

Natural Systems Resilience

Chapter 6



Chapter 6: Working for Resilience in Natural Systems

This portion of the Master Plan takes a closer look at resilience in relation to natural systems, including issues such as climate change, disaster mitigation, and management of sensitive environmental areas and productive lands.

Each element contains a profile of existing conditions, a risk assessment, and a discussion of opportunities. Goals and strategies for natural systems are contained in Chapter 7: Strategic Plan. An in-depth natural features inventory is included for reference in Appendix R.

CLIMATE CHANGE

Climate is not the same as weather. **Weather** is the state of the atmosphere at any given time and place (temperature, humidity, precipitation, wind, etc.). **Climate** is the set of meteorological conditions that prevail in a particular place or region over a long period of time. **Climate variability** describes fluctuations that are natural and brief. **Climate change** describes long-term (decades or longer) persistent changes.

Globally, climate change is occurring from increases of carbon dioxide in the atmosphere. Impacts will vary widely per region. Extreme weather and climate events associated with climate change can include regionally variable droughts, flooding, storms, wildfires, and heat waves. These events impact lives, livelihoods, health, ecosystems, economies, services, and infrastructure.

Profile

Our area is currently located in the USDA plant hardiness zone 5b. The climate is characterized by an extended winter (November through March) and short, cool summers. The average first frost day is in mid-October, and the average last frost day is mid-May.

Some regional indications of climate change include:

- Lake Superior has warmed 4.5 degrees F in only 30 years, which is twice as fast as air temperatures
- Regional data gathered since 1900 shows that the 2000s were the hottest decade, 1990s the second hottest, and 1980s the third hottest
- Plant hardiness zones are moving north⁴⁸

The largest observed temperature increases in the Midwest have occurred in Minnesota

and the Upper Peninsula of Michigan. Most models suggest further increases over the 21st century. These two areas are also predicted to experience the largest regional increase in winter temperatures.⁴⁹ Plant hardiness zones are likely to shift 0.5 to 1.0 zone every 30 years.⁵⁰

Lake Superior has a significant impact on the regional climate system. In the summer, the lake breeze circulation keeps the shoreline areas cooler compared to surrounding inland areas. Lake-effect precipitation is common in late fall and winter as cool air flows over warm lake waters.

It is projected that the following changes will take place near the Great Lakes over the next century:

- Number of days with low temperatures below 0 degrees Fahrenheit will drop by 50% or more
- Number of days with high temperatures above 90 degrees Fahrenheit will more than double
- Largest increases will occur over western portions of the Great Lakes region

- Extreme or heavy rainstorms will become 50-100 percent more frequent⁵¹

Responses to climate change involve mitigation and adaptation. Mitigation strategies address the cause, and may involve strategies such as reducing emissions of greenhouse gases (GHG) and reforestation (carbon sequestration). Adaptation strategies address the symptoms, and may involve strategies such as water resource management, stormwater control, storm shelters, etc.

Climate change responses can often lead to collateral benefits, resulting in a “no regrets” approach. For example, a reduction in GHG emissions also reduces pollution; further, if these emissions reductions are achieved through green building development and reductions in vehicle-miles-traveled, there are economically measurable savings in energy expenses and traveler convenience. A more compact urban form has the potential to reduce both GHG emissions and infrastructure costs. Responses may involve land use and transportation policy, building standards, housing, energy, water conservation, and local food production as discussed elsewhere in this plan. This chapter will focus on natural systems.

⁴⁸ “Lake Superior Climate Adaptation, Mitigation, and Implementation Plan”, Superior Watershed Partnership.

⁴⁹ “Climate Ready Great Lakes”, NOAA and Sea Grant presentation.

⁵⁰ Ibid.

⁵¹ Ibid.

Risk Assessment

Although the exact impacts of climate change in any one area can't be predicted because there are so many interacting variables, the likely risks of climate change in this region include:

Higher water temperatures

- Higher bacterial counts leading to closing of beaches, negatively impacting tourism.
- Negative impacts to cold water fish and the diatoms that feed the fish.

More extreme weather

- More extreme weather events involving wind, flooding or erratic freeze/thaw cycles cause property damage, utility service disruptions, and increased insurance claims and costs.
- Extreme weather events cause increased damage/erosion to Lake Superior beaches and cliffs, impacting tourism and infrastructure.

- Flooding overwhelms stormwater management systems, damages infrastructure, and exacerbates shoreline erosion along rivers.
- Warmer temperatures mean more winter precipitation in the form of rain, sleet, ice, or ice on snow causing transportation and power problems and damaging trees.

Drought, less precipitation, falling lake levels

- Drought causes agricultural challenges, stressed forests with increased vulnerability to pests, and greater wildfire danger.
- Declining snowfall impacts winter tourism, local culture and the local economy.
- Less ice cover on the lake means more wave action and increased evaporation.
- Falling lake levels disrupt the maritime shipping industry and create infrastructure challenges.

Impacts on plants, animals, and humans

- Changes in animal migration patterns put some organisms out of synch with food sources.

- Increased tree mortality and associated forest dieback due to increased temperatures and drought poses risks for carbon storage, biodiversity, wood production, water quality, and economic activity. Changes in forest cover could negatively impact the forest product industry. There could be a decline in some species such as sugar maple, birch, jack pine, black spruce, balsam fir, quaking aspen, eastern hemlock, tamarack and perhaps an increase in oak, hickory - but will the adaptation occur fast enough to compensate?
- Warmer temperatures cause an increase in pests and diseases.
- Warmer temperatures stress wetlands, which are essential waterfowl and amphibian breeding grounds and sources of shelter, food, and storm protection.
- Disruptive events cause emotional distress and social issues. Populations may even migrate out of impacted areas, causing climate refugees to surge into other areas.

Opportunities

The best opportunity for climate change response is to be ready rather than react. Readiness means anticipating impacts and planning for solutions ahead of time to reduce risk. Governments at various levels are starting to develop mitigation and adaptation plans. Examples include disaster management plans, adjustments in technologies and infrastructure, ecosystem-based approaches, basic public health measures, and livelihood diversification.

Opportunities may include:

- Expansion in "green" jobs related to climate change adaptation, clean energy industry, infrastructure improvement projects, and emergency services.
- Longer summer recreation season with more tourism
- Longer growing season
- Longer construction season
- Lower energy cost needs in winter (although higher in summer - air conditioning)

Building adaptive capacity means putting in place policy frameworks, data collection and evaluation processes, awareness-raising programs, and support

systems to encourage, allow, or require adaptation strategies. Climate readiness must be embedded in routine planning processes.

Specific strategies are addressed in detail in Chapter 7. Specifically these involve researching, identifying, and disseminating data on local conditions and vulnerabilities; improving outreach and communications; and effecting or advocating various projects such as:

- Habitat protection and restoration - Preserve or restore vegetation near cold water streams and rivers, wetlands, and Lake Superior for ecosystem health, flood control, and storm protection for infrastructure

CLIMATE CHANGE



- Plant diversity - Advance planning for future plantings that fit changing conditions (especially trees which take longer to grow). Increased diversity may ensure productivity/survival even with climate variability.
- Better drainage systems for area roadways
- Advance planning for emergency response to climate events
- More widespread water conservation/storage measures

The priority of these strategies should be continually assessed based on an updated understanding of potential level, extent and immediacy of projected impacts.

HAZARD MANAGEMENT

Emergency or hazard management consists of four elements: preparedness, mitigation, response, and recovery. Mitigation reduces the impact of events and lessens the need to respond to succeeding events. It is often tied to development decisions which are controlled by local government, but could also be related to decisions made by individuals or businesses.

High risk hazards are categorized as natural (fire, flood, severe weather, unstable ground), technological (hazardous materials, infrastructure failure), and societal (civil disturbances, large public gatherings, terrorism, transportation accidents, public health emergencies, environmental threats, economic disaster).

In Chocolay Township, the natural hazards that have a high risk of occurring or which would have a high degree of potential damage if they do occur include:

- Wildfire in the wildland/urban interface particularly exacerbated by extensive jack pine forests with accumulated fuel sources
- Flooding along Chocolay's many rivers and streams
- Flooding along roadways

Fire Hazards



Profile

Wildfires occur throughout the spring, summer, and fall in Michigan, however most take place in March through May when the vegetation is dead, brown, and combustible with little green vegetation to serve as a barrier to wildfire. The burning of yard waste leads to the majority of wildfires.

Wildfires are also caused by vehicle exhaust, sparks from trains and heavy equipment, camping, smoking, arson, and lightning.

The sand dunes paralleling Lake Superior are ideal jack pine habitat, but are also favored areas for development. According to the Marquette County

Hazard Mitigation Plan, aerial photography revealed 480 structures with a combined value of \$26.1 million within jack pine forests, primarily near the Lake Superior Shore.



Risk Assessment

The greatest risks of wildfire are in areas of jack pine forests, which are extensive in Chocolay Township, especially along Lake Superior. Forested areas of Chocolay Township are being increasingly populated and property values are increasing as former camps are converted to year round homes. This increases the exposure and vulnerability to wildfire. The development of homes and camps in forested areas increases fire risks through the introduction of activities and decrease of professional management and

harvesting of mature trees.

Homes and camps in remote areas are at greater risks due to the difficulty of getting police, fire, and emergency services on private, substandard, inadequately maintained or poorly identified roadways, driveways, and bridges. Recreational use of ATVs on unimproved county roads or in unauthorized remote areas can increase fire risks during dry periods due to carbon particles in exhaust. It may also be difficult to reach the remote areas traveled by these vehicles with fire suppression equipment.

Small particles of fuel such as dry grass, leaves, and small twigs dry out most rapidly, providing a combustible fuel source. Burning embers can move from one-quarter to one mile with the wind. Wind-driven embers can be blown under decks and porches, into cracks in the foundation, and into attics through faulty eave and roof vents. They can also ignite combustible vegetation adjacent to the home. Wildfires move more rapidly uphill, so homes built at the top of slopes are more vulnerable to wildfires. Winds off the lake can also increase fire intensity,

Fire Hazards

making fire suppression more difficult.

Wildfires are also costly in timber losses, with long-term effects including aesthetics, reduced soil productivity, changes to forest succession patterns, erosion, reduction in water quality, loss of wildlife and disruption of recreational use.⁵²

Unattended campfires along with high winds and dry conditions can provide high risk. Such fires are often started near the shores of lakes on soils with high organic content that smolders and later ignites.

Fireworks also start many lakeshore fires. Dune grass is one of the most important plants along the shoreline for holding sand in place and managing erosion. However, it is also one of the most flammable plants, and therefore a major wildfire threat. Flames from dune grass fires can reach 10 to 20 feet high.

Other kinds of fire danger occur in the home or yard. Homes built before 1964 are more problematic because of the balloon frame construction that allows fires to spread in wall cavities. Wiring fires may be caused by overloading with appliances without

cut-offs. Candles and saunas are other sources of fires caused by human error.

Fires in scrap tire piles are difficult to contain and extinguish, and produce acrid, oily smoke and oily residue that leaches into soil and can migrate to streams. Accumulated tires are also breeding grounds for mosquitoes, increasing the risk of West Nile Virus.

Opportunities

Preparedness and Mitigation

The Michigan DNR use burn permits to communicate to homeowners when it is safe to burn and when it is not. Any open fire larger than a campfire requires a burning permit unless the ground is snow covered. The DNR also provides resources for best burn practices. For example, campfires should be built away from dune grass and other flammable vegetation, and should be extinguished with water. Otherwise, they may continue to smolder and pose a risk for unsuspecting beach walkers.

The Chocolay Township Zoning Ordinance contains burn provisions that detail appropriate designs for covered burn barrels, setbacks of burn barrels from adjacent structures, prohibited materials for burning, and supervisory standards. Grated covers help keep burning embers from escaping.

The Firewise program promoted by MSU Extension is intended to create awareness for mitigating the risks of wildfire. Strategies generally relate to controlling fuel sources for fires. For example, it is especially important to remove fuel that is downhill from homes, and fuel that is within three feet of homes. This means keeping leaves, dead grass, and other debris out of this zone, and especially from under decks or porches.

Using fire resistant landscaping plants and materials can also help, as will frequently watering plants. Maintaining defensible space also means storing flammable items including firewood, boats, and RVs at least 50 feet from homes or attached structures.

The Firewise program also offers suggestions for zoning regulations to reduce fire risk.

Response and Recovery

A 30,000 gallon underground tank was installed with the fire station project in 2013, improving response potential. Additional dry hydrants or other water storage facilities are still needed in the eastern portion of the Township near residential areas and jack pine stands. It is important to establish regular maintenance inspections on the dry hydrants to ensure they remain functional.

Vegetation should be trimmed back from private roadways and driveways as fire vehicles and water tankers need a clearance 12 feet wide and 15 feet high for easy access. Steep grades, sharp curves, and narrow roads make it difficult or impossible for fire vehicles to respond to fires. If possible, a turn-around with a radius of 50 feet should be placed near homes to accommodate fire suppression vehicles. Residents can also facilitate emergency response by conspicuously posting addresses.

⁵² 2007. Hazard Mitigation Plan for the County of Marquette, MI. Marquette County Resource Management/Development Department.

Flood Hazards

Profile

Chocolay Township participates in the National Flood Insurance program (NFIP). This program makes available privately issued flood insurance that is subsidized by the federal government to communities that agree to manage flood prone areas within their boundaries to reduce future flood risks to new construction. This insurance is designed to provide an alternative to disaster assistance to meet the escalating costs of repairing flood damage.

Chocolay Township has adopted and enforces a floodplain management ordinance that meets NFIP requirements. Flood insurance is not available in communities that don't participate in NFIP. In non-participating communities, federal officers and agencies may not provide any form of financial assistance for acquisition or construction purposes, and loans guaranteed by Federal agency lenders such as the USDA

Risk Assessment

The Chocolay River drains 159 square miles. The floodplain map is shown in Appendix S. According to the County Hazard Mitigation Plan, aerial photography revealed 198 structures with a value of \$9.6 million within the designated flood zones.

There have been many flood events within the Chocolay River watershed. Flooding can occur within a short time from excessive rainfall, a rapid snowmelt, or sudden release of water from an ice jam. Flooding has been exacerbated in the past because of ice dams or sedimentation blocking the mouth of the Chocolay River where it enters Lake Superior. Some homes are too close to the river, and some are threatened by

Rural Housing Services, Federal Housing Administration, and the Department of Veterans Affairs would be prohibited. No federal financial assistance may be provided for reconstruction or repair within the flood hazard area.

Flood hazard maps indicating Special Flood Hazard Areas (SFHA) are available from the Federal Emergency Management Agency (FEMA). These maps were upgraded in 2014. A SFHA is a high-risk area defined as any land that would be inundated by a flood having a one percent chance of occurring in any given year (also referred to as the base flood or 100-year flood). The floodway is the stream channel and that portion of the banks that must be kept free from encroachment in order to discharge the base flood without increasing flood levels by more than one foot. Major storms, flash floods, and increased upland development can cause flooding higher than the base flood elevation. For example, fill in the floodplain reduces the ability of the floodplain to store floodwater, so the impacts of flooding will increase.

erosion. Erosion down and across the stream is caused from rock armor installed by some property owners. The river would normally meander through the sand dunes, but man has attempted to curb the natural relocation of the riverbed. Development in the Chocolay River drainage basin increases the amount and speed of run-off, exacerbating problems for older development downstream.

Silver Creek is a tributary to the Chocolay River. It can flood independently, but is often flooded due to backwater effects of flooding on the Chocolay.

Flooding can also occur on roadways in rapid melt situations when drainage ditches are inadequate or ice/snow piles interfere with drainage. This is particularly problematic when the roadway is the only source of ingress/egress for a large number of homes.

Development may take place within the SFHA if minimum requirements are met, as enforced by the Department of Environmental Quality and the Marquette County Building Department. Development may be prohibited in the floodway.

Property owners who feel their property has been incorrectly included in a designated SFHA can seek a Letter of Map Amendment (LOMA) with proof (usually an elevation survey).

For virtually every mortgage transaction involving a structure, the lender will review the current flood maps to determine if the structure is in the SFHA. If it is, the borrower is notified of the need to purchase flood insurance as a condition of receiving the loan. This review and notification also happens when a loan is sold on the secondary market, or when lenders do routine reviews of their mortgage portfolio.

Other areas of particular concern include portions of watercourses with narrower channels and steeper gradients, rock outcrops, and impermeable soil. Secondary hazards can include mudslides and subsidence of soil. Flooding can pollute drinking water sources, particularly when wells or septic tanks are flooded. Other services such as gas, electric, cable, and phone may be disrupted. In areas of particularly severe flooding, there could be permanent changes of river channels and shoreline, destruction of wildlife habitat, and financial hardship due to repair and replacement costs.

In April of 1985, spring rainfall combined with rapid snowmelt and a broken dam at Lake LeVasseur exacerbated flooding causing structural damage to homes in the Fernwood subdivision.

Flood Hazards

It was reported that twelve units received major damage and 33 units received minor damage in this event.⁵³ In January of 1986 the Chocolay River flooded due to ice blocking its mouth. There was concern that the sewer system would flood, so the ice was blasted by the Michigan National Guard. Since then, the Township has declined further requests from residents to blast ice dams due to complaints of damages to nearby homes. In July 2002, six structures in the upper Chocolay watershed were flooded when 5.6" of rain fell in an eight hour period. Prior to this, flood damage had not been reported in this area, other than washed out culverts on Mangum Road and Green Garden Road in 1985.

Chocolay Township would also be negatively impacted by flooding on the Carp River. When flooding occurs from ice or debris near the Carp River mouth, the blockage may back-up water, causing damage to the US-41/M-28 highway and disabling the City of Marquette's wastewater treatment facility which serves Chocolay Township.

Runoff from the storm event caused two regional dams to fail, flooding roads and bridges and cutting off utilities and access. It is expected that the area will experience warmer annual temperatures and an increase in extreme precipitation events, particularly more frequent rain events that occur in the spring when flooding is already a risk. Infrastructure may not be sufficient to handle more severe storm events.

Areas with only one main evacuation route are particularly vulnerable to disasters, such as the Agate Beach Association which frequently is cut-off due to flooding of Bayou Road.

In 2003, the Marquette area experienced devastating spring floods resulting from an excess of rain falling on frozen ground.

Opportunities

One way to decrease flood impacts is to prevent development in flood prone areas. Of course, this is usually where people want to live - close to the water. But decision makers should keep in mind that the person seeking the development is likely not the only one impacted. Downstream property owners might be the ones who are negatively impacted.

Impervious surfaces increase run-off two to six times over that occurring on natural land. Alternatives include permeable pavement or biofiltration areas (rain gardens) instead of dense grass.

Vegetated buffers should be protected or restored along streams that run through agricultural land to protect water from pollutants, provide habitat, and preserve cooler water temperatures.

Chocolay Township should keep detailed reports of flood damage since mitigation grants are tied to documentation of repeat flooding.

The upper reaches of the Chocolay River drainage basin should be studied to determine the capacity of water storage areas to contain runoff. The Township should help create a greater awareness of natural water catchment strategies, and consider adopting more low impact development standards in the zoning ordinance.

Individuals who live in flood risk areas should keep itemized lists of personal property including photographs to file claims and document uninsured losses which are tax deductible. They should have evacuation plans and a hazard kit handy in case of emergency, and keep sandbags, plywood, plastic sheeting, and lumber on hand.

If time permits, before evacuation, all utilities should be turned off at the main power switch and main gas valve should be closed.

All insurance policies and important documents should be kept in a safe place, along with names and contact information for agents. Containers can be filled with clean water ahead of time in case regular supplies are contaminated in the event.

⁵³ 2007. Hazard Mitigation Plan for the County of Marquette, MI. Marquette County Resource Management/Development Department.

WATERSHED PLANNING

Today, humans are the primary agents of change in the watershed. Logging at the turn of the century, the fires which followed, and the continuing agriculture and settlement of areas resulted in profound, long-term changes to the landscape.

The Chocoday River Watershed Council was formed in 1990 to provide stewardship for the Chocoday River Watershed. It is not in active status today.

Profile

Chocoday Township is one caretaker of the Chocoday River Watershed ecosystem. Five townships have boundaries within the Chocoday River Watershed, including Chocoday, Sands, West Branch, Skandia, and Forsyth.

The first order, headwater streams are not named or well-studied in the watershed. Named streams of the Chocoday River Watershed that are in Chocoday Township include (with their stream order) the Chocoday River (5), Silver Creek (2), Cherry Creek (2), Cedar Creek (2), Big Creek (3,4), Voce Creek (2), LeVasseur Creek (2,3), Dorow Creek (2), O'Neil Creek (2), and Foster Creek (2,3).

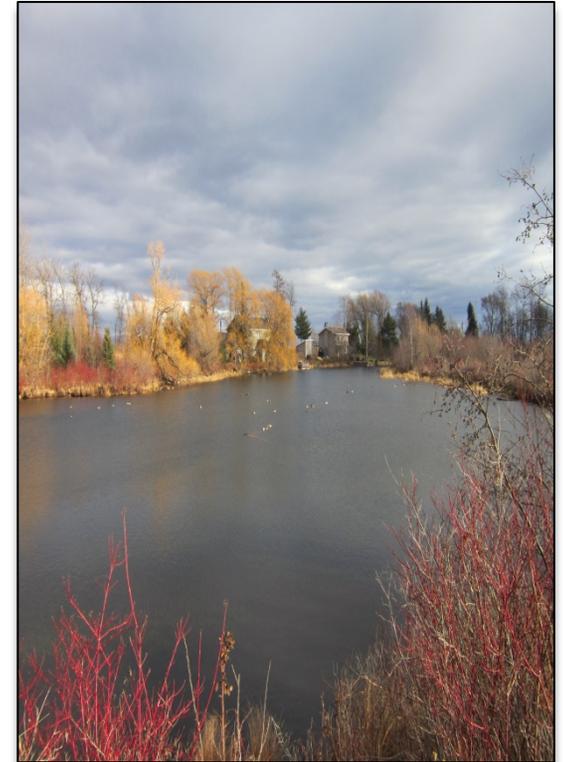
Streams in the Chocoday River have very consistent base flows, indicating a strong ground water influence. Base flows emanating from ground water is what provides water in streams during the driest parts of the annual cycle. Silver Creek, Big Creek, Cherry Creek, and Cedar Creek are all important tributaries in the Chocoday system that are fed by the Sands Plain aquifer. Generally, flood peaks in all four creeks dissipate quickly because stream gradients are steep, drainage areas are small, and sandy soils predominate.⁵⁴

The riparian area is the zone adjacent to the water that both influences and is influenced by the water. The riparian corridor provides habitat and areas of activity for many animals and plants. Maintaining natural vegetation along stream corridors is important for perpetuating these features and functions. These areas provide for bird feeding, breeding, and nesting, and the movement of wildlife.

The Chocoday River Watershed is a designated cold water fishery that is managed for trout and salmon and is a crucial watershed for the natural reproduction of many Lake Superior fish species. Trout and salmon require cool, clean streams with gravel bottoms to feed and reproduce.

In a 1999 report, the year round residential population of the Chocoday River Watershed was estimated at approximately 11,500 with some increase during summer months. About 11 percent of the watershed was urban/residential use, 14 percent agriculture, 60 percent forest.⁵⁵

There are 3 waterfalls in the watershed. Public access sites include the MDNR handicapped fishing access on M-28 in Chocoday Township, Chocoday Township Marina which includes a boat launch and kayak locker (Main Street, Village of Harvey), and Lake LeVasseur, Big Trout Lake, Engman Lake, Strawberry Lake, and Sporley Lake public access sites. Other informal public access sites exist at rivers.



⁵⁴ Premo, Dean B. 1999. Chocoday River Watershed Restoration and Adaptive Management Plan. A White Water Associates, Inc., project completed under contract with Marquette County Soil Conservation District and under direction of the Chocoday River Watershed Council.

⁵⁵ Ibid.

WATERSHED PLANNING

Risk Assessment

Possible watershed threats include the following:

- Chemical
 - ◆ Agriculture and forestry activities using herbicides, pesticides, fertilizers, and nutrients
 - ◆ Urban activities such as municipal and industrial waste contaminants
 - ◆ Underground storage tanks and volatile organic compounds
 - ◆ Closed landfills
 - ◆ Household hazardous wastes
 - ◆ Stormwater runoff from streets (salts, oils, grease)
 - ◆ Fire training sites
 - ◆ Lampricides
- Biological
 - ◆ Improper grazing management
 - ◆ Improper forestry practices
 - ◆ Recreational activities
 - ◆ Introduction of exotic flora and fauna species (purple loosestrife, sea lamprey)
 - ◆ Wetland loss or degradation due to development
- Physical - especially mobilization of sediments into streams
 - ◆ Flood control
 - ◆ Forest management
 - ◆ Road building and maintenance
 - ◆ Agricultural tillage
- Social
 - ◆ Zoning and land use planning
 - ◆ Poor stewardship

Almost half the soil types in the Chocolay River watershed are classified as highly erodible or potentially highly erodible. Sediments are caused by weathering and erosion. Agriculture can cause significant erosion. The causes of excessive sedimentation include land disturbance such as culverts and bridges, agricultural tilling, grazing of cattle in the riparian area, clearcutting of forests, poorly designed selective cutting, housing and other development, road construction and maintenance, and poorly designed and maintained gravel pits.

Too much suspended sediment causes stress to aquatic organisms and reduces light penetration into the water. Excessive instream sand and sediment bedload is the primary factor limiting the natural production of aquatic invertebrates and fish.

Elevations in water temperatures can cause reduced oxygen concentrations. This happens in areas where the stream vegetated canopy is reduced, turbidity is high, or where water is impounded.

Opportunities

The fact that ecosystems are inherently resilient is to our great advantage. In fact, some of today's best watershed managers state that "... successful restoration usually has less to do with skillful manipulation of ecosystems than it does with staying out of nature's way".⁵⁶

Still, if you are going to work with nature for the benefit of the watershed, the best approach is one that encompasses all the municipalities within the watershed. For example, a watershed overlay ordinance might be a way to get uniform zoning and development standards to benefit the entire watershed. Due to the differences between local zoning ordinances, and the costs and expertise associated with changing regulations, this could be difficult to implement across the watershed. Such a project is best coordinated by a County or Regional organization, such as Marquette County Resource/Development Department or the Central Upper Peninsula Planning and Development Region (CUPPAD).

Watershed improvement projects are intended to reduce sedimentation, improve aquatic habitat, control erosion, improve stream flow, enhance fish

migration, manage water temperatures, and protect groundwater/drinking water sources.

Projects include sediment traps, stream crossings, dam removal, bank stabilization cattle crossings, cattle exclusions, culvert replacement, and rip-rap installation. Also included are seeding and tree planting, storm sewer maintenance and street sweeping, stream restoration, Adopt-A-Stream program, stream monitoring, abandoned well closure, and water testing.

⁵⁶ Premo, Dean B. 1999. Chocolay River Watershed Restoration and Adaptive Management Plan. A White Water Associates, Inc., project completed under contract with Marquette County Soil Conservation District and under direction of the Chocolay River Watershed Council.

FLOODPLAINS, WETLANDS, DUNES, AND OTHER AREAS OF PARTICULAR CONCERN

The 2005 Comprehensive Plan highlighted goals and strategies for areas of particular concern. These areas were identified as cultural and natural resources which are significant because of their importance to human quality-of-life and the enrichment of the human experience. This is a human-centered perspective. This plan evaluates the risks and opportunities associated with these areas of particular concern from a larger ecosystem perspective, of which human systems are a part. The focus of this section is sensitive environmental areas such as floodplains, wetlands, dunes, steep slopes, and other natural features that provide vital ecosystem functions or that need protection so that other vital functions will not be compromised.

Periodic flooding is the lifeblood of the riparian corridors, marshes, beaches, and other natural areas. For example, flooding provides tangible benefits such as increased soil fertility, wetland creation, rejuvenation of spawning gravel, creation of barrier islands, promotion of aquatic habitat, transportation of woody material that provides fish habitat and bank stability, promotion of plant establishment, and the evolution of channels and shoreline features such as dunes. Wetlands reduce erosion, prevent flooding, filter contaminants, trap sediments, and serve as habitat for a wide variety of species including many game species. Michigan's sand dunes are a unique natural resource of global significance as the largest assemblage of freshwater dunes in the world. Dunes support numerous threatened and endangered plant and animal species and provide outdoor recreation opportunity.

Profile

The Township's management program consists mostly of zoning and development controls which, when combined with the efforts of other regulatory agencies, provides protection for areas of particular concern. Floodplain regulations were addressed in the flood hazard section.

Wetlands

Development restrictions are mandated by State law in wetlands. Most, but not all, wetlands are regulated by Michigan's wetland statute (Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended). Michigan is one of two states that have the authority to administer Section 404 of the federal Clean Water Act, the primary legislation that protects wetlands, and thus shares its jurisdiction with the U.S. Army Corps of Engineers. Regulated (or jurisdictional) wetlands are those that are located within 1,000 feet of a Great Lake; connected to or located within 500 feet of an inland lake, pond, river, or stream; or, if not connected, greater than 5 acres in size, or determined by the DNRE to be essential to the preservation of the State's natural resources. A permit from the State is required before dredging, removing,

or permitting the removal of soil or minerals from a wetland; depositing or permitting the deposit of fill material in a wetland; constructing, operating, or maintaining any use or development in a wetland; or draining surface water from a wetland. In order for a permit to be issued, the Michigan DNR must determine that the activity would otherwise be lawful, that the permit would be in the public interest, that the permit is necessary to realize the benefits from the activity, that no unacceptable disruption to aquatic resources would occur, and that the proposed activity is wetland dependent or that no feasible and prudent alternatives exist.

Non-jurisdictional wetlands are not regulated. These are small isolated wetlands that can be dredged and filled without a permit and yet often serve many of the same functions as the regulated wetlands, albeit on a smaller scale. They can be particularly important as sites for unique plants, breeding areas for frogs and toads, habitat for wildlife as varied as black bears and wood ducks, and integral to groundwater recharge. This latter function is of particular concern in Chocoley Township with its relatively slow recharge rates. The Township could promote or offer incentives for the preservation or restoration of these wetlands through the site plan review process.

The Conservation Reserve Program (CRP) is a voluntary program available to agricultural producers to help them safeguard environmentally sensitive land.

Enrollees plant long-term, resource-conserving covers to improve the quality of water, control soil erosion, and enhance wildlife habitat. In return, the U.S. Department of Agriculture (USDA) Farm Service Agency (FSA) provides them with rental payments and cost-share assistance. The Wetland Restoration Initiative enrolls wetlands and buffers within the 100-year floodplain. There is also a non-floodplain wetland initiative.

Local units of government are authorized to adopt and administer their own wetland regulations, provided they are at least as restrictive as state regulations. The DEQ must be notified if a community adopts a wetland ordinance, but it has no review or approval authority. Zoning standards could extend wetland protection to small depressional wetlands under 5 acres, or encourage the establishment of buffer zones or the preservation of native vegetation or mature trees around existing jurisdictional wetlands.

Dunes

Both the U.S. Army Corp of Engineers and the Michigan Department of Environmental Quality (DEQ) regulate how private landowners manage the land along the Great Lakes according to the federal Clean Water Act and Part 325 Great Lakes Submerged Lands of the Michigan NREPA. These regulations relate to the ordinary high water mark (OHWM), which is a line defining the boundary between upland and bottomland as determined by the Army Corp of Engineers or MDEQ.

FLOODPLAINS, WETLANDS, DUNES, AND OTHER AREAS OF PARTICULAR CONCERN

Activities that are carried out using human power on a limited scale do not require permits. Mechanized activity or work on a large scale requires permits from both agencies.

There are two types of permits, general or individual. The general permit applies only to activities proposed below the OHWM and above the water's edge, such as leveling or grooming sand or constructing a path. This can only be done in areas naturally free of vegetation or where vegetation removal is in accord with NREPA. Natural lake contours and shoreline location may not be altered or basins excavated. Grooming can only be done in the top 4 inches of sand, and plant roots cannot be disturbed. There are specific standards for construction of paths and mowing of vegetation. Other activities require individual permits.

Protection of the Lake Superior shoreline in Chocoley Township is furthered through

Risk Assessment

Risks associated with flooding have already been discussed. It is common to think of floods as destructive forces of nature. However, floods do not cause damage or suffering. Our decisions about where to live, work, and play are the cause.

Management of flood prone areas has typically been development-centered. A typical approach is to confine the waterway or water body to a predefined size and capacity that maximizes the extent of developable or agricultural land and also keeps the flood water away from people and their property. Under such a framework, the floodplain serves a human-centered role as a

enforcing the standards of the Lake Superior Shoreline/Dune Protection Overlay District. The intent of the overlay district is to protect property values, reduce the risk of structure damage from erosion and flooding, and preserve this unique ecosystem. The overlay district extends landward from the erosion hazard line (the landward edge of the zone of active erosion) to encompass the entire foredune, or to a maximum of 100 feet inland, whichever is the lesser distance. Vegetative management occurs under recommendations and requirements of the principle use clause. Earthmoving changes are regulated through a conditional use permitting process. In general, the overlay district guides vegetative and topographical modifications and encourages the preservation and/or restoration of native vegetation for erosion control and habitat values.

Shorelines

The zoning ordinance mandates that structures be setback 100 feet from the shorelines of water bodies, with options to increase the setback if water quality, aesthetics, or recreational value is threatened. This

conveyance network to pass the "excess" water as quickly as possible, with no consideration of the loss of ecological function, the potential damage to downstream property owners, or the cultural, economic, or environmental effects of that strategy.

Further, floodplains have been viewed as suitable sites for human development; the concern, if any, has been to ensure that structures built there are elevated above some minimal flood level, so they are considered "safe," and also to insure them. Hence, as recent flood disasters and their aftermath have indicated, communities often respond to such disasters by applying more of the same techniques that caused or exacerbated the problem in the first place.

waterfront setback is not always adequate in areas of steep topography, such as the Chocoley River, where development in the riparian zone on steep slopes can lead to erosion and habitat degradation. The Township could establish a river overlay district to establish setbacks in a similar approach to that of the shoreline/dune overlay.

The zoning ordinance further mandates and defines natural cover for a strip 30 feet wide adjacent to the waterbody. The Inland Lakes and Streams Act, Part 301 of PA 451, dictates that work below the ordinary high water mark or highest legal lake level requires a permit from the State. On an area greater than 1 acre, anyone disturbing soil, removing existing vegetation or changing topography within 500 feet of a lake or stream must obtain a Soil Erosion and Sedimentation Permit (regulated under Part 91 of PA 451) from the County. The Township could consider extending erosion control to areas less than 1 acre in extent through site plan review standards.

In the past, drainage of wetlands for agriculture and mosquito control was the primary factor of loss of coastal wetlands. Today, activities associated with urban development are the primary cause, such as construction of residences, roadways, flood control structures, recreational facilities, and industrial sites. Silviculture (controlling the establishment, growth, and composition of forests) is the major threat to northern forested wetlands, but other threats include peat mining and vacation home development. Michigan supplies nearly 30 percent of the U.S. demand for peat. The removal of peat can degrade wetlands by releasing toxic metals, organic pollutants, and causing eutrophication of surface waters; increasing runoff; changing groundwater conditions; and leading to soil loss through fires.

FLOODPLAINS, WETLANDS, DUNES, AND OTHER AREAS OF PARTICULAR CONCERN



Opportunities

Instead of controlling watercourses, the Township should control how and where human activities are allowed to adversely affect water bodies and wetlands. The greatest risk to the stability of these ecosystems is development pressure and mismanagement of the resources.

FARMLANDS, FORESTS, AND OTHER PRODUCTIVE LANDS

Actions dedicated to the preservation of productive lands are important to support the maintenance of a critical supply of land for the production of essential goods such as agriculture and timber products. Some economic benefits from productive farmlands include associated agricultural jobs and agritourism. Farm, forests, and open lands more than pay for the municipal services they require, therefore helping to mitigate the greater costs to maintain residential land use services. In addition to economic benefits, there are environmental, cultural, and quality-of-life benefits such as preservation of food and cover for wildlife, maintenance of air quality, groundwater recharge, stormwater storage, wetland protection, local food security, recreation opportunities, and preservation of scenic landscapes and rural character.

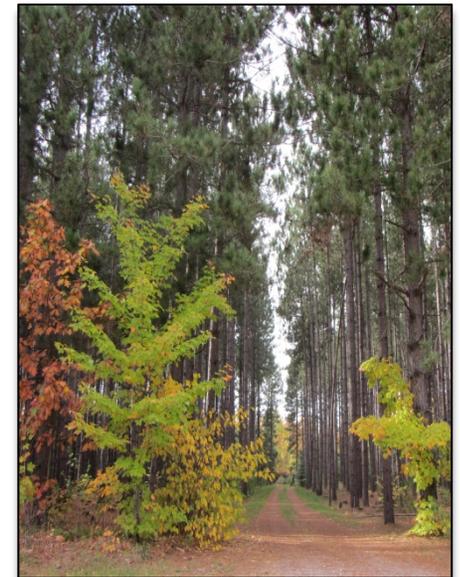
Profile

Chocolay Township contains 60 square miles of land area (38,401 acres). The Township has approximately 3,638 acres of primary working lands that are characterized by cleared pasture, farms and actively managed forests. Of these lands, 926 acres (25 percent) are publicly owned. These primary working lands are identified as area 12 on the character area map included in Appendix L. In addition, there are approximately 22,162 acres of natural preserve lands that are characterized by mostly wooded natural areas. Of these lands, 12,348 acres (56 percent) are publicly owned. These natural preserve lands are identified as area 13 on the character map included in Appendix L. In total, these lands consist of about 25,800 acres, 51 percent publicly owned, that are about 67 percent of Chocolay Township's total land area.

Chocolay Township has an agricultural past, with some heritage farms still in existence. The Township is also home to contemporary or hobby farms which distribute produce through local farmer's markets, direct to institutions, or direct to consumers through community supported agriculture (CSA) programs.

There are also government-owned lands that are dedicated to agricultural production. The State of Michigan owns approximately 700 acres of land that was managed as a State Prison farm and is now leased to area farmers for crop production. Chocolay Township also owns 14 acres of farmland adjacent to the Beaver Grove Recreation Area that has been used for private crop farming. In 2014, the Township Board approved a project to preserve these 14 acres for public agricultural use to include farm incubator plots, large plot community gardens, hoop houses, public u-pick bramble patches, food forest, agricultural support structures, and associated public spaces including trails. In essence, this project is to be an agriculture/permaculture park. This project is managed by a group of private citizens called the Chocolay Community Farm Collaborative, which is organized in association with the 501(c)(3) non-profit organization, Superior Sustainability.

Chocolay Township also contains approximately 12,348 acres of forest lands owned and managed by the State of Michigan or the Michigan Department of Resources or the Township. The rest is owned by either private individuals or corporations. Seven-hundred seventy-five (775) privately owned acres are enrolled in the Commercial Forest Program through the State of Michigan. Enrollees receive a significant property tax reduction as an incentive to retain and manage their forest land for long-term timber production in support of the state's forest products industry. These lands are open to the public for food access for hunting and fishing, but cannot be used for agriculture, grazing, or industrial, residential, resort, or commercial activities. In the state, the majority of forest land is in private ownership by families and individuals, so preservation and management programs for private citizens are very important to Michigan's future. A map of critical agriculture and habitat areas, groundwater recharge areas and other critical natural features is found in Appendix R.



FARMLANDS, FORESTS, AND OTHER PRODUCTIVE LANDS

Risk Assessment

Land used for agriculture and forestry often cannot compete with the land's value for other uses, and the large contiguous parcels that these industries need for their operations are being fragmented into smaller blocks which are less economically viable for production. Fragmentation of farmland can result in decreased economic viability in an already challenging industry. This is one reason that Chocolay Township maintains a larger minimum parcel size for lands in the Agriculture/Forestry zoning district.

In many areas of the Country, much of the land base is being converted for non-agricultural uses due to development pressures and lagging profitability. The

American Farmland Trust, through the National Resources Inventory, illustrates one startling fact - Florida and California, two of the three states experiencing the largest acre losses of agricultural land, currently account for 47 percent of the nation's vegetables and 71 percent of its fruit production based on market value. This enhances food security risks in other areas of the country.

Farm lands are desirable for development because the land is generally level and already cleared of trees. Chocolay Township lands that are at risk of conversion include the State lands that were once managed as a prison farm. Because they are close to Marquette, and located on good roadways, they are at risk of conversion should the State decide to divest itself of land. Good productive farmlands are in such short supply in the Upper Peninsula, particularly in close

proximity to population centers, that such conversions should be discouraged or limited.

Expansion of residential uses also leads to forest conversion. One problem associated with these conversions is increased risk of wildfire. This places a strain on firefighting resources in remote areas which are more difficult to access and are further from water sources. As humans move into forest habitat, they also pose a threat to wildlife habitats and forages. If food security were threatened, people would appreciate abundant wild deer and grouse populations. If energy security was threatened, people would also appreciate abundant timber resources to warm their homes.

Opportunities

Citizen Action

Well-managed and sustainable agricultural lands can help address a changing climate, growing population, and serious concerns about the nation's food and energy security. However, less land would need to be preserved for agriculture if more people would utilize their residential properties for growing food, as in gardening or homesteading. An increase in food supply provided by residents would enable more land to be left in a wild condition, for either wildlife habitat or environmental purposes.

In some areas of the Township, Lake Superior offers a climate moderating effect for growing. However, some inland areas have more extreme climate conditions. The Township has abundant surface waters and ample Superior shoreline, presumably indicating an abundant supply of fresh

water. However, Chocolay residents utilize groundwater, not surface or Great Lake water, and some groundwater supplies are less than ideal. The use of surface water for food irrigation involves working through regulations relating to amount of withdrawals and water testing. Residents can also capture rainwater to help with irrigation.

There are also less than ideal soils in many areas. The Upper Peninsula Research and Extension Center (UPREC) in Chatham, MI (30 minute drive from Harvey) is doing applied research on building healthy soils, and offers educational opportunities related to successful growing in northern climates. They provide a two-year, residential apprentice farmer program to help people get started with their own farming enterprise. They also offer specialized skill-building workshops open to the public on topics such as soil health, season extension, organic vegetable production, and post-harvest handling and food safety. Growers utilizing land at the Chocolay Community Farm are expected to benefit from partnerships with the UPREC and

Marquette Food Co-op for education and training, and from partnerships with local farm mentors. The Chocolay Community Farm will make land available for use close to Marquette and Northern Michigan University, and offers a growing opportunity for residents who have less than adequate growing conditions at home.

Property owners can collaborate to voluntarily protect productive lands. In the Upper Elk River Valley of Colorado, a group of ranchers worked together to create a voluntary compact with an established set of principles to allow home construction only where it would not harm agricultural operations or valley views. This became the first private, community-wide agreement of its kind in the nation. This collaboration led to the implementation of formal conservation easements and voter-approved preservation programs. Chocolay Township should maintain awareness of programs for private property owners that encourage preservation or conservation of productive lands, and share this information with property owners.

FARMLANDS, FORESTS, AND OTHER PRODUCTIVE LANDS

Local Government Action

It is difficult to weigh the long-term benefits of preserving productive lands and maintaining rural character versus the immediate gain in tax revenue from residential development. However, Chocolay Township still has many opportunities to increase the residential tax base closer to the population center. Once developed, prime productive lands are permanently lost.

In developing a future land use plan, the Township should direct new development to areas that are not current productive farmlands. This can be done by maintaining larger minimum lot sizes on these lands to limit subdivision, and making larger parcels closer to the population center available for residential subdivision. This also contributes to more efficient provision of public services. Development types that conserve land for productive use, such as rural cluster development subdivisions or development-supported agriculture, can alternately be considered as conditional uses with special review in rural areas less suitable for productive use. These terms are more fully defined in Chapter 7: Chocolay Township Future Land Use Plan.

Chocolay Township has already implemented the open space preservation mechanism (rural development subdivisions) in the zoning ordinance per the Michigan Zoning Enabling Act. This enables land zoned for residential development to be developed, at the option of the landowner, with the same number of dwelling units on a smaller portion of the land than specified in the zoning ordinance, provided at least 50

percent of the land area remains in a perpetually undeveloped state by legal means.

The Township should implement a purchase of development rights (PDR) ordinance per the Michigan Zoning Enabling Act, and then seek federal, state, or local funds to support the program to preserve prime productive lands. This would enable the County also to purchase development rights in the Township with Township approval. These programs can be financed from general local government appropriations, grants, donations, issuance of bonds or notes, general fund revenue, special assessments, etc.

The State has an interest in preserving farmlands, and has historically supported agriculture in Chocolay Township. However, the Township should prepare for the possible divesting of State lands to private ownership, which might lead to residential conversion. For example, these lands should be placed in a special zoning district with 40 acre or higher minimum lot size. The State could be approached to establish conservation easements on the lands before they are sold. A PDR program would allow the Township to purchase the development rights for these lands if necessary to preserve them.

The Township should stay up-to-date on federal and state preservation programs, and also private foundation resources. Availability may vary depending on the current farm bill.

The least costly way to save farmland is to make it so valuable that farmers don't want to sell it. Local government regulations should support innovative programs that improve agricultural profits such as value-added production, processing, distribution, retail, and tourism facilities and energy solutions such as biomass digesters that turn manure into electricity.

State or Federal Government Action

The U.S. Department of Agriculture and Natural Resources Conservation Service provide funding to

preserve land for various purposes. In Michigan, the Farmland and Open Space Preservation Program consists of six methods for preserving farmland and open space. Five of the programs involve agreements between the State and a landowner. The other program is designed to assist local units of government in implementing a local purchase of development rights program using public funding.

Conservation easements are voluntary permanent restrictions that a landowner may put on property, requiring or prohibiting certain actions by easement, covenant, or condition in a deed, will, or other legal instrument. The purpose is generally to retain natural, scenic, or open condition, or to preserve agricultural or forest use. These easements must be recorded with the register of deeds, and they run with the land regardless of ownership. This designation impacts the property assessment.

Under Michigan law, these easements may be granted to a governmental entity, charitable or education association, corporation, trust or other legal entity. Such an organization may include a charitable land trust that takes care of long-term enforcement and management. In the area, the U.P. Land Conservancy is one such organization. To participate in the U.P. Land Conservancy program, in addition to "donating" the land, a property owner wishing to establish a conservation easement with the U.P. Land Conservancy must provide an endowment fund for future care of the land. Another program is the Nature Conservancy.

Temporary agreements include farmland development rights agreements, local open space easements, and designated open space easements. These agreements involve preservation of land for certain purposes in exchange for certain tax benefits and exemptions from special assessments.