Lake Restoration: The Natural Resources and Environmental Plan

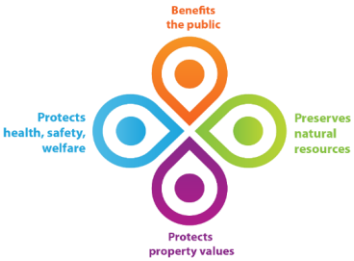
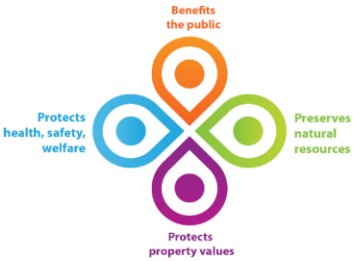
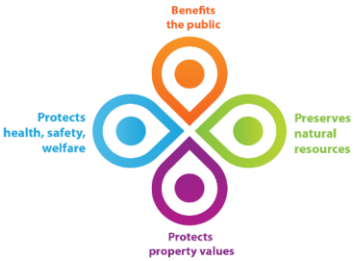


Table of Contents





Introduction

Secord, Smallwood, Wixom and Sanford lakes (Four Lakes) are in Midland and Gladwin counties in central Michigan. The Four Lakes system was created by impounding the Tittabawassee River through the construction of four dams. More than 8,400 properties, seven townships, a village, two counties and the State of Michigan directly benefit from the maintenance of lake levels created by dams on each lake.

The Four Lakes system provides natural resources, recreational opportunities and public access for the enjoyment by many thousands of people. It was established nearly 100 years ago when dams were constructed to produce hydropower. From the time when the original 1920s deeds were issued to Wolverine Power Company, and to property owners who have deed access to the lakes, for boating, fishing, hunting and other recreational activities.

Over time, properties dependent on the lakes were developed and a thriving environmental and economic ecosystem emerged. Individuals and families invested in the region with the reasonable expectation that the Four Lakes system would be there in perpetuity for themselves and their children.

A Devastating Flood Event

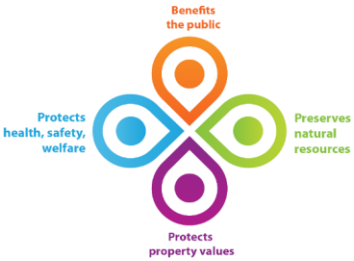
On May 19, 2020, the dam on Wixom Lake (Edenville Dam) failed, resulting in a surge of flood waters that subsequently caused the dam at Sanford Lake to fail. The upstream Secord and Smallwood dams were significantly damaged and immediately ordered to be drawn down by the Federal Energy for inspection. Now, for reasons of public safety, the two upstream dams cannot be refilled until they are rebuilt to meet current industry design standards.

The dam failures caused catastrophic flooding throughout the region, resulting in millions of dollars of damage to homes, businesses and public infrastructure. The region was declared a national disaster on July 9, 2020 by President Donald Trump.

Establishment of Legal Lake Levels Under Part 307

In May 2019, the Gladwin and Midland County circuit courts established the normal levels for each of the Four Lakes under authority of Part 307 “Inland Lake Levels” of the Michigan Natural Resources and Environmental Protection Act, 1994 Public Act 451, as amended, Part 307 (MCL 324.30701 et seq.) and approved the establishment of the Four Lakes Special Assessment District. Subsequently, Midland and Gladwin counties acquired the dams and lake bottom property and is moving forward to restore the dams. A preliminary engineering report and design, specific to dam construction and dam safety have been provided to the Michigan Department of Environment, Great Lakes and Energy (EGLE).

The purpose of Part 307 is to provide guidance for the control and maintenance of inland lake levels for the benefit and welfare of the public and the State’s natural resources. It allows counties to make policy decisions concerning the maintenance of inland lakes and provides a mechanism for transitioning privately owned dams to public ownership and control.



Part 307 weighs various factors in establishing lake levels including that legal lake levels provide the most benefit to the public, protects the public health, safety and welfare; best preserves the natural resources of the state; and best preserves and protects the value of property around the lake. EGLE and the Michigan Department of Natural Resources (MDNR) took part in the proceedings and issued no objections to the establishment of the legal levels for each of the Four Lakes. Further, the county circuit courts have "continuing jurisdiction", which means, anything affecting the lake levels, including deviation from the normal levels, must be presented to the circuit court for its consideration.

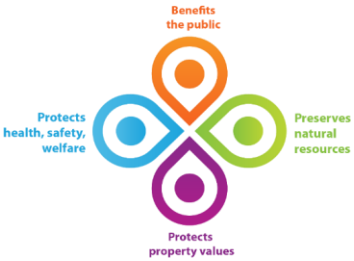
In addition, Midland and Gladwin counties appointed Four Lakes Task Force (FLTF) to be its Part 307 "delegated authority" to manage the operations and maintenance of the four dams. Subsequently FLTF conducted its due diligence and developed an affordable plan to acquire the dams from Boyce Hydro Power (Boyce) and make the necessary dam safety improvements. A purchase agreement was signed in late 2019 that unfortunately was not able to be executed before May 19, 2020, when the dam failures occurred.

In June 2020, the counties authorized the condemnation and taking of the properties from the former owner, Boyce. The counties also further appointed FLTF the delegated authority for all federal and state coordination and funding in connection with the recovery and restoration of the Four Lakes.

Synopsis of Lake Restoration Plan

Given the May 2020 disaster, the focus is now shifted to restoring and enhancing an ecosystem that was devastated. This document outlines the FLTF Lake Restoration Plan approach, which will take time to finalize. Key elements are:

- Restoration of lakes to legal lake level
- Habitat restoration and enhancement of the lake bottoms
- Stabilization and shoreline best management practices
- Debris management
- Managing invasive species
- Managing drained lake bottom vegetation
- Restoration of hydrology to wetlands
- Re-connecting tributaries to the lakes
- Mitigating for wetlands impacted in dam construction zones
- No additional harmful interference to the Tittabawassee River floodplain from pre-May 2020 condition
- Develop Region Recreational Master Plan
- Use of best practices for threatened and endangered species



Stakeholder Engagement and Involvement

Four Lakes Task Force will develop a Four Lakes Restoration Plan over the next 18 months and encourages stakeholder engagement and involvement. FLTF will require early acceptance of the plan's template from regulatory agencies, followed by a funding plan for the resources to study and implement.

The property owners along the lake, who all were financially damaged by the disaster, through no fault of theirs, are now being asked to pay the majority of the cost to restore the lakes for the next 40 years for capital improvement, and additionally each year for operation and long-term maintenance of the dams, lakes and ecosystem.

Secord and Smallwood Dams

These dams constitute serviceable structures; and for purposes of evaluating impacts and addressing environmental permitting, the dams are considered as a planned maintenance program with a temporary drawdown for rehabilitation and then lake-level restoration.

The rehabilitation includes approximately $43 million of improvements which will reduce risk of flood damage to lake front owners through run-of-river operations, improve public safety, maintain property values, provide recreational opportunities and restore the ecosystem and economy that has existed along these highly developed lakes for many years. Where opportunities present themselves, FLTF will work to enhance the lake ecosystem with improvements to fish, reptile, amphibian, mussel and avian habitats.

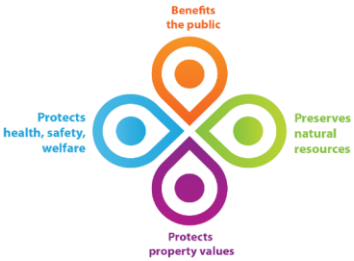
Regulators ordered Secord and Smallwood lakes be drawn down to protect public safety and inspection of the dams. The lakes are not completely drained and will be restored in 2024. EGLE and FLTF have determined a lake restoration plan is not necessary. Once the lake levels are restored, the previously thriving lake ecosystem is anticipated to rebuild and these lakes will once again be able to provide benefits to the community.

Edenville and Sanford Dams

These dams failed during the flood event and reconstruction, which is estimated to cost $172 million, is needed. Upon failure, the communities of Wixom Lake and Sanford Lake were left with drained lakebeds and disruption of an ecosystem and community that established over the past 100 years around the lakes. Given the magnitude of environmental damage, and the scope of reconstruction of the dams, a lake restoration plan is needed to begin restoration of the ecosystem and address environmental regulations.

Wixom and Sanford Lakes - Transition and Restoration Planning Summary

While the loss of the lakes resulted in catastrophic impacts to the thriving ecosystem, opportunity remains. With significant investment, the lakes and habitats can be restored - the fish, birds, turtles and frogs will return. With forward-thinking and proper planning, the lakes can be made even better than they were for the fish and wildlife that they support. There is opportunity to study and understand the underwater world from a perspective that is rarely witnessed, and to use the information to create and implement a plan to maximize ecosystem function. The purpose of this section is to identify and describe



opportunities that could be conducted as part of the restoration of Wixom and Sanford lakes to restore and enhance the ecology of these systems.

Given the environmental damage due the failure of the dams, a lake restoration plan for natural resources and environment is needed. This is critical for the community to understand how recreational and natural resources value is being restored. The scope and magnitude of the plan will be developed by FLTF with input from EGLE, U.S. Fish and Wildlife Service (USFWS), MDNR and other stakeholders. FLTF will work to finalize the plan in 2022. The base components of the lake restoration plan are detailed in the following sections**.**

Safely Restoring the Dams

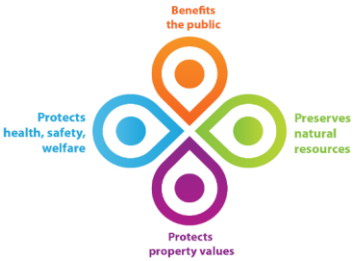
Chapter seven of the feasibility report provides detail on the dam restoration plan and summarizes key factors for dam safety permitting. The design storm criteria for all dams will be based on an Inflow Design Flood (IDF) in accordance with the Federal Emergency Management Agency (FEMA) Dam Safety Guidelines as recommended by the Michigan Dam Safety Task Force. The selected design storm may significantly exceed the current State of Michigan EGLE dam safety requirements for each of the dams. This restoration provides an opportunity to EGLE and FLTF to work together on Dam Safety Advocacy.

Dam Operations

Spillway gate operations at the dams will be vastly improved post construction. The existing Tainter gates (chain operated, bottom opening gates) will be replaced by hydraulically operated crest gates. Hydraulic power will be required to hold the gates in the up, or closed position. Upon loss of power the gates will immediately lower to the fully open position, creating a “fail safe” system. Each gate will have two hydraulic cylinders, one located on each side of the gate and outside of the water path to avoid debris and icing. The gate seals and sills will be equipped with heaters for winter operations. The gates will be capable of fully automatic operation, remote manual operation and local manual operation.

Each dam will also be equipped with an auxiliary spillway to pass additional water during high flow events. The auxiliary spillways will be “passive” overflow structures that are ungated, do not require power, or require operator intervention. The passive design will ensure reliable spillway capacity during high flow events.

Operation of the dams post-construction will be fully run-of-river. The four dams were originally constructed to create impoundments to support hydroelectric generation. Historically the four projects operated on a pond and release basis within 0.7-feet of drawdown to maximize on peak generation. Post-construction there will be no hydroelectric generation and the impoundments will be maintained at their legal lake levels via run-of-river operations. Except for high flow conditions, each impoundment will be kept at its legal lake level and release the required seasonally adjusted minimum flow, or inflow, whichever is less. Run-of-river operations will benefit aquatic life in the littoral zone and improve the recreation experience.



Permitting

For the dams to be reconstructed, EGLE will have to issue permits in accordance with Public Act 451 of 1994, specifically Part 315 (Dam Safety), Part 301 (Wetlands), Part 303 (Lakes and Streams) and Part 31 (Floodplains). Also, impacts to threatened and endangered species and cultural resources will be considered during the permitting process. FLTF intends to submit a comprehensive permit application to address each of these requirements for the construction of the dams.

Natural Resource Management

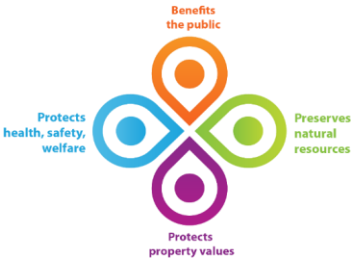
Prior to the dam failure, Sanford Lake and Wixom Lake provided access to recreation and natural resources for thousands of property owners. The lakes are highly developed, primarily with residential homes with public access provided by the MDNR, counties and townships. The primary function of the lakes, from FLTF point of view, are recreation and natural resources. These are key for protecting property values, local economics and local governmental services. Restoring the dams, will restore the water to lakes but additional measures are needed to restore natural resources.

The lakes also provided hydrology to support wetland complexes within and adjacent to the lakes, and the loss of the lakes have impacted groundwater. The dams provide barriers for invasive species, the shorelines were, for the most part, stable and the lake bottom, when originally flooded, had many standing trees in deeper portions that provided habitat for many aquatic species, especially fish. In general, these lakes were a great resource and utilized extensively for recreation and natural resources.

Subsequently, the failure of the dams and the draining of Wixom and Sanford lakes, vast bottomlands were exposed for the first time in nearly 100 years. Bisected by the Tittabawassee and Tobacco River channels, these bottomlands offer a unique perspective of the aquatic habitats that existed not long ago; embedded logs, sandy points, mud flats, gravel bars, steep drop-offs and century-old standing timber offered a diversity of lentic habitats that produced thriving stocks of native fish, which attracted large numbers of recreational anglers. The lakes were also home to a variety of reptiles, amphibians, waterfowl and freshwater mussels, along with the plants and microorganisms that drove the food web.

Within the former impoundments, the Tittabawassee and Tobacco rivers can be seen meandering through a mostly barren landscape, as they continue to adjust to the newly exposed bottomland environment. Streambank and streambed erosion are ongoing, several headcuts are present and the streambed is mobile and continually shifting. Dozens of tributary stream channels are carving their way to meet the mainstem rivers. The drop of the water table has drained a significant number of adjacent wetlands and left upstream culverts perched. With the water drained and productive soils exposed, herbaceous and woody vegetation are already colonizing the former lakebeds. Unfortunately, these conditions are perfect for colonization of invasive species, including common reed grass (*Phragmites australis*).

The abrupt water elevation change caused perched culverts and drained shallow water areas of the former lakes cutting off access for the drained lakes' remaining fish to historic spawning and nursery waters. For example, northern pike (*Esox lucius*), which typically spawn in shallow marshes and small streams, ditches and drains, can no longer access those waters with the lakes drained. Crappie (*Pomoxis*



sp.), which like to spawn in shallow, still waters with weed growth, found themselves in a flowing river with no vegetation at all. Bluegills (*Lepomis macrochirus*) and largemouth bass (*Micropterus salmoides*) that spawn in a variety of substrates under still, shallow water found themselves in flowing water. Initial site investigations suggest a minimum of 26 tributaries that provided fish access to spawning habitat have been "disconnected" from Wixom and Sanford lakes.

Wetlands are in the process of forming within the drained lakebed, and hydrology for numerous wetlands adjacent to the lakes has been lost or significantly reduced. Initial estimates indicate that while hundreds of acres of wetland are forming within the drained lakebeds, significantly more adjacent wetlands have been hydrologically impacted as a result of the disaster. Hydrology within these adjacent wetlands is expected to be restored once the lakes are refilled.

Stream and Shoreline Stabilization

Sediment is a primary pollutant to watercourses everywhere and uncontrolled lakeshore erosion was a major cause of turbid water and excessive sedimentation in Wixom and Sanford lakes. Over the years, landowners have hardened the shoreline with various forms of bank protection to protect their property from river currents, boat wakes and other erosive forces. Unfortunately, from exacerbating erosion on neighboring properties to eliminating connections to northern pike spawning marshes, negative ecological impacts associated with widespread construction of seawalls are well-documented.

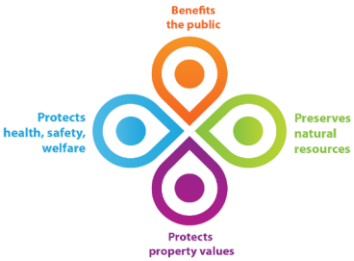
Natural shorelines are critical for a myriad of aquatic or semi-aquatic wildlife including fish, reptiles, amphibians and waterfowl, to name a few. Natural shorelines often contain vegetative communities, undercut banks and other microhabitats, stable substrates and easily traversed transitions from aquatic to terrestrial habitats, all which are to the benefit of native wildlife.

Restoration of shoreline areas will incorporate, when possible, bioengineering principles to create a natural and resilient shoreline, beneficial to landowners and the natural environment. Where desired by stakeholders, plantings of native shrubs and herbaceous vegetation will be installed to prevent sediment erosion along the shoreline. Bioengineered shorelines will provide many benefits to the landowners and lake ecosystems by absorbing wave and wake energy, reducing erosion, providing habitat for fish and wildlife, and filtering out nutrients from surface runoff prior to entering the lakes.

The FLTF is investing over $40 million to shoreline stabilization and erosion control, including interim stabilization measures on the Edenville and Sanford dams and stabilization of three miles of critically eroded shorelines. Some of this work has been completed to date, with the majority to be completed in 2021 and 2022. FTLF is also facilitating a do-it-yourself program to provide education and materials to homeowners to assist with the stabilization of non-critical shoreline areas. There are approximately 87,500 cubic yards of sediment to be addressed.

Next Steps

- Map the shorelines of Wixom and Sanford lakes to illustrate the areas of hardened and natural shorelines.



- Identify critical habitat areas where natural shorelines can be protected or improved, or where hardened shorelines have potential for alteration to improve the land/water interface.
- Identify areas for protection/improvement of potential migration routes between the lakes and adjacent wetlands and woodlands.

Nutrient Loading

Nutrient loading can negatively impact water quality. Sources of nutrient loading to inland lakes includes sediment/soils, pet waste, fertilizers, detergents, stormwater runoff and many others. FLTF plans to work with stakeholders, including The Nature Conservancy, to prioritize and implement best management practices that improve soil health and reduce sediment and nutrient loading[1]. Beneficial practices include vegetated buffer strips, grassed waterways, prairie strips, constructed wetlands, saturated buffers and two stage ditches, all of which will act to reduce peak flows and filter nutrients and sediments prior to entering the lake systems. Additionally, The Nature Conservancy will support the necessary policies and programs, including outreach, that incentivize these implementation of best management practices.

Interim Management of Lake Bottom

Four Lakes Task Force has determined that management of the bottomlands in the interim is necessary to prevent a terrestrial ecosystem from forming and to ensure the lake will be able to be utilized for recreation once the water levels are restored. Grasses will be encouraged as they do not impact the plans to refill the lakes and will prevent erosion. A tree management program will be put in place to ensure tree height in the refilled lakes allows for boating and swimming, but also provides necessary habitat for fish. Additional details can be found in the vegetation control section of this document.

Rehydration of Wetlands

EGLE has indicated that impacts to wetlands that develop within the bottomlands of Wixom and Sanford lakes, although not expected to develop into high quality systems, must be mitigated for once the lakes are restored. EGLE also indicated that wetlands that have been impacted due to loss in hydrology from the failure of the dams could be considered for wetland mitigation if hydrology is restored once water to the lakes are restored.

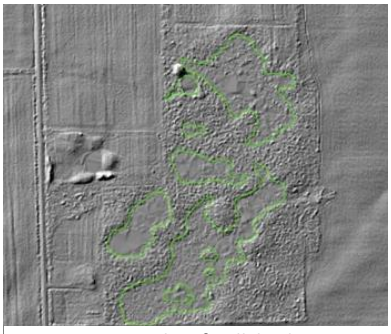


Figure 1. Example of Hillshade Dataset developed using a LiDAR Digital Elevation Model

Qualified wetland professionals have completed a desktop analysis[2] that included a review of a variety of data resources (Light Detective

[1] www.nature.org/EdgeofField
www.nature.org/en-us/about-us/where-we-work/united-states/michigan/stories-in-michigan/soil-health-in-saginaw-bay/
www.nature.org/content/dam/tnc/nature/en/documents/rethink-soil-executive-summary.pdf

[2] See Pre- and Post-Disaster Wetland Analysis in Chapter 8 Appendix

and Ranging (LiDAR) derivatives, imagery, watershed connectivity modelling and previous wetland mapping) to determine an estimated extent of:

1. Pre-disaster wetlands
2. Post-disaster wetlands
3. Pre-disaster surface waters
4. Post-disaster surface waters

Using this information, calculations were performed with the goal of determining the potential extent of:

1. Wetlands potentially impacted by the disaster
2. Wetlands created due to surface water drawdowns
3. Surface water area lost due to the disaster

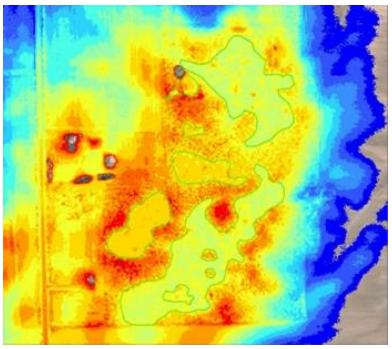


Figure 2. Example of LiDAR Classified data developed from a LiDAR Digital Elevation Model

In total, 43,458 acres were reviewed that encompass the Wixom and Sanford Lake flowage areas. These areas experienced a significant decline in wetland and surface water acreages following the disaster, Table 1.

Table 1. Pre- and Post-Disaster Wetland and Surface Water Analysis Results

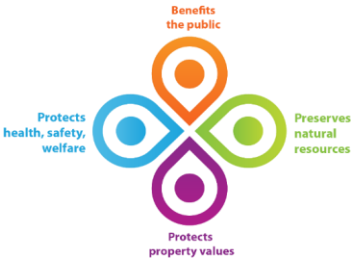
Wetlands			
Pre-Disaster (acres)	**Post-Disaster (acres)**	**Post-Disaster Created (acres)**	**Δ* (acres)**
9,726	6,564 to 7,679	389	-1,658 to -2,773
Surface Water			
Pre-Disaster (acres)	**Post-Disaster (acres)**	**Δ* (acres)**	
3,756	1,148	-2,608	

* 'Δ' represents net change from pre-disaster to post-disaster.

Although approximately 389 acres of wetland is expected to develop within the Sanford and Wixom Lake bottoms, over 2,000 acres of wetland are estimated to have been impacted by the loss of approximately 2,608 acres of surface water associated with the lakes. It is expected that these wetlands will have their hydrology, ecological function and integrity restored once the lakes and their associated hydrology are re-established. In addition, shallow water wetlands are planned to be restored and created as a part of the lake restoration plan. These efforts, including return of the lake water levels, will be considered a part of the wetland mitigation process.

Next Steps

- Develop methodology to verify wetland estimates.
- Implement field verification of desktop wetland estimates.



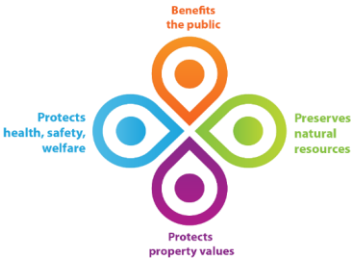
Fish Community and Opportunities for Improvement

The historic fish community within Wixom and Sanford lakes, prior to the dam failures of 2020, contained a diversity of native cool- to warm-water fishes[3], as described in the Tittabawassee River Assessment (Schrouder et al. 2009). Sunfishes, including black and white crappie (*Pomoxis nigromaculatus* and *Pomoxis annularis*), bluegill, pumpkinseed (*Lepomis gibbosus*), green sunfish (*Lepomis cyanellus*) and rock bass (*Ambloplites rupestris*) dominated the fish community. Top predators in these systems were black bass (largemouth and smallmouth), northern pike, muskellunge (northern strain; *Esox masquinongy*), walleye (*Sander vitreus*) and channel catfish (*Ictalurus punctatus*). Sanford Lake also supported a resident white bass (*Morone chrysops*) population. Both impoundments also had sizable populations of a variety of redhorse sucker species (*Moxostoma* sp.), white sucker (*Catostomus commersonii*), carp (*Cyprinus carpio*) and black, brown and yellow bullhead (*Ameiurus* sp.). In Sanford Lake, age distributions for the predator species were balanced with good survival to older ages, resulting in desirable numbers of large individuals to attract fishing activity. Periodic stocking of walleye and muskellunge by MDNR supported the fisheries for those predatory species.

Walleye are one of the most popular sport fish species in the state and are widely stocked in Michigan inland lakes and impoundments. Walleye stocking has been an important component of fishery management activities by the MDNR in all four of the Tittabawassee River lakes for many years. To successfully spawn and survive to maturity, walleye require specific conditions that are not found in most Michigan lakes and rivers, thus the need for the ongoing statewide stocking program. In some cases, suitable spawning habitat may be lacking. In other cases, the abundance and species composition and timing of zooplankton available for walleye fry to feed on may be wrong, resulting in poor fry survival. Predation on walleye larvae and fry by other fish species can also impair self-sustainability of walleye inland Michigan walleye populations. If suitable spawning habitat is the limiting factor, it is possible to artificially improve walleye egg deposition and hatching by adding gravel and rock to riverine habitat (Crane and Farrell 2013; Katt et al 2011; Dustin and Jacobson 2003). However, it should be noted that other factors may continue to bottleneck walleye survival and population self-sustainability.

Since restoration of the impoundments will result in aquatic conditions that approximate those from pre-dam failure, a restoration target of fish communities similar to those present prior to May 2020 appears logical and reasonable. While it is anticipated that all the species naturally present prior to dam failure will repopulate Wixom and Sanford lakes at some point in time, strategies for a more controlled repopulation may be considered. Ultimately, Fisheries Division of the MDNR is the agency charged with overseeing the management of the fishery resources in the Tittabawassee River, Wixom and Sanford lakes. Any management activities such as fish stocking or habitat improvement should be led and endorsed by MDNR Fisheries Division.

[3] See Secord, Smallwood, Wixom and Sanford Lake Restoration - Fishery Scoping Reports in Chapter 8 Appendix



Sustainability

Wixom and Sanford lakes have historically supported thriving fish communities. The long-term success of restoration will depend on the ability of the fish community to sustain a balanced and diverse fishery. The surest way to meet the objective is through protection and/or creation of high-quality habitat for reproduction, growth and recruitment of the fish species within the community.

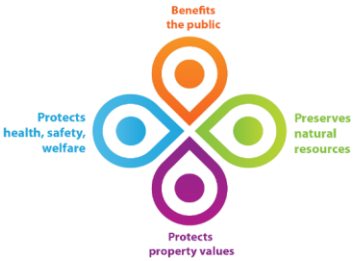
Different species of fish may have unique habitat requirements, and each life stage of a fish may have unique habitat requirements. Some fish, such as bluegill, are prolific and have very general habitat requirements; they can be successful nearly anywhere they occur, and the primary limiting factor is reduced growth rates associated with overpopulation. Northern pike, on the other hand, require shallow, flooded marshes for spawning; this species has probably been more adversely affected by shoreline development than any other. A common theme for most of the fish known to occur in Wixom and Sanford lakes is that they are heavily dependent on high-quality shoreline habitats, during some stage in their life history.

Developed impoundments often contain less than desirable fish habitat due to factors such as removal of logs, brush and vegetation for boating and swimming and armoring of the shorelines. Deficiency of submerged habitat can limit fish abundance, ecological diversity and fisheries (Wills et al. 2004). The importance of coarse woody debris in lake ecosystems is well known to fisheries managers (Everett and Ruiz 1992, Chau 2015, Wolter undated). From providing spawning substrates and cover for certain fish species, to improving macroinvertebrate communities, the merits of coarse woody debris are discussed throughout the literature. Restoration goals are typically associated with increasing carrying capacity by improving spawning success, juvenile survival, growth rates and recruitment to the fishery. In addition to creating healthier fish populations, habitat projects can also be used to increase angler success by concentrating fish over structure in otherwise barren areas. Though somewhat rare in Michigan, fish attractant-type structures (e.g., rock piles, log cribs, brush bundles) are commonly used to create fish-holding habitat. Structure can be added near public access and fishing piers to increase the catch for shore-bound anglers.

Fish passage technology has been used to try and mitigate some of the impacts of dams on fish populations. However, creating effective fish passage at the dams would be challenging at best if not impossible due to the height of the dams and the fish species (non-jumpers) considered for passage. The primary target species for passage include walleye, suckers and lake sturgeon. In addition, major trade-offs related to unwanted spread of invasive species, particularly sea lamprey (*Petromyzon marinus*), would need to be rigorously evaluated especially considering the unlikelihood of providing effective fish passage.

Next Steps

- To develop a detailed restoration plan, documenting and mapping existing habitats is crucial to understand how much potential exists for improvement. Habitat management is advisable if existing habitats are limiting the productivity of the fishery. The need for “improvement” work must be determined based upon the amount, type and distribution of existing habitats.

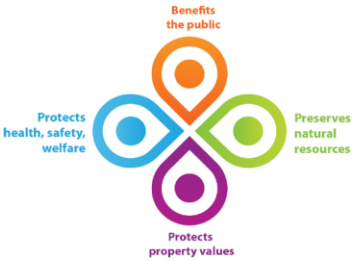


- Understand limiting factors associated with species of interest. For example, natural mortality rates for crappies are quite high. Cover is a crucial element for larval and juvenile crappies to avoid predation. The limiting factor for a quality northern pike population is access to shallow, flooded marshes for spawning. Grasses, sedges or rushes make good substrates for egg deposition. Spawning marshes must be inundated with water for at least three months after egg deposition for the best survival rate (Becker 1983).
- Document and map the existing spawning substrate available in the riverine section below the Secord, Smallwood and Edenville dams. Velocity, depth, substrate particle size and embeddedness are key habitat components to consider for walleye spawning habitat (Gillenwater et al 2006).
- Determine where habitat improvement projects are acceptable, based upon potentially conflicting uses such as navigation, swimming, etc.
- Identify appropriate areas for and types of improvements. For example, Wills et al (2004) found that half-log habitat structures significantly increased smallmouth bass nest density and nest success, but particularly in areas with gravel substrate. Installation of gravel and cobble/rock could potentially improve wild spawning success for walleye.
- Identify areas appropriate for creation of shallow water marshes considering potentially conflicting recreational uses.
- Inventory of on-site materials that might be used for habitat improvement, including areas of vegetative growth on bottomlands and nearshore. Consider accessibility issues associated with materials and equipment.
- Identify areas for improving success for anglers and providing maps of enhanced fishing areas, for both boat and shore-bound anglers.
- Identify tributaries and associated wetlands of each lake that have in the past and will again provide access to reproductive habitat for fish and other aquatic organisms.

Reptile and Amphibian Community and Opportunities for Improvement

Many amphibians and reptiles rely on the aquatic environment for habitat, reproduction and food. They are also an important food source for a variety of vertebrate species including fish (bass, pike, muskellunge), mammals (mink, otters, foxes, raccoons, skunks, shrews) and birds (herons, bitterns, hawks). Amphibian and reptile populations are threatened by a number of human activities including alteration, fragmentation and loss of wetland habitats (Harding 1997). Shoreline hardening can also restrict the movement of some amphibians and reptiles, particularly for turtles, between aquatic and terrestrial habitats.

In Michigan, eutrophic lakes typically have the largest number of associated amphibians and reptiles (Holman 2012). Wixom and Sanford lakes are considered to be eutrophic or mesotrophic, indicating they should support diverse populations of frogs, turtles and snakes. Nearly all salamanders and some frog species rely primarily on vernal ponds (seasonal temporary pools) for reproduction because these ephemeral pools are free from fish predation on eggs and larvae (Holman 2012). Forested wetlands in the



immediate vicinity of the impoundments are likely to support a diverse community of these animals as well, when water tables are high enough to create the vernal pond habitats they require for successful reproduction. Simply re-filling the lakes will restore many of these wetland habitats.

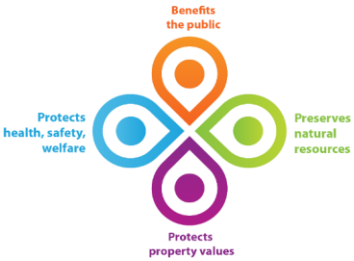
Schrouder et al (2009) reported that 11 frog and toad species, seven salamander species, 10 turtle species, one lizard species and 15 snake species occur within the Tittabawassee River watershed. A search of the Michigan Natural Features Inventory (MNFI) county element data for Midland and Gladwin counties resulted in the addition of one more turtle (wood turtle; *Glyptemys insculpta*). In total, three turtle species Blanding's turtle (*Emydoidea blandingii*), wood turtle and eastern box turtle (*Terrapene carolina carolina*) and three snake species, queen snake (*Regina septemvittata*), Butler's garter snake (*Thamnophis butleri*) and eastern massasauga (*Sistrurus catenatus*) are listed as state special concern; and one turtle (spotted turtle; *Clemmys guttata*) and one snake (eastern fox snake; *Pantherophis gloydi*) species are listed as state threatened. Eastern massasauga is also listed as federally threatened.

Amphibians and reptiles benefit when the water/land interface is maintained in a natural form. These animals need unrestricted movement between the water and upland areas and hardened vertical shorelines, like steel or concrete seawall, can be a barrier to their movements. Fallen trees along shorelines are a habitat component that many amphibians and reptiles utilize, particularly turtles for basking in the sun. Installation of tree trunks along shallow natural shoreline areas and shallow wetlands will promote reptile and amphibians, as well as fish.

Nesting habitat can be a limiting factor. Some turtle species need specific nesting habitat such as open sandy areas. Artificial nesting mounds have been successfully used for wood turtle, painted turtles (*Chrysemys picta*) and snapping turtles (*Chelydra serpentina)* (Buhlmann and Osborn 2011, Paterson et al 2013). Habitat mapping will identify areas of opportunity and potential availability of desirable soil types with the lakebed.

Vernal ponds, often found in wooded wetlands, are critical breeding habitats for many species of salamanders and some frogs. These species will benefit greatly from restoration of the Tittabawassee River impoundments and rehydration of associated wooded wetlands in the adjacent riparian zones. Without fish-free spring vernal pools, many salamanders and some frog species have very poor reproductive success.

The restoration plan will restore and create riparian wetlands along the restored lakebeds via grading to achieve desired water levels following re-inundation. A wetland restoration plan will be developed for the purposes of pursuing wetland mitigation opportunities from the restored and created wetland areas. Plantings of native emergent and aquatic vegetation species will promote a biodiverse ecosystem following restoration; success will be measured via pre-approved performance standards during a scheduled monitoring period. Habitat structures will be constructed from repurposed woody debris left over from the flood event. Restoration of shallow water wetlands will benefit fish and wildlife, species, including reptiles and amphibians, by providing critical reproductive, nursery, basking and foraging habitat



while providing an opportunity for onsite wetland mitigation. Water quality will also be improved through nutrient uptake and suspended solids retention within shallow water wetland areas.

Next Steps

- Identify and map existing high-quality habitats for reptiles and amphibians and develop a plan to protect, improve and expand these areas.
- Identify sites where improvements may benefit reptiles and amphibians.
- Verify initial estimates of adjacent wetland loss, wetland developing within the lake beds and resulting wetland restoration once hydrology is restored.

Avian Community and Opportunities for Improvement

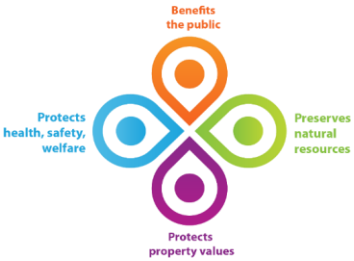
A variety of waterfowl species historically used the impoundments, but the commonly found species are Canada goose (*Branta canadensis*), mallard duck (*Anas platyrhynchos*) and wood duck (*Aix sponsa*); diving ducks, such as bufflehead (*Bucephala albeola*), were seasonally present. Canada geese can be an annoying nuisance for riparian property owners and should not be intentionally attracted to the impoundments. Mallards and wood ducks are both desirable ecologically and rarely create nuisance issues with lake front property. Both species are known to use artificial nesting structures when available. Nesting tubes for mallards and nesting boxes for wood ducks can easily be installed in shallow water areas after the lakes are refilled, to ensure predators are unable to reach the nests. Natural shorelines and wetlands benefit wading birds such as herons and bitterns. Ospreys (*Pandion haliaetus*) and bald eagles (*Haliaeetus leucocephalus*) are fish predators and can provide an attraction for birders. Bald eagles were observed at Wixom Lake in 2019 and 2020. Osprey were not observed. Osprey nesting platforms are successfully used in many states to attract this raptor species. Installation of osprey nesting platforms would be easiest during the current dewatered condition of the impoundment.

Next Steps

- Map the shorelines of Wixom and Sanford lakes to illustrate the areas of natural shorelines and opportunities for creation of shallow water wetlands.
- Identify critical habitat areas where natural shorelines can be protected or improved, or where hardened shorelines that have potential for alteration to improve the land/water interface.
- Identify possible Osprey and duck nesting platform sites in both Wixom and Sandford lakes.

Mussel Community and Opportunity for Improvement

Hoeh and Trdan (1984) documented 13 native freshwater mussel species alive and one species that was only found as a shell from 1979-1981 in the Upper Tittabawassee watershed. MNFI (2021) has documented five state-listed mussel species (four special concern and one threatened) in Gladwin County and 11 listed species in Midland County (four additional special concern, one state endangered species – black sandshell [*Ligumia recta*] – and the snuffbox mussel [*Epioblasma triquetra*] that is state and federally endangered). A total of 11 state or federally listed mussel species have been reported from the counties of the Four Lakes region. Michigan Mussels Web App (MMWA 2021) highlights the regions of the Four



Lakes mussel fauna including four species of concern in the Secord Lake headwaters of the Tittabawassee River as well as the same four species of concern in the Tobacco River/West Arm of Wixom Lake and three species of species concern Smallwood, Wixom and Sanford lake portions of the Tittabawassee River.

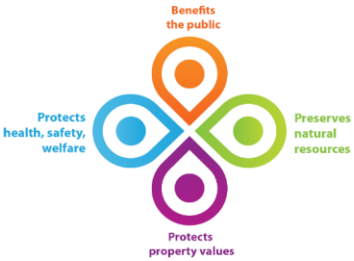
Mulcrone and Rathbun (2020) gives an up-to-date account of mussel species distribution across Michigan and they document all species of native mussel presence (common and rare). In the area encompassing the Four Lakes region, the presence of 22 species has been documented, including the state and federally endangered snuffbox, state endangered black sandshell and lilliput (*Toxolasma cylindrellus*), state threatened slippershell (*Alasmidonta viridis*), as well as eight species of special concern. This suggests that 22 species is likely the maximum number of native freshwater mussels to be found in the Four Lakes region. Past data may not reflect true distribution of mussels since much of Michigan's lakes and rivers have not been thoroughly surveyed using standardized methods (Strayer and Smith 2003). Evidence has shown that in areas where species of mussels are thought to have been extirpated, with increased search effort rare species may still be found alive (Metcalfe-Smith et al. 2000).

Central Michigan University (CMU) is under contract with the FLTF to address mollusks, particularly mussels, associated with Edenville and Sanford lakes[4]. CMU will be designing studies to document mussel species and populations present post disaster, including the presence of any threatened or endangered species, and work with the regulatory agencies to address impacts and, if necessary, mitigating factors.

Next Steps

- Mollusk surveys are often required to document current and ongoing influences or impacts on native freshwater mussels and presence of invasive mollusks. Density, species richness, size classes that indicate reproduction and influence of events (e.g., evident of cessation of growth lines or shell damage due to scouring or dislodgment) are documented during surveys for native freshwater mussels. Presence or absence of invasive mollusks are also documented during surveys.
- Relocation of endangered and threatened species, as well as possibly the surrounding mussel community, is sometimes required in areas that are experiencing impact. In areas where endangered and threatened species of native freshwater mussels are influenced by variable water levels, predictable sediment influxes changes in benthic zone habitat or other threats are regions where up to 100% of the substrate and habitat is fully surveyed to find all mussels. The mussels are then moved to an agreed-upon safe location with suitable habitat that will ensure survival.
- Mitigation due to death or damage of mussels could be in a variety of forms including but not limited to replacement costs (production, restocking, monitoring; Southwick & Loftus 2017). Mitigation can also take the form of best management practice implementation, riparian zone restoration, relocation or propagation of mussels (Patterson et al. 2018) or reintroduction of mussels.

[4] See Secord, Smallwood, Wixom and Sanford Lake Initial Mussel Reports for Four Lakes Task Force in Chapter 8 Appendix

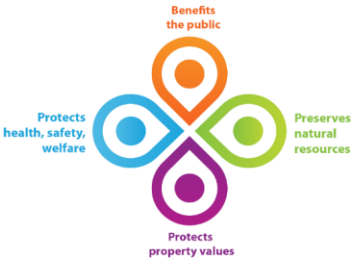


- Monitoring is often a requirement after impacts to endangered and threatened species post-event in order to document successes or challenges post-event. Because of the longevity of native freshwater mussels (in Michigan many species can live greater than 50 years old) annual monitoring is often required greater than or equal to five years post event. The monitoring often consists of a focus on tracking the endangered or threatened species with general survey methods or by the use of Passive Integrated Transponder technology that are attached to the mussels during initial surveys. Common species are often not the focus of the required monitoring however general observations are required and permitting reporting to the State of Michigan and the USFWS is required on an annual basis.
- Mollusk experts at CMU are contracted with FLTF to design and perform standardized surveys of all Four Lakes and remaining mussel habitat. CMU will be using college students to aid in surveys of mussel habitat as well as areas where mussels are not found in order to assess current mussel diversity, distributions and densities.
- CMU will use standardized surveys (e.g., Strayer and Smith 2003) using timed search methodologies that are likely to incorporate SCUBA techniques at randomized locations throughout the lakes. Survey methods will be suitable to detect rare species (e.g., at least four person hours, Metcalfe-Smith et al. 2000) including the federally endangered Snuffbox. Live mussels and shells will be documented, and summary reports written by CMU for the FLTF, State of Michigan and the USFWS.
- CMU has experience with detection and restoration of rare and common mussel species throughout the Great Lakes region and will apply their knowledge to determine the distribution of mussel species in the Four Lakes.

Threatened and Endangered Species

Impacts on threatened and endangered species are currently being studied related to EGLE permitting and to obtain federal funding for the project. Compliance with these requirements is necessary. FLTF has initiated consultation with the MNFI[5] and the USFWS by reviewing the USFWS Information for Planning and Consultation (IPaC) Tool[6]. Consultation has provided a list of species to be considered potentially present within and nearby the Wixom and Sanford Lake flowages. The MNFI responded to consultation noting that there were no concerns relating to impacts on state threatened and endangered species. The IPaC identified four potential threatened and/or endangered species present within the area. A consultation request has been submitted to the USFWS to discuss potential avoidance and minimization measures for these species. These species include the Northern long-eared bat (*Myotis septentrionalis*; threatened), Eastern massasauga rattlesnake (threatened), Snuffbox mussel (endangered) and Rufa red knot (*Calidrus canutus rufa*; threatened).

[5] https://mnfi.anr.msu.edu/
[6] https://ecos.fws.gov/ipac/



State Guidelines

Michigan's threatened and endangered species are protected under the Natural Resources and Environmental Protection Act, Act 451 of 1994, Part 365[7], "Endangered Species Protection" which is regulated by the MDNR. Under Part 365, it is illegal to "take" any species that the state has determined to be threatened or endangered, or those that the USFWS has determined to be threatened or endangered. "Take" means, in reference to fish and wildlife, to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. If take may occur, the MDNR may permit the activity if it is determined that it is necessary to alleviate damage to property or to protect human health.

Federal Guidelines

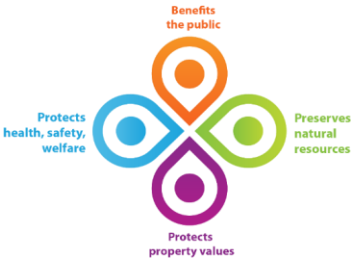
Under the Endangered Species Act (ESA)[8], the USFWS is tasked to protect and recover imperiled species and the ecosystems upon which they depend. Section 7 of the ESA requires Federal agencies to use their legal authorities to promote the conservation purposes of the ESA and to consult with the USFWS, as appropriate, to ensure that effects of actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of the listed species. To complete this process, the FLTF and involved Federal agencies will consult with the USFWS to identify ways to address potential federally threatened and endangered species within the impacted area. Measures will be developed, if necessary, to avoid or minimize impacts on these species to gain approval from the USFWS to proceed.

In addition to Section 7, federal regulations require compliance with the Migratory Bird Treaty Act (MBTA)[9] and the Bald and Golden Eagle Protection Act (BGEPA)[10]. The MBTA was established to prohibit take of migratory birds. The BGEPA was established to prohibit anyone without a permit from the USFWS to take a bald or golden eagle. These two acts protect active nesting sites. Avoidance and minimization measures will be developed to prevent take of these species may include timing restrictions, completing presence/absence surveys, walking construction zones immediately prior to site work, implementing buffer zones and if necessary, applying for and obtaining specialized permits from the USFWS.

Next Steps

- Consult with the USFWS to discuss the project, its potential effects on species and to develop agreed upon avoidance and minimization measure requirements.
- Identify any species that are currently under USFWS review that may be protected by the ESA prior to start of construction.
- If requested by the USFWS, draft, submit and gain approval of a Biological Evaluation or Biological Assessment. This document would further outline required conservation measures and justification as to why the project will not impact the species and would require USFWS approval.

[7] http://legislature.mi.gov/doc.aspx?mcl-451-1994-iii-1-endangered-species-365
[8] https://www.fws.gov/laws/lawsdigest/ESACT.HTML
[9] https://www.fws.gov/laws/lawsdigest/migtrea.html
[10] https://www.fws.gov/laws/lawsdigest/BALDEGL.HTML



- Develop an Avoidance and Minimization Measures Plan for construction that summarizes the conditions of the USFWS approval for meeting the ESA, MBTA and BGEPA requirements.

Invasive Species

During low water periods, invasive *Phragmites*, also known as common reed, can greatly increase in distribution. Without control, *Phragmites* will out-compete native wetland plants, reduce wildlife use of wetland areas and can even block shoreline access for riparians. *Phragmites* was observed near the Sanford Dam in early 2021. *Phragmites* can easily be controlled with annual monitoring and treatment. This should be occurring throughout the period of low water for the Tittabawassee River impoundments and continue after they are restored.

Sea lamprey are a continual concern for managers of the Great Lakes fisheries; however, restoration of the dams and lakes will result in a permanent and effective barrier to block upstream passage of this destructive species. In the interim, FLTF will consult with MDNR on any necessary measures for managing sea lamprey migration.

Invasive submergent vegetation, including Eurasian water milfoil (*Myriophyllum spicatum*), curly leaf pondweed (*Potamogeton crispus*), starry stonewort (*Nitellopsis obtuse*) and others, is typically addressed through survey and mapping of macrophyte communities and annual herbicide treatments aimed at improving native communities. The same holds true for emergent invasives, such as narrow-leaved cattail (*Typha angustifolia*). Ultimately, management of the submerged invasive vegetation will be associated with the Lake Associations after the lakes are restored.

Early detection and rapid response is the mantra of invasive species management. Periodic survey to identify infestations as early as possible, with immediate control measure is the surest way to control these species before they become a problem.

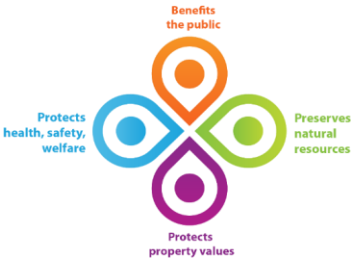
Next Steps

- Visually survey the exposed lakebed to identify invasive species infestations. Follow-up with state-of-the-art control measures if an invasive species infestation is found.

Cultural Resources

Impacts on cultural resources are currently being studied to obtain federal funding for the project. Historic properties are any prehistoric or historic districts, sites, buildings, structures, or objects that are eligible for or already listed in the National Register of Historic Places. They include any artifacts, records and remains (surface and subsurface) that are related to and located within historic properties and the properties of traditional religious and cultural importance to tribes. In April 2021, Merjent, Inc. began archaeological field investigations. Surveys are being conducted following guidance from the Michigan State Historic Preservation Office (SHPO) Archaeological Field and Reporting Standards and Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation[11]. Archaeological field

[11] https://www.nps.gov/history/local-law/arch_stnds_0.htm



investigations are underway at the Edenville and Sanford dams and a findings report will be developed for each dam.

State Guidelines

In Michigan, cultural resources are managed by the Office of the State Archaeologist and the SHPO, that are part of the Michigan State Housing Development Authority. According to the Michigan Attorney General Opinion #6585[12], it is the policy of the State of Michigan to preserve and maintain burial places of the dead. Little to no regulation exists from a State regulatory standpoint.

Federal Guidelines

Under Section 106 of the National Historic Preservation Act (NHPA)[13], any project that involves a federal undertaking (e.g., funding, permits, approvals) requires that the federal agency take into account the effects of the project on historic properties and to provide the Advisory Council on Historic Preservation with a reasonable opportunity to comment. In addition, federal agencies are required to consult on the Section 106 process with the SHPO, Tribal Historic Preservation Offices (THPO) and Indian Tribes.

Next Steps

- Complete archaeological field investigations and finalize reports.
- Submit reports to the SHPO for review, comment and approval.
- Identify any avoidance and minimization measures required to remain in compliance with Section 106. This could include requiring an onsite archaeological monitor during ground excavation activities, avoiding ground disturbing construction activities in select areas, or requiring additional field survey measures.
- Provide SHPO consultation to federal agencies to support funding arrangements.

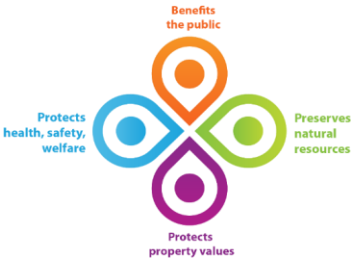
Sustainable Future

A long-term management and monitoring plan will be put in place for shoreline management, nutrients, invasive and protected species.

Vegetation Control on the Lake Bottomlands

The Federal Energy Regulatory Commission (FERC) ordered Secord and Smallwood lakes to be drawn down eight to 10 feet due to flood damage to the dams. This resulted in thousands of acres of lake bottomland, previously submerged for 100 years, becoming dry land. The lakes' formerly abundant aquatic vegetation can no longer survive in most of the drained areas of Wixom and Sanford lakes, as the lake water was drained below the historic weed line, leaving wide expanses of bare, sandy lake bottomland with a number of old standing tree stumps, both short (one-to-two feet) and tall (over six

[12] https://www.nps.gov/history/local-law/arch_stnds_0.htm
[13] https://www.nps.gov/history/local-law/nhpa1966.htm



feet). Within two months of the flood, some of the bare lake bottomlands began to sprout terrestrial vegetation, first grasses and weeds (both native and invasive) then, tree seedlings.

The trees were tentatively identified as eastern cottonwood (*Populus deltoides*) and willows (*Salix sp.*) and sprouted in abundance, estimated in some areas at seven trees per square foot of lake bottomland. These seedlings grew three to seven feet tall by the end of the 2020 growing season. Conversations with the Delhi Dam[14] community in Iowa and conservationists along the Missouri River revealed that the tree sprouting was predictable and that FLTF could expect the trees to continue very rapid growth until they were well over 30 feet tall. These tree saplings may be managed by mechanical mowing or by applications of herbicides.

An invasive weed found on the exposed lake bottomlands is purple loosestrife (*Lythrum salicaria*). This was not viewed with great concern, as purple loosestrife has been successfully managed in Michigan by biological controls. *Phragmites* is an invasive species commonly found in the area, which is not seen in abundance on the exposed lake bottomlands to-date but could be expected to proliferate across the lakebed if left unmanaged. *Phragmites* are commonly controlled by herbicides or mechanical mowing.

Grasses and Annual Weeds

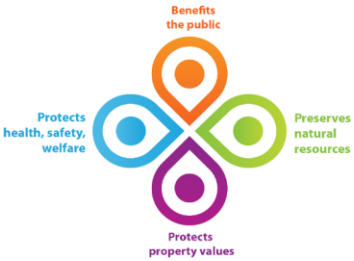
Grasses and annual weeds have root systems that will stabilize the exposed lake bottomlands against erosion. Preferred grasses are either native warm season grasses (warm season grasses like big bluestem [*Andropogon gerardii*], little bluestem [*Schizachyrium scoparium*], Indian grass [*Sorghastrum nutans*]) or a tall fescue (*Festuca arundinacea*; Kentucky 31), all of which are deep-rooted perennial grasses. Tall fescue is an inexpensive grass seed that is not demanding of growing conditions and establishes more quickly than the warm season grasses. Grasses will not adversely impact plans to refill the lakes. FLTF has advised lakefront property owners to plant grasses to stabilize sloping lake shoreline areas in front of their properties and the major erosion protection projects performed on the lakes also use grasses to protect newly rebuilt shoreline slopes. Any control measures applied to manage invasive weeds should be designed to do little harm to these grasses.

Tree Management

EGLE suggested FLTF allow the trees to grow on the exposed lake bottoms, as trees will help hold the soils in place, preventing erosion and providing habitat for terrestrial animals. The lakes have average depths ranging from eight to 15 feet. Given that Edenville and Sanford dams are scheduled to be rebuilt in 2025 and 2026, respectively, the tree saplings would have time to grow to significant size before the lakes are refilled. Dense masses of trees standing 30-40 feet tall above the lake bottom would likely adversely affect the value of shoreline property and be a serious impediment to any recreational use of the lakes. Removing thousands of such trees would add significant expense to the cost of restoring the lakes. Once the tree trunks become three inches or more in diameter, they can become potential habitat for the northern long-eared bat, a federally listed threatened species living in Michigan[15], further complicating

[14] Dehli Dam, a hydropower dam, located in Iowa failed in 2010

[15] https://www.fws.gov/midwest/endangered/mammals/nleb/



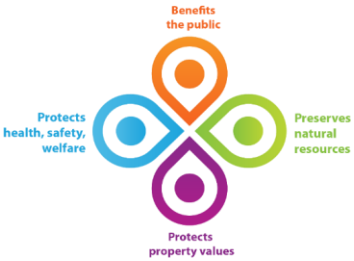
tree removal. While these bats may not choose to inhabit the trees that would grow on the lake bottomlands, this illustrates possible unintended consequences of allowing a terrestrial ecosystem to develop on the lake bottomlands. FLTF has chosen to manage the exposed lake bottomlands to avoid such complications.

Submerged trees can create beneficial aquatic habitat. For example, great crappie fishing can be found in flooded timber in reservoirs. Small saplings in shallow water can be excellent crappie spawning locations. The management program for trees in the four lakes can provide both benefits. Allowing trees to grow to a limited height in deep water areas will provide fish habitat while keeping the trees small enough that they will not be a hazard to boaters or swimmers. Ending any general weed and tree control program in shallow water areas for a year prior to refilling the lakes will create abundant small saplings that would become excellent fish spawning habitat, yet not interfere with boating. FLTF has engaged a fisheries biologist, Streamside Ecological Services, for advice on creating habitat that will benefit the fishery when the lakes are eventually refilled.

Cottonwoods are commonly found sprouting on recently cleared ground, particularly if the ground has plentiful moisture. Young cottonwoods are beneficial to terrestrial animals, providing both cover and a food source (the bark and sprouts). However, FLTF wants to avoid creating habitat for terrestrial animals and cottonwood has low value as lumber or firewood. The trees can grow to be very large, but the soft, weak wood makes the branches prone to break off in windstorms and the drifts of cottonwood seeds can be a real nuisance in the springtime.

Willows are also commonly found sprouting on recently cleared ground and like to grow on moist soils. There are many species of willows and those growing in great numbers on the lake bottomland have not yet been identified. Some willows are shrubs, others can grow into large trees (e.g., weeping willow; *Salix babylonica*) and some are non-native species in Michigan. Identification of the willows is not important, as the willow species growing on the lake bottomlands is/are intermingled with the cottonwoods, so both will be managed by the same methods. Willows are a source of cover and food for terrestrial animals, such as deer and rabbits and provide flowers for bees, but, again, this is not the kind of habitat FLTF wishes to create. Like the cottonwood, the wood of large willow trees is soft and weak and has low value as lumber.

The current plan for managing cottonwoods and willows on the lake bottoms is to employ a three-zone control strategy. The main part of the lake bottomland area can be treated by aerial spraying with a herbicide suitable for controlling woody shrubs without harming grasses. Aerial spraying involves some spray “drift”, which may affect plants up to 100 feet outside the immediate treatment zone. To minimize damage to trees and other desirable landscape plants, aerial spraying will be done at least 100 feet from shore. In the zone from 100 feet to 40 feet from the shoreline, trees can be mowed mechanically or sprayed with ground-based equipment. Shoreline property owners will be asked to manage trees on the lake bottom within 40 feet of their shoreline. This will reduce conflict between professional applicators and most homeowner property left on the lake bottoms, such as docks and boat lifts. In some parts of the lakes, tree growth within 40 feet of the shoreline is minimal.



FLTF understands that weed and tree management programs have a seasonal component. Spraying is most effective when the trees and weeds are growing, which is late spring through the summer. Mechanical mowing is limited to areas and times of the year where ground-based equipment can safely operate without getting stuck in mud or leaving unacceptable ruts in the bottomlands (mid-summer and winters when cold enough to freeze the bottomlands). In addition, mechanical mowing must avoid debris on the lake bottom (until that is removed under another FLTF program), while aerial spraying is not impacted by the debris. FLTF will choose weed and tree control methods that are best suited to meet the needs of the lake community.

Invasive Plant Control

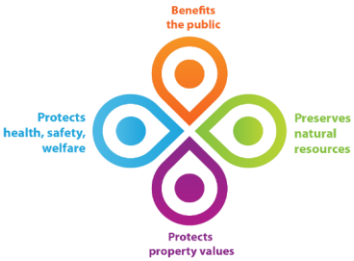
Purple loosestrife has been seen growing on the lake bottoms intermingled with the tree seedlings. Existing biological controls may be sufficient to keep this plant under control. Herbicide sprays that kill tree seedlings are also effective on purple loosestrife. It is expected that the tree seedling control work will also control purple loosestrife.

Phragmites is not currently abundant on the lake bottoms, but small stands may be found on the bottomlands and on land areas around the shores. This invasive plant is not well-controlled by the herbicides that will be chosen for tree control. Repeated mechanical mowing three to five times during the growing season is an option but does not kill the rhizomes that can sprout new reeds. Professional applicators will choose an appropriate herbicide and apply it appropriately. Such application may require a permit from EGLE. For large stands of phragmites, controlled burning may also be an effective control measure. *Phragmites* control methods will be selected on a case-by-case basis.

Other invasive plant species reported by a FLTF consultant, Merjent, to be found on the exposed lake bottoms and adjacent properties include:

- Oriental bittersweet (*Celastrus orbiculatus*)
- European buckthorn (*Rhamnus cathartica*)
- Japanese knotweed (*Reynoutria japonica*)
- Autumn olive (*Elaeagnus umbellata*)
- Spotted knapweed (*Centaurea stoebe*)
- Reed canary grass (*Phalaris arundinacea*)
- Black locust (*Robinia pseudoacacia*)
- Multiflora rose (*Rosa multiflora*)
- Hybrid cattail (*Typha x glauca*)
- Non-native honeysuckles (*Lonicera* sp.)
- Japanese barberry (*Berberis thunbergia*)

The Gladwin and Midland counties' conservation districts will be consulted for assistance with invasive plant species control.



Recreational Planning

The Federal Energy Regulatory Commission (FERC) licenses for Sanford, Edenville, Smallwood and Secord dams include conditions requiring the development and implementation of a recreation plan for each project. Each license detailed the recreation amenities that were to be provided at each site which generally included fishing access, canoe portage, restrooms, signage, parking and certain components of the plan to be Americans with Disabilities Act (ADA) compliant or barrier-free. Prior to the dam failures, very few of these required recreation components were in place. With Boyce's February 2021 Application for Unconditional License Surrender, all four projects are expected to transition to EGLE jurisdiction, which does not include any recreation requirements.

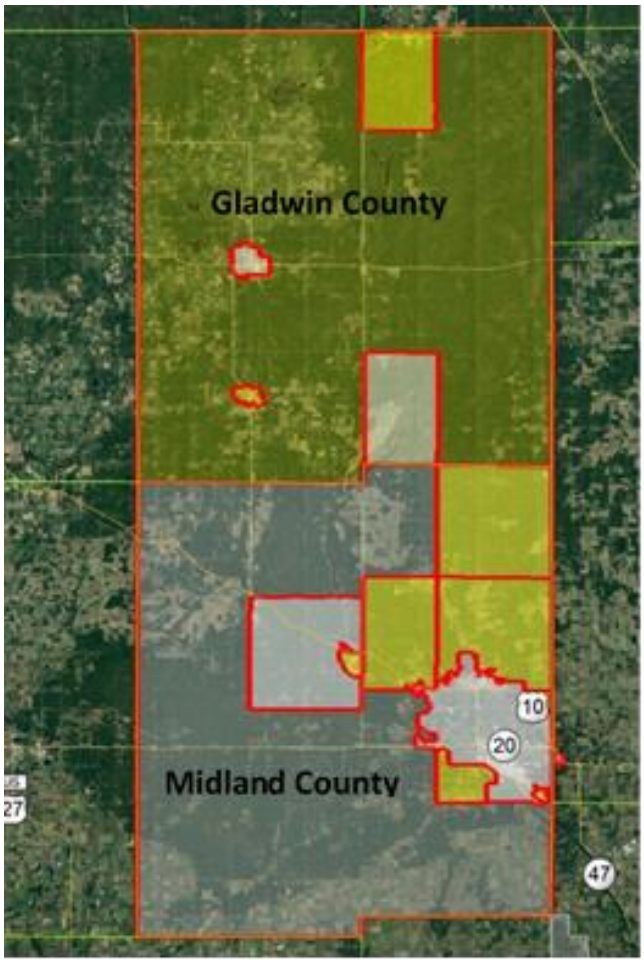


Figure 3. Map of communities with state approved recreations plans. Active plans are shown in yellow and expired plans are shown in white.

Nonetheless, FLTF is willing to help coordinate and plan for future recreation opportunities within the system. FLTF will assess the existing recreational facilities for damage and seek input from the counties and local municipalities on current needs and future interest. There are five recreational plans recorded with the State for Gladwin County and eight recreational plans are on record with the State for Midland County, see map in Figure 3. Based on the review, FLTF will assist with development of a regional recreational master plan, in accord with the counties' objectives.

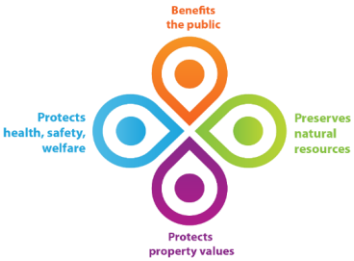


Table 2. State recognized recreation plans in Midland and Gladwin counties

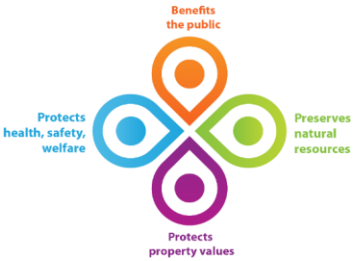
Expiration Date	County	Organization
12/31/2021	Gladwin	Gladwin County
12/31/2023	Gladwin	City of Beaverton
12/31/2019	Gladwin	City of Gladwin
12/31/2018	Gladwin	Billings Township
12/31/2022	Gladwin	Clement Township
12/31/2018	Midland	Midland County
12/31/2019	Midland	City of Midland
12/31/2020	Midland	Jerome Township
12/31/2022	Midland	Mills Township
12/31/2023	Midland	Lincoln Township
12/31/2024	Midland	Larkin Township
12/31/2025	Midland	Midland Township
12/31/2023	Midland	Village of Sanford

An annual grant cycle is available for communities to submit for available funding if they have an approved and active recreation plan on file at the State. Planning assistance will be provided to help communities organize grant applications or understand the process for getting or updating a recreation plan through the State.

Environmental Permitting

The construction activities to restore the four dams will require permits from EGLE. Within Michigan, EGLE is the governing body which regulates specific activities which take place within regulated wetlands, floodplains, dams and inland lakes and streams. Work which results in temporary or permanent impacts to these environmental features require permits be issued from EGLE prior to any work commencing. Extensive conversations and discussions between EGLE and FLTF have been conducted over the past year to determine the potential permitting requirements for the environmental impacts which are related to construction of the dams.

In addition to environmental permitting, all construction activities which result in over an acre of disturbance or are within 500 feet of an inland lake or stream will require soil erosion and sedimentation control (SESC) permits from the County. Sites that will disturb greater than five acres of ground require coverage under EGLE's National Pollutant Discharge Elimination System via a Notice of Coverage. SESC permits require that the applicant design the project to protect natural watercourses, inland lakes, wetlands and offsite properties from sediment deposition due to construction activities.



EGLE and County regulations have a corresponding Part within the State of Michigan Natural Resources and Environmental Protection Act (NREPA), Public Act (PA) 451 of 1994. Below please find a summary of each of Part under NREPA relevant to the four dam construction projects.

State of Michigan Part 301 – Inland Lakes and Streams

Part 301, Inland Lakes and Streams, of the NREPA, 1994 PA 451, as amended[16] (Part 301) details what activities require a permit from EGLE for work taking place in a regulated inland lake or stream. Activities requiring a permit include, but are not limited to, filling or dredging below the ordinary high water mark (OHWM), placement of structures (e. g., docks, shoreline protection, or culverts), impacts to downstream waters and any activity that may interfere with the natural flow of water within a regulated stream or inland lake. Under Part 301, the primary action that will require a permit for these projects is filling below the OHWM. EGLE defines the OHWM as the line between upland and bottomland identified by the presence of a distinct change in character of the land caused by successive changes in water levels. More details related to the OHWM for each dam is discussed in subsequent sections.

State of Michigan Part 303 – Wetlands

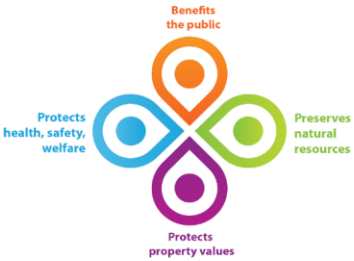
Wetlands are protected under Part 303, Wetland Protection, of the NREPA, 1994 PA 451, as amended[17] (Part 303). A wetland is, as defined in Part 303, "a land or water feature, commonly referred to as a bog, swamp, or marsh, inundated or saturated by water at a frequency and duration sufficient to support, and that under normal circumstances does support, hydric soils and a predominance of wetland vegetation or aquatic life." A wetland is regulated under Part 303 if it meets the following criteria:

- Has a surface water connection to an inland lake, pond, river, or stream.
- Located within 500 feet of an inland lake, pond, river, or stream.
- Not connected to one of the Great Lakes or Lake St. Clair, or an inland lake, pond, stream, or river, but more than five acres in size.

Work activities within a regulated wetland which require a permit include placement of fill, dredging, excavation or grading of soil, placement of a structure, maintaining a use and draining a wetland. If the placement of fill exceeds a surface area of 0.3-acre, wetland mitigation is required. Wetland mitigation as summarized in Part 303 and includes the following:

- Restoration of previously existing wetlands
- Creation of new wetlands
- Preservation of high-quality wetland(s)
- Acquisition of approved credits from a wetland mitigation bank

[16] http://legislature.mi.gov/doc.aspx?mcl-451-1994-iii-1-inland-waters-301
[17] http://legislature.mi.gov/doc.aspx?mcl-451-1994-iii-1-inland-waters-303



The amount of mitigation required is dependent of the quality and plant community type of wetland being disturbed and the degree of disturbance. The higher the quality of wetland being disturbed, and the higher the degree of disturbance (temporary matting vs. excavation), the more wetland mitigation is required.

State of Michigan Part 31 – Floodplain

The State of Michigan's Floodplain Regulatory Authority, found in Part 31, Water Resources Protection, of the NREPA, 1994 PA 451, as amended[18] (Part 31), requires a permit for any alteration or occupation of the 100-year floodplain of a river, stream or drain with a drainage area greater than two square miles. Generally, compensation excavation is not required for fill volumes of less than 300 cubic yards. If fill is greater than this value, compensating excavation/cut is needed within the same floodplain, positioned appropriately, so a net fill of zero is achieved.

A hydraulic analysis is required to be submitted to EGLE on streams/drains with a drainage area of two square miles or greater when a proposed project may cause an increase in flood elevations or change in the direction of flow. When it is not definitive as to whether a project will or will not cause an increase, then an analysis should be provided to show that there will be no increase or harmful interference. "Harmful interference" means causing an increased stage or change in direction of flow of a river or stream that causes, or is likely to cause, any of the following: Damage to property, a threat to life, a threat of personal injury, pollution, impairment, or destruction of water or other natural resources. Detailed flood modeling and mapping is discussed in chapter 7 of the feasibility study.

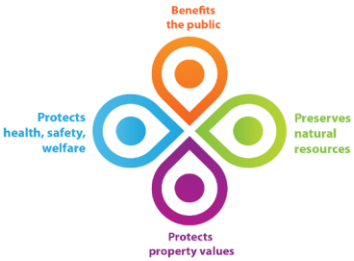
National Flood Insurance Program Project Impacts

Multiple communities within the Tittabawassee River watershed, including the City of Midland, participate in the National Flood Insurance Program (NFIP). The NFIP was established in the National Flood Insurance Act of 1968 and is operated under FEMA. The NFIP allows communities to establish actuarial flood insurance rates for areas located within defined Special Flood Hazard Areas (SFHA) representing the 1% annual chance floodplain. Properties located within the SFHA are required to be covered under a flood insurance policy when the property is financed by a federally backed mortgage. Properties within the SFHA without a federally backed mortgage, or properties outside of the SFHA, still have the option to be covered under a flood insurance policy, although it is not required.

Participating communities must regulate development within the floodplain for all projects including the following: filling and grading; excavation, mining and drilling; storage of materials; repairs to a damaged building that do not affect structural members; temporary stream crossings; activities by other government agencies, such as roads, bridges and school permits.

A Letter of Map Change (LOMC) is required to be submitted to FEMA when there are proposed changes revising the Special Flood Hazard Area (SFHA).

[18] http://legislature.mi.gov/doc.aspx?mcl-451-1994-ii-1-31



The following include proposed designs for the dams: improving gate capacity and gate operations which will not increase the 100-year floodplain, improving the overall spillway capacity, compensating cut for harmful fill in the floodplain over 300 cubic yards and obtaining needed construction permits.

A LOMC will not be submitted for the above noted. This will be an option for the community at the conclusion of the project. It is anticipated that the capacity will allow for the lowering of the 100-year floodplain, and this would be a benefit to the communities. Future discussions on a LOMC can be discussed with applicable communities; this would not be the responsibility of FLTF.

State of Michigan Part 91 – Soil Erosion and Sedimentation Control

Part 91, Soil Erosion and Sedimentation Control, of the NREPA, 1994 PA 451, as amended[19] (Part 91), provides for the control of soil erosion and protects adjacent properties and the waters of the state from sedimentation. A permit is generally required for any earth change activity which disturbs one or more acres of land or which is within 500 feet of a lake or stream. Part 91 is administered and enforced by various state, county and local governmental agencies.

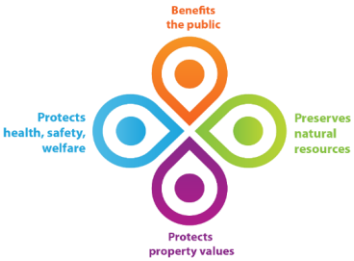
With respect to Midland County, the Drain Commissioners office serves as the County Enforcing Agent (CEA) and per the Board of Commissioners is responsible for issuing SESC permits for projects. Within Gladwin County, the Conservation District serves as the CEA and reviews and issues SESC permits. If the soil disturbance is five or more acres, a Notice of Coverage (NOC) permit must also be obtained through EGLE.

State of Michigan Part 315 – Dam Safety

The State of Michigan's Dam Safety Authority, found in Part 315, Water Resources Protection, of the NREPA, 1994 PA 451 as amended[20] (Part 315), defines a dam as "an artificial barrier, including dikes, embankments and appurtenant works, that impounds, diverts, or is designed to impound or divert water or a combination of water and any other liquid or material in the water; that is or will be when complete six feet or more in height; and that has or will have an impounding capacity at design flood elevation of five surface acres or more." Regulated dams are under the jurisdiction of the EGLE Dam Safety Unit. Permits are required for any improvement and construction activities related to the dam components, for example embankments and spillways.

Dams regulated under Part 315 are assigned a hazard rating of either high, significant, or low hazard. The hazard rating does not indicate the condition of the dam, but the potential to loss of life and damage to downstream property in the event of dam failure. The hazard rating also dictates the storm frequency (e.g., 500-year, flood of record, ½ probable maximum flood) that a dam is required to pass, establishing the required spillway capacity. It is important to note that the State of Michigan is in the process of potentially changing these regulations following the Edenville Dam failure. FLTF is well informed of the

[19] http://legislature.mi.gov/doc.aspx?mcl-451-1994-ii-2-soil-conservation-erosion-and-sedimentation-control-91
[20] http://legislature.mi.gov/doc.aspx?mcl-451-1994-iii-1-inland-waters-315



potential changes and maintain communications with EGLE to ensure potential changing requirements are incorporated into the design basis for each dam.

Environmental Permitting Summary Per Dam

Each dam restoration project will require its own EGLE and SESC permit. The construction at each dam will have varying amounts of impacts, all of which will fall under one or multiple Parts of the NREPA, as summarized above. Construction to restore Secord and Smallwood Lake is less involved than Wixom and Sanford and is scheduled to begin at least one year sooner. Hence, more information regarding the extent of environmental permitting is known for these dams. General permitting requirements for the southern two dams, Edenville and Sanford, can be anticipated at the current time, and as design progresses details of the permitting requirements will be developed further. Additionally, any requirements from state or federal agencies related to threatened and endangered species or cultural resources for each dam project will be accounted for as requested. At this time, discussions on threatened and endangered species and cultural resources requirements are still ongoing. Archaeological field investigations have been completed at Secord and Smallwood dams[21]. No archaeological resources were identified. Merjent recommends that no historic properties will be affected by the proposed project at these sites. Below is a summary of the anticipated environmental permitting requirements for each dam.

Secord Dam

Secord Dam, the northern most dam of the four lakes system is located within Secord Township of Gladwin County. The Secord Dam did not fail because of the May 19, 2020 storm event, however, was damaged. As a result of the event, FERC ordered that Secord Lake be lowered for inspection of the Secord Dam, as a result the lake was lowered approximately eight feet to the spillway sill elevation.

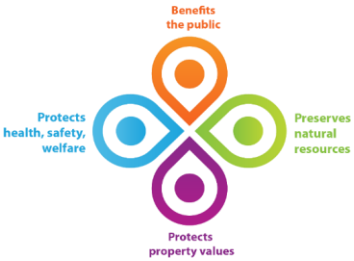
Since the Secord Dam did not fail, rather was ordered by FERC to be lowered, EGLE views the proposed construction activities at Secord Dam as maintenance and improvement of an existing structure. This simplifies the environmental permitting requirements for construction. The proposed restoration schedule of the dam has construction beginning late 2023. This along with Smallwood Dam would be the first two dams where construction activities would begin. As part of this schedule, environmental permit applications would be submitted in early 2022. This application would include the final design plans prepared by GEI and all necessary supporting documents as required by EGLE. To aid and expedite EGLE's review of the application, EGLE permitting staff are involved in design progress meetings.

With respect to Part 301 (Inland Lakes and Streams), impacts are anticipated during construction. These impacts would primarily be the placement of fill below the OHWM. The OHWM upstream of the dam is anticipated to be interpreted as the Part 307[22] legal lake level of Secord Lake[23]. The OHWM downstream of the dam is anticipated to be interpreted as the Part 307 legal level of Smallwood Lake. The likely impacts

[21] See Phase I Archaeological Resources Investigation of the Secord Dam and Smallwood Dam Projects in Chapter 8 Appendix

[22] http://legislature.mi.gov/doc.aspx?mcl-451-1994-iii-1-inland-waters-307

[23] See Four Lakes Lake Level Study in Chapter 8 Appendix



under Part 301 would include placement of riprap on the upstream face of the earthen embankment, riprap placement downstream of the dam and at the outlet of the proposed auxiliary spillway. The riprap installed at all locations would protect against erosion. The volume of these impacts would be quantified and illustrated on the design plans and included on the EGLE permit application.

Regarding Part 303 (regulated wetlands), permanent impacts are expected. To quantify the amount and type of existing wetlands on the Secord Dam property, Merjent's professional wetland scientists and field biologists completed a formal wetland delineation. The field delineation identified eight wetlands which consisted of both emergent and forested wetland types. The total area of wetlands delineated was 1.37-acres. For more details related to the field delineations and Merjent's methodology and findings, please refer the Secord Dam wetland report[24].

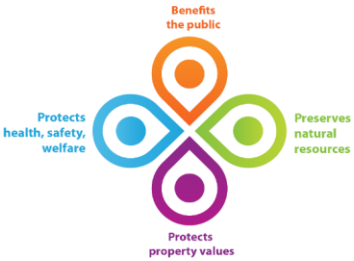
Of the wetlands that exist on the site, approximately 0.34-acre of forested wetland and 0.37-acre of emergent wetland are expected to be impacted. As this total area (0.71-acre) exceeds the limit set by EGLE of 0.3-acre disturbance, mitigation will likely be required. The environmental impact map[25] illustrates the delineated wetland boundaries of the site, overlaid on the 30 percent design plan. The site map illustrates where the wetland impacts are expected with most being associated to re-sloping of the embankment, construction of an access road and construction of the auxiliary spillway.

The available space on the Secord Dam property is limited. This will most likely result in the need for mitigation credits to be purchased, if available. FLTF and their environmental consultants are further evaluating options related to mitigation and the amount of mitigation required.

Construction activities will take place within the Part 31 regulated 100-year floodplain. Impacts are expected in the area immediately downstream of the dam. The site map[26] illustrates the approximate location of the 100-year floodplain in blue. All work within these areas will need to be quantified and if the volume of fill in this area exceeds 300 cubic yards, compensating excavation will be required so the net fill is zero. These impact volumes have yet to be calculated; however, if compensating excavation is required that information will be included in the construction plans.

FERC is in the process of terminating the active FERC license at the Secord Dam hydropower facility. Upon termination of the license, regulatory jurisdiction will shift from the federal government to EGLE. This dam meets the requirements as defined by Part 315 and is further classified as a high hazard dam. The Dam Safety Unit within EGLE would need to provide a permit for any construction activities on the dam features. This would include work to the embankments, spillway, tailrace area and powerhouse. EGLE dam safety engineers have been heavily involved in providing feedback related to the proposed design and concepts. As design progresses, EGLE will continue to be actively involved to ensure all activities are permittable.

[24] See Secord Dam Wetland Delineation Report in Chapter 8 Appendix
[25] See Secord Environmental Impact Map in Chapter 8 Appendix
[26] See Secord Environmental Impact Map in Chapter 8 Appendix



Lastly, the construction activities at the Secord Dam will require an SESC permit. Within the design plan, temporary and permanent best management practices (BMPs) will be accounted for. These would include possible items such as silt fence, turbidity curtains, cofferdams and straw wattles. The Gladwin County Soil Conservation District will be the governing office to issue the permit. Typically, SESC permits are the responsibility of the contractor and this permit will be acquired once the project is bid and the contract has been awarded.

Smallwood Dam

Smallwood Dam, the second most northern dam of the Four Lakes system, is located within Hay Township of Gladwin County. The Smallwood Dam did not fail because of the May 19, 2020 storm event, however, sustained significant damage to the downstream embankment from severe erosion. As a result of the event, FERC ordered that Smallwood Lake be lowered for inspection of the Smallwood Dam. The lake was lowered approximately 10-feet to the spillway sill elevation.

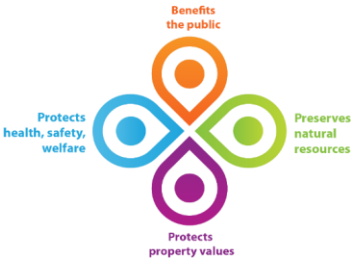
Like Secord Dam, since the Smallwood Dam did not fail, EGLE views the proposed construction activities as maintenance and improvement of an existing structure. This again simplifies the environmental permitting requirements. The Smallwood Dam restoration project is on the same schedule as Secord Dam and proposed construction activities are planned to being in late 2023. Environmental permit applications would be submitted in early 2022. This application would include the final design plans prepared by GEI and all necessary supporting documents as required by EGLE. To aid and expedite EGLE's review of the application, EGLE permitting staff are involved in design progress meetings.

With respect to Part 301, impacts are anticipated during construction; these being the placement of fill below the OHWM. The OHWM upstream of the dam is anticipated to be interpreted as the Part 307 legal lake level of Smallwood Lake and the OHWM downstream of the dam is anticipated to be interpreted as the Part 307 legal level of Wixom Lake[27]. The expected impacts under Part 301 would include placement of riprap on the upstream face of the earthen embankment, riprap placement downstream of the dam and at the outlet of the improved auxiliary spillway for erosion protection. The volume of these impacts would be quantified and illustrated on the design plans and included on the EGLE permit application.

Regarding Part 303, permanent impacts are expected within regulated wetlands. Merjent also completed a formal wetland delineation on the Smallwood Dam property to quantify the area and type of wetlands. The field delineations identified seven wetlands which consisted of both emergent and forested wetlands. The total area of wetlands delineated was 19.62-acres. For more details related to the field delineations and Merjent's methodology and findings please refer the Smallwood Dam wetland report[28].

Of the total wetlands which exists on the site, approximately 0.07-acres of forested wetlands and 0.93-acre of emergent wetlands are estimated to be impacted. This total (1.00-acre) exceeds 0.3-acres of disturbance meaning mitigation will likely be required. The environmental impact map[29] illustrates the

[27] See Four Lakes Lake Level Study in Chapter 8 Appendix
[28] See Smallwood Dam Wetland Delineation Report in Chapter 8 Appendix
[29] See Smallwood Environmental Impact Map in Chapter 8 Appendix



delineated wetland boundaries of the site, overlaid on the 30 percent design plan. The site map illustrates where the wetland impacts are expected with most being associated to construction of the new berm on north side of the property, re-sloping of the embankment, construction of the potential access road and improvement of the existing auxiliary spillway.

The Smallwood Dam property may allow for on-site mitigation to take place. This mitigation may include creation of new wetlands or the improvement of existing wetlands which are on the site. FLTF and their environmental consultants are further evaluating options related to mitigation and the amount of mitigation required.

Construction activities will take place within the Part 31 regulated 100-year floodplain. These impacts are expected in the area downstream of the dam. The impact map[30] illustrates the approximate location of the 100-year floodplain in blue. All work within these areas will need to be quantified and the if the volume of fill in this area exceeds 300 cubic yards, compensating excavation will be required so the net fill is zero. These impact volumes are yet to be calculated; however, if compensating excavation is required that information will be included in the construction plans.

FERC is in the process of terminating the active FERC license at the Smallwood Dam hydropower facility. Upon termination of the license, regulatory jurisdiction would shift from the federal government to EGLE. This dam meets the requirements as defined by Part 315 and is further classified as a high hazard dam. Again, the EGLE dam safety unit would issue a permit for any construction activities on the dam features. EGLE dam safety engineers have been engaged with the preliminary design and will continue to be involved to ensure a permit under Part 315 is obtained.

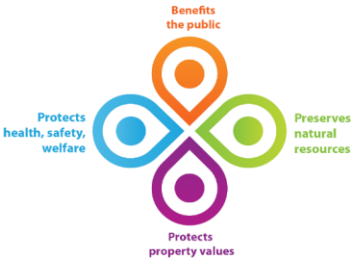
Lastly, the construction activities at the Smallwood site will require an SESC permit. SESC BMPs will be included in the construction design plans. These plans will be the basis to obtain the SESC permit through the Gladwin County Soil Conservation District office.

Edenville Dam

Edenville Dam is located primarily in Tobacco Township of Gladwin County. A small portion of the embankment is located within Edenville Township of Midland County. The dam is situated near the confluence of the Tobacco River (west side) and Tittabawassee River (east side) and has two primary spillways, one located on each river. The Edenville Dam forms Wixom Lake. A section of the Tittabawassee embankment failed during the May 19, 2020 storm event and areas near the Tobacco spillway were significantly damaged. As a result of the failure limited water, if any, is being impounded by the Tittabawassee dam structure and approximately 10-15 feet is being impounded by the recently modified Tobacco spillway. Wixom Lake is substantially drained, and both rivers are returning to their original alignments.

Extensive environmental permitting will be required to rebuild the Edenville Dam due to the failure. EGLE may not consider this as improvement or construction to an existing dam, and conversations with EGLE

[30] See Smallwood Environmental Impact Map in Chapter 8 Appendix



are underway to understand the scope of permitting that will be needed. Construction activities are planned to begin in 2024, with environmental permitting applied for and issued in 2023.

Impacts to all the environmental features discussed in the prior sections are expected. This includes impacts to inland lakes and streams (Part 301) with fill below the OHWM. It is unclear what will be interpreted as the OHWM and those discussions with EGLE are also in process. Fill will be placed within the 100-year floodplain (Part 31). Interpretation and direction from EGLE will also be required to establish a baseline condition so quantities can be calculated and to determine the extent of potential floodplain impacts.

Regarding Part 303, permanent impacts are expected within regulated wetlands. Merjent completed a wetland delineation at the Edenville Dam property. The field delineations identified 34 wetlands which consisted of both emergent and forested wetlands. The total area of wetlands delineated was 43.42-acres. For more details related to the field delineations and Merjent's process and findings, please refer to the Edenville Dam wetland report[31]. The extent of the wetland impacts have yet to be determined but are anticipated to be associated to embankment reconstruction and construction of the auxiliary spillway[32]. Once the impact area has be quantified, mitigation options will be evaluated, if needed. Purchase of credits at Potato Creek Wetland Mitigation Bank is likely an option.

The Edenville Dam is not regulated by FERC since the termination of the license to generate hydropower in 2018. EGLE Dam Safety has regulatory jurisdiction and all plans for construction and improvement will need to be reviewed and ultimately permitted under Part 315. Again, EGLE Dam Safety engineers have been engaged with the preliminary design and will continue to be involved to ensure a permit under Part 315 is obtained.

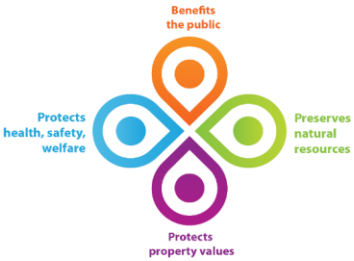
As the Edenville Dam is located within two counties, likely two soil erosion permits will be needed. One from the Gladwin County Soil Conservation District office and the other from the Midland County Drain Commissioner's office. SESC BMPs will be included in the construction design plans and will be the basis to obtain these permits once the project has been bid and the contract awarded.

Prior to the dam failures, EGLE and Boyce Hydro had a consent order[33] related to wetlands permitting. FLTF agreed to implement the consent order, upon transfer of the property to the counties. With the dam failure, some items of the consent order naturally have changed.

Sanford Dam

Sanford Dam is the southernmost dam and is located in Jerome Township of Midland County. The dam failed during the May 19, 2020 storm event. As a result of the failure, limited water is being impounded by portions of the dam embankment which still remain. Sanford Lake is substantially drained, and the Tittabawassee River is returning to its original alignment.

[31] See Edenville Dam Wetland Delineation Report in Chapter 8 Appendix
[32] See Edenville Environmental Impact Map in Chapter 8 Appendix
[33] See Boyce Nov 2019 Consent Judgement in Chapter 8 Appendix



More extensive environmental permitting will be required to rebuild the Sanford Dam due to the failure. EGLE may not consider this as improvement or construction to an existing dam, and conversation with EGLE are ongoing to understand the scope of permitting needed. Construction activities are planned to begin in 2024, with environmental permitting applied for and issued in 2023.

Impacts to all the environmental features discussed in the prior sections are expected. This includes impacts to inland lakes and streams (Part 301) with fill below the OHWM. It is unclear what will be interpreted as the OHWM and those discussions with EGLE are in process. There will also be fill placed within the 100-year floodplain (Part 31). Interpretation and direction from EGLE is required to establish a baseline condition so quantities can be calculated and the extent to the potential floodplain impacts can be determined.

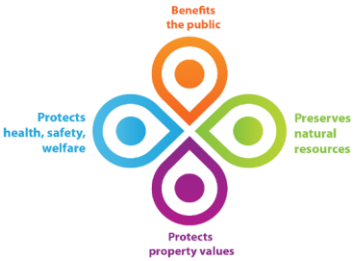
Permanent impacts are expected within Part 303 regulated wetlands. Merjent completed a wetland delineation at the Sanford Dam property. The field delineations identified five wetlands which consisted of both emergent and forested wetlands. The total area of wetlands delineated was 0.95-acres. For more details related to the field delineations and Merjent's process and findings, please refer the Sanford Dam wetland report[34]. The extent of the impacts have yet to be determined but are anticipated to be associated to the construction of the auxiliary spillway[35]. Once the impact area has be quantified, mitigation options will be evaluated, if needed. Purchase of credits at Potato Creek Wetland Mitigation Bank is likely an option.

FERC is in the process of terminating the active FERC license at the Sanford Dam hydropower plant. Upon termination of the license, regulatory jurisdiction will shift from the federal government to EGLE. This dam meets the requirements as defined by Part 315 and is further classified as a high hazard dam. EGLE Dam Safety unit would review and responsibility for issuing a permit under Part 315. EGLE Dam Safety engineers have been engaged with the preliminary design and will continue to be involved to ensure a permit under Part 315 is obtained.

The SESC permit for the Sanford Dam would be issued by the Midland County Drain Commissioner's office. SESC BMPs will be included in the construction design plans and will be basis for securing the SESC permit once the project has been bid and the contract awarded to a Contractor.

[34] See Sanford Dam Wetland Delineation Report in Chapter 8 Appendix

[35] See Sanford Environmental Impact Map in Chapter 8 Appendix



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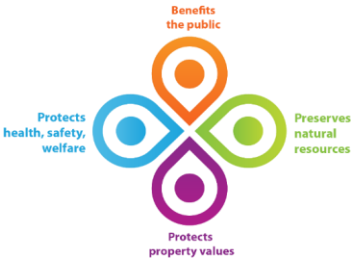

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