DO, this is from a single sample however. More of these far downstream samples will need to be collected to confirm if this is a consistent trend (NHBP, 2014).

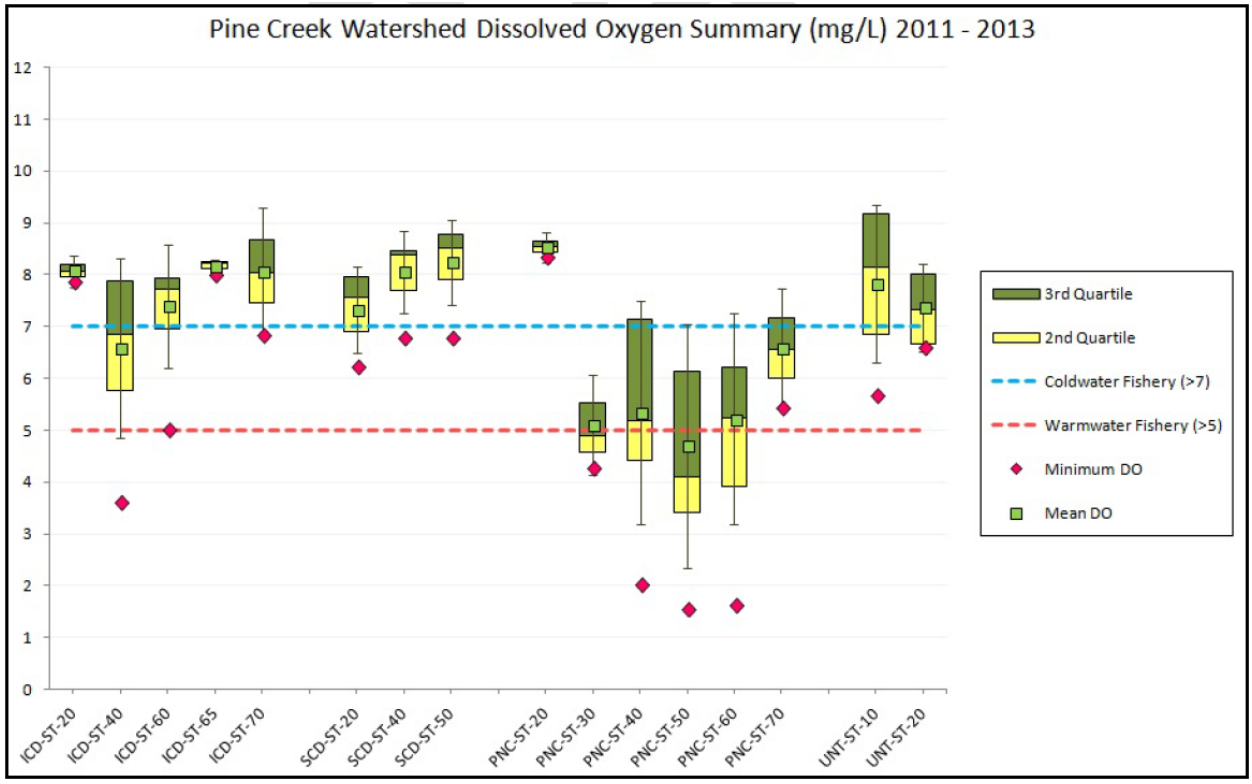


Figure 23. Pine Creek Watershed Dissolved Oxygen Summary

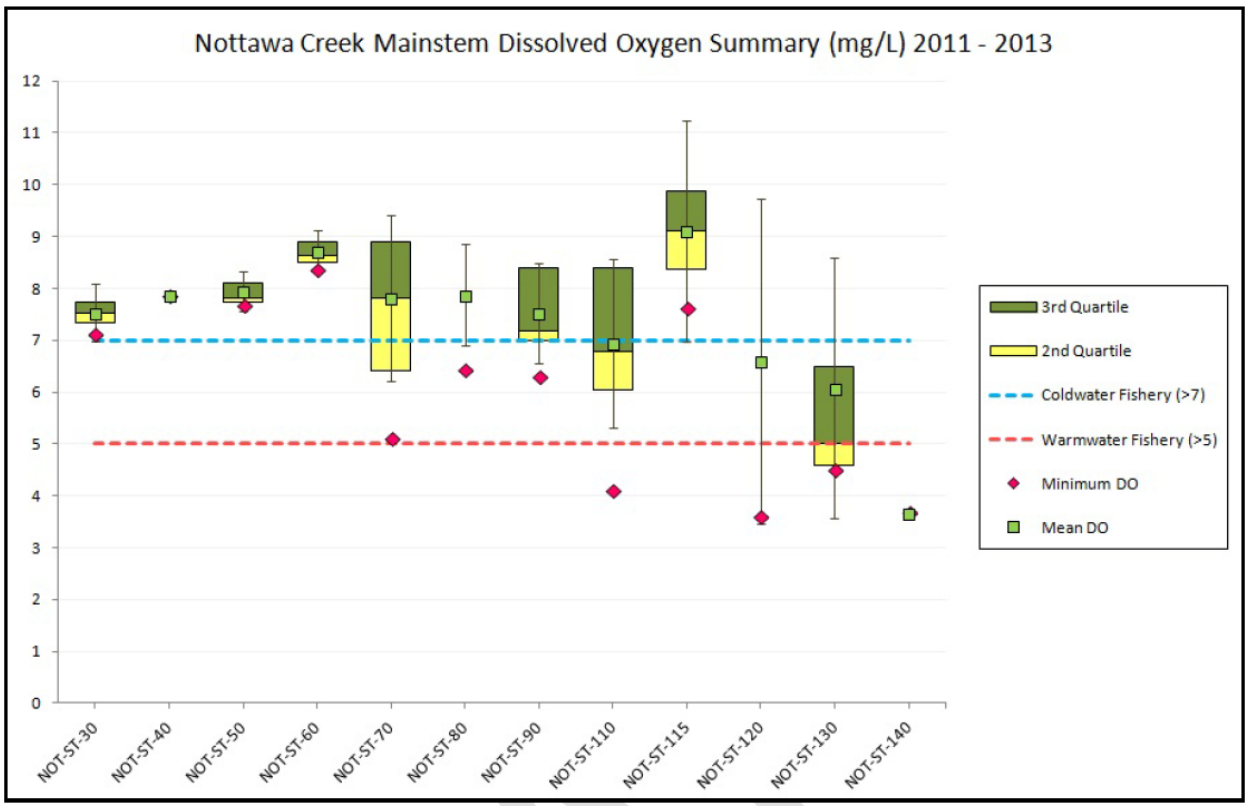


Figure 24. Nottawa Creek Watershed Dissolved Oxygen Summary

6.3.2. Turbidity

Turbidity is in indication that sediment and erosion is occurring into surface waters. Changes in turbidity can indicate a large amount of mobilized sediments, which often bring nutrient enrichment and other pollutants to the water. Turbidity is reported in typically reported in NTU, and is not numerically regulated by EPA or DEQ, due to a considerable variability of measurement and levels between States (USEPA, 1988). Michigan uses a narrative standard that indicates the waters of the state shall not have any unnatural physical characteristics that are injurious to any designated use, such as turbidity. This parameter is useful for the NHBP water program to determine how much erosion may be occurring from a particular storm, and at what point is this sediment entering a particular tributary. The largest turbidity spikes that have occurred are in the Indian Creek Drain, a small tributary of the Pine. The Pine has spiked as high as 30 NTU on the Reservation after storm events, which may cause minor impairment to fish and plant life. Continuous monitoring equipment, partially funded by USEPA, will be installed in 2016 and may catch more significant storm events. The Nottawa Creek has generally maintained low to background levels of turbidity, near what would be expected of reference streams in the ecoregion (USEPA, 2000). Monitoring of Nottawa Creek tributaries may discover higher levels on these smaller streams.

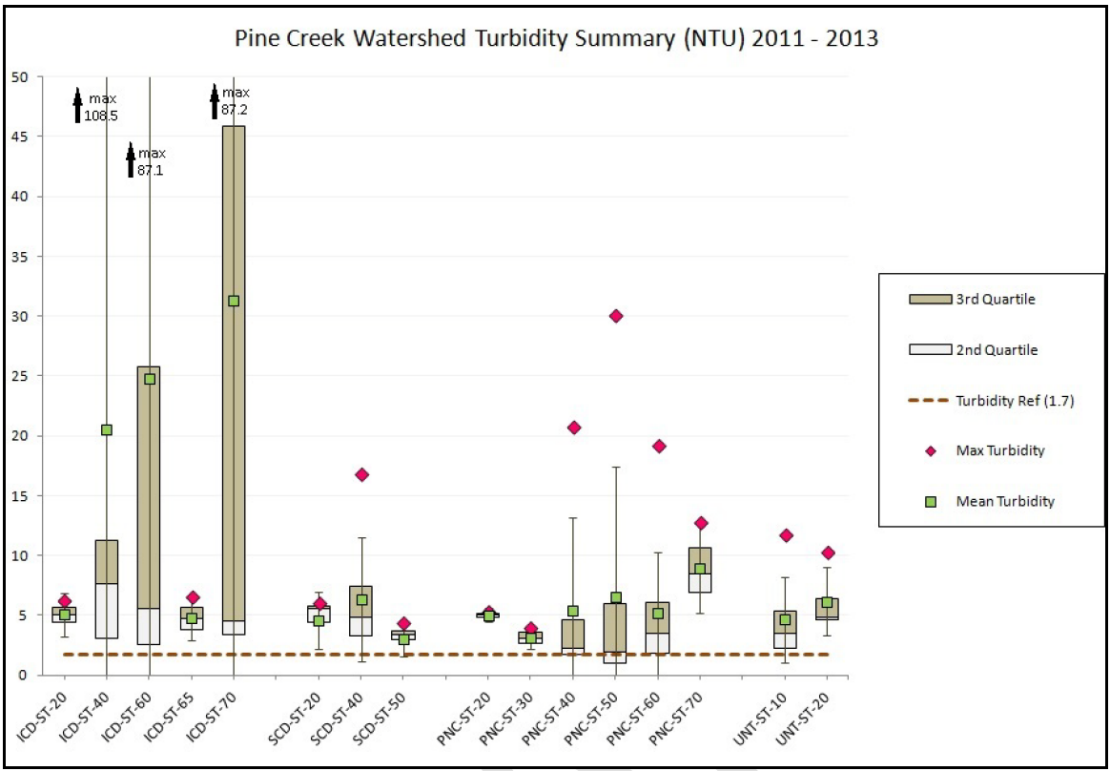


Figure 25. Pine Creek Watershed Turbidity Summary

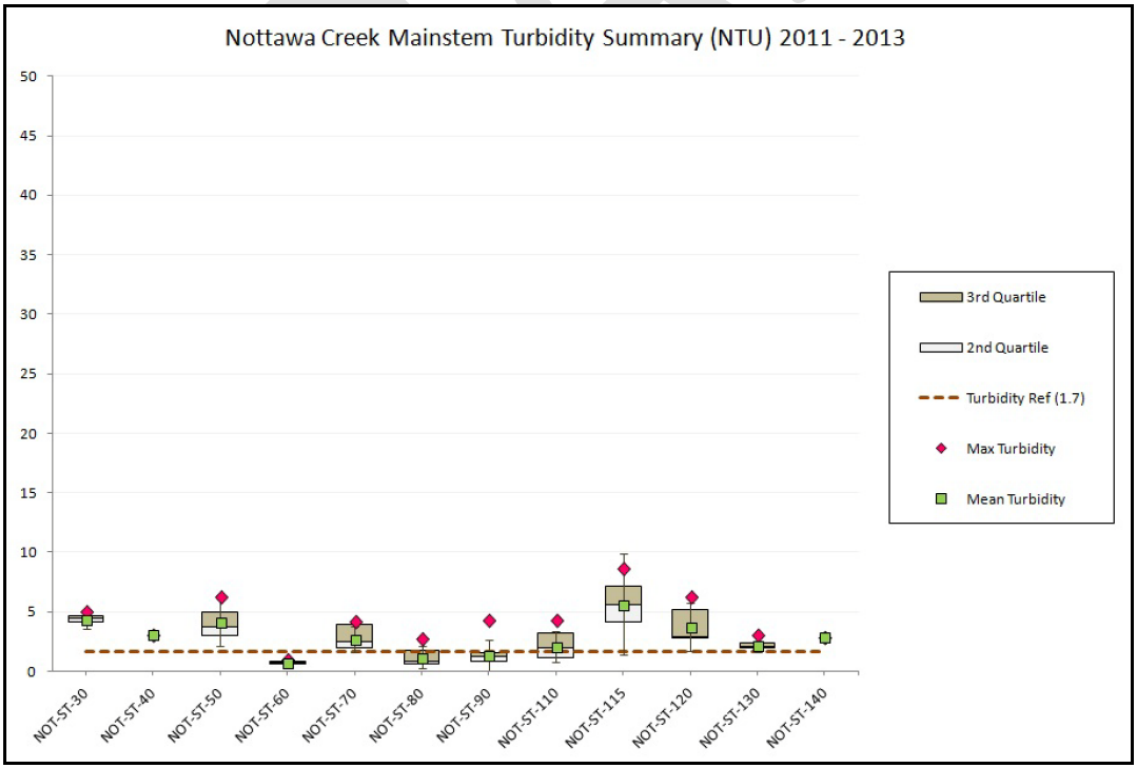


Figure 26. Nottawa Creek Watershed Turbidity Summary

6.3.3. Temperature

Temperature is an important characteristic which determines how much oxygen is available to aquatic organisms. Many species in Michigan are unable to survive when water temperatures are above a certain threshold, which often occurs during warms summer months with lower water levels. Many of the physical, biological, and chemical characteristics of a surface water system are directly affected by temperature (Kal County, 2009). Until approval of NHBP Tribal WQS, we are utilizing the standards set by the State of Michigan. They specify that: "coldwater…receive a heat load which would (a) increase the temperature…at the edge of the mixing zone more than 2 degrees Fahrenheit (b) increase the temperature…at the edge of the mixing zone greater than the following maximum temperatures…" and warmwater… receive a heat load which would (a) increase the temperature…at the edge of the mixing zone more than 5 degrees Fahrenheit (b) increase the temperature…at the edge of the mixing zone greater than the following maximum temperatures…". (MDEQ, 2006). These temperatures are not to exceed 68 F in Jun-Aug for a coldwater fishery, and not to exceed 84 F in June, and 85 F in July and August for warmwater fisheries.

The water quality of the Pine Creek watershed is fairly good, with temperatures well supportive of a warmwater transitional fish community. Mean temperatures are also mostly within the range for coldwater streams on the tributaries. During some extreme summers when the flow is reduced to the tributary streams they temperatures can quickly escalate into undesirable ranges for some fish species. The mainstem of the Nottawa Creek has overall more consistently cool temperatures and high dissolved oxygen. It generally shows less fluctuation in quality than the Pine Creek, and stays more consistently cool than the Pine. Overall the water temperature is supportive of a coldwater

fishery community, which is beneficial for the stocking of brown trout by the Michigan DNR. While most of the mean water temperature readings are below the coldwater threshold, several readings are well above the 68 F limit. Man-made impoundments are also impacting temperatures on the Nottawa Creek by causing solar heating in slow backwaters. The Tribe is interested in pursuing long-term loggers for temperature and other parameters on the Nottawa and Pine Creeks (NHBP, 2014).

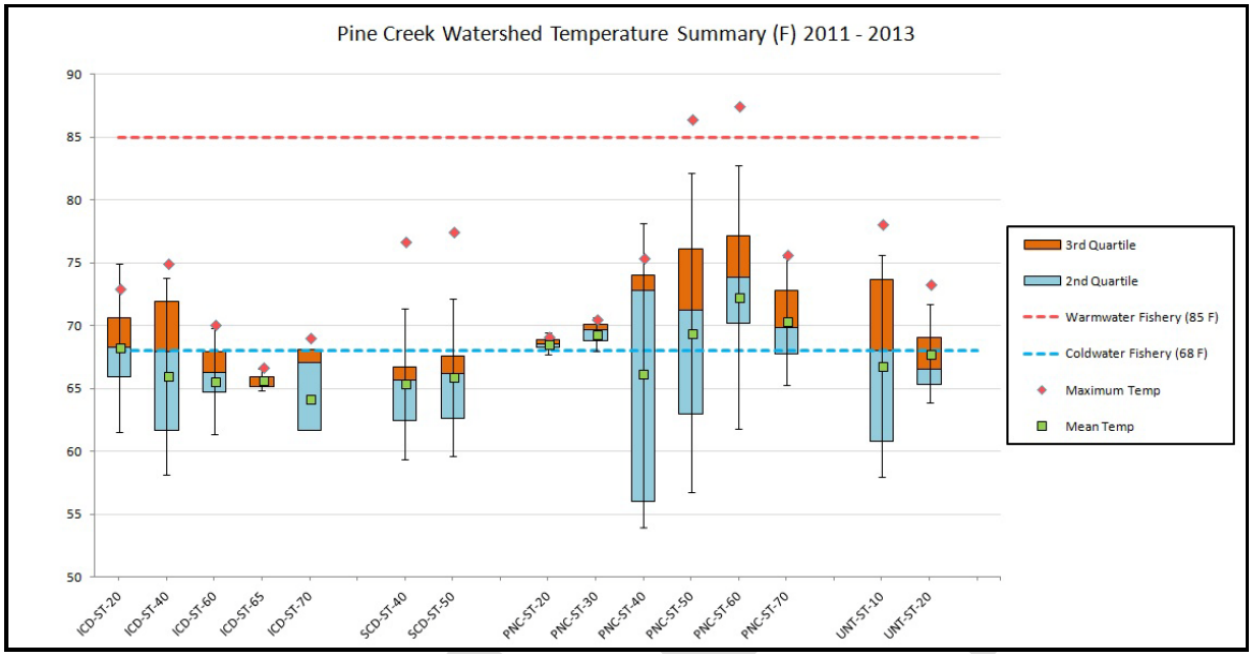


Figure 27. Pine Creek Watershed Temperature Summary

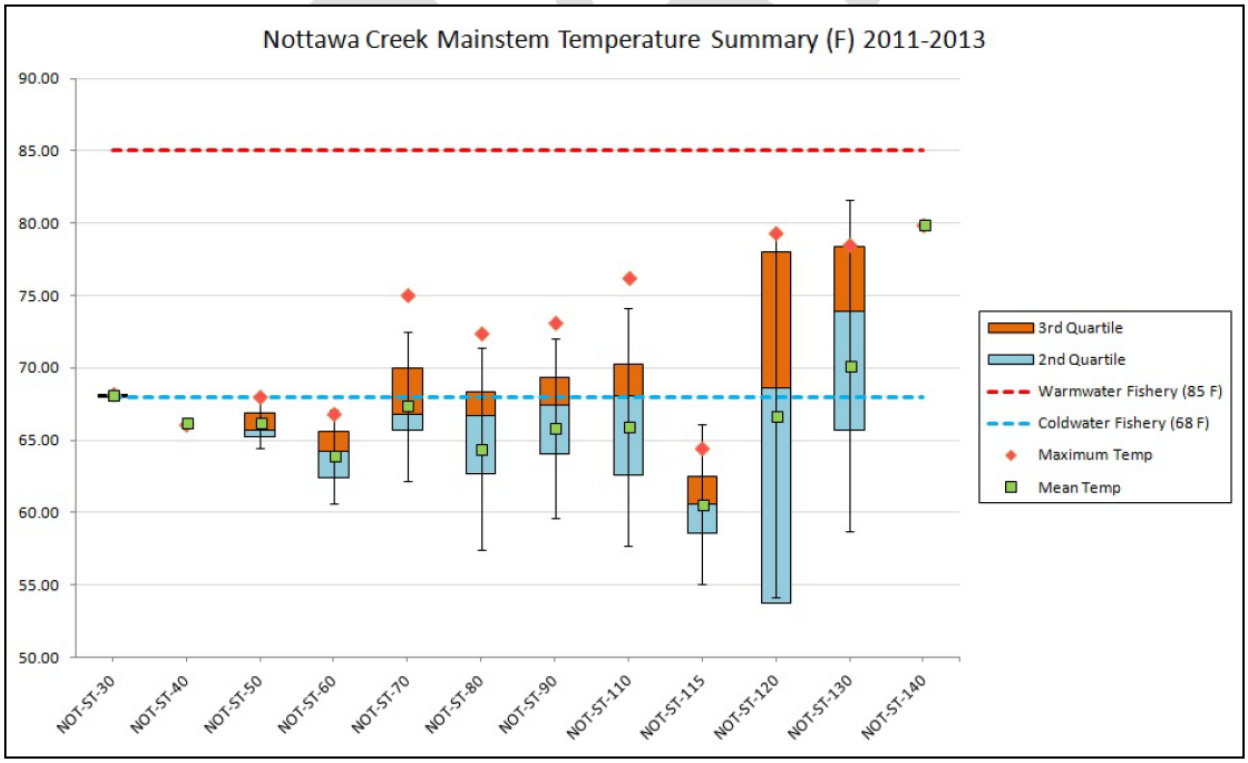


Figure 28. Nottawa Creek Watershed Temperature Summary

6.3.4. E. coli

Pathogens in surface water can cause disease, and E. coli is used as an indicator of other pathogens (Saginaw Chippewa, 2013). Runoff from manure applied to saturated fields, CAFOs, failing septic systems, wildlife, and urban runoff are sources of E. coli to the Pine and Nottawa Watersheds. NHBP refers to the Michigan WQS on E. coli monitoring: for total body contact recreation there shall not be more than 130 E. coli per 100 ml for a 30 day geometric mean, no more than 300 per ml at any time, and no more than 1000 colonies per ml for partial body contact recreation. Our goal is to maintain all surface waters for at least the partial body contact standard, though recreational and cultural uses may lead to desire for the higher level of total body contact.

NHBP Water Staff has not had the resources to conduct sufficient E. coli monitoring in and around the Pine Creek Watershed. Sampling in 2012 showed an average of 3 samples in the Indian Creek Drain of 865 colonies per ml. While this meets the standard for partial body contact in Michigan, the site is near our Pow-Wow grounds and is frequented by children, and medicines are collected in and around the water. Samples taken around the Reservation in 2015 averaged around 450/ml, well above the total body contact standard. A TMDL for E. coli has been developed in the adjacent Portage River/Little Portage Creek watershed, and Kalamazoo County has documented pathogen impacts in several nearby tributaries of the St Joseph River (MDEQ , 2012). The table below is used from the Kalamazoo County Report of 2009 (Kal County, 2009)

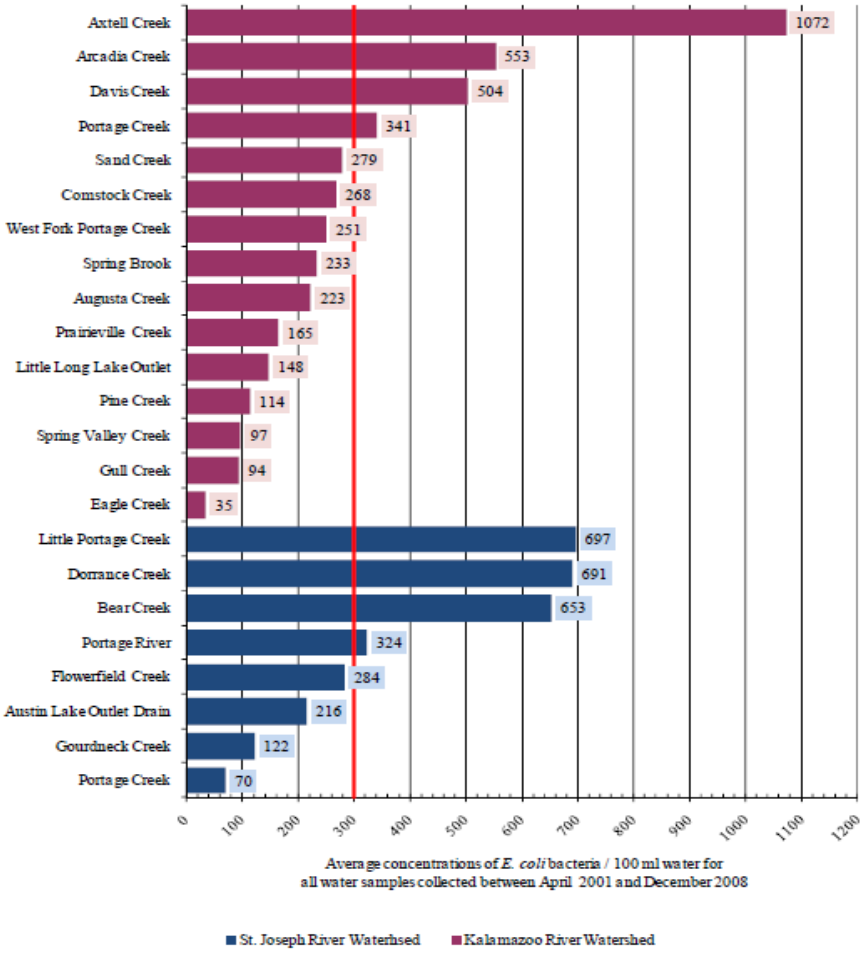


Figure 29. E. coli Monitoring by Kalamazoo County in St Joseph and Kalamazoo River Watersheds

6.3.5. Nutrients

Nutrients are essential to the health and diversity of our surface waters. However, in excessive amounts, nutrients cause hyper-eutrophication, which results in overgrowth of plant life and decline of the biological community. Excessive nutrients can also result in potential human health risks, such as the growth of harmful algal blooms - most recently manifested in the Pfiesteria outbreaks of the Gulf and East Coasts. Chronic nutrient over enrichment of a waterbody can lead to the following consequences: low dissolved oxygen, fish kills, algal blooms, overabundance of macrophytes, likely increased sediment accumulation rates, and species shifts of both flora and fauna (USEPA, 2000).

Historically, National Water Quality Inventories have repeatedly shown that nutrients are a major cause of ambient water quality use impairments. EPA's 1996 National Water Quality Inventory report identifies excessive nutrients as the leading cause of impairment in lakes and the second leading cause of impairment in rivers (behind siltation). In addition, nutrients were the second leading cause of impairments reported by the States in their 1998 lists of impaired waters. Where use impairment is documented, nutrients contribute roughly 25-50% of the impairment nationally. The Clean Water Act establishes a national goal to achieve, wherever attainable, water quality which provides for the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. In adopting water quality standards, States and Tribes designate uses for their waters in consideration of the Clean Water Act goals, and establish water quality criteria that contain sufficient parameters to protect those uses (USEPA, 2000)

High nitrogen can be harmful for water quality, decrease oxygen, and result in harmful algal blooms. NHBP measures Total Nitrogen as a combination of Total Kjeldhal Nitrogen and Nitrate-Nitrite Nitrogen, through EPA Method 351.2 and 353.2, and samples are processed by KAR Laboratories Inc. Sampling in the summer of 2015 showed all sites being above background conditions as defined in the 2000 USEPA Ambient Water Quality Criteria Recommendations for Ecoregion VII.

Excess levels of Phosphorus can also cause negative effects on aquatic life. Increased plant production increases turbidity, decreases average dissolved oxygen concentrations, and increases fluctuations in diurnal dissolved oxygen and pH levels. Such changes shift aquatic species composition away from functional assemblages composed of intolerant species, benthic insectivores, and top carnivores that are typical of high-quality streams toward less desirable assemblages of tolerant species, generalists, omnivores, and detritivores that are typical of degraded streams (Ohio EPA, 1999). EPA Method 365.2 is used via KAR Laboratories to measure Total Phosphorus in the Pine and Nottawa Creeks. 2015 sampling showed levels high enough above USEPA ambient water quality criteria which could result in use impairment (USEPA, 2000).

6.3.6. pH

This parameter measures the potential of hydrogen and gives an idea how acidic or alkaline water is. NHBP is currently using the State of Michigan pH Rule which says that pH shall be maintained within a range of 6.0 to 9.0, and not be artificially induced to great than a 0.5 variation. Existing water quality data has not shown any deviation from this range which is preferred by most aquatic life. Sudden or unexpected change in pH could indicate a wastewater discharge or other runoff to the stream.

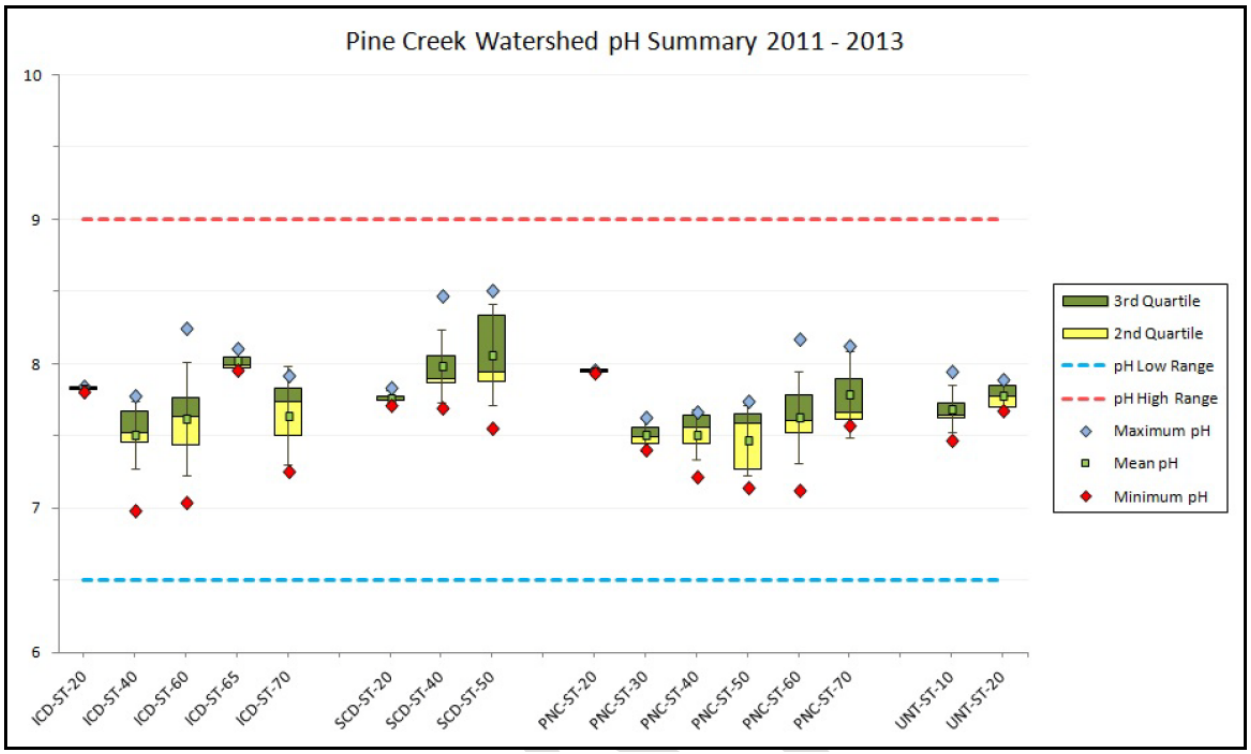


Figure 30. Pine Creek Watershed pH Summary

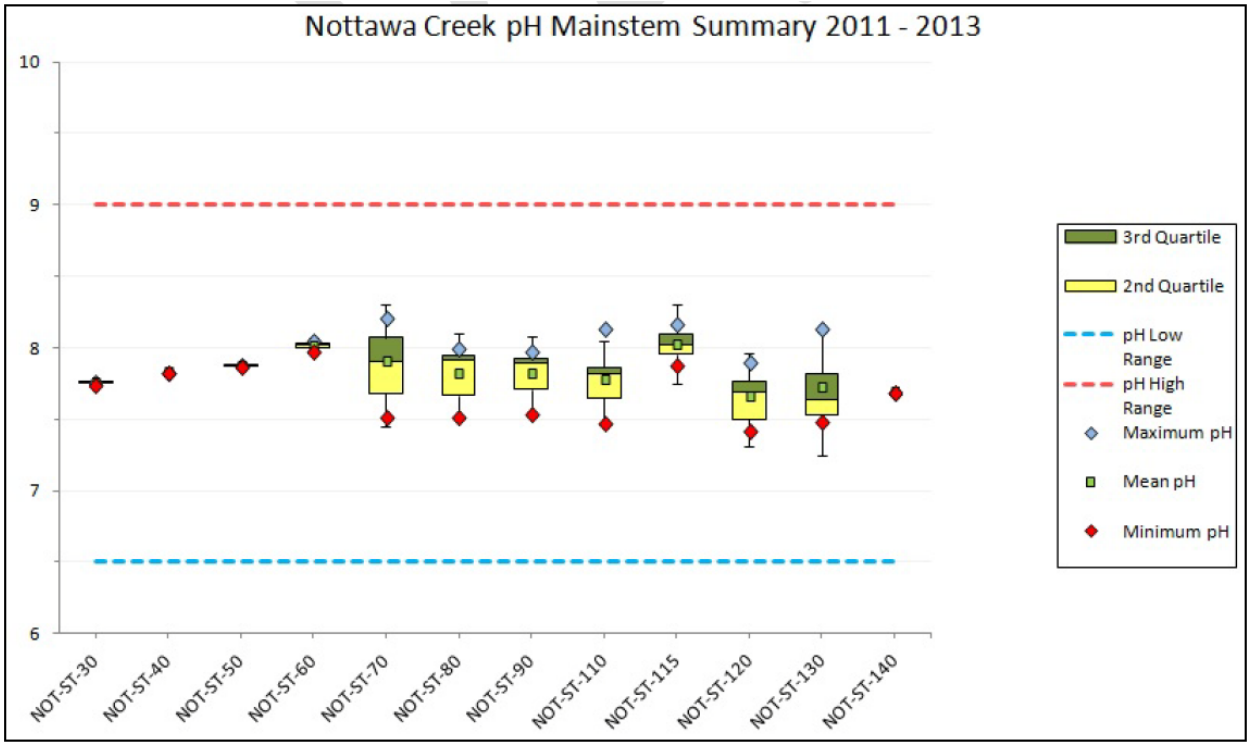


Figure 31. Nottawa Creek Watershed pH Summary

6.3.7. Conductivity

Conductivity is the measure of water's ability to pass an electrical current. It is directly affected by the amount of dissolved ions and temperature of water. Conductivity in American rivers generally ranges from 0.05 milliSiemen per centimeter (mS/cm) to 1.5 mS/cm. Inland fresh water studies indicate that streams supporting good mixed fisheries have a range between 0.15 mS/cm and 0.5 mS/cm. Certain species of fish or macroinvertebrates may have trouble surviving at ranges outside of this. Some industrial waters range as high as 10 mS/cm (USEPA, 2016).

This can be an indicator of salt used for snowmelt entering waterways, or other potential nonpoint sources. While NHBP has not encountered many unusual conductivity measurements, this parameter assists the Tribe in being watchful of unexpected water quality changes. It is shown as Specific Conductance in graphs below for the Pine and Nottawa Watersheds.

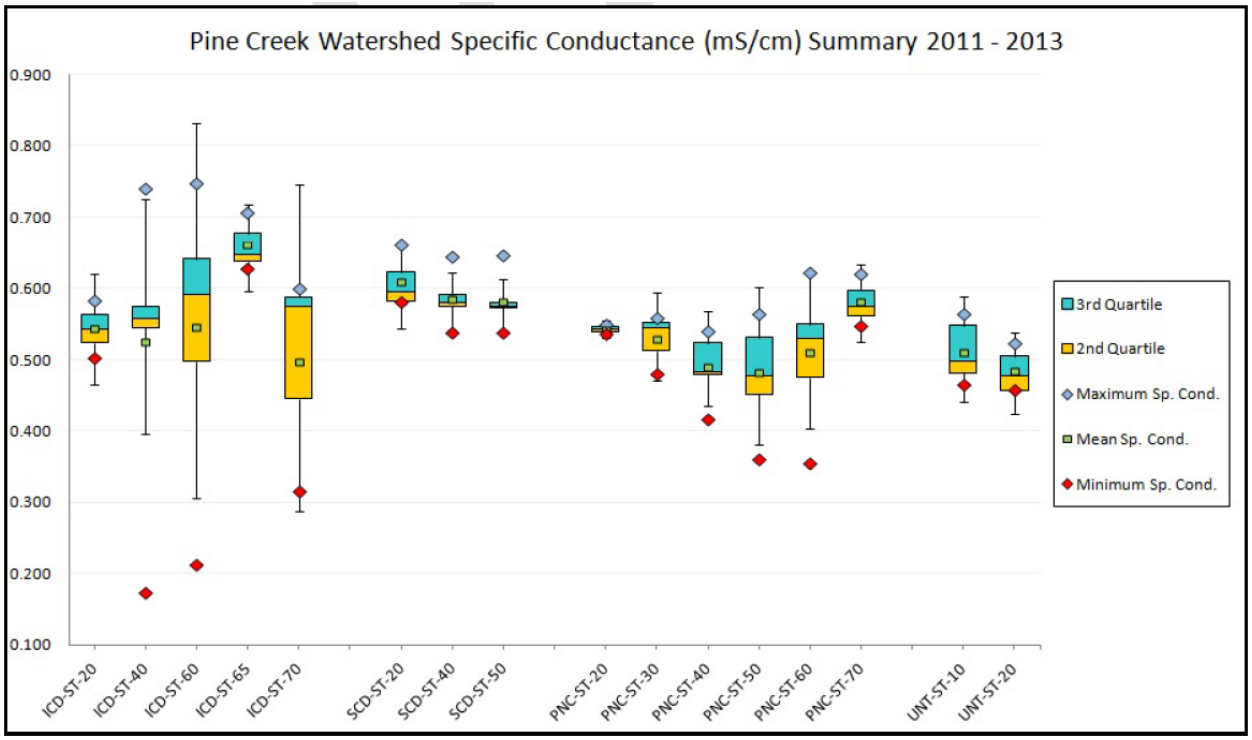


Figure 32. Pine Creek Watershed Specific Conductance Summary

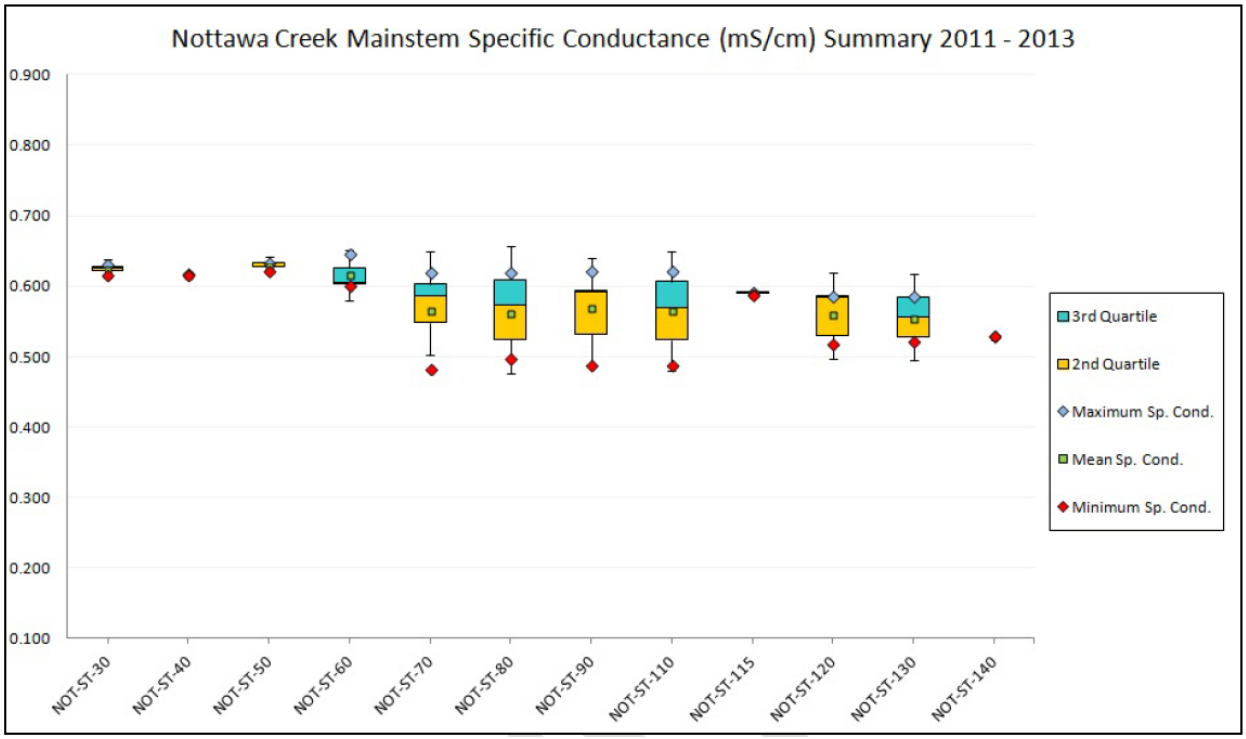


Figure 33. Nottawa Creek Watershed Specific Conductance Summary

6.3.8. Pesticides

The Tribe is interested in initiating a program to monitor pesticide residues in surface water in addition to physical parameters, nutrients, and bacteria monitoring. As discussed in the previous section, agricultural activities are the primary impacts to Tribal waters near the Pine Creek Reservation. A USGS study prepared with assistance of the Tribe in 2004 found trace amounts of pesticides in nearly all surface water samples collected in the Pine Creek and its tributaries (USGS, 2004). According to the USGS report, atrazine is the most commonly applied pesticide in Calhoun County, and alachlor, bentazon, metolachlor are distributed and applied in the county and found in ground water samples[UE4][EK5] (NHBP, 2014a). No surface water monitoring has occurred since the USGA/NHBP joint study, though is the future program is under development with input from USEPA Technical Staff. NHBP Community Water System wells are monitored periodically for a number of substances regulated by the Safe Drinking Water Act, including some pesticides.

6.3.9. Macroinvertebrates

MDEQ has performed periodic surveys of macroinvertebrates on a limited number of sites on the Pine & Nottawa Creeks. These surveys utilized the MDEQ Procedure #51 method (WB-SWAS-051), which will also be used by NHBP water quality staff. The sampling generally resulted in acceptable macroinvertebrate communities on both waterbodies, with no major changes over time (Wesley & Duffy, 1999). An MDEQ Survey in 2005, which also reviewed previous reports, documented in-stream habitat limitations from agricultural channelization, and eroded sediments covering benthic environments (Walterhouse, 2007). NHBP plans on implementing macroinvertebrate and habitat sampling using the Part 51 Method as part of our water monitoring strategy over the next three

years. The Environmental Department will continue to pursue staff training necessary to conduct these types of surveys to assist in detection of non-point source pollution.

6.4. Data Interpretation for Each Waterbody

6.4.1. Use Goal Attainment Status Determination

The Tribe is actively pursuing the creation of Water Quality Standards specific to the Huron Potawatomi Tribe. While there is considerable interest in the Tribal Environmental Advisory Council (TEAC) in the development of these standards, the Tribe has not yet had the capacity and resources to develop its own standards. In the interim the Tribe will adopt the water quality reference values specified by the US Environmental Protection Agency and the State of Michigan. If there is a difference between the reference values, the Tribe will opt for the more protective of the two agencies. Beneficial or Desired Uses for each site were also considered to determine the appropriate level of protection.

Data collected from the NHBP water program from 2011 – 2013 was the primary source of information. The Water Quality Assessment of 2014 provided a graph of each basic parameter to assess the information against reference conditions (NHBP, 2014). In 2015 GIS maps of this data were created to visualize the location of sampling stations and which river stretches may not be meeting set goals (see appendices). If the mean parameter measurement was below the standard, such as the Dissolved Oxygen level for a warmwater stream of 5 mg/L, the site would be listed as 'Not Meeting Goal ', and if a one-time maximum dropped below this level the listing becomes 'Threatened'. Even if a waterbody was generally meeting a standard, but showed the potential to drop beyond the reference value, it would be listed as threatened.

A major limitation is the small number of years included in this current Assessment. While basic physical/chemical properties have been measured multiple times each year at many sites, only a limited number of nutrient and E. coli samples have been conducted. We do not anticipate major changes to these levels through 2010 – 2015. With continued data collection and analysis of 2014-2015 data collected by the NHBP water monitoring program, waterbody Goal Status will continue to be refined. The high amount of large-scale agriculture in the watershed indicates that nutrient and pathogen impairments are likely, and MDEQ projects in adjacent watersheds has confirmed these impairments. NHBP will utilize statistical methodology to be identified in the future surface water QAPP to determine attainment status, and will include the percent exceedance of criteria

Tables 7 and 8 show the Desired Tribal Uses, criteria exceeded, and goal status for each parameter of concern by sampling site for the Pine Creek Watershed. Tables 9 and 10 demonstrate the same information for Nottawa Creek Watershed Sites.

6.4.2. Pine Creek Sampling Site Summaries

The Nottawaseppi Huron Band of the Potawatomi conducts sampling on the Pine Creek, and its tributaries the Indian Creek Drain, Snyder Creek Drain, Unnamed Tributary, and Harvey Creek. The Pine Creek flows into the Nottawa Creek just south of the Reservation, and then into the St Joseph River near Mendon. Water Temperature and Dissolved Oxygen levels are either threatened or Not Meeting Goals for a warmwater fishery at most of the sites. Turbidity is higher in the small

tributaries, and along with these sediments comes excess levels of nutrients, which are above reference levels in a limited number of samples. Agricultural land cover is predominant in this watershed, and farm related NPS are the biggest contributors of runoff. Some runoff occurs from rural roads and crossings in Calhoun County, and channelization and hydrologic modifications have also impacted water quality. Table 7 summarizes the Desired Uses for the Pine Creek Waterbodies.

Table 7. Pine Creek Watershed Desired Tribal Uses

RIVER BASIN (HUC 8)	HUC 12 ID	WATERBODY	STATION ID	DESIRED TRIBAL USES
St. Joseph River 04050001	Pine Creek 040500010304	Pine Creek	PNC-ST-20	**Agricultural** Navigation Industrial water supply **Public Water Supply** **Warmwater Fishery** Cold/Cool Water Fishery **Aquatic Habitat** **Subsistence Fishing/Gathering** **Spiritual and Cultural Uses** **Total Body Contact Recreation** **Partial body contact recreation** **Wild Rice Habitat**
			PNC-ST-30	
			PNC-ST-40	
			PNC-ST-50	
			PNC-ST-60	
			PNC-ST-70	
		Indian Creek Drain	ICD-ST-20	**Agricultural** **Aquatic Habitat** **Subsistence Fishing/Gathering** **Spiritual and Cultural Uses** **Partial body contact recreation**
			ICD-ST-40	
			ICD-ST-60	
			ICD-ST-65	
			ICD-ST-70	
		Snyder Creek Drain	SCD-ST-20	**Aquatic Habitat** **Subsistence Fishing/Gathering** **Spiritual and Cultural Uses** **Partial body contact recreation**
			SCD-ST-40	
			SCD-ST-50	
		Untitled Tributary	UNT-ST-10	**Aquatic Habitat** **Subsistence Fishing/Gathering** **Spiritual and Cultural Uses** **Partial body contact recreation**
			UNT-ST-20	

Note: NHBP Desired Uses are in bold

Table 8 summarizes the surface water quality criteria exceedances at the sampling sites in the Pine Creek Watershed. Most sampling sites that had a sufficient number of samples included criteria that were either Threatened or Not Meeting Goals. Pine Creek sampling sites on the Reservation (PNC-ST-50, PNC-ST-60), exceeded temperature maximums, and were below dissolved oxygen minimums to support a warmwater fishery. While these sites were often in range, during increasingly common hot and dry summers, readings indicative of poor quality have been recorded. Nutrients appear to be high at these sites as well, though more sampling will need to be conducted.

Turbidity was highest after storm events at the Indian Creek Drain Sites (ICD-ST-40, ICD-ST-65), with a relatively high max reading at the Pine Creek PNC-ST-50 site of 30 NTUs.

Sampling Site ID Number	Parameter	Criteria	Goal Status
PNC-ST-30	Temperature (F)	< 85 (Jul-Aug)	Threatened
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity	< 14.5	Meeting Goal
PNC-ST-40	Temperature (F)	< 85 (Jul-Aug)	Threatened
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity	< 14.5	Threatened
PNC-ST-50	Temperature (F)	< 85 (Jul-Aug)	Not Meeting Goal
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity (NTU)	< 14.5	Threatened
	E. coli (MPN/100 mL)	< 1000	Threatened
PNC-ST-60	Temperature (F)	< 85 (Jul-Aug)	Not Meeting Goal
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity (NTU)	< 14.5	Threatened
	E. coli (MPN/100 mL)	< 300	Not Meeting Goal
	Total Nitrogen (mg/L - ppm)	< 0.54	Not Meeting Goal
	Total Phosphorus (ug/L - ppb)	< 33.0	Not Meeting Goal
ICD-ST-40	Temperature (F)	< 85 (Jul-Aug)	Threatened
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity (NTU)	< 14.5	Not Meeting Goal
	E. coli (MPN/100 mL)	< 1000	Threatened
	Total Nitrogen (mg/L - ppm)	< 0.54	Not Meeting Goal
	Total Phosphorus (ug/L - ppb)	< 33.0	Not Meeting Goal
ICD-ST-65	Temperature (F)	< 85 (Jul-Aug)	Meeting Goal
	Dissolved Oxygen (mg/L)	> 5.0	Threatened
	Turbidity (NTU)	< 14.5	Threatened
	E. coli (MPN/100 mL)	< 1000	Threatened
	Total Nitrogen (mg/L - ppm)	< 0.54	Not Meeting Goal
	Total Phosphorus (ug/L - ppb)	< 33.0	Not Meeting Goal
SCD-ST-40	Temperature (F)	< 85 (Jul-Aug)	Threatened
	Dissolved Oxygen (mg/L)	> 5.0	Meeting Goal
	Turbidity (NTU)	< 14.5	Threatened
	E. coli (MPN/100 mL)	< 1000	Threatened
	Total Nitrogen (mg/L - ppm)	< 0.54	Not Meeting Goal
	Total Phosphorus (ug/L - ppb)	< 33.0	Not Meeting Goal
UNT-ST-10	Temperature (F)	< 85 (Jul-Aug)	Threatened
	Dissolved Oxygen (mg/L)	> 5.0	Threatened
	Turbidity (NTU)	< 14.5	Meeting Goal
	E. coli (MPN/100 mL)	< 1000	Threatened

Table 8. Pine Creek Watershed Sampling Sites Attainment Status

6.4.3. Nottawa Creek Sampling Site Summaries

NHBP collects water samples on the mainstem of the Nottawa Creek where a majority of wild rice stands are located. Just south of the Reservation the Pine Creek flows into the Nottawa, though the historic confluence may have been on the Reservation before channelization in the 1960's and 70's. The Nottawa is classified as a cold/cool water stream and is stocked with brown trout by the MDNR. Table 9 summarizes the Desired Uses for the Nottawa Creek.

St. Joseph River 04050001	Mud Lake-Nottawa Creek 040500010306 (Before Pine)	Nottawa Creek	NOT-ST-30	**Cold/Cool Water Fishery** Aquatic Habitat **Subsistence Fishing/Gathering** **Spiritual and Cultural Uses** **Total Body Contact Recreation** **Partial body contact recreation** **Wild Rice Habitat**
		Nottawa Creek	NOT-ST-40	
		Nottawa Creek	NOT-ST-50	
		Nottawa Creek	NOT-ST-60	
	Mud Lake-Nottawa Creek 040500010306 (Before Pine)	Nottawa Creek	NOT-ST-70	Agricultural Navigation Industrial water supply Public Water Supply Warmwater Fishery **Cold/Cool Water Fishery** **Aquatic Habitat** **Subsistence Fishing/Gathering** **Spiritual and Cultural Uses** **Total Body Contact Recreation** **Partial body contact recreation** **Wild Rice Habitat**
		Nottawa Creek	NOT-ST-80	
		Nottawa Creek	NOT-ST-90	
		Nottawa Creek	NOT-ST-110	
		Nottawa Creek	NOT-ST-115	
		Nottawa Creek	NOT-ST-120	
		Nottawa Creek	NOT-ST-130	
		Nottawa Creek	NOT-ST-140	

Table 9. Nottawa Creek Watershed Desired Tribal Uses

Table 10 summarizes surface water criteria exceedances from sampling sites on the Nottawa Creek. Many sites do not have a sufficient number of samples to be included in this analysis, and sites 70, 80, and 110 are listed here. NOT-ST-70 is at the crossing of V Drive South where sampling can be conducted from the bridge or from water. This bridge is scheduled to be re-built in the summer of 2016. This site has recorded higher temperatures which may be due to warmer water flowing in from the Pine Creek. Water temperature and DO improve at the next downstream sampling site NOT-ST-80, which is adjacent to highly productive wild rice beds. Turbidity is low at all Nottawa Creek Sites. Future sampling will be conducted as part of this NPS project to review nutrients and E. coli in the Nottawa Creek. A considerable amount of agricultural irrigation is present throughout the watershed, with a number of direct surface water withdrawals downstream of the Reservation.

Sampling Site ID Number	Parameter	Criteria	Goal Status
NOT-ST-70	Temperature (F)	< 68 (Jun-Aug)	Not Meeting Goal
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity (NTU)	< 14.5	Meeting Goal
NOT-ST-80	Temperature (F)	< 68 (Jun-Aug)	Threatened
	Dissolved Oxygen (mg/L)	> 5.0	Threatened
	Turbidity (NTU)	< 14.5	Meeting Goal
NOT-ST-110	Temperature (F)	< 68 (Jun-Aug)	Not Meeting Goal
	Dissolved Oxygen (mg/L)	> 5.0	Not Meeting Goal
	Turbidity (NTU)	< 14.5	Meeting Goal

Table 10. Nottawa Creek Watershed Sampling Sites Attainment Status

7. DISCUSSION

Section 6 discussed some of the origins of Non-Point Source Pollution in the Pine and Lower Nottawa Creek Watersheds. The types of desired uses were also included, along with some of the river stretches that may not be meeting, or have threatened water quality criteria. Table 11 below summarizes the attainment status for each water monitoring station included in Chapter Six.

As mentioned in previous Sections, additional sampling needs to occur, particularly for criteria that cannot be measured on site such as Total Nitrogen, Total Phosphorus, and E. coli. Very few of these samples have been collected on Nottawa Creek Sites, and repeated sampling is needed on the Pine Creek and tributary sites. This will be focused at locations which have consistently not met these criteria. This sampling will following in accordance with NHBP 2012 Surface Water QAPP which was revised in 2015. The revision reduced the number of sites regularly monitored in response to Departmental resources. Additional up or downstream sampling can be initiated with the commencement of this 319 project, which may be needed to determine source location and BNP effectiveness.

A list of sampling recommendations is listed below:

- Continue monitoring at the Nine Targeted NHBP Sites for both physical/chemical parameters, E. coli, and Nutrients as laid out in the 2015 Surface Water Monitoring QAPP Revision.
- Multiple samples for E. coli to get more data at Pine Creek and tributary sites, particularly those on and near Reservation recreation areas.
- Continuous monitoring station establishment on the Pine Creek Reservation planned for 2016, will give a more long-term picture of daily fluctuations in temperature, dissolved oxygen, and turbidity.
- Continue to research the possibility of Tribal Water Quality Standards for criteria that are not established for the State of Michigan: turbidity, Total Nitrogen, Total Phosphorus.
- Further collaboration with NHBP Mnomen monitoring and restoration project, which is breaking new ground in a culturally appropriate restoration of wild river rice (Zizania aquatica). Review standard water monitoring parameters in field book being developed by regional wild rice partnership amongst Tribes.

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SAMPLING SITE ID	Temperature (F)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	E. coli (MPN/100 mL)	Total Nitrogen (mg/L - ppm)	Total Phosphorus (ug/L - ppb)
	Cold < 68 (Jun-Aug) Warm < 85 (Jul-Aug)	Cold > 7.0 Warm > 5.0	< 14.5	Full Body Contact < 300 Partial Contact < 1000	< 0.54	< 33.0
PNC-ST-30	Threatened	Not Meeting Goal	Meeting Goal			
PNC-ST-40	Threatened	Not Meeting Goal	Threatened			
PNC-ST-50	Not Meeting Goal	Not Meeting Goal	Threatened	Threatened		
PNC-ST-60	Not Meeting Goal	Not Meeting Goal	Threatened	Not Meeting Goal	Not Meeting Goal	Not Meeting Goal
ICD-ST-40	Threatened	Not Meeting Goal	Not Meeting Goal	Threatened	Not Meeting Goal	Not Meeting Goal
ICD-ST-65	Meeting Goal	Threatened	Threatened	Threatened	Not Meeting Goal	Not Meeting Goal
SCD-ST-40	Threatened	Meeting Goal	Threatened	Threatened	Not Meeting Goal	Not Meeting Goal
UNT-ST-10	Threatened	Threatened	Meeting Goal	Threatened		
NOT-ST-70	Not Meeting Goal	Not Meeting Goal	Meeting Goal			
NOT-ST-80	Threatened	Threatened	Meeting Goal			
NOT-ST-110	Not Meeting Goal	Not Meeting Goal	Meeting Goal			

Table 11. Attainment Status Summary All Sampling Sites

The following section will examine the level of attainment status and attempt to link impairments to potential sources. Both the Pine and Nottawa Creek Watersheds will be separately reviewed. Table 11 summarizes all sampling sites reviewed in Section 6 into one table. Many sites are not meeting water quality goals for Dissolved Oxygen, and are threatened for E. coli and Temperature. None of the sites are meeting goals for nutrients, though more sampling will need to be conducted to reinforce criteria conclusions.

7.1. Pine Creek

- Pine Creek Mainstem
    - Priority Water Quality Concerns:
        - Water Temperature
        - Dissolved Oxygen
        - E. coli
    - Secondary Water Quality Concerns:
        - Total Phosphorus
        - Total Nitrogen
        - Turbidity
- Snyder Creek Sub-Watershed
    - Priority Water Quality Concerns:
        - Turbidity
        - E. coli
        - Total Phosphorus
        - Total Nitrogen
    - Secondary Water Quality Concerns:
        - Water Temperature
        - Dissolved Oxygen

- Recommended Sampling:
    - Continued seasonal monitoring at 5 targeted sites in Pine Creek Watershed for physical/chemical parameters, particularly dissolved oxygen, temperature, turbidity, and conductivity.
    - Additional sampling for E. coli on Pine Creek and tributaries, collection of 3 samples per site to get waterbody mean.
    - Collect additional samples for Total Nitrogen and Phosphorus, identify funding sources for lab analysis of nutrient and pathogen samples.
    - Install continuous monitoring station on Pine Creek for more long-term examination of current conditions. Incorporate discharge monitoring as future resources become available.

- NPS Categories of Concern and Management Priorities:
    - Agricultural Impacts
    - L:ivestock Operations Impacts
    - Hydrologic Modifications
    - Wetland Degradation
    - Landscaping Practices

- Stormwater from Developed Areas
- On-Site Wastewater Systems
- Road and Trail Crossing
- Construction Site Runoff
- Removal of Forested and Vegetative Cover

7.2. Nottawa Creek

- Nottawa Creek Mainstem
  - Priority Water Quality Concerns:
    - Water Temperature
    - Dissolved Oxygen
  - Secondary Water Quality Concerns:
    - E. coli
    - Total Phosphorus
    - Total Nitrogen

- Recommended Sampling:
  - Continued seasonal monitoring at 3 targeted sites on the Nottawa Creek for physical/chemical parameters, particularly dissolved oxygen, temperature, turbidity, and conductivity.
  - Collect samples for Total Nitrogen, Phosphorus, and E. coli, and identify funding sources for lab analysis of nutrient and pathogen samples.
  - Look to install continuous monitoring station on Nottawa Creek for more long-term examination of current conditions and variations in discharge.

- NPS Categories of Concern and Management Priorities:
  - Agricultural Impacts
  - Livestock Operations Impacts
  - Hydrologic Modifications
  - Wetland Degradation
  - Stormwater from Developed Areas
  - On-Site Wastewater Systems
  - Road and Trail Crossing
  - Removal of Forested and Vegetative Cover
  - Existing Contaminated Sediments

8. SELECTION OF NPS BEST MANAGEMENT PRACTICES

Section 8 covers how NHBP will select Best Management Practices (BMPs) to address Non-Point Source Pollution highlighted in Section 7 in the Pine and Upper Nottawa Creek Watersheds. An overview of key participants related to water protection and BMP guidance follows, including organizations, municipalities, and government agencies involve with the process. Existing BMPs and the process for selecting future BMNPS to address NPS pollution from Section 7 will also be identified. Implementation of BMPs is primarily covered in the NHBP 319 NPS Management Plan.

8.1. NHBP Environmental Mission

The Nottawaseppi Huron Band of the Potawatomi Environmental Department is committed to the protection, enhancement and restoration of the Tribe's environmental, natural and cultural resources. We remain dedicated to pursuing the community's goals related to natural resources conservation through direct interaction with the community, including participation with the Tribal Environmental Advisory Committee, We continue to recognize the indivisible bond between traditional Potawatomi people and the environment, and strive to incorporate culture and history into all our activities.

The main focus of the NPS project are the watersheds surrounding the Pine Creek Reservation and nearby wild rice beds, the Pine Creek and Lower Nottawa Creek. The Reservation is the center of our government, and the location where we have resided for over 175 years. We have additional Trust Lands in Emmett Township near Battle Creek, and own land and an office building in Grand Rapids. Our service area cover 7 counties from Branch to Ottawa, and our members live throughout the St Joseph, Kalamazoo, and Grand River Basins. We continue to re-acquire Tribal Lands working towards a cohesive land base in Calhoun and Branch counties, near our historic Nottawaseppi Reservation near Mendon (Figure 1, pg. 7).

As our Land Base is moved through the Fee-to-Trust process, we may add further watersheds into our NPS area of interest, particularly the Spencer Creek in Branch County. This will take place in future program applications. Due to much of the land not being in Tribal ownership, NHBP may likely partner with other land owners or agencies to address the most significant NPS problem areas.

8.2. Core Participants

NHBP intends to lead a cooperative effort to identify NPS challenges and select BMPs best suited to address nonpoint source pollution in the Pine and Nottawa Creek Watersheds in collaboration with key partners, depending on the nature of the site 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 12 presents the core participants, the mission of these agencies and organizations, and the role during BMP selection and implementation. Figure 13 shows the organizational flow of NHBP and its non-tribal partnerships for addressing NPS pollution. The process for BMP selection with aid from these participants is described in detail below.

PARTICIPANT	OBJECTIVE	ROLE in 319 PROGRAM
Nottawaseppi Huron Band of the Potawatomi		
Tribal Council	Authorizes ordinances, grant programs, construction projects, policies, and Tribal Budgets	Final approval BMP site plans
Tribal Environmental Advisory Committee (TEAC)	Support protection of NHBP's natural resources, recognizes balance between resource protection and land use, sponsors Wild Rice Camp, Earth Day, and Tribal Environmental Conferences.	Review projects to reduce NPS, community and staff input, promote program at community events
Environmental Department	Committed to protection enhancement and restoration of the Tribe's environmental, natural and cultural resources.	Lead role in NHBP 319 NPS Program, determine BMP siting, water monitoring for NPS sites
Planning and Land Use Committee (PLUC)	Facilitate coordination amongst the Tribal Community and Leadership regarding Land Use decisions and projects.	Provide input and authorization for BMP projects, determine if land uses are appropriate
Planning Department	Facilitate efforts of all NHBP Departments to accomplish goals, secure financial resources, and guide strategic planning.	Assist in obtaining additional funding sources, and the design and implementation of enhancement projects
Culture and Historic Preservation Office	Strives to honor the memory and sacrifices of our ancestors through: The education and revitalization of traditional Bodéwadmi culture, ethnobotanical knowledge, history, and language	Provide input and cultural guidance on water programs, and on methods to enhance water protection projects
Department of Public Works	Provide a clean, safe, healthy and comfortable environment for staff, residents and visiting guests, maintains all NHBP buildings and properties.	Responsible for drinking and wastewater utilities, can assist with labor and heavy equipment on BMP projects
Housing Department	Provide NHBP Tribal Members the opportunity to realize affordable, safe, and decent housing.	Assist in obtaining additional funding support, secure contractors for construction projects
Legal Department	Protecting and promoting the development of Tribal sovereignty and self-determination by providing legal services and counsel to Tribal Council and Governmental Departments	Assist in ordinance development, defining Tribal sovereignty, securing Treaty rights, assisting with land ownership issues.
Communications Department	Primary source of information about NHBP, maintains NHBPI.com and Facebook page	Develop promotional and educational materials, event promotion, member outreach
Membership Services Department	Committed to providing exceptional programs and services to enrich the lives of NHBP Members, families, and communities.	Outreach and involvement with Membership, youth and elders

Tribal Police	Serve, protect and provide professional law enforcement to the Nottawaseppi Huron Band of the Potawatomi community.	Provide assistance as needed
Non-Tribal Partner Organizations		
Calhoun Conservation District	Leading local conservation for more than 70 years, working with environmental and agricultural communities coordinating conservation projects and programs throughout the county.	Primary partner in water and AG conservation, MAEAP program, coordinate watershed plans, wrote 1998 Nottawa Creek Study
Calhoun County Water Resources Commissioner	Duties include the construction and maintenance of drains, determining drainage districts, apportioning costs of drains among property owners, administer MS4 permit for the County	Involved with any work related to drains, partner and assist on BMP selection/implementation
Friends of the St. Joseph River (FotSJR)	To unite a diverse group of stakeholders throughout the watershed in a collaborative effort to protect, restore and foster stewardship of the St. Joseph River Watershed.	Bi-State network of stakeholders throughout basin, can assist with support and promotion of water protection activities
Potawatomi Resource Conservation and Development Council	Our approach toward farmland preservation includes methods to protect the water, achieved through county conservation plans, and permanent filter strip along waterways	Can provide small amounts of resources to support BMP projects, has previously partnered with NHBP
St Joseph Conservation District	Works with partners to promote ground and surface water practices, irrigation services, sustainable ag practices, education, environmental stewardship and community projects.	Adjacent County Conservation District, Nottawa Creek drains to St. Joe in county, assist with BMPs, partner at the FotSJR
Calhoun County Road Department (CCRD)	Directly maintains and repairs 87 bridges and more than 1,300 miles of county roads, maintains more than 200 miles of state highways throughout Calhoun County on a contract basis	Technical Assistance, BMP implementation, partner for water crossing projects
Village of Athens	Responsible for Land Use within the Village, and drinking water supply	Nearby, historic connection to the Reservation, partner on Nottawa Creek Projects
Townships: Athens, Leroy, Burlington, Newton, Leonidas	Responsible for Land Management in target watersheds.	Partner on projects, much of the land in the two watersheds is in private ownership
SouthWest Michigan Land Conservancy (SWMLC)	Since its inception, SWMLC has protected almost 14,000 acres of dunes, wetlands, forests, savannas, prairies, farms and vineyards that give our region its distinctive character	BMP site identification, resource for land/water protection, Technical Assistance

Inter-Tribal Council of Michigan (MITC)	Represents 11 of the 12 federally recognized tribes in Michigan. Environmental Services Division is provides environmental and environmental health related technical assistance and services.	Technical Assistance, Groundwater protection planning
Michigan DEQ Nonpoint Source Program Kalamazoo District Office	State environmental agency responsible for region surrounding Tribal Lands, provides education, technical guidance, coordination	Technical Assistance, Education, BMP consultation, permitting on non-Reservation Lands
Michigan DNR Plainwell Field Office	Committed to the conservation, protection, management, use and enjoyment of the state's natural and cultural resources for current and future generations.	Technical Assistance, biological data, BMP selection
Michigan Department of Agriculture & Rural Development (MDARD)	Assures food safety, protects animal and plant health, sustaining environmental stewardship, providing consumer protection, enabling rural development	Technical Assistance and partner on BMP projects, administer MAEAP farm environmental assurance program & NRCS RCPP for St. Joe
U.S. Environmental Protection Agency Region 5 Tribal Program	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 program, identify BMP resources
Bureau of Indian Affairs Great Lakes Restoration Initiative Program	The BIA Tribal GLRI Program provides financial assistance to Great Lakes tribes to protect, enhance, and restore the Great Lakes	Technical Assistance, funding, partner on wild rice related BMP projects
USDA Natural Resources Conservation Service (NRCS)	Conservation planning and assistance to benefit soil, water, air, plants, and animals that results in productive lands and healthy ecosystems. Supports (RC&D) Councils.	Technical and financial assistance, consultation, work with Resource Conservation Protection Program (RCPP). Also EQIP, CSP, & Soil Survey programs.
USDA Farm Service Agency (FSA)	Works with landowners through the Conservation Reserve Program, to install conservation practices that protect sensitive lands, decrease erosion, restore habitat, safeguard ground/surface water.	Technical and financial assistance, BMP consultation and design. CRP and FWP programs.
U.S. Army Corps of Engineers	Promoting water resource protection and ecosystem restoration in the Great Lakes region	Technical assistance, possible financial assistance through ongoing assessment of the Pine Creek Watershed
U.S. Fish & Wildlife Service	Tribal Wildlife Grants are used to provide technical and financial assistance to Tribes for the development and implementation of programs that benefit fish and wildlife resources.	Technical Assistance, financial assistance for land protection, partner on BMP projects

Table 12. Core 319 Participants, NHBP and Non-Tribal

8.3. NHBP Governance Related to NPS Program Management

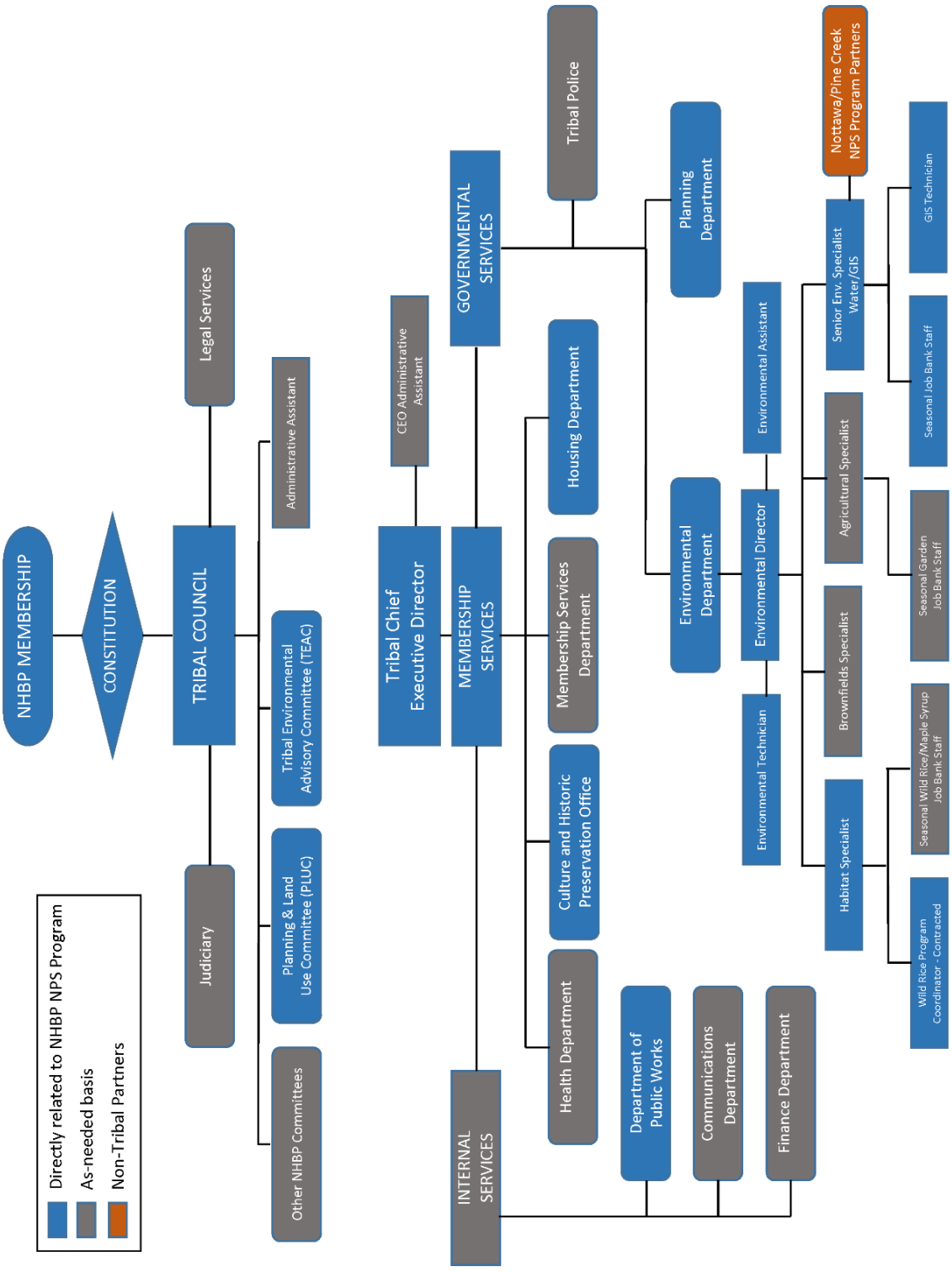

Figure 34. Conceptual NHBP NPS Program Management Chart

Table 12 shows the key Tribal and Non-Tribal Partners in the NHBP NPS Management Program, though it is by no means inclusive. Additional agencies such as Ducks Unlimited or other organizations may be brought in to partner as needed and identified during the BMP selection process. Additionally other watershed organizations exist within the regions, and both several State and Community Colleges could partner with NHBP such as Western Michigan University, Michigan State University, Kellogg Community College, Kalamazoo Valley Community College, and Lansing Community College. Figure 34 is a conceptual organizational chart for NHBP in relation to the NPS Management Program. It has been developed for this project and is not an official NHBP Government Document.

8.4. Existing BMPs on NHBP Properties

NHBP has had a basic surface water monitoring program since 2000, where the Tribe partnered with the USGS, USEPA, and the BIA to prepare "Water Resources on and near the Nottawaseppi Huron Band of Potawatomi Indian Tribal Lands…" (USGS, 2004). In 2010 we our CWA 106 program was approved by the USEPA, which began yearly monitoring of surface water sampling stations in the Pine and Nottawa Creek Watersheds. NHBP does not currently have a Non-Point Source Program, though several BMPs for stormwater have been implemented on the Reservation, and additional BMPs have been implemented in the region by local and agency staff. As part of this 319 NPS program NHBP water staff will compile known BMP projects in the target watersheds.

8.4.1. Agricultural

Agriculture is the largest land use in the Pine and Nottawa Creek Watersheds, and there are several programs that are being utilized to reduce runoff from farms in these waterways. The Calhoun Conservation District provides local coordination for many federal, state, and local water management programs. The District is a primary contact for the Michigan Agriculture Environmental Assurance Program (MAEAP), an innovative voluntary program that addresses environmental risks. The USDA has a field office for the Natural Resources Conservation Service and the Farm Service Agency near Marshall. These agencies implement numerous conservation programs within the target watersheds.

8.4.2. Livestock Operations

The Conservation District is also able to provide farm specific risk assessments and provide best management practice ideas for livestock operations. NRCS and FSA also provide resources reduce the impacts to surface waters that could be occurring from these facilities.

8.4.3. Hydrologic & Habitat

Two projects have been conducted on the Nottawa with Clean Michigan Initiative (CMI) funds to stabilize banks, and to implement BMPs. The first was completed in 2001 in the Village of Athens, with the Conservation District and the Potawatomi RC&D as partners. Water quality was improved by restoring eroding streams banks along a spillway, and reducing sediment delivery (MDEQ/CCD, Michigan Department of Environmental Quality & Calhoun Conservation District. Nottawa Creek Athens Bank Stabilization Projet, 2001). The second was completed in 2006 and included runoff containment, grassed waterways, and silage runoff collection (MDEQ/CCD, 2006). The partners on this project included the Potawatomi RC&D, County Road and Drain Commission, Friends of the St. Joe River, and the Tribe.

8.4.4. Wetlands

The NRCS administers the Agricultural Conservation Easement Program, ACEP, which was previously named WRP. This program has provided financial and technical assistance to help conserve agricultural lands and wetlands and their related benefits throughout our region. NHBP currently has the Q Drive North property under a WRP Easement, and is working towards a wetland restoration on an adjacent property to the south. These easements and restoration provide a buffer for surface waters from the surrounding agricultural runoff, and also work to recharge groundwater which stabilizes streamflow.

8.4.5. Landscaping

The Tribal Environmental Department has worked since its inception to establish ordinances and policies to enhance landscaping for water quality. They have helped to install native vegetation and no mow zones around several streams and stormwater zones on and around the Reservation.

8.4.6. Stormwater

All developments on NHBP land are designed by licensed engineers with detention ponds to keep stormwater from flowing directly to streams. Only during very large flooding events do these ponds overflow as an emergency outlet. Environmental staff continue to investigate methods for these stormwater areas to provide habitat and aesthetic value to the Reservation Community and ecology. Additionally the Calhoun County Water Resources Commissioner is a valuable partner in agricultural stormwater drainage, and is has implemented BMPs to reduce the amount of sediment entering waterways.

8.4.7. On-Site Wastewater

In 2014 the Pine Creek Reservation Community moved to Community Wastewater Treatment System. This system services all homes, offices, and government buildings around the government campus. This system eliminated over 40 separate septic treatment systems,

reducing the potential for failing systems to contribute wastewater into streams. The community system is a self-contained groundwater discharge, and is located well away and above the Pine Creek floodplain. The Calhoun County Environmental Health Department inspects septic systems and reviews new systems and conducts evaluations during house sales.

8.4.8. Transportation

NHBP does not currently have a list of active road crossing BMPs in the watershed. We are currently with the Calhoun County Road Commission on the V Drive South Bridge replacement project, to ensure that runoff during and after construction is reduced. We have also transplanted hundreds of wild rice plants from the construction zone to the Reservation.

8.4.9. Construction Sites

A Soil Erosion and Sediment Control Ordinance was adopted by the NHBP Tribal Council in 2000. The Tribes instructs all contractors to follow best practices for construction such as the installation of sediment fencing, and follows up with inspections by the Environmental Department and the Michigan Department of Environmental Quality.

8.4.10. Urban and Developed Areas

8.5. Future BMP Selection to Reduce of Non-Point Source Pollution

This section will cover the decision making process and steps for selecting BMPs to address NPS in the Pine and Lower Nottawa Creek Watersheds. These categories of NPS impacts were addressed in Chapter 6, and this portion will also discuss how NHBP will incorporate participation of the both the Tribal Membership and general public. NHBP has an excellent GIS database with both ecological and parcel data that will assist in project site selection.

1. Prioritization of sub-watersheds based on water quality status discussed in Chapter 6. High summer water temperatures and low dissolved oxygen are an issue throughout these waterways and a high priority. Additionally E. coli, and turbidity are emerging problems to be monitored. Once more nutrient data are collected this may also become a high priority indicator. The Snyder Creek Drain sub-watershed is also of special interest as the Tribe owns much of its land in this 3000 acre basin.
2. Identify relevant BMPs that are appropriate for the type of NPS pollution being addressed,
3. Consult with Tribal Environmental Advisory Committee regarding highest priority projects and pollutants, Environmental Director, and Planning Staff.
4. Identify relevant BMPs that are appropriate for the type of NPS pollution being addressed with technical assistance from local and federal staff.

5. Consultation with Tribal NPS Partners, local and county municipalities, road and drain commissions, local conservation organizations, then state and federal partners and agencies.
6. Narrow the types of BMPs to be implemented based on the desired scale of improvement and size of parcels, feasibility of project, landowners, and potential effectiveness.
7. Initiate dialogue with crucial landowners, or the Tribal Planning Department and PLUC Committee, to review water body status and potential BMPs for those areas.
8. Consult with key project partners to rank BMP project list, and identify possible collaborative opportunities.
9. Present proposed BMP project to Tribal Leadership for input and approval.
10. Investigate implementation of BMPs through possible funding from partners and outside sources.
11. Proceed with construction and enactment of projects.

8.6. Partner Participation and Government Coordination

The Nottawaseppi Huron Band of the Potawatomi has established long-standing partnerships with local and regional agencies and organizations that are relevant to water quality. Staff will continue to work and consult these partners in selecting and siting BMPs in the Pine and Nottawa Creek Watersheds, particularly in and around the Pine Creek Reservation. Most of the BMPs will be of a rural nature and primarily related to agricultural enhancements. There are no cities in this sub-basin, and only a portion of some villages is included. Primary partners for rural BMPs will be the Calhoun Conservation District (CCD), Friends of the St Joseph River, and the Calhoun County Water Resources Commissioner. CCD assists in connecting landowners with the proper programs in the NRCS, FSA, or Michigan Department of Agriculture and Rural Development. Additional participants that will be involved regularly include the Michigan Department of Environmental Quality, for coordination with existing 319 and TMDL projects, and the Potawatomi Resource Conservation and Development Council (RC&D). Water staff have announced the intention to pursue the 319 Program at meetings of the FotSJR and to additional local organizations and staff. The following table provides a summary of potential BMPs that NHBP may implement to reduce NPS in the target watersheds. The Watershed Management Plan for the St Joseph River was an instrumental resource in developing this list.

NHBP Water Staff will continue to engage local water resources and relevant organizations in 2017, and announce the project at meetings of the Friends of the St. Joseph River, and through contact through other core project partners. We are developing a project information sheet to distribute to the community and partners in early 2017.

Best Management Categories and Practices	PRIORITY			
	TRIBAL	HIGH	MED	LOW
Agricultural & Livestock				
Establish standards on NHBP leased agricultural lands to implement BMP to protect water quality listed in the NHBP NPS Plan, orient farmers towards becoming MAEAP certified	X	X		
Create model agricultural practices pilot projects incorporated in NHBP Food Sustainability Program	X		X	
Encourage local agricultural producers to become MAEAP verified, which encompasses a number of programs. The Calhoun Conservation District is actively involved in this effort.		X		
Identify most critical locations for vegetated buffers strips in non-tiled fields. Work with Conservation Districts, NRCS, FSA, and MDARD to identify programs and funding for these locations		X		
Identify livestock operations that do not have appropriate manure management plans in place. Work with project partners to locate resources needed to develop plans.		X		
Determine if a full tillage and drainage survey of the watersheds has been conducted. Works towards conducting this survey and compiling needed information			X	
Survey which producers are conducting soil testing to determine appropriate application rates. Assist in locating resources within partner organizations.			X	
Facilitate the development of an Integrated Pest Management Plan (IPM) for NHBP agricultural leases, promote the development of IPM Plans to other AG lands adjacent to waterways	X		X	
Work with Conservation Districts to develop local ordinances for required riparian buffers, and setbacks for application of manure and chemicals			X	
Identify need for Agrichemical Containment Facilities to store pesticides in enclosed area to prevent groundwater contamination.				
Identify critical areas in need of grass, tree, or other plantings to reduce erosion and sedimentation				
Install livestock fencing for exclusion from riparian areas and plant vegetated livestock buffers				X
Irrigation efficiency and management plans in coordination with the MAEAP program.			X	
Survey of ground and surface water irrigation withdrawals in the Pine/Nottawa Watersheds.			X	
Informational meeting, training sessions, or mailing for producers in the watersheds.		X		
Hydrologic & Habitat				
Coordination with Drain/Water Resources Commissioners on ecological drain maintenance and properly sized stream crossings		X		
Enhance fish populations through habitat improvement measures			X	
Streambank protection to stabilize eroding banks on waterways on Tribal and Non-Tribal Lands, ranking of sites from high to low restoration priority	X	X		
Targeted water quality and temperature monitoring to assess impacts from polluted runoff	X	X		
Review potential for dam or barrier removal where impacting water quality and habitat				X
Provide resources for Pine & Nottawa wetland hydrology restoration project	X		X	
Wetlands & Sensitive Areas				
Wetland restoration in historically inundated areas to assist in water filtration		X		
Identification and protection of sensitive lands on Tribal and Non-Tribal Lands	X	X		
Acquisition of critical streamside properties to protect water quality	X		X	
Landscaping				
Coordinate with NHBP Department of Public Works on landscaping for water quality best practices	X	X		
Work with local municipalities on landscaping practices that promote runoff reduction			X	

Stormwater & On-Site Wastewater				
Review existing NHBP stormwater protection systems and policies	X	X		
Work with local municipalities to develop positive stormwater runoff practices			X	
Implement innovative techniques on NHBP lands such as rain gardens, bioretention basins, or permeable surfaces	X	X		
Implement check dams on NHBP and non-NHBP land to trap sediment from entering streams	X		X	
Review SOPs for NHBP Community Wastewater System and review future capacity				
Transportation				
Identify and survey all road/trail stream crossings on Tribal and Non-Tribal Lands	X	X		
Review existing BMPs for design and maintenance standards of road/stream crossings				
Construction Sites				
Site review of new developments on Tribal properties using an approved site plan checklist, incorporate this checklist into all future development	X	X		
Removal of Forested and Vegetative Cover				
Management plan for timber and wood fuels on NHBP properties				
Review of NHBP forestry management plan in relation to the NPS activities				
Urban & Developed Areas				
Review and promote Green Infrastructure and Low Impact Development on Tribal properties	X	X		
Educational signage to promote water quality practices and Tribal heritage	X	X		
Rain barrels and other roof runoff projects on Tribal and Non-Tribal Lands	X		X	
Meet with NHBP staff, community, leadership, and committees to provide training and to promote the goals of the NPS Management Plan	X	X		
Update NHBP electronic media including website and social media to promote the program	X	X		
Increase household hazardous waste options for Tribal Citizens and others in the watershed	X		X	
Water quality protection and stormwater ordinance development	X		X	

Table 13. Preliminary List of Future Best Management Practices by Category

Information for these potential BMPs came from The St. Joseph River Watershed Management Plan, The Nottawa Creek Watershed Project, The TMDL for E. coli on the Little Portage Creek, and The Portage River Watershed Management Plan.

9. EXISTING NHBP AND NON-TRIBAL NPS CONTROL PROGRAMS

Understanding and reducing runoff from NPS contributions needs to be a collaborative effort, and utilize the many existing programs that are currently active. These include a number of efforts and programs in the Pine/Nottawa Watersheds to assist agricultural producers, and some NHBP Departments that work in areas that could have an impact on redoing NPS. This 319 Assessment Plan, along with the Management Plan, will guide the NHBP Environmental Department to coordinate the resources available to address the challenge identified.

9.1. Existing Programs to Address NPS Water Impacts

A number of local, state, and federal programs exist in the watershed to address the variety of NPS impacts in the Pine and Nottawa Creeks. Table 14 shows an overview of some of these programs, and the areas that the particular program may address.

Non-Point Source Related Programs	NPS Category								
	Agriculture	Hydrologic	Wetlands	Landscaping	Storm/Waste Water	Transportation	Construction	Forest Removal	Urban & Developed
NHBP Water Resources Program, along with other Environmental support staff, are primarily responsible for implementing, managing, and tracking all 319 management activities.	X	X	X	X	X	X	X	X	X
NHBP Planning Staff assist in locating funding resources, preparing grant applications, and serving as a point of contact for Tribal construction projects that involve NPS management					X	X	X		X
The NHBP Housing Staff can also assist in locating resources for water protection programs related to housing developments, and may be a potential partner on projects within Tribal jurisdiction					X	X	X		X
NHBP Environmental (TEAC) & Planning (PLUC) Committees. Serve as potential partners and source of minor project support. Assist in community outreach on NPS projects.		X		X	X	X	X		X
Bureau of Indian Affairs, Midwest Region Water Resources Program. Can assist Tribes with water management issues.		X	X						

Great Lakes Restoration Initiative, Bureau of Indian Affairs Circle Of Flight Program. Restore stream side habitat and incorporate wild rice into water quality monitoring programs.		X	X						
US Fish and Wildlife Service, Tribal Wildlife Grant. Provide technical and financial assistance to Tribes to benefit fish and wildlife habitat such as conservation easements. USFWS has several other programs that may be incorporated into non-tribal lands.	X		X						
US Army Core of Engineers Tribal Nations Programs, Section 203, Tribal Partnership Program to study flood reduction and watershed planning, Section 516 of WRDA, sediment reduction funding.		X	X						X
Michigan Department of Environmental Quality NPS Program. Provides technical assistance, education, grants, enforcement, and monitoring to reduce NPS pollution	X		X		X	X	X		X
Michigan Department of Natural Resources, Monitoring of fisherieson Pine and Nottawa Creeks, assist in assessment of BMP effectiveness		X							
Calhoun Conservation District, provides local coordination for many federal, state, and local water management programs. CCD will be a primary partner to connect landowners to conservation programs, and have a Michigan Agriculture Environmental Assurance Program (MAEAP) Technician on staff to direct producers towards verification.	X	X	X	X	X	X	X	X	X
Michigan Department of Agricultural and Rural Development is responsible for the MAEAP Program, a voluntary program that helps farms of all sizes to voluntarily minimize agricultural pollution risks, through the Farmstead System, Cropping System, Livestock System, and Forest/Wetlands/Habitat System.	X		X	X				X	
Natural Resource Conservation Service (NRCS), has a number of programs to improve water quality and reduce soil erosion from cultivated lands. NRCS has a Tribal specific program, the Conservation Stewardship Program, Environmental Quality Incentives Program, and the Wetland Reserve Enhancement Program. NRCS also funds the RCPP program which brings additional resources in the St. Joseph River Basin.	X	X	X					X	

Farm Service Agency, Conservation Reserve Program and Farmable Wetlands Program encourage landowners to convert erodible cropland into buffer strips and plantings to reduce erosion and runoff.	X	X	X						
Michigan Department of Transportation administers a Soil Erosion & Sediment Control Program that includes environmental stewardship and training for staff. NHBP has coordinated with MDOT on culturally relevant riparian plantings which reduce NPS pollution.						X			X
Calhoun County Road Department, collaborate on bridge construction to incorporate water quality into design.						X			X
USEPA Tribal Programs, Section 106 and 319 of the CWA, which provide funding for water protection for on and around Tribal Lands, and the PPG Program which provides and support and capacity for Tribal Environmental Protections.	X	X	X	X	X	X	X	X	X
Potawatomi Resource Conservation & Development Council, primary project partner on BMP projects, can provide technical assistance on filter strip design, and minor financial assistance.	X		X					X	
Inter-Tribal Council, a consortium of Michigan Tribes. Currently assisting NHBP with a Source Water Protection Plan, also offer assistance in wetlands and water quality areas.		X	X						
USEPA Wetland Program Plan, support for the development of Tribal Plans. Wetland protection is crucial in the prevention of NPS pollution.			X						
Michigan/Indiana St. Joseph River Watershed RCPP Partnership. Promotes coordination with NRCS partners to delivers conservation, targeted $6.8 M federal funding to decrease sediment and increase infiltration.	X		X						
Bureau of Indian Affairs, Division of Forestry and Wildland Fire Management, assistance and guidance on forestry plan preparation, fuels management.								X	
Village of Athens Wellhead Protection, education on groundwater protection, educational materials, potential project partner		X							X

Table 14. Programs Related to Non-Point Source Pollution in the Watershed

9.2. Available NPS Programs Summary

As seen in the previous table, there are a number of programs in the watershed that can assist in implementing BMPs for Non-Point Source pollution. Some are related to NHBP government departments such as planning and housing, which can leverage grant funding resources in related projects, and are the point of contact for any construction projects on Tribal Land. The NRCS through the USDA has a number of programs that can be utilized, and the local conservation districts can help landowners find the right program, and also assist in providing MAEAP certifications. Other agencies such as the US Army Corps of Engineers have Tribal specific programs available in tributaries of the Great Lakes, and the Bureau of Indian Affairs has several initiatives that could also contribute to NPS efforts.

The Nottawaseppi Huron Band of the Potawatomi Environmental Department is working with USEPA Region 5 to establish an NPS management Program to improve water quality in the Pine and Nottawa Creek Watersheds. Support of the 319 program with implement this plan documented in the accompanying 319 Assessment and Management Plans. NHBP will be better able to organize these various efforts to meet program goals once the program is enacted through grant funding.

10.CONCLUSIONS

This 319 Non-Point Source Assessment Plan has provided a comprehensive overview of the conditions, geography, and water quality of the Pine and Lower Nottawa Creek Watersheds. These watersheds have a direct nexus to the Nottawaseppi Huron Band of the Potawatomi Pine Creek Reservation, established in 1840, and cultural riparian resources such as the state threatened wild river rice which occurs in the area.

A multitude of non-point source pollution issues affect these waters which flow through Tribal Lands, covered in Sections 6 & 7, and these impacts are resulting in impaired water temperatures, lowered dissolved oxygen, sedimentation, and increased levels of E. *coli* and nutrients. The following information presented in Table 15 provides a summary of the overall resource concerns and potential recommendations that could mitigate some of these impairments.

Watershed	Key Finding	Recommendations
Pine Creek Mainstem	During the summer months mainstem temperature and Dissolved Oxygen are not meeting goals. E. *coli* and total nutrients have also demonstrated exceedances.	BMPs focused on providing stable vegetation and riparian shading on agricultural land. Practices that improve water infiltration such as wetlands may increase groundwater flows through hot and dry summer months. Review of hydrologic alterations and possibilities to restore historic functions. Examine any impacts from Tribal developments. Install continuous water monitoring station on Pine Creek to get longer term picture of physical/chemical parameters. Continue targeted sampling of 5 sites in Pine Creek Watershed. Increased regular sampling for E. *coli,* total nitrogen, and total phosphorus
Snyder Creek Sub-Watershed	Elevated turbidity spikes during storm events, high levels of E. *coli* and nutrients.	Agriculture and Livestock BMPs, particularly on sediment and manure management. Continued sampling at targeted sites, increased sampling for E. *coli* and nutrients, and expanded number of sampling sites better determine potential sources.
Nottawa Creek	During the summer months the mainstem temperature and Dissolved Oxygen are not meeting goals. E. *coli* and total nutrients need further investigation.	BMPs focused on providing stable vegetation and riparian shading on agricultural land. Practices that improve water infiltration such as wetlands may increase groundwater flows through hot and dry summer months. Review of hydrologic alterations and possibilities to restore historic functions. Install continuous water monitoring station on Nottawa Creek to get longer term picture of physical/chemical parameters and information on changes in streamflows. Continue targeted sampling of 3 sites on the mainstem. Increased regular sampling for E. *coli,* total nitrogen, and total phosphorus.

Table 15. NPS Assessment Key Findings and Recommendations

The previous Key Findings Table, organized by watershed, summarizes the information collected throughout this Assessment. The most consistent water quality problems areas are with high water temperatures and low dissolved oxygen levels during summer months, spikes in turbidity in smaller tributaries, and levels that exceeded normal ranges for pathogens and nutrients. As also identified in the St. Joseph River Management Plan, the Nottawa Creek Watershed Project, and the Portage River Watershed Plan, a lack of vegetation and destabilized streambanks are a major contributor of these pollutants in the Pine/Nottawa Watersheds, and the large St. Joseph River Basin. Additionally livestock operations and field manure application are likely contributing to the increased pathogen/nutrient content of surface waters. Another key area of focus is the restoration of wetlands and historic hydrologic functions. The St. Joseph Watershed is one of the most highly cultivated areas in the Lake Michigan Basin, with 58% of land use in agriculture (Wesley & Duffy, 1999). Poorly vegetated streams on Tribal lands may also be adding to the amount of sediment entering these waterways during storm events. Priority will be given to implementing BMP on and near NHBP properties, and additional priority areas will be identified upstream and in the Nottawa Creek Watershed. The Snyder Creek Drain Watershed empties into the Pine Creek on Tribal Land and will be a particular area of focus with a manageable 3000 acre drainage.

Section 8 of this plan shows the large number of governments, agencies, and organization that NHBP is currently collaborating on to work in the target watersheds. Environmental Staff sit on the boards of several organizations and committees, and regular attend meetings related to regional water quality. Other Tribal Committees and Departments have already and will continue to be engaged to support the project and communicate its objective to Tribal Membership. Public comment will be made available on both the Assessment and Management Plans, and will be discussed in more detail in the latter plan to follow. NHBP has been conducting water quality sampling from 2011-2016, and also has data from a previous collaboration with the USGS to develop the basis for this assessment. Selection of BMPs was conducted primarily through existing Watershed Plans for the St. Joseph and similar streams adjacent to the project area. Additional input will be considered from project partners and the public before the final document is issued.

The Nottawaseppi Huron Band is working to meet all of the eligibility requirements for Section 319 funding through the USEPA. These are as follows:

1. Be a federally recognized Tribe
    a. NHBP is federally recognized
2. Compile an approved CWA section 319(a) NPS Assessment Report
    a. USEPA Region 5 approval of this document fulfills this requirement
3. Complete an approved CWA section 319(b) NPS Management Plan
    a. Development of a NPS Management Plan began in 2016
4. Be CWA section 518€ approved for Treatment As State (TAS)
    a. NHBP has received TAS for the CWA 106 program and has updated the requirements for this approval in 2017

11.REFERENCES

Albert, D. A. (1994). *Regional Landscape Ecosystems of Michigan, Minnesota, and Wisconsin: A Working Map and Classification (Fourth Rev. July 1994).* Michigan Natural Features Inventory.

CCD. (1998). *Nottawa Creek Watershed Project, Calhoun Conservation District.*

CCD. (2016). *Little Portage Creek Watershed Management Plan #2012-0017, Calhoun Conservation District, Prepared for MDEQ.*

CCD. (2016). *Portage River Watershed Management Plan #2012-0017, Prepared by the Calhoun Conservation District, Prepared for: MDEQ.*

Degraves, A. (2005). *St. Joseph River Watershed Management Plan.*

FotSJR. (2016, 5 10). *Wetland Partnership Project*. Retrieved from Project Developments: http://www.fotsjr.org/WetlandPartnership

Kal County. (2009). *Kalamazoo County, Healh & Community Services, Surface Water Monitoring Program Annual Report 2007 - 2008.*

Kalamazoo River Watershed Council. (2011). *Kalamazoo River Watershed Management Plan, Revised Draft 6 January 2011.*

MDEQ . (2012). *Total Maximum Daily Load for E. coli in Little Portage Creek, Michigan Department of Environmental Quality.*

MDEQ. (2006). *Michigan Department of Environmental Quality, Water Bureau, Part 4. Water Quality Standards.*

MDEQ. (2011). *A Biological Survey of Sites in the Upper St. Joseph River Watershed, Branch, Calhoun Cass, Hillsdale, Kalamazoo, and St. Joseph Counties, Michigan, August and September 2010, MDEQ Water Resources Division.*

MDEQ. (2014). *Status and Trends of Michigan's Wetlands: Pre-European Settlement to 2005. Chad Fizzel.*

MDEQ Water Resources Division. (2011). *A Biological Survey of Sites in the Upper St. Joseph River Watershed, Branch, Calhoun Cass, Hillsdale, Kalamazoo, and St. Joseph Counties, Michigan, August and September 2010.*

MDEQ/CCD. (2001). *Michigan Department of Environmental Quality & Calhoun Conservation District. Nottawa Creek Athens Bank Stabilization Projet.*

MDEQ/CCD. (2006). *Michigan Department of Environmental Quality & Calhoun Conservation District. Nottawa Creek BMP Implementation Project.*

MDNR, B. Gunderman . (2013). *Michigan Department of Natural Resources. Nottawa Creek Status of the Fishery Report, 2012.*

Michigan Department of Environmental Quality Water Bureau. (2005). *Michigan Water Quality Monitoring Strategy Update.*

NHBP. (2014). *NIBI - Water Quality Assessment Report 2011-2013 FINAL. Nottawaseppi Huron Band of the Potawatomi Environmental Department.*

NHBP. (2014a). *Water Monitoring Strategy, Nottawaseppi Huron Band of the Potawatomi Environmental Department.*

NRCS. (2007). *National Resources Conservation Service. Part 630 Hydrology National Engineering Handbook.* US Department of Agriculture.

Ohio EPA. (1999). *Ohio Environmental Protection Agency, Association Between Nutrients, Habitat, and the Aquatic Bioata in Ohio Rivers and Streams.*

Potawatomi RC&D Council. (2011). *St. Joseph River Watershed Fish Migration Barrier Inventory.*

Prein & Newhof. (2010). *Groundwater Resource Evaluation, Nottawaseppi Huron Band of the Potawatomi Indians - Pine Creek Reservation.*

Saginaw Chippewa. (2013). *Nonpoint Source Assessment Report for the Saginaw Chippewa Indian Tribe of Michigan.*

U.S. Environmental Protection Agency. (1997). *Volunteer Stream Monitoring: A Methods Manual.*

U.S. Environmental Protection Agency. (2006). *Final Guidance on Awads of Grants to Indian Tribes under Section 106 of the Clean Water Act.*

USACE. (2012). *Regional Supplement to the Corps of Engineers Wetland Delination Manual: Northcentral and Northeast Region (Ver 2.0), U.S. Army Corps of Engineers.*

USEPA. (1988). *Turbidity, Water Quality Standards Criteria Summaries: A Compilation of State/Federal Criteria.*

USEPA. (2000). *US Environmental Protection Agency, Ambient Water Quality Criteria Recommendations, Rivers and Streams in Nutrient Ecoregion VII.*

USEPA. (2007). *U.S. Environmental Protection Agency. Ecoregions of Michigan.* Retrieved from ftp://ftp.epa.gov/wed/ecoregions/mi/MI_DRAFT_Desc-Issues12-27-07.pdf

USEPA. (2010). *US Environmental Protection Agency, Handbook for Developing and Managing Tribal Nonpoint Source Pollution Programs Under Section 319 of the Clean Water Act. Office of Water.*

USEPA. (2016, March). *US Environmental Protection Agency.* Retrieved from Monitoring and Assessing Water Quality - Volunteer Monitoring: http://water.epa.gov/type/rsl/monitoring/vms59.cfm

USGS. (2004). *United States Geological Survey. Water Resources on and near the Nottawaseppi Huron Band of Potawatomi Indian Tribal Lands, Calhoun County, Michigan, 2000-03.*

Walterhouse, M. (2007). *A biological survey of sites in the upper St. Joseph River watershed: Branch, Calhoun, Cass, Hillsdale, Kalamazoo, and St. Joseph counties, Michigan, August and September 2005. Michigan Department of Environmental Quality, Water Bureau, Staff Report 07/04.*

Wesley, J., & Duffy, J. (1999). *St. Joseph River Assessment, Fisheries Division Special Report.*

WMU. (1981). *Western Michigan University. Hydrogeologic Atlas of Michigan.* Department of Geology.

Zbiciak, R. P. (2015, 7 8). *Wetlands in the St. Joseph River Watershed, MDEQ*. Retrieved from http://www.fotsjr.org/Resources/Documents/SJRW_Presentation_Zbiciak_3-15-10.pdf

12.APPENDICIES

12.1. APPENDIX 1 - NHBP Land Use Classification Guidelines Amended

The intent of providing land use classification guidelines is to provide general characteristics of an area of Tribal land. These guidelines can be utilized to assist the Planning and Land Use Advisory Committee as well as the Tribal Council in making informed decisions regarding land use matters. This is not intended to serve as zoning ordinances but instead to serve as general guidelines.

Agricultural

The purpose of the Agricultural classification is to establish and preserve land for the production of crops, livestock, or agricultural products. The intent of this classification is to restrict residential, commercial, government/community service, recreation, and other development activities on land suited for agriculture, and to preserve the open space character of farmland and rural lifestyles associated with agriculture, and to discourage land use activities which conflict with agricultural production. Facilities and accessory structures that support agricultural activities are permitted.

Church/Cemetery

The purpose of the Church classification is to provide land for conducting religious and spiritual activities. Cemetery classification is provided for the burial of human remains, cultural items, funerary, sacred objects, or other repatriation activities.

Commercial

Commercial designation allows land to be used for small and medium sized businesses such as, but not limited to: wholesale and retail outlets, dealerships, professional services, food and entertainment, commercial storage and warehouse units, hotel/motel complexes and some forms of small and light manufacturing where there is no significant pollution discharge to earth, air or water. A commercial designation is established in which the principal use of the land is for various types of commercial activities which provide the outlets for commodities, personal services, professional services and other business uses related to the needs of the particular section of the community in which it is located.

Cultural

The purpose of the Cultural classification is to provide land to preserve, protect, and exercise cultural practices that are valued by the Tribe.

Government/Community Service

The purpose of the Government/Community Service classification is to provide land for Tribal government services. These services are determined by Tribal Council as necessary infrastructure for providing programs and services to the Tribal membership. Examples include, but are not limited to: community buildings, public utility buildings, educational facilities, healthcare facilities, long-term care facilities, and judicial facilities.

Open Space

The purpose of Open Space classification is to retain or conserve the open natural character of the landscape and protect the natural biophysical processes of these areas.

Recreation
The purpose of the Recreation classification is to provide land for outdoor enjoyment of the environment including, but not limited to: baseball field, soccer field, tennis court, basketball court, and volleyball court. Facilities and accessory structures that support recreation activities are permitted

Residential
The purpose of the Residential classification is to provide land for single family dwelling units. These units can either be detached or duplex units.

Right of Way
The purpose of the Right of Way classification is to provide a pathway for facilities such as: roadway, electric utilities, gas line, etc.

Sensitive Land
Sensitive Land classification is not a land use classification independent of the other classifications but instead, an overlay of multiple areas within the entire land use plan. Sensitive lands are identified due to their unique characteristics, complex nature, or high importance and value to the Tribe. These lands may be any shape or size and may be located throughout the Reservation. Measures shall be taken to protect, preserve, and clearly identify these critical areas when performing any activities within any land use classification. Development is not necessarily prohibited within these areas however, if development activity is conducted, special measures may need to be implemented to address unique site conditions