

Miccosukee Tribe of Indians of Florida



Nonpoint Source Pollution Management Program Plan

Prepared by

Julian Douglas
Department of Water Resources
2017

CONTENTS

1.0	Overview - - - - -	p. 2
2.0	Introduction - - - - -	p. 13
3.0	Management Program Summary - - - - -	p. 17
3.1	Applicable Policies - - - - -	p. 20
4.0	Nonpoint Source Pollution Management Program - - - - -	p. 22
4.1	Agricultural Runoff - - - - -	p. 22
4.2	Hydrologic Modifications - - - - -	p. 25
4.3	Urban Runoff - - - - -	p. 26
4.4	Petroleum Conveyance - - - - -	p. 27
4.5	Construction Activities - - - - -	p. 34
4.6	Waste Storage, Disposal, and Leaks - - - - -	p. 35
4.7	Off-Road Vehicle Activities - - - - -	p. 35
5.0	References - - - - -	p. 38
6.0	Appendices - - - - -	p. 39
7.0	Acronyms - - - - -	p. 55

1.0 OVERVIEW

The Miccosukee Tribe of Indians has a rich history, which is indelibly tied to the Everglades ecosystem. During the 1800s, the Tribal members who sought refuge in the Everglades had to adapt to their surroundings. Survival in this environment meant that Tribal members needed to form a deep understanding of the natural processes and the resources found in the Everglades. Equipped with this knowledge, the Miccosukee Tribe was able to rely on their environment to provide clean water, shelter, and nourishment for generations of Tribal members. Today, the cultural traditions and the prosperity of the Miccosukee Tribe remain connected to the health of the Everglades. In the 21st century, the environments located within Miccosukee lands face pollution problems caused by agricultural practices, urban development, and industrialism. Each of these activities generates pollutants that enter Tribal waterbodies through many diffuse sources. This type of pollution is known as nonpoint source (NPS) pollution, which may originate from areas within Tribal lands or from outside sources. NPS pollution typically occurs as a result of land surface runoff, when rainwater flows over and through the ground, absorbing and assimilating pollutants that are present across the landscape. These pollutants are transported into canals, streams, and wetlands on Tribal lands, which then flow downstream into Federal lands, including Everglades National Park (ENP), Big Cypress National Preserve, Biscayne National Park and the Florida Keys National Marine Sanctuary. Pollutants are transported to the Gulf of Mexico and the Atlantic Ocean, causing harm to estuaries and marine environments. NPS pollution presents a series of challenges for the Tribe, which must be addressed through collaborative management efforts between the Tribe and other governmental agencies.

The purpose of this document is to describe NPS pollution occurring within the Tribal lands of the Miccosukee Tribe of Indians of Florida, and to provide detailed management strategies for an NPS Management Program. This document presents a set of best management practices (BMPs) in order to restore impacted water bodies to optimal conditions that will promote the health, ecological needs, cultural preservation, and economic opportunities of the Miccosukee Tribe. The Tribe's Department of Water Resources studies NPS pollution and performs its existing management operations under the federal Clean Water Act (CWA), Section 106 grant program. The NPS Management Program will continue a long-standing commitment from the Miccosukee Tribe to address water pollution problems and restore optimal water quality for Tribal

waterbodies. The completion of an NPS assessment report and an NPS management plan are required to qualify for Section 319 grants, which provide funding for a wide variety of management activities that will assist the Miccosukee Tribe in addressing NPS pollution issues. The Department of Water Resources will seek to take advantage of Section 319 funding in the future in order to better address NPS pollution problems on Tribal lands. This document provides the initial framework for a long-term management program that can occur within the scope of the aforementioned grant opportunities. This document is *not* to be considered a 303(d) Listing of Impaired waters, nor does the Tribe have a 303(d) List that would require actions from the EPA or other state or federal agencies in regard to water pollution issues. The NPS pollution problems discussed in this document are presented in order to direct the management actions by Tribal authorities (i.e., Department of Water Resources) to the locations that have been adversely affected by polluted surface runoff in Tribal lands and waterbodies.

Protection and conservation of the Tribe's natural resources is essential in order to assure the continuation of all the existing uses and designated uses on Tribal lands. For example, the management practices that promote clean water quality in the Tribe's lands will enhance the habitat such that healthy fish populations can thrive, and tribal members may continue the practice of subsistence fishing. Some of the existing and designated uses for Tribal water bodies include the subsistence activities such as hunting, fishing, frogging, traditional agriculture, propagation of native fish, wildlife, and plant life, as well as recreational activities such as airboating and enjoyment of the natural ecosystem. Successful NPS management will promote the favorable environmental conditions to achieve the existing and designated uses in Tribal waterbodies. The complete list of existing and designated uses for Tribal waterbodies is included in the Miccosukee Tribe's Water Quality Standards, adopted in 1997 (See Appendix II). The Tribe's continuation of these uses is dependent upon the quality of the surface water.

The NPS management program area includes two primary areas. The first is the Miccosukee Tribe's Federal Indian Reservation, lands held in trust by the federal government. The second is comprised of the lands provided to the Tribe under a perpetual lease from the State of Florida, known as the "Leased Lands", located in Water Conservation Area (WCA)-3A (See Figure 1). This area was leased to the Tribe in perpetuity in 1982 to be kept in its natural condition and to

protect the native flora and fauna for the benefit of the Tribe's cultural rights. The settlement agreement with the state confirms that the area leased to the Miccosukee Tribe, "shall qualify as if it were an Indian reservation", for specific purposes. For example, the settlement agreement states that, "members of the Miccosukee Tribe shall have the right in such Leased Area and such reservation to hunt and fish for subsistence purposes". The management of water quality is essential in order to maintain such activities and uses in the Leased Lands. Therefore, the NPS Pollution Management Program is consistent with the settlement agreement with the State of Florida.

The combined land holdings of the Miccosukee tribe will be referenced in this document as "Tribal lands," and the waterbodies and wetlands contained in those areas will be referred to as "Tribal waterbodies." The total land holdings of the Miccosukee Tribe cover a large area, comprised of several separate parcels of wetlands and upland areas. The sum total of these areas is 270,818 acres (over 400 square miles). The majority of this land area consists of the Leased Lands in WCA-3A (189,158 acres), and the Alligator Alley Reservation (75,000 acres). A comprehensive list of Tribal lands were identified and described in the Miccosukee Tribe's NPS Pollution Assessment Report. The Miccosukee Tribe owns several smaller parcels of land across the state of Florida, which are located more distantly from the Everglades ecosystem. While the NPS Assessment Report did not identify existing pollution problems in these areas, it is possible that pollution concerns may arise in the future. The NPS Pollution Management Program is designed to identify pollution problems as they occur and to respond to these issues through the use of BMPs on a case by case basis.

The Everglades is a vast network of ecosystems, occupying an area that is thousands of square miles in size. The natural sheet flow of water that once hydrated the areas of the Everglades has been significantly altered by engineering projects. Over the past century, the natural surface water flow in Florida was replaced by a system of canals and other water management infrastructure. Historically, the natural flow of water began in the Kissimmee River, which discharged into Lake Okeechobee. Today, the waters of the Kissimmee still enter the Lake, however major portions of the river have since been straightened and channelized. Large areas with cattle concentrated cattle grazing caused an increased flow of nutrients into Lake

Okeechobee. Instead of traveling along a natural sheet flow, the water from Lake Okeechobee flows through canals to the south, first through the Everglades Agricultural Area (EAA), then to the WCA, continuing south to ENP, and finally out to Florida Bay, the Florida Keys National Marine Sanctuary, and the Atlantic Ocean. The current layout of the Everglades is a collection of compartmentalized areas that act as reservoirs. These seven areas are the result of several large-scale engineering projects designed to control and divert the natural flow of water through a series of canals and gated control structures. The seven areas are: the EAA; the C-139 basin, Big Cypress National Preserve, and the areas that comprise the Everglades Protection area (WCA-1; WCA-2; WCA-3; and ENP).

The WCAs were created to benefit the areas of central and south Florida in several key ways: providing flood protection for urban areas, storing water for dry periods, recharging groundwater supplies, providing habitat for plant and plant and animal communities, providing natural areas for recreational activities, and delivering water to Everglades National Park and other natural systems. It is important to note that the variety of objectives for the WCAs cannot all be satisfied in a given set of environmental conditions or water levels. Several of these objectives are incompatible with one another, for example the success of WCAs to meet flood control and water storage objectives can impede wildlife conservation efforts, recreational activities, or other uses such as hunting. The dynamic hydrology of the WCAs forces all managers to weigh the benefits and drawbacks of different management measures, such that some objectives attain priority over others. For example, during extended periods of high water levels, managers may choose to prioritize flood control measures at the expense of wildlife conservation activities.

The majority of Miccosukee Tribal land exists within the Leased Lands of WCA-3A, thus the flow of surface water and the pollution transported along with the path of the water flow travels through the Tribe's lands prior to entering federal lands, including ENP. The hydrologic system in Florida connects Tribal lands to a much larger area, which complicates Tribal NPS pollution management. The Tribe recognizes one significant limitation in its pollution-managing abilities: the NPS pollution management program can not address the non-Tribal sources of pollutants entering Tribal waterbodies from upstream. However, the management practices enacted to benefit Tribal lands will confer direct benefits to the ecosystems downstream within federal

lands. The interconnected system of water resources provides an opportunity for partnership between the Miccosukee Tribe and Federal and State agencies to work towards mutually beneficial goals for restoring water quality across the Everglades. The efforts to manage and reduce NPS pollution on Tribal lands will benefit the Miccosukee Tribe, and will also enhance the environments downstream from Tribal lands.

The Miccosukee Water Resources Department has provided notice and an opportunity for public comment regarding the NPS Pollution Management Program Plan. A public comment period for the Management Plan was provided to interested stakeholders and took place between the dates of November 30, 2017 and December 30, 2017. Public notices were delivered to the homes of all Tribal members living in the Miccosukee Reserved Area (MRA) and a copy of the notice was posted in the Miccosukee Tribe's administration building. The notice was also extended to the general public, published in the Daily Business Review, in order for interested stakeholders in the area to review the Management Plan and provide comment. The comments were reviewed by staff of the Water Resources Department and are reflected in the final draft of the Management Plan.

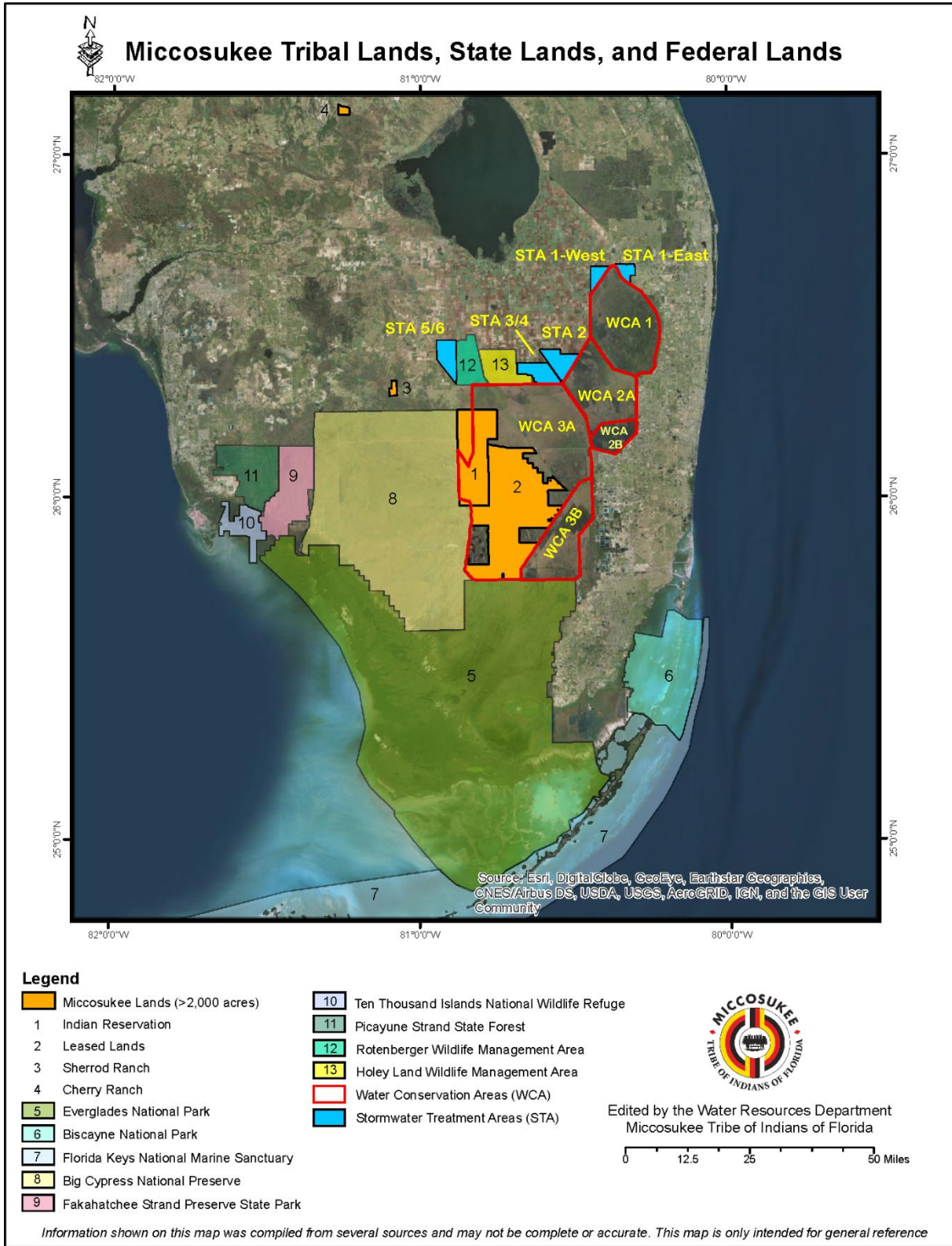


Figure 1: Map of Tribal lands, State lands, and Federal lands

Significant water quality problems were previously identified in the Miccosukee Tribe's 2016 NPS Assessment Report (See Appendix III). Several water bodies within Miccosukee Tribal Lands were determined to be adversely affected by NPS pollution, to the extent that the Miccosukee Tribe's Water Quality Standards were violated. The Miccosukee Tribe's Water Quality Standards take into consideration the water quality standards of federal lands downstream and provide for the attainment and maintenance of these standards for downstream waters, primarily Everglades National Park. The polluted conditions in the areas mentioned in the Assessment Report provide the basis for management actions by Tribal authorities. The goal of management actions will be to prevent future NPS pollution and mitigate the existing harm to impacted water bodies. The NPS Management plan is intended to address the NPS pollution concerns identified in the 2016 NPS Assessment Report. The Management Plan complements the Assessment Report by identifying and recommending BMPs, pollution prevention strategies, and outreach activities to educate tribal members about NPS pollution management measures. The Management Plan asserts the authority of the Miccosukee Tribe to implement the NPS Pollution Prevention Program and it provides a framework for the implementation of the proposed program. Tribal authority has been certified through the full approval for treatment in a similar manner as a state (TAS) in accordance with CWA section 518e.

The NPS Assessment Report defined seven classes of NPS pollution that impact Miccosukee Tribal lands: agricultural runoff, hydrologic modifications, urban runoff, petroleum conveyance issues, construction activities, waste leaks, and off-road vehicle impacts. The most detrimental NPS problems to be addressed are caused by agricultural runoff, urban storm water runoff, and hydrologic modifications. In many locations on Tribal lands, multiple NPS pollution sources impact the water bodies and wetlands, e.g. the Alligator Alley Reservation, the MRA, and the Miccosukee Leased Lands in WCA-3A. Each of these areas is influenced by several categories of NPS pollution, which creates additional challenges from a management standpoint.

There are several indicators used by the Miccosukee Tribe to assess water quality in Tribal waterbodies: nutrient concentrations, dissolved oxygen availability, turbidity, and pH. Quantitative measurements were compiled for these water quality indicators and were included in the findings of the NPS Assessment Report. Field observations for nuisance vegetation

conditions were also recorded by the staff of the Miccosukee Water Resources Department to supplement the water quality measurements. These observations were compared to aerial photography to determine the presence or absence of nuisance vegetation conditions, which can reveal areas, which have undergone eutrophication or hydrologic modifications. The Miccosukee Tribe established a set of Water Quality Standards, adopted in 1997 by the Miccosukee Business Council, and approved in 1999 by the U.S. Environmental Protection Agency (EPA). A summary of the relevant Water Quality Standards is included in Appendix I. A summary of the results of the NPS Assessment report is included in the proceeding section, with further detail provided in Appendix III. It was determined in the NPS Assessment report that several Tribal water bodies were found to be in violation of the Tribe's water quality standards.

Results of the Nonpoint Source Pollution Assessment Report

In a continuing effort to study and monitor water quality in Miccosukee Tribal lands, data is collected monthly at 31 sampling sites across the Federal Reservation and WCA-3A. The Tribe conducts two yearly, comprehensive studies during the spring and fall to collect water quality data and characterize the water bodies throughout the Tribe's lands. In 2016 a total of 79 sites were sampled during the Fall Everglades Study and 16 additional sites were sampled during the 2017 Spring Everglades Study. While the yearly studies are essential for documentation and characterization of pollution across Tribal lands, they do not reveal the seasonal changes in water quality as shown by the monthly water quality monitoring sites. The following information is a summary of the results from water quality sampling, originally documented in the Miccosukee Tribe's NPS Assessment Report.

Increased nutrients levels (including total phosphorus) constitute one of the most severe water quality problems impacting Tribal lands and the Everglades in general. Elevated concentrations of total phosphorus lead to eutrophication, which causes detrimental impacts to the environment such as decreased species diversity, changes in the dominant biota, increased turbidity, and increased sedimentation. The unnatural enrichment from nutrients causes increased growth of algae and the formation of dense mats of floating, aquatic plants such as water hyacinth (*Eichhornia crassipes*). As the plant material dies and decomposes due to bacterial and fungal activity, oxygen is consumed and the nutrients are released back into the water. During this

process, eutrophication leads to the development of anoxic conditions that deprive fish and aquatic invertebrates of oxygen, causing mortalities. Additionally, these conditions cause the formation of gases, which can be unpleasant or injurious to humans. Blue-green algae are also known to produce toxins harmful to humans, and potentially deadly to livestock and wildlife. The Miccosukee Tribe's policy is to limit the introduction of nutrients from anthropogenic sources into Tribal waters.

Nutrient impacts on Tribal lands have been evaluated with respect to total phosphorus (TP) concentrations. The Miccosukee Tribe's Water Quality Standards include numeric criteria for TP, such that concentrations do not exceed 10 ppb. Surface waters in Miccosukee Tribal areas are categorized as either Class III-A waters or Class III-B waters, with a combination of numerical and narrative criteria assigned to each class. The 10 ppb TP criterion applies to Class III-A waters, which include: North Grass, South Grass, Gap, L-28 Interceptor Canal, and surface waters of the Miccosukee Reserved Area, Tamiami Trail Reservation, Krome Avenue Reservation, and Dade Corners Reservation. The 10 ppb TP criterion does not apply to Class III-B waters. For these areas, TP and other water quality metrics are routinely tested and monitored for environmental impacts such as the presence of nuisance vegetation. The management efforts included in the NPS Pollution Management Plan, such as BMPs are expected to reduce TP levels in Tribal water bodies. It should be noted, however that pollution sources occur upstream of Tribal waterbodies, in non-tribal lands. Therefore, the success of the Miccosukee Tribe's NPS Management Program will rely on cooperative efforts with state and federal agencies to reduce nutrient input from non-tribal sources located upstream from Tribal waterbodies.

The Miccosukee Tribe's NPS Assessment report identified priority areas, where repeated water samples had shown elevated nutrient concentrations. Some of the highest nutrient concentrations were found in waterbodies within the cattle pastures in the Rectangle and at Cherry Ranch, which are categorized as Class III-B waters. Although the numerical criterion for TP of 10 ppb does not apply to these areas, if this standard were to apply, the Tribal waterbodies in the cattle pastures would be in violation of that standard. For this reason, the reduction of TP concentrations in the cattle pastures is a priority for MEPA. The Miccosukee Tribe will implement BMPs in order to reduce TP concentrations to satisfactory levels. The Rectangle and

Cherry Ranch were designated as priority areas in the NPS assessment Report, so that BMPs can be implemented to improve overall water quality.

Dissolved oxygen, the measurement of gaseous oxygen in water, has a significant effect on water quality. Dissolved oxygen influences many different biological and chemical processes in the Everglades, with direct impacts to fish and invertebrates. A dissolved oxygen concentration below 5.0 mg/L causes stress to the environment, such that aquatic organisms lack oxygen for aerobic respiration. Dissolved oxygen was determined to be lower than the minimum allowable concentration of 5.0 mg/L in certain sample sites of many Tribal waterbodies. A number of areas within the Federal Reservation had dissolved oxygen concentrations below 5.0 mg/L. The North Grass, South Grass and Old Tamiami Trail Canal each had more than 50% of the sampling sites below this value. Additionally, each of the following areas had at least one sampling site in which did not meet the dissolved oxygen Water Quality Standard: L-28 Canal, C-60 Canal, Gap, Rectangle, Cherry Ranch, and Sherrod Ranch. Although the numerical criterion for dissolved oxygen does not apply to each of these areas, if this standard were to apply, the Tribal waterbodies would be in violation of that standard.

Turbidity, a measurement of water clarity, greatly impacts biological processes in the Everglades. High concentrations of particulate matter affect light penetration, which has detrimental impacts on productivity, recreational uses, and habitat quality. Suspended particles also provide attachment sites for other pollutants such as metals and bacteria that exist in the water. For this reason, turbidity can be used as an indicator of various forms of pollution within a waterbody. Some factors influencing turbidity are the presence or absence of finely divided inorganic and organic matter, algae, dissolved organic matter, and microorganisms. For the majority of the sample sites, turbidity was determined to be of good quality as defined by the Tribe's Water Quality Standards. One notable exception occurred for several locations within the cattle pastures in the Rectangle and Cherry Ranch. In these areas the turbidity was recorded in excess of 29 NTU above background levels, such that the color and natural appearance of the water was significantly altered. This alteration of water clarity can cause an array of localized environmental impacts. The precise causes of elevated turbidity should be determined in order to design effective management measures. The elevated turbidity does not signify a violation of

Water Quality Standards, however reductions in turbidity remains among the Tribe's priorities for water quality improvements.

The pH plays an indirect but substantial role in water quality. The pH influences the solubility and biological availability of chemical constituents such as nutrients and heavy metals. For example, the pH controls how much phosphorus is in the water, and which form of phosphorus is most abundant. These two factors determine the amount of biologically available phosphorus for aquatic organisms and plants. In the case of heavy metals, the degree to which these pollutants are soluble in water determines their toxicity to nearby organisms. Metals tend to become more toxic in waters with a lower pH because they have a higher solubility. The pH of a water body is influenced by soils and rainfall as well as chemical pollution from anthropogenic sources.

Depending on the chemicals involved from NPS pollution, the pH of a waterbody may either be increased (resulting in increased alkalinity) or decreased (resulting in increased acidity). The chemicals that enter Tribal waterbodies may originate from agricultural runoff, wastewater discharge, or urban/industrial runoff. All of the sampling sites on Tribal lands were determined to be in compliance with acceptable pH levels outlined in the Tribe's Water Quality Standards. Only one site was determined to have significantly elevated pH. This sampling site, located in the cattle pastures at Cherry Ranch, maintained an average pH of 9.2 over the annual sampling period. Further investigation is necessary to determine the cause of the increased alkalinity in this localized area.

Nuisance vegetation conditions are a readily observable indication of the detrimental impacts of NPS pollution to water quality. Unlike the rest of the water quality indicators described above, this water quality criterion has been assessed qualitatively by the Miccosukee Department of Water Resources. At each sample site, nuisance vegetation conditions were noted as either present or absent. The presence of nuisance vegetation conditions could indicate the proliferation of exotic invasive plant species, or the dominance of a particular type of native aquatic plant with known tendencies to exploit high nutrient conditions, e.g. cattails (*Typha spp.*) and willows (*Salix spp.*). While the NPS Assessment Report made no quantitative estimate for the extent of nuisance vegetation conditions, these conditions could be estimated through the use of satellite imagery and GIS software. These conditions, monitored over time could highlight changes and

trends in Tribal waterbodies as a visual indication of management success. Nuisance conditions were present in most of the water bodies on Tribal lands including the North Grass, South Grass, Gap, Rectangle, and the Old Tamiami Trail Canal. Tribal waterbodies experiencing nuisance conditions in these areas have sustained objectionable concentrations of invasive vegetation and display stimulated growth of cattail, willow, and various aquatic plant species.

2.0 INTRODUCTION

The NPS management program establishes a framework for addressing NPS pollution of water bodies within Miccosukee Tribal lands and the Leased Lands in WCA 3-A. The goal of the NPS management program is to design and implement a series of management practices in order to address a variety of NPS pollution problems. Management practices will target strategic areas that have experienced more severe impacts from NPS pollution. A group of NPS problem areas have been identified in the preceding NPS assessment report, prepared by the Miccosukee Tribe. Several water quality metrics were used to assess NPS problem areas, including total phosphorus, dissolved oxygen, turbidity, pH, and nuisance vegetation conditions. These metrics were tested monthly at a total of 31 sampling sites throughout the Miccosukee Indian Reservation and the Leased Lands in WCA-3A. The data collected for these metrics was evaluated for compliance with existing Water Quality Standards, in the specific waterbodies where they apply. Water bodies were categorized in the NPS assessment report based on the proportion of sampling sites that were determined to meet Water Quality Standards (See Appendix I). The waterbodies were categorized by one of the following three labels: 1) having fewer than 50% of sampling sites that met Water Quality Standards (signifying major impacts from NPS pollution); 2) having more than 50% of sampling sites that met Water Quality Standards (signifying moderate impacted from NPS pollution); or 3) having 100% of sampling sites that met Water Quality Standards (minimally impacted by NPS pollution). In order to achieve the highest proportion of Tribal waterbodies that meet Water Quality Standards, a series of objectives must be met such that the five water quality metrics are managed properly for all of the identified NPS problem areas.

In order to identify NPS problem areas and management priority areas within Tribal lands, the Miccosukee Water Resources Department has studied several important aspects of water quality,

which are a part of ongoing monitoring and assessment projects. Water quality data was collected from monthly grab samples for the five metrics described in section 1. Every sample site was evaluated in each waterbody within Miccosukee Tribal lands so that an overall determination of water quality could be made for each waterbody as a whole. The waterbodies determined to be the most impacted by NPS pollution are the L-28 Interceptor Canal, L-28 Canal, C-60 Canal, cattle pastures within the Rectangle area, the South Grass wetlands, and the Old Tamiami Trail Canal. Several of these areas (the cattle pastures, L-28 Canals, and Old Tamiami Trail Canal) were identified as BMP implementation priority areas in the Nonpoint Source Assessment Report. Each of these areas were selected for specific reasons due to the extent of NPS pollution, and the potential benefits gained from the implementation of BMPs and other management measures. An explanation of the priority area designations is provided below.

The Old Tamiami Trail Canal runs directly adjacent to the MRA, which receives runoff from the Tribal housing area, administrative buildings, and roadways. The NPS pollution impacting this waterbody has implications for the health and wellbeing of Tribal members, who draw drinking water from nearby wells, and may use the canal for fishing and frogging. Due to the close proximity of the Old Tamiami Trail Canal to the Tribal housing areas, it is essential to understand the extent of NPS pollution in this area. There have been no numeric Water Quality Standards developed for the Old Tamiami Trail Canal. However, if the Tribe's Water Quality Standards for total phosphorus, dissolved oxygen, and nuisance vegetation conditions were to apply to this waterbody, over 50% of the sites that were sampled would have been in violation of those Standards.

The cattle pastures in the Rectangle were determined to be an NPS problem area due to the results of water quality sampling that showed more than 50% of sampling sites that did not meet Water Quality Standards for total phosphorus and nuisance vegetation conditions. There were also several sites in the Rectangle that do not meet the Water Quality Standards for dissolved oxygen and turbidity. Through the implementation of BMPs in the cattle pastures, this area can be expected to display improved water quality, as will the L-28 canals, and important locations downstream, such as the South Grass area.

The pastures within the Rectangle area occupy 13,000 acres, which are leased from the Tribe to a second party for cattle grazing in cow-calf operations. Several ditches and canals located in the pastures have poor water quality with elevated nutrient levels, high turbidity, and decreased dissolved oxygen levels. The likely cause for water quality impacts is the ability for cattle access over 15 miles of drainage canals. Erosion has been extensive along the ditches and levees in the pastures because cattle routinely access these areas for drinking. Additionally, cattle commonly defecate directly into the waters of the canal, introducing high levels of nutrients as well as pathogens. As a result of these impacts, some of the waters in the Rectangle do not meet the Class III-B Water Quality Standards. Nuisance conditions are evident in the agricultural ditches i.e. growth of invasive aquatic vegetation. For these reasons, the Rectangle has been identified as an area of concern and a high priority area for the NPS pollution management plan. A complete set of range control stipulations has been prepared for the cattle pastures in the Rectangle area. These have been included in the lease agreement, which has been signed by the owners of Rocking G Ranch, whose lease of the property commenced in the Summer of 2017.

Waters of the L-28 canals are generally of poor quality and have elevated nutrient concentrations and low dissolved oxygen. Various agricultural ditches in the Cattle Pastures discharge into the adjacent L-28 canal, and the L-28 Interceptor canal is the recipient of large amounts of nutrients from non-tribal areas to the northwest that have intensive cattle grazing operations. The L-28 canal runs from north to south along the eastern border of the Rectangle area. The canal is separated from the pastures by a levee. The levee is degraded in some sections and results in overland flows from the Cattle Pasture agricultural ditches into the L-28 canal. Cattle have also been observed entering the L-28 canal, where the cattle are likely to increase nutrient loading through soil erosion and defecation directly into the waters. Additionally, surface water inputs to the L-28 Canal are conveyed by the L-2, L-3, L-4 canal and levee system which are all impacted by agricultural NPS pollution originating from areas outside of Tribal lands. Direct impacts of nutrient loading in the L-28 canals can be observed downstream in the South Grass area, where a large section of wetland over 13 km² is dominated by the overgrowth of cattails, and continues to increase in size. When nutrient levels are high, cattails exhibit aggressive growth, often outcompeting other native plant species. This cause and effect relationship serves as an example

that BMP implementation adjacent to the L-28 canals will confer water quality benefits not only in the canals, but also in downstream areas, such as the South Grass area.

BMP solutions were identified through a review of the literature, including peer-reviewed scientific journals and published reviews of the most commonly accepted practices for addressing NPS pollution problems. Since agricultural runoff was identified as a significant problem on Tribal lands, much of the research focused on identifying the BMPs that represent the most current and innovative methods available for reducing nutrient inputs to surface waters. Transport BMPs are designed to limit the introduction of nutrients and sediment into surface waters in canals adjacent to pasture land (primarily in the Rectangle and Cherry Ranch). A successful management program to reduce the transport of nutrients into the Tribe's water bodies will safeguard against eutrophication and water quality degradation. There are a series of tradeoffs associated with each BMP, i.e. no single management practice works best for all situations. The Department of Water Resources will determine the most effective use of each BMP as they can be prudently applied to priority areas.

The primary goal for cattle pasture BMPs is to maximize the ecological benefits while avoiding excessive upfront costs, maintenance costs, or disruptions to cow/calf operations. It may be beneficial to combine the use of several BMPs in order to achieve the best results for water quality, and to address specific goals of the Miccosukee Tribe. Some of the BMPs outlined in this document focus management efforts toward reducing the transport of nutrients (primarily total phosphorus) from pasture lands into water bodies via runoff (e.g. vegetated filter strips; artificial shade structures; salting). Other BMPs focus on reducing erosion along the waterways (e.g. streambank protection). Soil often contains high concentrations of nutrients. In fact, erosion can contribute larger quantities of nutrients into water bodies than the inputs contributed from cattle manure. Therefore, efforts that control soil erosion will help in reducing the amount of phosphorus that enters the canals. Management strategies that incorporate plans to reduce runoff as well as erosion will be most effective at limiting the transport of nutrients into water bodies of the Miccosukee Tribe. The discussion of BMPs also considers methods for invasive plant removal from Tribal lands. Invasive plant removal is pertinent to the Miccosukee Tribe because the dominance of invasive plants threatens the native plant and wildlife communities

traditionally located within Miccosukee Tribal lands. Each of the proposed BMPs is evaluated with respect to ecological benefits, functional drawbacks, and cost effectiveness.

A clear set of objectives are planned to reduce overall NPS pollution in Tribal waterbodies. (1) In order to reduce nutrient inputs from cattle ranches, a group of proposed BMPs are expected to result in the exclusion of cattle from canals in the Rectangle and Cherry Ranch. Several BMPs are identified to address this objective, which are presented in detail in Section 3 of this document. (2) The banks of levees along major canals are to be stabilized in order to reduce erosion. (3) Nuisance vegetation is to be targeted and removed from Tribal lands, especially invasive plant species. (4) A monitoring system is to be established in order to identify oil spills in key locations such as gas stations, and along the route of the oil pipeline. The findings from the monitoring system will focus on the collection and analysis of water samples in order to determine whether any actions are required to clean up spilled oil and repair infrastructure. (5) Education and outreach programs are to be developed by the Water Resources Department. These programs will address a series of important issues such as proper waste disposal, maintenance of septic systems, detecting waste leaks, and best operating procedures for off-road vehicles.

3.0 MANAGEMENT PROGRAM SUMMARY

The administering agency for the NPS Pollution Management Program is the Miccosukee Environmental Protection Agency (MEPA). MEPA was formed in 1999 when the Miccosukee Business Council adopted Resolution MBC-08-90. MEPA is comprised of three departments, Water Resources, Wildlife Services, and Real Estate, which cooperatively manage the Miccosukee Tribe's natural resources, protect Tribal lands, and develop new programs to promote sustainability and environmental health. MEPA is the administering agency for the NPS Management Program. Resolution MBC-08-09 also authorized the adoption of the Miccosukee Environmental Protection Code. Subtitle B of the Code outlines the Tribe's Water Quality Standards, which were introduced with several important purposes in mind: (1) to establish goals for specific water bodies of the Miccosukee Tribe's Federal Reservation; (2) to designate the uses for which the surface waters of the Miccosukee Tribe shall be protected; (3) to prescribe water quality criteria (narrative, numeric, biological and sediment) in order to sustain the existing

designated uses; (4) to assure that degradation of existing water quality does not occur; (5) to provide a legal basis for regulatory controls; (6) to provide for the protection of Tribal water quality for the benefit of threatened and endangered species listed by the U.S. Fish and Wildlife Service; (7) to promote the health, social welfare and economic well-being of the Miccosukee Tribe of Indians of Florida; (8) to provide a basis for CWA Section 401 certification.

In accordance with the Miccosukee Constitution, the governing body for the Miccosukee Tribe is the Miccosukee General Council (also known as the Business Council). The officers of the General Council consist of the Chairman, Assistant Chairman, Treasurer, Secretary, and Lawmaker. The Council oversees the activities and programs conducted by the MEPA, therefore the NPS pollution program plan requires final approval from the Council.

Funding for the NPS Pollution Management Program is provided through EPA grants as outlined in the CWA, for tribal environmental programs. The Miccosukee Tribe is a federally recognized tribe, and has been approved for treatment in a similar manner as a state (TAS) in accordance with CWA section 518e. The Miccosukee Tribe has an approved NPS assessment report in accordance with CWA section 319(a) and the Miccosukee Tribe will be eligible for Section 319 funding, pending the approval of this NPS Pollution Management Program Plan, in accordance with CWA section 319(b). Additional funding has previously been acquired through the CWA section 106 grant, which has assisted in the implementation of many of the Tribe's water quality improvement projects to date, including all of the work performed for the NPS Assessment Report and NPS Pollution management Program Plan.

The staff involved with the NPS pollution management program consists of the entire Water Resources Department, which includes the water resources director, the water resources manager, the water quality manager, the water quality technician, the water resources technician, the environmental specialist, and the wetlands specialist. Specific operations and components of the program will involve the other branches of the MEPA (Real Estate and Wildlife Departments) as well as the Miccosukee Fish and Wildlife Law Enforcement Unit on a case by case basis. Staff of the Water Resources Department work towards the development of goals, objectives, and BMP solutions to NPS pollution problems, and will often enlist the assistance

from staff of the other departments during the implementation of various projects. The cooperative nature of the different departments allows for more effective rollout of initiatives

The Miccosukee Tribe's Water Resources Department is assisted by local experts and consultants in the design and implementation of the NPS pollution management program. Tribal members often serve as consultants, offering unique perspectives and valuable information regarding past land use of managed areas, noting long-term changes and trends in wildlife populations and vegetation. Tribal elders also recount descriptions of Tribal lands prior to disturbances from human activities and urban development, therefore they are able to provide qualitative assessments and bench marks for wetland restoration activities. The Water Resources Department also meets frequently with experts from various agencies to discuss issues such as plant biology, hydrology, invasive species, ecology, wildlife populations, aquatic chemistry, construction/engineering, and many other relevant subjects. Meetings between the MEPA and various state and federal agencies occur regularly as part of the Western Everglades Restoration Project (WERP), the Central Everglades Restoration Plan (CERP), and the Lake Okeechobee Watershed Project (LOWP), where these subjects are the focus of large-scale management projects impacting the Everglades Protection Area and the EAA. Meetings for these projects assist the Tribe in developing a more comprehensive understanding of the many issues that relate directly and indirectly to NPS pollution management. Partners on these project include the EPA, U.S. Fish and Wildlife Service (FWS), U.S. Department of Interior (DOI), U.S. Army Corps of Engineers (ACE), ENP, and South Florida Water Management District (SFWMD), among other agencies and stakeholders. The combined effort of the various experts provides the Miccosukee Tribe with technical assistance, education, training, and demonstration of management projects.

The Miccosukee Tribe's NPS pollution management program focuses on a waterbody-based approach, addressing specific pollution concerns within priority waterbodies and management units. Tribal waterbodies are certainly impacted by pollution generated from within Tribal lands, however the non-Tribal pollution sources located upstream of Tribal lands represent a much greater threat to the ecology and water quality. Due to the hydrology of the Everglades system, it would be imprudent to address the concerns on Tribal lands in isolation from the larger system. For this reason, the Miccosukee Tribe is deeply involved with management efforts that address

pollution problems in large areas, known as the Western Basins (made up of the C-139 Basin, Feeder Canal basin, L-28 Basin, and L-28 Tieback Basin). The WERP is one way that the Miccosukee Tribe is currently working to improve water quality, quantity, timing, and distribution at the watershed level. A watershed-based management approach is not currently being pursued by the Miccosukee Tribe as it relates specifically to the NPS pollution management program. Management within this framework would be exceedingly difficult to achieve due to the logistical constraints of reaching agreements with all landowners in the vast watershed that includes Tribal lands, as well as the Everglades Protection Area. Such an undertaking may result in a management plan that appears useful in theory, however many obstacles could derail management efforts in the future. There are many variables impacting NPS pollution upstream in non-Tribal lands that can undermine the success of management actions in the southern portion of the Tribe's watershed. Many of these variables are tied to State and Federal policies and complicated land management issues, which the Miccosukee Tribe are limited in their capacity to influence. In summary, the Miccosukee Tribe plans to move forward with the NPS pollution management program on Tribal lands and waterbodies, but will not include measures for the upstream watershed approach.

3.1 APPLICABLE POLICIES

A) Miccosukee Business Council Resolutions

In order to manage Tribal waterbodies with the best practicable level of protection from aquatic pollution, the Miccosukee Business Council developed a set of Water Quality Standards for the Federal Reservation, adopted on December 19, 1997. The water quality standards are defined in the Miccosukee Environmental Protection Code Subtitle B: Water Quality Standards for Surface Waters of the Miccosukee Tribe of Indians of Florida. This document describes the water quality criteria and the level of protection granted to distinctly defined water bodies located on Tribal lands. The Tribally adopted Water Quality Standards were approved by the U.S. Environmental Protection Agency (U.S. EPA) Region IV on May 20, 1999 under Section 303 of the CWA. These standards were later amended and approved to include the MRA as outlined in the Miccosukee Business Council Resolutions MBC-03-00 and MBC-04-00 on March 15, 2001. In support of the Miccosukee Tribe's Water Quality Standards and Environmental Protection Code,

the Department of Water Resources manages several water quality monitoring and protection projects.

B) Miccosukee Reserved Area Act

The U.S. Congress enacted public Law 105-313 on October 30, 1999, which established the MRA. The MRA Act explicitly requires the Miccosukee Tribe to adopt and comply with water quality standards that are, “at least as protective as the water quality standards for the area encompassed by Everglades National Park approved by the Administrator under the Federal Water Pollution Control Act (33 U.S.C. 1251 et seq.)” The MRA Act grants jurisdiction of the MRA to the Miccosukee Tribe and provides an indispensable mechanism for controlling nonpoint pollution sources.

C) Clean Water Act

Section 106 of the CWA authorizes the U.S. Environmental Protection Agency (EPA) to provide financial assistance to states in order to establish and administer programs for the prevention, reduction, and elimination of water pollution. In 1987, Congress amended section 518 of the CWA to include provisions that allow the EPA to treat an Indian tribe in a manner similar to a state (TAS) for the purpose of providing Section 106 funding. This also enables the EPA to provide technical assistance for tribes to assess and preserve water resources on their lands. Funding for the NPS Management Program will be made possible through CWA Section 319 grants from the EPA.

D) Everglades Forever Act

In 1994, Florida statute § 378.4592 was passed in order to restore the Everglades. This piece of legislation requires the State of Florida to restore and protect the Everglades ecological system. Specifically, the goals of the Everglades Forever Act are to reduce excessive phosphorus levels, and to pursue comprehensive and innovative solutions to water quality issues of water quality, water quantity, hydroperiod, and invasive species.

4.0 NONPOINT SOURCE POLLUTION MANAGEMENT PROGRAM

There are seven categories of NPS pollution that occur on Miccosukee Tribal Lands: agricultural runoff, hydrologic modifications, urban runoff, petroleum spills, construction activities, waste leaks, and off-road vehicle activities. The NPS Management Program addresses the causes of each of these pollution categories with the designation of specific BMPs and other management solutions, which are outlined in this chapter. The NPS pollution management program is designed to be effective in the short term, yet flexible enough to adjust with environmental changes over time. Therefore, water quality goals and objectives have been identified for multiple time scales. MEPA (specifically the Miccosukee Water Resources Department) is the lead agency in charge of implementation of the BMPs in the NPS management program. The Water Resources Department has hired a new employee, serving as an environmental specialist, who is working on the development of the NPS Management Program.

4.1 AGRICULTURAL RUNOFF

Agricultural areas including cattle pastures and cropland represent a major source of NPS pollution impacting Miccosukee lands. Sources of agricultural runoff may originate from non-tribal lands, such as the EAA and Western Basins. This Management Plan will address the sources located on Tribal Lands only, which are the cattle pastures on Cherry Ranch, and those within the eastern portion of the Rectangle (east of Snake Road). The combined land area of the eastern cattle pastures of the Rectangle and Cherry ranch is 9,073 acres. While this land area makes up only 3% of all Tribal lands, the pollutants generated in these areas are concentrated, and have the potential to pollute a much larger area downstream. The major pollutants impacting Miccosukee lands are the nutrients found in cow excrement and in eroded sediments entering water bodies. The nutrient input occurs immediately after storm events in runoff, however the impacts can be even more detrimental when cattle enter water bodies for drinking (See Figures 2-5). Both cow excrement and soils contain nutrients that increase total phosphorus concentrations in the water, accelerating eutrophication and potentially violating Water Quality Standards. Additional impacts include increased biological oxygen demand (BOD), decreased dissolved oxygen concentrations, increased turbidity, and nuisance vegetation conditions. Waters impacted by agricultural runoff include the Alligator Alley Reservation, specifically the North Grass, Rectangle, South Grass, Gap, L-28 Canal, and C-60 Canal. Other impacted waters are

located on Cherry Ranch, Sherrod Ranch, in the Lard Can Canal and Wingate Mill Canal. Agricultural areas located outside of Tribal lands also contribute pollutants via runoff into Tribal lands. For example, the L-28 Interceptor canal receives pollutant loads from non-Tribal areas located upstream.

The pervasiveness of nuisance vegetation, including invasive plants in the Everglades is, in part, a consequence of the agricultural runoff, which occurs upstream. The nutrient input from cattle pastures and agricultural areas creates water conditions favorable for the growth of plant life. There are some species, which are capable of exploiting the rich supply of nutrients, so they experience tremendous growth downstream from nutrient inputs. These species dominate and alter the community compositions as they exclude native plant species. Additionally, the thick growth of plants such as water hyacinth and *Hydrilla verticillata* can clog waterways, impeding the flow of water, the movement of aquatic animals as well as boat traffic.



Figure 2: A cow loafing in a canal with nuisance vegetation at Cherry Ranch



Figure 3: Cattle commonly enter the L-28 canal in the Rectangle for cooling and drinking



Figure 4: A commonly used drinking area in the Rectangle accessible to cattle



Figure 5: Cow manure located within a few meters of a canal in the Rectangle

4.2 HYDROLOGIC MODIFICATIONS

Human-induced changes to aquatic and wetland ecosystems can negatively impact the natural faunal and floral communities on Miccosukee Tribal lands. Hydrologic modifications have been made in several ways, such as channelization, flow regulation, bridge construction, removal of riparian vegetation, and streambank destabilization. Hydrologic modifications are not a classic case of NPS pollution, however alterations to flow have long-term impacts on water quality due to the redistribution of nutrients and other pollutants. The construction of canals provides a path for nutrients and contaminants to be transported over great distances, which facilitates the export of pollutants to areas far from the source of pollution. The conveyance of pollutants far from the originating source can complicate management and mitigation of NPS pollution by enlarging the size of impacted areas and by obscuring the causes of the ecological damage. Hydrologic modifications can cause lasting damage due to the synergistic effects occurring with existing pollution and the movement of water through conveyance canals. For this reason, hydrologic modifications are considered a major focus for NPS pollution management.

Conveyance canals can exacerbate NPS pollution and reduce the biological capacity of the native system to buffer against NPS pollution impacts. These impacts include high nutrient concentrations, increased nuisance vegetation, and loss of habitat. The impacts of hydrologic modification have caused violations of Water Quality Standards for conductivity, pH, dissolved oxygen, and nutrient concentrations. Other potential impacts include loss of wetlands, altered hydroperiods, increased sediment transport, and changes to the community composition of plant life. It has been assumed in the past that levees act to confine and compartmentalize pollution in order to prevent the spread of pollutants into other areas of the Everglades. However, it is possible for problems to occur near confining levees, in which small, undefined breaches and subsurface seepage may impact water bodies and wetlands in the vicinity of major conveyance canals.

4.3 URBAN RUNOFF

Urbanization affects the quantity of stormwater, causing an increase in runoff and an acceleration of runoff flow (peak discharge rate). The increase in volume and velocity of runoff causes more frequent flooding, drastic changes in natural streams and channels, erosion of stream banks, and damage to structures and vegetation. Urban runoff may contain a mixture of several pollutants that can harm water bodies on Miccosukee lands. The primary pollutants associated with this class of water pollution are nutrients, metals, biological contaminants, toxins, sediments, and heat (thermal pollution). Pollutants may enter water bodies through storm drains or as surface runoff over large developed areas with impervious cover such as asphalt on roads and parking areas. The greatest water quality impacts from urban runoff occur immediately following a large storm event, and can cause long-lasting damage to the aquatic ecosystem. Urban stormwater is known to accelerate eutrophication, increase BOD, decrease dissolved oxygen concentration, and increase turbidity (particularly near construction sites). Detrimental impacts from NPS pollution are typically localized in populous areas, however remote areas may also be impacted, as large capacity conveyance canals act to concentrate and transport runoff from non-tribal sources over great distances. The MRA is the area of highest impact from this class of NPS pollution due to a higher population and the proximity of impervious road surfaces adjacent to water bodies. Resort Area properties are susceptible to pollution from urban stormwater as well. The Alligator Alley

Reservation is susceptible to detrimental impacts from urban stormwater in the Rectangle, Triangle, and South Grass areas, however these locations face a reduced risk as compared to the MRA. One pathway for pollutants in this area is from the southern side of I-75 to the canals, which enter the Triangle and South Grass areas.

4.4 PETROLEUM CONVEYANCE

Petroleum conveyance poses a potential source of hazardous materials to water bodies within Miccosukee Tribal lands. Crude oil and other petroleum products can be detected in water by testing samples for total petroleum hydrocarbons (TPH), which are known contaminants of the environment. Some of the chemicals found in TPH are hexane, benzene, toluene, xylenes naphthalene, and fluorine, as well as other oil compounds. Environmental damage can occur due to the presence of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and polycyclic aromatic hydrocarbons (PAHs). Oil can cause environmental damage through several mechanisms, including oxygen depletion in waterbodies, caused by the microbial processes associated with oil degradation. Petroleum products are known carcinogens, toxic to humans as well as wildlife and can cause mortality through the ingestion or absorption through an organism's skin or respiratory structures. Oil that coats or smothers wildlife affects vital biological processes such as gas exchange, and temperature regulation. Oil causes damage to wetland vegetation, which provides the foundation for the structure and function of the ecosystems in Miccosukee tribal lands. When oil makes contact with plant tissue, it causes necrosis and prevents photosynthesis, which results in plant mortality. If oil penetrates the soil, it can damage roots and cause widespread impacts to the environment. Large-scale die offs of grasses and other vegetation can be expected to cause instability in the substrate. Without roots to anchor the hydric soils, a habitat will have increased rates of erosion and transport of sediments downstream. Changes in community structure, diversity, and species compositions can result from these environmental disturbances.

A sub-surface petroleum conveyance pipeline is located within the Miccosukee Tribal lands, which is currently owned and operated by Breitburn Florida LLC. The pipeline transports approximately 18,000 barrels (756,000 gallons) of crude oil per month. The pipeline begins at the Raccoon Point Oil Field in Ochopee, FL, located in Big Cypress National Preserve, west of

the Miccosukee Federal Reservation. The pipeline runs northeast, into the Miccosukee Reservation, crossing beneath the L-28 Tieback Canal, turning northward between the Gap and South Grass areas, continuing northward into the Triangle area, and then the Rectangle area, where the pipeline terminates at the Devil's Garden Oil Truck Loading Facility (See Figure 6). The Devil's Garden Facility (also operated by Breitburn) contains large oil storage tanks with a total capacity of 14,000 bbl (588,000 gallons), as well as a small portable engine oil drum, and a sump water tank. The sump tank has a capacity of 400 bbl (16,800 gallons) and is used to collect and drain storm water, trapping any petroleum that may seep from leaking pipes, valves, or pumps. There have been no detectable impacts from these petroleum-related activities on Reservation lands to date, but the potential for spills or seepage exists nevertheless. For this reason, preventative protocols are in place, as well as response procedures in the event of future accidents.

A number of safety protocols are established to prevent the release of petroleum into the water bodies of the Miccosukee Reservation. Breitburn Florida LLC is under lease from the Miccosukee Tribe to transport oil across Tribal Land. The company also operates and manages the Devil's Garden Truck Loading Facility. Breitburn established a Spill Prevention Control and Countermeasure (SPCC) Plan for Devil's Garden, which outlines safety measures and coordinates response activities for oil spills. The company is responsible for adhering to these protocols and acting quickly in response to any oil spills that may occur at their facilities or pipeline infrastructure. The SPCC Plan focuses on prevention and control measures and includes response procedures to be followed to minimize potential impacts in the unlikely event that a spill occurs. The SPCC plan is updated regularly for technical and administrative amendments. Breitburn Florida LLC also has a Hurricane Emergency Evacuation Plan in place, to be used in the event that a hurricane threatens to impact the oil infrastructure. Secondary containment around the truck loading rack at Devil's Garden includes concrete aprons and curbs that slope to a center catch basin. The catch basins are connected to recovery sumps fitted with automatic pumps that return the recovered oil back to the sump tank. Additionally, all bulk storage containers have dedicated secondary containment systems or are located inside of a building or equipment skid that provides adequate containment.

There are materials in place to promptly and effectively respond to spills within Miccosukee Tribal lands. Two storage structures have been placed in strategic locations, containing equipment that can be used to assist in the containment and cleanup of spills or leaks involving petroleum products. One of these storage structures are located along the eastern side of the L-28 Interceptor Canal, near the southern tip of the Triangle Area, and one is located near the northernmost portion of the L-28 Tieback Canal (See Figure 7). A complete inventory of the equipment contained in the storage structures can be found in the SPCC Plan. All equipment has been inspected by the staff of the Water Resources Department for signs of wear or degradation as of March, 2017. Equipment in these storage structures should be inspected at least once yearly to ensure all materials are in proper working condition in order to remain prepared for oil spills on Tribal lands.

Two gasoline/diesel fueling stations are also located on Tribal lands. The first is the Miccosukee Service Plaza, located at the southern end of the Rectangle at the intersection of Snake Road and I-75. The second is the Miccosukee Gas Station, located in the MRA along Tamiami Trail. The Miccosukee Service Plaza and the Miccosukee Gas Station are located in close proximity to the I-75 Canal and the L-29 Canal, respectively. Research has shown that the small amounts of fuel frequently spilled at gas stations can cumulatively cause long-term environmental damage in residential areas (Hilpert and Brysse, 2014). Concrete pads underneath the pumps can accumulate an estimated 40 gallons of gasoline per year, which can eventually penetrate the concrete and escape into underlying soil and groundwater. This creates a health problem of particular concern for Tribal members who use wells as a water source. The location of the fueling stations poses a moderate risk to local waterbodies as well as distant ones. Storm water runoff from gas stations can be a mixture of gasoline, diesel, anti-freeze, motor oil, and other automotive fluids. If these pollutants enter the canals, they may then be transported across great distances and impact water quality in downstream areas to the south.

Above-ground storage tanks (ASTs) and underground storage tanks (USTs) may also pose a potential risk for environmental contamination. Although there have been significant improvements in the design, construction, and operation of USTs, research has indicated that groundwater contamination continues to be a problem at sites adjacent to gas stations. A study

conducted by the U.S. Geological Survey detected a particular gasoline additive in 40% of public wells, and found a correlation between the concentrations of this additive and the proximity to USTs (Ayotte et al., 2005). Human health is of paramount importance, therefore intensive testing and monitoring is recommended for sites that could impact drinking water of Tribal members. The Miccosukee Tribe maintains regular contact with EPA Region 4 inspectors for ASTs and USTs. All Federal Regulations are strictly adhered to at both the Miccosukee Gas Station and the Miccosukee Service Plaza. Specifically, 40 CFR 112 and 40 CFR 280 of the SPCC Rule are closely followed. There have been no detectable impacts due to petroleum conveyance or fueling stations on Miccosukee Tribal lands to date, but the potential for spills or seepage exists. Monitoring of water and soil contamination near the gas stations will be an important component of the tribal NPS pollution management program.

In order to prevent the runoff of pollutants from fueling stations into nearby waterbodies a group of simple BMPs should be followed by staff members. Dry cleanup methods should always be followed, including the use of absorbent materials to remove spilled fluids from the ground. Containment structures should also be installed on site to prevent leaked fluids from being transported with stormwater into nearby waterbodies. Routine equipment maintenance of pumps, tanks, and other infrastructure can prevent leaks and avoid pollution issues in the future.

It is difficult to estimate the percentage of land use associated with this NPS pollution category. The physical space dedicated to housing and transporting oil and gasoline is small in comparison to the overall size of Tribal lands. In the event that a significant oil spill occurs, the area of impact would expand to a far larger size. Due to the location of the pipeline within a wetland, any leak has the potential to disperse oil across a vast area as waters flow across the area. Likewise, the gas stations and the truck loading facility are located in close proximity to canals with the ability to transport any amount of spilled oil far from the source. Due to the ability of oil to disperse into the wetlands and canals adjacent to oil infrastructure, it is estimated that the amount of land use associated with this NPS pollution category is 50,500 acres, which includes wetlands in the Gap, South Grass, and Triangle areas, as well as the canals adjacent to oil infrastructure. Assuming that a catastrophic oil spill could occur and spread throughout the

wetlands and canals in these areas, it is estimated that oil pollution could impact 19% of Tribal lands.

A monitoring program for oil leaks and spills has not yet been designed. In order to evaluate whether oil contamination is occurring, grab samples must be taken at regular (monthly) intervals from waterbodies located in close proximity to gas stations and the truck loading facility, i.e. the areas where oil pollution is likely to occur. Additionally, several sampling locations should be identified along the route of the pipeline. Visual signs such as oil slicks should be noted by staff, and water samples should be tested using gas chromatography/mass spectrometry methods to determine the presence and concentration of VOCs, SVOCs, and PAHs.

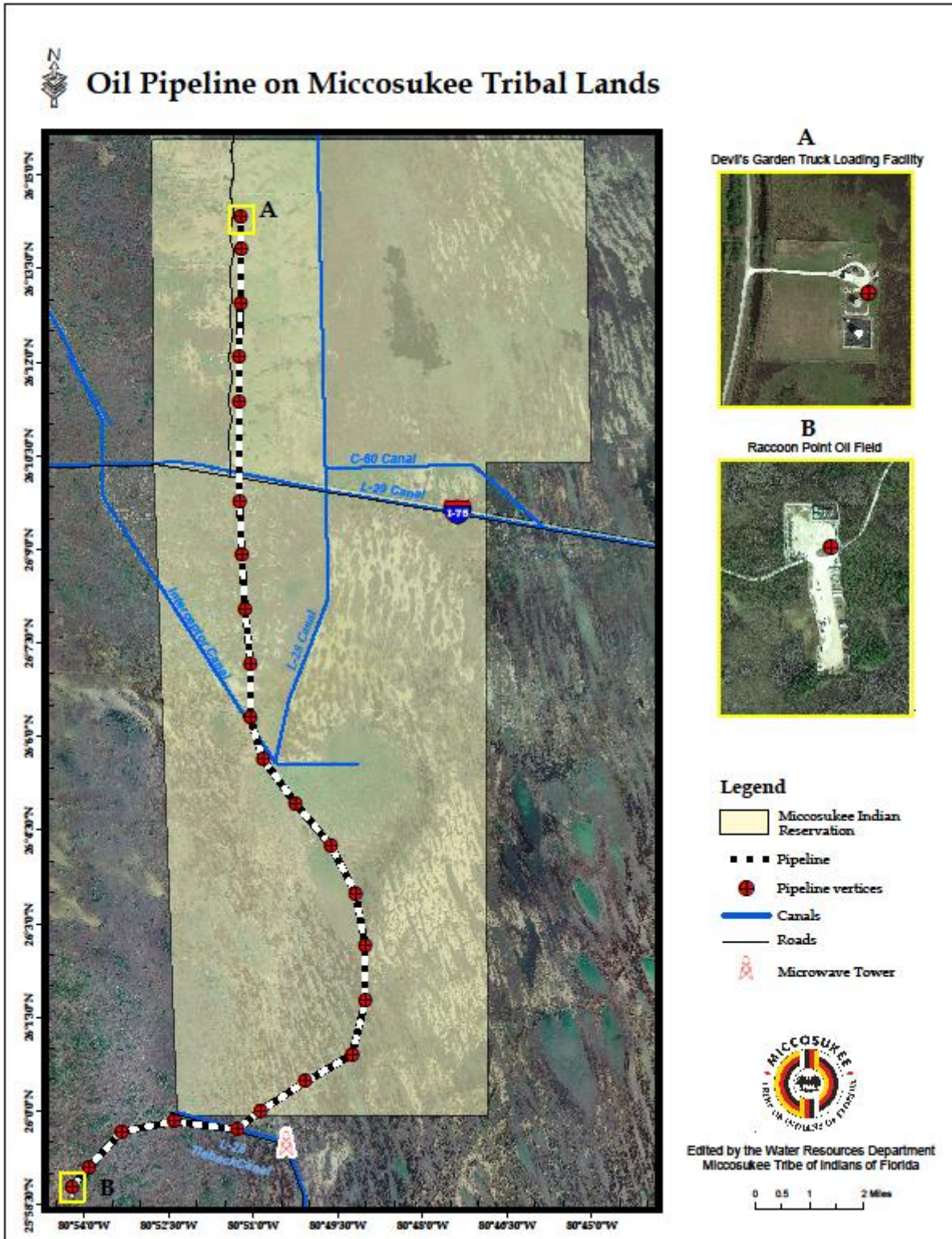


Figure 6: Map of oil conveyance pipeline located on Miccosukee Tribal land

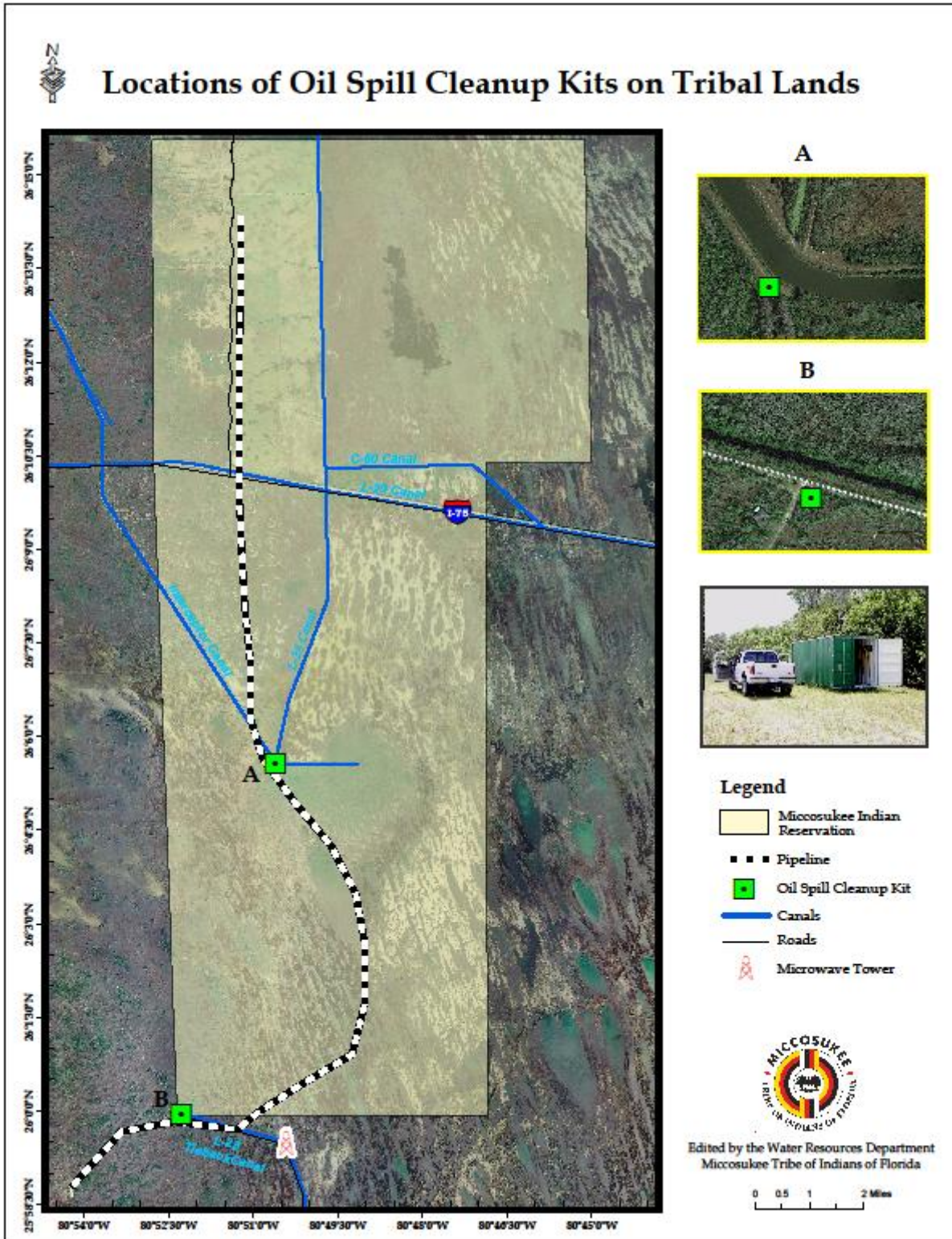


Figure 7: Map of Oil Spill Cleanup Kits on Micosukee Tribal Land

4.5 CONSTRUCTION ACTIVITIES

Construction activities have the potential to cause a number of pollution problems for Tribal waterbodies. The greatest impact to water quality from construction activities is due to soil erosion. Construction projects often leave large areas of bare soil, which are vulnerable to the erosive effects of wind and surface runoff. When soils enter waterbodies, they carry a load of nutrients into the aquatic system, which leads to eutrophic conditions and degraded water quality. Sedimentation also causes problems for wildlife, and contributes to the development of eutrophic conditions. The majority of construction projects impacting Tribal lands are carried out by Florida Department of Transportation (FDOT), and Johnson Engineering. Major construction projects are ongoing at several locations including a large portion of Tamiami Trail adjacent to the MRA, and at Dade Corners adjacent to the Miccosukee Resort and Miccosukee Smoke Shop. These projects are long in duration, and occur within meters of major waterbodies including the wetlands in the Leased Lands of WCA-3A, L-29 Canal, and the Old Tamiami Trail Canal. In these areas it will be important to monitor water quality in canals and nearby water bodies in order to assess the impacts of sediment inputs from construction activities. A number of structural and nonstructural BMPs will be implemented in order to reduce the impact of construction operations on Tribal waterbodies. Implementation of these BMPs will involve the cooperation with FDOT, Johnson Engineering, and Tribal members. The Miccosukee Tribe expects construction companies and their workers to implement BMPs in order to reduce the impacts of erosion and sedimentation in Tribal waterbodies. MEPA will oversee operations in order to enforce the use of effective BMPs and protect Tribal waterbodies and wetlands.

To a lesser extent, construction projects are carried out in Tribal housing areas in the Tamiami Trail Reservation and the MRA for the construction of house pads, culverts, and other small-scale development. During construction phases it is crucial that BMPs are implemented to cover the soil and prevent erosion and runoff into waterbodies including the Old Tamiami Trail Canal, the L-29 Canal, and adjacent wetlands. MEPA will oversee construction activities in order to implement the most effective BMPs to address erosion and NPS pollution concerns.

Environmentally sensitive areas will be monitored throughout all phases of construction to ensure that all structural BMPs are installed properly and functioning to minimize polluted surface runoff.

4.6 WASTE STORAGE, DISPOSAL, and LEAKS

Improper waste storage can become a source of pollution when powerful storm events wash chemicals into water bodies. High water levels during the wet season can also reach areas where waste is stored, allowing pollution to enter the water. The tribe has issued temporary Occupancy and Access Permits to non-Tribal members in order to maintain their hunting camps. A total of 63 hunting camps are located on 15,000 acres of Tribal wetlands within the Miccosukee Reservation and the leased lands in WCA-3A. These camps may have a number of items on site, such as chemical cleaners, fuel, gas-powered generators, or other waste that can adversely affect the water quality nearby. Water Resources Staff will organize an educational outreach program to provide Tribal members with resources and information about proper storage and disposal of waste. Information may be delivered to Tribal members in any of three methods: public meetings, distribution of brochures, or at centralized locations such as bulletin boards or information kiosks.

The Tamiami Trail Reservation is the center of the Miccosukee Indian population. Due to the remote location of housing in the MRA, most human waste is disposed into septic tanks, rather than conveyed through sewer lines. Septic tanks have the potential to leak waste into surrounding areas, introducing contaminants such as nutrients, fecal coliform bacteria, nitrates, phosphorus, and pathogens into Tribal waters. The introduction of these pollutants to adjacent waters may cause biological oxygen demand on the system, depleting dissolved oxygen required by many aquatic animals. Conductivity and temperature fluctuations are also common effects from septic system leakage. Leaking septic tanks are an environmental hazard, therefore Tribal members should practice preventative maintenance and have their septic systems inspected at least every three years in order to identify any leaks or other problems.

4.7 OFF-ROAD VEHICLE ACTIVITIES

Traveling in the remote wetlands of the Everglades is nearly impossible for conventional vehicles. The waters are too shallow and obstructed for most boats, and the soils are too soft and wet for most vehicles to safely navigate during most of the year. A variety of off-road vehicles (ORVs) are used by Tribal members, MEPA staff, and others. ORVs greatly enhance a user's ability to enter the remote areas within Tribal lands and waterbodies. Four general categories of

ORVs are used in the muddy, variable terrain found on Miccosukee Tribal lands, including four-wheeled all-terrain vehicles (ATVs), four-wheel drive swamp buggies with large tractor tires, tracked vehicles, and airboats. In the open, flat terrain of the wetlands that experience prolonged flooding, airboats are the most commonly used type of ORV.

Direct impacts of ORVs include soil rutting, soil compaction, damage to vegetation, spread of exotic/invasive species, noise, aesthetic alterations of wilderness, alterations of water flow, and intrusive interference with natural wildlife behaviors. In the Everglades WCAs, tracked vehicles have substantially damaged tree islands. Relative to other ORVs, airboats cause the least damage to soils and vegetation, but repeated use of the same trails leads to uprooted vegetation and subsequent soil displacement, producing channels in areas that were formerly vegetated. As with all gas-powered vehicles, the potential for leaks or spills exists with ORVs. Due to the ability of these vehicles to access remote areas of the Reservation, ORVs have the capacity to pollute and alter the environment in unique ways. Tactless driving and inadequate vehicle inspections may cause unnecessary harm to the environment, therefore education and proper planning can help to reduce the impact from ORVs. The impacts from ORVs are dispersed over a large portion of Tribal lands. It is difficult to estimate the amount of land area affected by this form of NPS pollution. The majority of observed impacts from ORVs occur in the South Grass, Gap, Triangle

ORV use has been poorly managed due in part to the haphazard network of trails and the remoteness of the areas used for hunting, fishing, and recreation. Many trails are used ephemerally, and routes are sometimes altered due to water levels, soil saturation, and overgrowth of vegetation. In order to better understand the effects of ORVs on soil, water, vegetation, fish and wildlife, more research can be conducted to study these impacts on Tribal lands. ORVs impact different aspects of Tribal lands depending on which environment they are being used, and whether the activities occur during the wet or dry season. For example, full-track vehicles and swamp buggies may cause soil compaction during the dry season and rutting in wet season within the same muddy wetland areas. Airboats may cause loss of vegetation and increased turbidity in certain areas during the wet season that are inaccessible to airboats during the dry season. These types of scenarios will be important to identify so that managers can make predictions about the impacts of ORVs and protect sensitive areas. Aerial photography and

reconnaissance can assist managers in identifying which areas experience the most severe impacts from ORVs. Studies should focus on key issues, such as habitat use by native species, vegetative growth rates in disturbed areas, soil compaction, and the water flow velocity and transport of pollutants through airboat paths in wetlands.

In addition to studying and predicting the areas that are vulnerable to detrimental effects from ORVs, managers can minimize damage through educational outreach. One method for reducing the environmental impacts from ORVs is to educate users about the effects of ORV activities and to instruct users about operating recommendations for minimizing impacts to the land, water and wildlife. Informational materials can be presented in a number of ways to educate ORV operators. MEPA staff will conduct public meetings with Tribal members and camp permittees to disseminate information. Educational posters, bulletin boards, and pamphlets can be placed in strategic areas such as boat ramps and other points of access for ORVs, such as the gates at the entry points of levees. Educational pamphlets can also be distributed directly to Tribal members and camp permittees along with relevant web addresses or phone numbers for users to obtain further information.

Another method for reducing the environmental impacts from ORVs is to create clearly marked paths and trails for users to follow. Flags and other visible markers can be installed in order to eliminate confusion or ambiguity about the location of commonly used ORV paths. When these paths are clearly marked it will reduce the impacts of ORVs, limiting the disturbance to a few heavily trafficked areas, rather than a sprawling network of interweaving paths. Over time, if ORVs can avoid sensitive areas, vegetation can regrow. By confining travel to more obvious trails, this will assist managers by reducing confusion about which pathways to ride through. MEPA staff can organize public meetings for the purpose of facilitating the sharing of expert knowledge among Tribal members, the Miccosukee Wildlife Police Unit, and Tribal consultants. MEPA staff can also share valuable geographic information such as GPS tracks and waypoints with ORV users in order to establish a commonly accepted set of paths for all users.

5.0 REFERENCES

- Ayotte, J. D., Argue, D. M., and F. J. McGarry. 2005. Methyl tertiary-Butyl Ether occurrence and related factors in public and private wells in southeast New Hampshire. *Environmental Science and Technology*, 39 (1): 9-16.
- Florida Department of Agriculture and Consumer Services. 2008. Water quality best management practices for Florida cow/calf operations.
- Hilpert, M. and P. N. Breyse. 2014. Infiltration and evaporation of small hydrocarbon spills at gas stations. *Journal of Contaminant Hydrology*, 170: 39-52.
- Lim, T. T., Edwards, D. R., Workman, S. R., Larson, B. T., and L. Dunn. 1998. *American Society of Agricultural Engineers*, 45(5): 1375-1381.
- Lee, K. H., Isenhardt, T. M., Schultz, R. C., and S. K. Mickelson. 2000. Multispecies riparian buffers trap sediment and nutrients during rainfall simulations. *Journal of Environmental Quality* 29(4): 1200-1205.
- Lodge, T. E. *The Everglades Handbook*. CRC Press. 2010. Boca Raton.
- Louisiana State University Agricultural Center. 2002. Beef production best management practices. 2884.
- Mendelsohn, I. A., Anderson, G. L., Baltz, D. M., Caffey, R. H., Carman, K. R., Fleeger, J. W., Joye, S. B., Lin, Q., Maltby, E., Overton, E. B., and L. P. Rozas. 2012. Oil impacts on coastal wetlands: implications for the Mississippi river delta ecosystem after the deepwater horizon oil spill. *Bioscience*, 62(6): 562-574.
- Nader, G., Tate, K. W., Atwill, R., and J. Bushnell. 1998. Water quality effect of rangeland beef cattle excrement. *Rangelands*, 20(5): 19-25.
- Osmond, D. L., Butler, D. M., Rannells, N. R., Poore, M. H., Wossink, A., and J. T. Green. 2007. *Grazing practices: a review of the literature*. North Carolina Agricultural Research Service.
- Sharpley, A. N., Daniel, T., Gibson, G., Bundy, L., Cabrera, M., Sims, T., Stevens, R., Lemunyon, J., Kleinman, P., and R. Parry. 2006. Best management practices to minimize agricultural phosphorus impacts on water quality. United States Department of Agriculture, Agricultural Research Service, ARS-163.
- South Florida Water Management District. 2009. Pasture water management for reduced phosphorus loading in the Lake Okeechobee watershed, Final Report.

Webber, D. F., Mickelson, S. K., Ahmed, S.I., Russell, J.R., and W. J. Powers. 2010. Livestock grazing and vegetative filter strip buffer effects on runoff sediment, nitrate, and phosphorus losses. *Agriculture and Biosystems Engineering*, 65(1): 34-41.

6.0 APPENDICES

APPENDIX I: Water Quality Standards for the Miccosukee Tribe of Indians of Florida

Nutrients: In no case shall nutrient concentrations of Tribal Class III-A surface waters be altered so as to cause an imbalance in natural populations of aquatic flora or fauna. Total phosphorus concentrations shall not exceed 10 parts per billion (ppb) in Class III-A waters. In class III-B waters, nutrients shall not be discharged which result in undesirable aquatic life effects or which result in chronic or acute toxicity to aquatic life.

Dissolved Oxygen: The dissolved oxygen standard for Class III-A waters states that a concentration of 5.0 mg/liter must be maintained at a minimum. In waters which are designated as Class III-B, dissolved oxygen must be maintained at levels which will support indigenous aquatic life. Dissolved oxygen levels that are attributable to natural background conditions may be established as alternative dissolved oxygen criteria for a water body or portion of a water body. Daily and seasonal fluctuations in dissolved oxygen levels shall be maintained. Human-induced nutrient eutrophication occurring in Class III-A surface waters contributing to increased algal growth and resulting in less than 5.0 mg/liter of dissolved oxygen in the water is a violation of this standard.

Turbidity: Turbidity in Class III-A waters shall not reduce light transmission to a point where aquatic biota are inhibited or alter color or natural appearance of the water, and in no instance shall the turbidity exceed 29 NTU above natural background conditions at any place or at any time. In class III-B waters, turbidity shall not be discharged which result in chronic or acute toxicity to aquatic life.

pH: The pH of all Tribal surface waters shall not be permitted to fluctuate in excess of 1.0 unit over a period of 24 hours for other than natural causes. pH shall not be less than 6.5 nor greater than 9.0 in order to fully protect aquatic life.



















































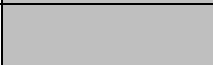
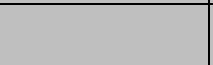
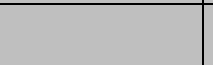
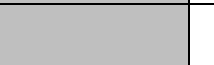











Nuisance vegetation conditions: plant nutrients or other substances stimulating algal growth, from other than natural causes, shall not be present in concentrations that produce objectionable algal densities or nuisance aquatic vegetation, or that result in the dominance of nuisance species instream, or that cause nuisance conditions in any other fashion. Phosphorus and nitrogen shall not be permitted to reach levels which result in man-induced eutrophication problems. Total phosphorus shall not exceed 10 ppb in Class III-A waters. In class III-B waters, total phosphorus discharges shall not be made which result in undesirable aquatic life effects or which result in chronic or acute toxicity to aquatic life.

APPENDIX II: Designated Uses and Existing Uses of Miccosukee Tribal Lands


Designated Use	North Grass	South Grass	Gap	Triangle	Rectangle	Tamiami, Krome, and Dade Corners Reservations	Miccosukee Reserved Area
Preservation of natural populations of plants and animals	√*	√*	√*				
Propagation of fish and wildlife	√*	√*	√*				
Hunting, fishing, frogging, airboating	√*	√*	√*			√*	√*
Traditional Agriculture	√*	√*	√*				
Hunting Camp Leases	√*	√*	√*				
Light industrial, commercial				√		√*	√*
Industrial, commercial					√*		
Residential community development				√	√*	√*	√*
Agricultural Activities				√	√*		
Tourism				√*	√*	√*	√*
Cattle grazing				√*	√*		
Retention, Detention Reservoirs				√	√*		
Tribal administration, government headquarters complex						√	√


Asterisk (*) indicates an existing use at the time when Water Quality Standards were adopted

APPENDIX III: Results of Surface Water Quality Monitoring from NPS Assessment Report


Waterbody Name	Total Phosphorus	Dissolved Oxygen	Turbidity	pH	Nuisance conditions
North Grass wetlands					
L-28 Canal					
L-28 Interceptor					
C-60 Canal					
South Grass wetlands					
Gap wetlands					
Triangle wetlands					
Rectangle (Cattle					
Old Tamiami Trail Canal*					
MRA wetlands					
Resort Area Properties					
Sherrod Ranch*					
Cherry Ranch*					

Legend

 Fewer than 50% of sample sites meet WQS

 More than 50% of sample sites meet WQS

 Sample sites consistently meet WQS

 There is insufficient data available to make substantial claims on WQ condition

*Indicates numeric Water Quality Standards have not been developed for these areas. Therefore, while values may not fit acceptable levels, they do not constitute violations of Water Quality Standards.

APPENDIX IV: Best Management Practices

The following series of tables represents the suite of BMPs to be used in the Miccosukee Tribe’s NPS Pollution Management Program. The combination of structural and non-structural BMPs are presented below and are characterized with respect to size, location, rationale, and the entities responsible for implementation. BMPs are also described based on their expected beneficial impacts to water quality and the methods chosen for measuring their degree of success. Structural BMPs presented here include retention methods and fence installation. Non-structural BMPs include source controls, planning and regulating tools, maintenance and operational procedures, as well as education and outreach programs.

BMP	<i>Fence Installation and Maintenance</i>
Size	Perimeter fence along the length of L-28 Canal in the Rectangle (approx. 6.4 miles); additional interior fences with lengths TBD: (see “Prescribed Grazing” BMP)
Type	Structural; Source Control; Maintenance and Operational Procedures
Location	Cattle Pastures (Rectangle)
Rationale	Excluding livestock from canals will reduce damage and erosion along the sides of canals and will significantly reduce nutrient input.
Entity responsible for implementation	Rocking G Ranch (Cattle Pasture Lessee); MEPA
How success will be measured	Reductions in TP and turbidity in the L-28 canal, and the irrigation canals in the Rectangle, increased flow in irrigation ditches
Impact on water quality	Decreased TP; decreased turbidity; reduced streambank damage and erosion on sides of waterways; protection of vegetative cover along the sides of canals; prevention of transmission of disease-causing pathogens; reduced nutrient input from cattle waste leads to reduced vegetation in canals and ditches, enhancing flow of water
Schedule	Short-term: In 2018 vegetation will be cleared and the state of the current fence line will be assessed. Initial construction will begin in 2018 by replacing and repairing existing fence sections. Full perimeter fencing will be completed in conjunction with plans for alternative drinking sources and artificial shade structures for cattle in the proceeding years.
	Long-term: 5 year plan to be completed by 2022.
	Ongoing: Maintenance of fences, fence posts, and gates will occur as needed.

BMP	<i>Prescribed Grazing (i.e. rotational grazing)</i>
Size	Fences will be used to exclude cattle from ditches, and to define the paddocks used for prescribed grazing across an area of approx.12,000 acres
Type	Structural; Source Control; Maintenance and Operational Procedures
Location	Cattle Pastures, Rectangle
Rationale	Strategic placement and rotation of livestock to several paddocks over time prevents environmental problems associated with overgrazing (high rates of erosion along canals, concentration of manure (i.e. nutrients) entering waterbodies, soil compaction, trampled vegetation). This system also requires less fertilizers to be used, allows for regrowth of vegetation, and lessens the potential for eutrophication and nuisance vegetation conditions.
Entity responsible for implementation	Rocking G Ranch (Cattle Pasture Lessee); MEPA
How success will be measured	Reductions in TP and turbidity in the L-28 canal, and the irrigation canals in the Rectangle
Impact on water quality	Decreased TP and decreased turbidity will be accomplished by reduced streambank damage and erosion on sides of waterways; protection of vegetative cover along the sides of canals; and reduced nutrient input from cattle waste. Prescribed grazing prevents the transmission of disease-causing pathogens and bacteria.
Schedule	<p>Short-term: Partial fencing is already in place. New perimeter fence construction will begin in 2018. Interior fencing construction to occur throughout 2018 and 2019 to establish paddocks.</p> <p>Long-term: Prescribed grazing practices will begin by 2020, upon completion of BMPs for Shade Structures and Alternative Water Sources. Fallen/deteriorated fences will be replaced by 2021</p> <p>Ongoing: Maintenance of fences, fence posts, and gates will occur as needed</p>

BMP	<i>Alternative Water Sources</i>
Size	Number of water sources TBD for approx. 2000 cattle within a 12,000 acre area
Type	Structural; Source Control
Location	Cattle Pastures (Rectangle)
Rationale	Freshwater sources provided for livestock that are located away from waterbodies (especially canals) will reduce the amount of time that cattle spend in or near the canals. This will reduce erosion around the sides of the canal and will reduce nutrient inputs and turbidity.
Entity responsible for implementation	Rocking G Ranch (Cattle Pasture Lessee)
How success will be measured	Reductions in TP and turbidity in the L-28 canal, and the irrigation canals in the Rectangle
Impact on water quality	Decreased TP; decreased turbidity; reduced streambank damage and erosion on sides of waterways; protection of vegetative cover along the sides of canals; prevention of transmission of disease-causing pathogens; reduced nutrient input from cattle waste
Schedule	<p>Short-term: Installation of water sources will begin in 2018. Completion of this step will be important to accomplish prior to completing full installation of fences to ensure adequate drinking sources are available to cattle</p> <p>Long-term: 5 year plan to be completed by 2022. As perimeter fence construction occurs, optimal sites will be identified for watering areas.</p> <p>Ongoing: Maintenance of water sources will occur routinely in order to ensure proper function and prevent adverse health effects to livestock</p>

BMP	<i>Shade Structures for Cattle</i>
Size	Number and size of artificial shade structures TBD to provide sufficient shading for approx. 2,000 cattle within a 12,000 acre area. Planting adequate numbers of shade trees will ensure long-term shading opportunities for cattle with minimal long-term costs for maintenance
Type	Structural; Source Control
Location	Cattle Pastures, Rectangle
Rationale	Encourages the use of upland sites for shading and loafing, reducing the time cattle spend in canals, reducing nutrient inputs from waste and erosion
Entity responsible for implementation	Rocking G Ranch (Cattle Pasture Lessee)
How success will be measured	Reductions in TP and turbidity in the L-28 canal, and the irrigation canals in the Rectangle
Impact on water quality	Decreased TP; decreased turbidity; reduced streambank damage and erosion on sides of waterways; protection of vegetative cover along the sides of canals; prevention of transmission of disease-causing pathogens; reduced nutrient input from cattle waste
Schedule	<p>Short-term: As canals become fenced off to exclude cattle beginning in 2018, shade structures will be constructed to allow cattle to loaf in cooler areas. Shade structure construction will begin in 2018 and will be completed by 2020. This step will be important to accomplish prior to completing full installation of fences</p> <p>Long-term: During construction of artificial shade structures, shade trees will be planted and allowed time to grow. Eventually, the mature shade trees can replace artificial shade structures.</p> <p>Ongoing: Maintenance of shade cloth and any damaged structural components will occur as needed throughout the use of the artificial shade structures</p>

BMP:	<i>Nutrient Management</i>
Size	N/A
Type	Source Control; Maintenance and Operational Procedures; Non-Structural
Location	Cattle Pastures (Rectangle)
Rationale	A proper management scheme for nutrients in cattle pastures will reduce the load of nutrients entering adjacent waterbodies from fertilizers, feedstock, and waste.
Entity responsible for implementation	Rocking G Ranch (Cattle Pasture Lessee)
How success will be measured	Reductions in TP and turbidity in the L-28 canal, and the irrigation canals in the Rectangle
Impact on water quality	Reduced nutrient input to Tribal waterbodies will bring about improvements to water quality including decreased TP, and reducing the harmful impacts from eutrophication and nuisance vegetation conditions.
Schedule	Short-term: Proposed plan was signed by cattle pasture lessee in 2017. Once a finalized plan is agreed to, nutrient management operations will begin in 2018
	Long-term: Procedures will be reevaluated and water quality monitoring data will be used to guide changes in nutrient use by 2020.
	Ongoing: Nutrient management plans will be evaluated on an annual basis.

BMP	<i>Establish and Maintain Vegetated Buffers</i>
Size	Along the levy on the west side of the L-28 Canal in the Rectangle (approx. 6.4 miles in length); and along additional irrigation canals with lengths TBD
Type	Structural; Retention; Source Control
Location	Cattle Pastures (Rectangle); MRA; Tamiami Trail Reservation
Rationale	Permanently vegetated areas adjacent to waterbodies will retain water and soil (i.e. reduce erosion) to reduce pollutants in surface water runoff, provide water quality treatment, slow runoff velocity, reduce turbidity, and remove bacteria and pathogens from runoff.
Entity responsible for implementation	MEPA
How success will be measured	Reductions in TP and turbidity in the L-28 canal, and the irrigation canals in the Rectangle, as well as waterbodies adjacent to Tribal Housing areas
Impact on water quality	Reduce erosion and nutrient inputs from land; trap sediment and nutrients; and slow runoff velocity
Schedule	Short-term: Desired vegetation types will be determined during 2018 with installation occurring during optimum weather conditions in 2019 (i.e. during the wet season) Subsequent planting will occur in key areas during each successive year.
	Long-term: 5 year plan to be completed by 2022 in conjunction with fence construction activities.
	Ongoing: Maintenance, such as removal of invasive plants and periodic trimming of vegetation

BMP	<i>Proper Disposal of Animal Carcasses</i>
Size	N/A
Type	Maintenance and Operational Procedures; Source Control; Non-Structural
Location	Cattle Pastures (Rectangle)
Rationale	The removal of animal carcasses (particularly when located near waterbodies) is crucial to preventing the spread of disease-causing pathogens and bacteria. Preventing this pollution from entering waterbodies will protect human health, avoid contamination of the environment and drinking sources for livestock
Entity responsible for implementation	Rocking G Ranch (Cattle Pasture Lessee)
How success will be measured	Visual surveys will assert that no animal carcasses are found in close proximity to any surface waters. Record keeping of mortalities in a geographic database will be performed by the lessee.
Impact on water quality	Prevent the spread of pathogens and bacteria in waterbodies that can harm wildlife and human health.
Schedule	Short-term: Environmentally sensitive areas will be identified and monitored in 2018 to ensure mortalities that occur near these areas are quickly removed and disposed of properly
	Long-term: A database of locations where animal mortalities occur will be created in 2020.
	Ongoing: As per stipulations in the lease for the cattle ranches, best management practice will be used to address mortalities as they occur in environmentally sensitive areas

BMP	<i>Septic Tank Inspections</i>
Size	N/A
Type	Source Control; Maintenance and Operational Procedure; Non-Structural
Location	MRA, Tamiami Trail Reservation, Snake Road Housing Area
Rationale	Detection of waste leaks from failed septic tanks will prevent pollution of nearby wetlands with nutrients and disease-causing pathogens and bacteria
Entity responsible for implementation	MEPA
How success will be measured	Reductions in TP in waterbodies and wetlands near housing areas; Confirmed reports of undamaged and properly functioning septic systems across all Tribal housing areas on an ongoing basis.
Impact on water quality	Decreased TP; Prevent the spread of pathogens and bacteria in waterbodies that can harm wildlife and human health.
Schedule	Short-term: A funding source will be found within 2 years.
	Long-term: Inspections will begin in 2020, with re-inspections occurring at intervals of 3 years for all Tribal houses. Educational programs will be developed in 2020 to instruct homeowners about proper care and maintenance of septic systems.
	Ongoing: Education and outreach programs will provide information to homeowners on a continual basis.

BMP	<i>Sediment and Erosion Control Measures</i>
Size	To be used on construction projects in a variety of spatial scales throughout the Tribal properties listed below
Type	Maintenance and Operational Procedure; Source Control
Location	MRA, Tamiami Trail Reservation, Krome Avenue Reservation, and Dade Corners Reservation, Snake Road Housing Area
Rationale	Prevent soil erosion, thus reducing nutrient input and turbidity in canals and other surface waters
Entity responsible for implementation	FDOT; Johnson Engineering; Contracted construction companies; Tribal members (home owners) (all under supervision of MEPA)
How success will be measured	Sustained low levels of turbidity and TP in adjacent waters, including the L-29 canal and Old Tamiami Trail canal
Impact on water quality	Reduce the amount of sediment entering Tribal waterbodies, thus reducing nutrient loading (decreased TP, turbidity, and BOD).
Schedule	<p>Short-term: Turbidity and TP measurements will be collected throughout 2018 and areas will be identified with erosion and sedimentation concerns.</p> <p>Long-term: Sediment control structures will be implemented across Tribal lands in appropriate areas to prevent erosion in previously identified areas by 2020.</p> <p>Ongoing: Continuation of current management practices; as new construction plans are developed, appropriate erosion control measures will be developed.</p>

BMP	<i>Rolled Erosion Control Products</i>
Size	Small areas, roughly 1 acre in size consisting of newly constructed house pads and existing housing areas that undergo construction within the 700 acre housing area
Type	Structural; Source Control;
Location	MRA, Tamiami Trail Reservation, Snake Road Housing Area
Rationale	Prevent soil erosion during construction of house pads, thus reducing nutrient input and turbidity in nearby waterbodies
Entity responsible for implementation	Contracted construction companies, Tribal members (home owners) under supervision of MEPA
How success will be measured	Successful ground cover with rolled materials and reduced soil erosion will cause decreased turbidity and TP in the nearby Tamiami Trail Canal and adjacent wetlands
Impact on water quality	Decreased TP and turbidity due to reduced soil erosion
Schedule	Short-term: A funding source and selection of the optimal product will occur in 2018. Education and training will be provided in 2019, with the first installations occurring in 2020.
	Long-term: Erosion control products will be fully installed in 2021
	Ongoing: Inspection and maintenance of erosion control products will occur continuously following installation.

BMP	<i>Educational Posters, bulletin boards and pamphlets</i>
Size	N/A
Type	Education and Outreach Programs, Non-Structural
Location	Kiosks to be placed near boat ramps, access points in the MRA, and strategic areas in the Miccosukee Federal Reservation and WCA-3A (e.g. Miccosukee Indian School, General Store, and Administration Building)
Rationale	Preventative steps taken toward reducing NPS pollution are more simple and cost-effective than implementing other structural BMPs. Outreach programs and information sharing will bring significant water quality benefits by instructing people how to implement BMPs. Information will be given for proper storage and disposal of waste, responsible ORV use, and septic system maintenance
Entity responsible for implementation	MEPA
How success will be measured	Level of participation by Tribal members will be an early indication of success, and subsequent follow-up interviews will measure the degree to which Tribal members are aware of and adhere to BMPs. The Tribal members' willingness to participate in BMPs is increased. Water quality sampling for TP, turbidity and other appropriate metrics, as well as community surveys will be used to determine the ultimate success of education and outreach programs.
Impact on water quality	Decreased TP; decreased turbidity; reduced streambank damage and erosion on sides of waterways; protection of vegetative cover along the sides of canals; prevention of transmission of disease-causing pathogens; reduced nutrient input from cattle waste
Schedule	<p>Short-term: Preparation of educational materials will begin in 2018. Education and training to begin in 2019 and continue through 2020.</p> <p>Long-term: Installation of kiosks or other visual display areas will occur in 2020. Development of NPS curriculum and youth programs at Miccosukee Indian School will be completed in 2020</p> <p>Ongoing: Maintenance of display areas and additional informational materials will be developed on an ongoing basis.</p>

BMP	<i>Invasive Plant Removal</i>
Size	Invasive plant growth is patchy and intermittent (particularly floating aquatic vegetation). Localized, targeted plant removal efforts will occur across a large area approx. 21,000 acres
Type	Maintenance and Operational Procedures
Location	Rectangle, Triangle, Sherrod Ranch
Rationale	Removal of invasive plants will prevent further degradation of the native plant communities, and enhance the flow of water through conveyance canals
Entity responsible for implementation	MEPA; SFWMD; Rocking G Ranch (Cattle Lessee)
How success will be measured	A marked decrease in nuisance vegetation conditions in canals and adjacent areas; increased D.O.; decreased turbidity
Impact on water quality	Enhanced flow through conveyance canals, improved (increased) D.O. concentrations, decreased turbidity, prevention of eutrophic conditions, decreased sedimentation
Schedule	<p>Short-term: Invasive plant removal near the perimeter fence line of the cattle pastures will occur in 2018 and 2019</p> <p>Long-term: An invasive plant eradication plan will be developed by 2021. Targeted plant removal measures will begin in 2020 and the invasive plant eradication plan will begin implementation in 2021.</p> <p>Ongoing: Plant Removal activities will occur as required to address various invasive plant species found in Tribal lands and water bodies</p>

7.0 ACRONYMS

ACE	U.S. Army Corps of Engineers
AST	above-ground storage tank
BMP	best management practice
BOD	biological oxygen demand
CERP	Comprehensive Everglades Restoration Plan
CWA	Clean Water Act
D.O.	dissolved oxygen concentration
DOI	U.S. Department of Interior
EAA	Everglades agricultural area
ENP	Everglades National Park
EPA	U.S. Environmental Protection Agency
FDOT	Florida Department of Transportation
FWS	U.S. Fish and Wildlife Service
LOWP	Lake Okeechobee Watershed Project
MEPA	Miccosukee Environmental Protection Agency
MRA	Miccosukee Reserved Area
NPS	nonpoint source
ORV	off-road vehicle
PAH	polycyclic aromatic hydrocarbon
PPB	parts per billion
SFWMD	South Florida Water Management District
SPCC	Spill Prevention Control and Countermeasure
SVOC	semi-volatile organic compound
TAS	treatment as a state
TPH	total petroleum hydrocarbons
TP	total phosphorus
UST	underground storage tank
VOC	volatile organic compound