



City of North Muskegon Coastal Sustainability Assessment

Completed 11/28/2022

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Acknowledgements

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This Self-Assessment Tool references recommendations and best practices developed by LIAA, as well as from the following entities:

- Michigan State University School of Planning, Design and Construction—A Self-Assessment of Sustainability in Your Community
- Environmental Protection Agency (EPA)—Flood Resilience Checklist
- Sustainability Tools for Assessing and Rating Communities (STAR)
- Seagrant Wisconsin—Green Infrastructure Audit Tool
- Maryland’s CoastSmart Communities Tool

The statements, findings, conclusions, and recommendations in this document are those of the authors and do not necessarily reflect the views of the Department of Environment, Great Lakes, and Energy and the National Oceanic and Atmospheric Administration.



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How to use this assessment tool

Each sustainability principle features various benchmarks that are often used as an indicator of local resilience. To complete the community self-assessment, read the benchmark question and its description and choose from the following response options:

Example of how a community may score themselves

Yes (Y) - The community has included this sustainability principle in its planning efforts and/or local policies and initiatives.

Yes, but should improve (I) - The community either practices this sustainability principle but does not explicitly include it in its planning documents, or the principle can be found in planning documents but could be implemented to a greater degree.

No (N) - The community has not considered this sustainability principle in its plans or local initiatives.

Don't know (?) - It is unclear if the community is practicing this sustainability principle or if this sustainability principle is applicable given local conditions.

Not applicable (NA) - This sustainability principle is not applicable given local conditions (for example, dune protection in a community without dunes).

	Benchmark	Self-Assessment	Description
2.4	Does the master plan, zoning ordinance or other municipal plan, regulation or program call for incentivizes or regulations for developments to include affordable housing options?		For a community to effectively address housing issues, it should have adopted plans that describe the local goals, objectives and action steps to achieve greater sustainability as it pertains to housing. Support for these plans acts as support for the “sticks and carrots” that the municipality can use to implement the community’s vision for its housing.

The purpose of this self-assessment tool is to evaluate each of the benchmarks and look for gaps in your community's overall sustainability by identifying what is working well (Y), what is present but needs improvement (I), what is missing (N) and what is unclear (?). Once each benchmark has been categorized, the community can begin to plan for a more resilient future by addressing the best practices that would benefit the local economy, social opportunities, environment and coastlines.

Data gathering and mapping

Coastal communities can work towards implementing sustainable policies and best practices once they understand the risks that certain areas and structures are under. Data and mapping that is well-organized and easily presented can help to educate community residents on the importance of planning ahead for potential risks. This is a first step in planning for flood damages to residences, businesses, natural ecosystems and critical public facilities. Planning ahead can help to prevent damages or reduce the negative effects that these damages can cause.

	Benchmark	Self-Assessment	Description
24.1	Does the community use historical mapping of lake levels and lake level projections to inform land use decisions?	N –	The Great Lakes fluctuate in a decadal pattern with an average reduction in shoreline at around 1 foot per year. This fluctuation wherein buildable beach is present for some time and then gone later contributes to development in highrisk areas. Historical data, projections and responsive zoning can help reduce risky development.
24.2	If adjacent to a Great Lake, has the community mapped shoreline erosion using data provide through the Great Lakes Research Center, NOAA and the State of Michigan?	NA	Use the following link to view shoreline data for Michigan's coasts: https://portal1-geo.sabu.mtu.edu/mtuarcgis/apps/webappviewer/?id=d758800bb18e460ab39aa66631051156
24.3	Are flood risk maps and related data updated every five years?	? – not locally, but County Haz. Mit. Plan is expired and being rewritten at this time	It is important that data on flood risks remain updated so that community planning mitigation efforts are based on accurate information.
24.4	Has the community benchmarked its climate risks and vulnerability to natural disasters so that it can measure improvements over time?	N –	Measurable benchmarks may include: property damages, the number of people and/or structures at risk and public spending on disaster recovery.
24.5	Are maps (or other spatial tools like GIS) used to spatially define the vulnerability of roads, public buildings (schools, hospitals, fire stations, etc.) and public services (wastewater treatment, water distribution, power transmissions, etc.) to coastal hazards?	I – The County Haz. Mit. Plan provides a map of critical facilities in the city; vulnerability is not defined	Using Digital Elevation Models, shoreline erosion data, lake level data and other key sources, communities can assess the risk to their most important assets. Decision makers can use these analyses to reduce hazard risks and improve sustainability.
24.6	Has the extent of past coastal hazards been identified and mapped based on historical records, existing plans and reports or scientific and local knowledge?	I – County Haz. Mit. Plan lists flood events, but does not map them.	Understanding past events can help inform future plans. The community should try to gather information from as many sources as possible in order to create a clearer picture of what risks the community may be facing.

Y—Yes I— Yes, but should improve N— No ? — Don't know NA — Not applicable

Data gathering and mapping (continued)

	Benchmark	Self-Assessment	Description
24.7	Do any plans, and especially the Hazard Mitigation Plan, describe the damage and cost of previous storms, floods or erosion?	I – the County Haz. Mit. Plan describes damage, but not all of the costs	Dollar amounts for past damages can help community members decide how risk averse they want to be going forward.
24.8	Does the community track repetitive loss properties within the National Flood Insurance Program?	N – repetitive losses are not mentioned in the County Haz. Mit. Plan; there have been 3 total losses since 01/01/78	A repetitive loss property is any insurable building for which two or more claims of more than \$1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978
24.9	Are maps or spatial data used to predict the probable extent of future coastal hazards?	N – special data is available; LIAA providing flood scenario maps	Similar to benchmark 24.7, measuring the probability of different coastal scenarios (100-year storm versus 500-year storm, for example) can help community members and decision makers decide to what extent they want to avert coastal risks.
24.10	Do community plans estimate the potential financial losses that may result from lake-level rise?	Y – County Haz. Mit. Plan estimates \$146 million in property insurance coverage (based on SEV);	Along with understanding the sites most at risk of taking on damages, the community also benefits from knowing the potential costs of future damages so they can plan accordingly.
24.11	Does the municipality share the findings from risk and vulnerability assessments with planning staff, public works officials, transportation planners, emergency management, elected officials and the general public?	I – not actively, but information is available online in the County Haz. Mit. Plan	It is important for each municipal department to be on the same page, especially regarding hazard mitigation efforts. This can help increase consensus and buy-in around decision-making.
24.12	Has the community conducted a buildout analysis using current zoning to better understand the potential for development in at-risk areas?	N – LIAA is providing maps to assist with this effort	While a full buildout is rare, communities should be aware of the potential for increased development to occur in risk prone areas. This may help inform zoning changes to improve resilience.

Y—Yes I — Yes, but should improve N — No ? — Don't know NA — Not applicable

Zoning regulations

Municipal governments are responsible for protecting public health, safety and natural resources now and for generations to come. Zoning regulations are a useful tool for preserving natural assets and siting developments in low-risk areas. The local government should engage the community to explain the potential risks that natural hazards pose to community assets when development is not regulated. The master planning process is an ideal time for this engagement to occur.

	Benchmark	Self-Assessment	Description
25.1	Does the municipality use zoning regulations to reduce damages to the built environment?	Y – The zoning ordinance references the Ordinary High Water Mark and FEMA maps to determine building locations; flood water information is required on certain site plans	Zoning regulations can work to prevent development in areas at serious risk of flooding, which can help reduce the fiscal damage that a natural disaster may cause.
25.2	Is the zoning ordinance reviewed periodically to ensure that it is effectively reducing the risk of flood damages?	I – Zoning ordinance is reviewed periodically; Not specifically for this issue	If the same developed areas are repeatedly experiencing flooding, it may be time to seek regulatory options to reduce the financial burden that rebuilding these structures is having.
25.3	Does the master plan or zoning ordinance mention vegetation requirements for properties and developments near or within coastal areas?	N –	Vegetation plays an important role in reducing runoff, preventing flooding and maintaining natural landscapes.
25.4	Does the master plan or local ordinances prevent the removal of native vegetation around houses near dunes and beaches?	N –	Dunes and beaches are at a greater risk of deterioration when vegetation is removed during development. Planning documents and municipal ordinances can help protect these natural features.
25.5	Does the zoning ordinance work to minimize the amount of impervious surfaces in the entire community?	N – There is a reference to waiving a portion of the performance guarantee for site development.	Impervious surfaces contribute to runoff, dune and beach loss and can be harmful to the natural and built environments. Pervious surfaces and natural landscaping should be utilized as much as possible.
25.6	Has the municipality established a buffer area around flood zones to restrict or guide development in these areas?	I – There are limitations as to building and utility location; there is not a defined buffer zone	This is an alternative to benchmark 25.1. When it is unfeasible to restrict development in a flood-prone area (i.e. there is already development there) the municipality may look to guide redevelopments and new developments to improve that area's ability to withstand natural hazards.

Y—Yes I — Yes, but should improve N — No ? — Don't know NA — Not applicable

Zoning regulations (continued)

	Benchmark	Self-Assessment	Description
25.7	Does the community have local ordinances to protect dunes, bluffs, eroding cliffs, wetlands and/or beaches from development disturbance?	NA	These natural features are lost forever if not protected. They play an important role in economic, social and environmental sustainability.
25.8	Are frequently flooded areas zoned or planned for open space protection and/or recreation use to prevent risky developments?	I – Open/recreation	Areas that are repeatedly flooded are best kept in their natural state. Maintained as open space or recreation areas, they still contribute to the overall quality of the community.
25.9	Does the community regulate the elevation of residential, non-residential and public buildings or infrastructure to be above the base flood elevation within the 100-year floodplain?	Y – Regulations are provided in the Flood Hazard (Sec. 30-71 through Sec. 30-75), Stormwater Management (Sec. 56-1 through Sec. 56-123), and Zoning Ordinances (Chapter 3; Section 3.17).	While elevating structures above the base flood elevation does not remove all risk to the property, it does reduce the chance that the structure will be damaged by a coastal hazard.
25.10	Does the community require the flood-proofing of structures within the 100-year floodplain?	Y – Under the State of Michigan Building Code, as amended	Flood proofing refers to structural and non-structural changes, or adjustments made in the building that reduces or prevents flood damage to the structure and/or its contents. The two widely recognized types of flood-proofing are wet flood-proofing and dry flood-proofing.
25.11	Does the community prevent the rebuilding of structures destroyed by coastal hazards? (Where rebuilding is allowed, are additional design elements required to reduce the risk of future damages?)	NA	By preventing or regulating the rebuilding of damaged structures from coastal hazards, the municipality is reducing the health and financial risks posed to the property owner, as well as the potential costs incurred by the public.

Y—Yes I — Yes, but should improve N — No ? — Don't know NA — Not applicable

Structural design near dunes and bluffs

Traditionally, coastal homes are highly sought after (for their location and views) and for municipalities (high demand locations provide higher property tax returns). However, in recent decades some communities are finding that the social and economic costs that high-risk developments pose can often outweigh the benefits. Certain areas may need to be regulated to prevent development altogether. However, when this is impossible or undesirable, the local government can guide development to increase the sustainability of both the natural and built environments. These are best practices for all water-adjacent structures, and especially for those on dunes.

	Benchmark	Self-Assessment	Description
26.1	Are coastal homes regulated to have a smaller footprint?	NA	Home designs with additional floors are able to provide the same amount of square footage to the homeowner but with less of a footprint on the natural environment. This also helps to reduce the amount of impervious surfaces.
26.2	Are homes built on dunes designed with innovation that promotes multiple uses for rooms in order to take up less space?	NA	This would likely require incentives or an educational component rather than a regulatory power. Good design can work to reduce a building's footprint.
26.3	Are homes sited on dunes designed to avoid a concentrated dispersion of rainwater?	NA	Homes in critical areas should be regulated to prevent water from dispersing concentratedly, which causes damage to the natural environment, especially on dunes.
26.4	Are homes on dunes encouraged to share driveways in order to avoid the amount of impervious surfaces?	NA	Driveways typically use impervious materials so a reduction in their presence in critical areas can be an important step in sustaining dune and beach quality.
26.5	Are homes on dunes allowed to use pervious materials for driveways?	NA	The municipality can help reduce runoff and dune destruction by allowing pervious materials to be used for driveways.

Y—Yes I— Yes, but should improve N— No ? — Don't know NA — Not applicable

House siting

While structural design benchmarks are important factors in sustaining natural ecosystems, house siting can also contribute to the well-being of the natural environment, especially for dunes. Municipalities can work prudently to protect their dunes, which are important aspects of the environmental and economic sustainability of a place, by using regulatory controls to prevent unduly harmful development patterns.

	Benchmark	Self-Assessment	Description
27.1	Are homes on dunes and beaches regulated or incentivized to be placed at the point of arrival in order to reduce the damage created by driveways and parking?	NA	Previously mentioned, driveways and other impervious surfaces should be avoided to the extent possible, especially near dunes and beaches. Zoning regulations and incentives can promote house siting that reduces the need for more impervious driveway material.
27.2	Are coastal homes designed to work with natural features and conditions of the site?	NA	Developments in critical ecosystems should not place an undue burden on said ecosystem's sustainability. Developments should alter the site as little as possible.
27.3	Are homes on dunes prevented from building close to the crest of the dune?	NA	Development on the crest of the dune can cause damage to the dune itself while also placing the structure at risk of damage or loss.
27.4	Are homes on dunes encouraged to be oriented on the long axis of the house across the slope to minimize the variation in elevation within the footprint of the structure?	N – There is not a specific requirement, however, most of the city is relatively flat	Zoning regulations, incentives or education can be used by the municipality to encourage more sustainable site plans.

Y—Yes I — Yes, but should improve N — No ? — Don't know NA — Not applicable

Critical facilities and infrastructure

Sustainable communities can experience a natural disaster and continue to provide public services to residents before, during and immediately after the emergency. They are able to accomplish this by siting critical facilities such as police stations, fire stations, hospitals and important records in locations protected from damages in the event of a natural disaster.

	Benchmark	Self-Assessment	Description
28.1	When new critical facilities are developed, are they sited in locations that are protected from possible flooding?	I – The Stormwater Management ordinance discusses new and replacement stormwater infrastructure in limited detail	Critical facilities should be located outside of flood zones whenever possible. This is where data gathering and mapping play an important role.
28.2	If critical facilities are located in areas at risk of flooding, are they outfitted with additional structural protective features?	N – there are no critical facilities located within areas at risk of flooding	Critical facilities must be able to function in the event of a natural disaster. This means ensuring that power, water, waste disposal, communications, and occasionally natural gas and steam are protected from potential damages.
28.3	Does the community have an emergency plan in place to continue providing services during an emergency?	Y – The County Haz. Mit. Plan provides details to maintain emergency services during an emergency	In the event that a critical facility(ies) cannot function during or after a natural disaster, the community should have a plan in place to continue providing public services by other means.
28.4	Does the community have a plan for upgrading/repairing critical transportation infrastructure?	Y – Refer to County Transportation Plan	Transportation infrastructure is vitally important to the community's economic and social sustainability. Proper maintenance and hazard planning can help ensure that this infrastructure remains intact.
28.5	When critical transportation infrastructure is repaired are best practices considered to reduce the risk of future flood damages?	Y – Refer to County Transportation Plan	This may include elevating roads above predicted flood levels, moving roads landward as erosion occurs and/or incorporating future flooding and lake-level rise into culvert size and placement.

Y—Yes I— Yes, but should improve N — No ? — Don't know NA — Not applicable

Critical facilities and infrastructure (continued)

	Benchmark	Self-Assessment	Description
28.6	When upgrading existing community infrastructure, does the community consider the impact of coastal hazards?	Y – there are public lands and parks located within areas at risk of flooding and are designed to flood if needed during increases in lake levels	When the community updates its infrastructure it is important to consider environmental factors such as coastal erosion and/or shoreline change, lakelevel rise, coastal flooding and storm surge.
28.7	When planning new community infrastructure, does the community consider the impact of coastal hazards?	Y – new critical infrastructure is not planned for areas at risk of flood	See Benchmark 28.6

Y—Yes I—Yes, but should improve N—No ?—Don't know NA—Not applicable

Disaster preparedness

Historical coastline data and projections can help municipalities implement scenario-based plans. For instance, flood risks can be predicted based on lucky, expected or worst-case scenarios. Each of these scenarios can be used to see how many structures or community assets may be damaged in the event of a natural disaster. This can help the community prioritize its hazard mitigation efforts.

	Benchmark	Self-Assessment	Description
29.1	Are there public facilities available for residents to receive supplies or shelter in the event of a disaster?	I – There are facilities in the nearby City of Muskegon; none in The City of North Muskegon are identified in Haz. Mit. Plan	In the event that a natural disaster affects the ability of residents to remain in their homes, access supplies or seek health assistance, the community should have designated facilities to support the affected public.
29.2	Do residents know where emergency relief facilities are located within the community?	I – facilities are made public on County website; no reference on City website	Relief facilities are only as helpful as people's ability to access them. Educating the public before the occurrence of a natural disaster can help mitigate health risks.
29.3	Are there emergency relief facilities sited close to the community's vulnerable populations?	N – nearby facilities in adjacent communities are the closest locations that are identified in the County Haz. Mit. Plan	People who are low-income, elderly, disabled, living alone or spatially isolated are the most susceptible to the negative effects of a disaster. Their vulnerability to natural hazards can be reduced by siting resources close to these residences.
29.4	Has the community used scenario planning strategies to identify areas most at risk during a natural disaster?	N – LIAA is providing maps to assist with this effort	Scenario planning helps the community to decide the extent to which it will make plans and changes to mitigate its risk of flood damages. Scenario planning is when the lucky, expected or worst-case scenario guides mitigation efforts.
29.5	Has the community adopted a Hazard Mitigation Plan, an Emergency Preparedness Plan or a plan similar in nature?	Y – A Haz. Mit. Plan has been adopted by the County (currently undergoing revisions/updates in 2022)	Plans can help to outline goals, objectives, action steps and responsibility for implementation. They can also give an idea of when and where budget expenditures should be allocated before, during and after flood damages have occurred.

Y—Yes I— Yes, but should improve N — No ? — Don't know NA — Not applicable

Disaster preparedness (continued)

	Benchmark	Self-Assessment	Description
29.6	Are first responders prepared to address a natural disaster within the community?	Y – there are county-wide plans and procedures in place for a wide-variety of potential disasters	The municipality should work closely with the police, fire department and ambulatory services to identify gaps and opportunities to response efforts in the event of a community emergency.
29.7	Are professional planners, engineers and/or certified floodplain managers involved in the formation of the capital improvements plan?	Y – professional planners and engineers are involved in the formation of CIP	Experts in their given field can provide plan insights that may otherwise be overlooked.
29.8	Does your community have a communication system to reach the public before, during and after a disaster event?	Y – The Haz. Mit. Plan details several communication formats from online, TV, radio, ect.	Being able to communicate safety procedures and updates to community members is an important factor when recovering from a major storm event.
29.9	Are community members engaged through education programs about mitigation options?	N –	Community members should understand why certain zoning regulations, local programs and public works projects exist. This can help promote public support and may encourage community members to implement mitigation features on their property.

Y—Yes I— Yes, but should improve N— No ? — Don't know NA — Not applicable

Bluff and ravine protection

Bluffs and ravines both play important roles in the environmental, economic and social sustainability of a place. Bluffs are a tourism draw for their aesthetic qualities and provide a natural barrier for coastal homes from flooding. Ravines are important to sustain in order to reduce the risk of flooding to nearby properties. There are certain tools and best practices that municipalities can implement to make sure that these natural features are not damaged, or damaged to a lesser extent, by development.

	Benchmark	Self-Assessment	Description
30.1	Does the master plan mention bluff and ravine protection?	NA	Zoning regulations and other policy initiatives need to be backed up by an adopted community plan. The master planning process also helps to educate the public on the importance of protecting these natural features and how this can be accomplished by the private landowner.
30.2	Does the zoning ordinance require setbacks from bluffs and ravines for new structures, redeveloped structures or new impervious structures?	NA	Setbacks from bluffs can help to protect the bluff itself from eroding faster than its natural tendencies and can also prevent homes from being sited in a risky location. Setbacks from ravines can help reduce erosion and the potential for flood damage near bodies of water.
30.3	Has the community identified properties near bluffs and ravines at risk of damage or loss?	NA	Bluffs and ravines naturally erode, though developments and climate change can make these processes proceed at a faster rate. The community should work preemptively to reduce the likelihood of property damage or injuries to residents.
30.4	Does the community map bluffs and ravines in relation to fluctuating water levels?	NA	Mapping bluffs and ravines in relation to Great Lakes changing water levels can help to identify structures at risk of damage. Not all bluffs and ravines are susceptible to changes in lake levels and some are projected to change at greater rates.

Y—Yes I—Yes, but should improve N—No ?—Don't know NA—Not applicable

Bluff and ravine protection (continued)

	Benchmark	Self-Assessment	Description
30.5	Does the community prevent the use of all-terrain vehicles (ATVs) on beaches, sand ridges or dunes in order to protect native vegetation from destruction?	NA	ATV's can damage the native vegetation that is vital to the sustainability of coastal ecosystems.
30.6	Does the municipality have a program that works to help stabilize dunes? This can include replanting native beach grass and utilizing slot-type snow fences.	NA	The municipality on its own, or in collaboration with local organizations and volunteers, can actively place natural and built features that act to reduce dune erosion.
30.7	Are steps, bridges and ramps mounted on posts to traverse steep or unstable slopes?	NA	These infrastructure components can help to prevent erosive damages to dunes.

Y—Yes I— Yes, but should improve N— No ? — Don't know NA — Not applicable

Professional training

Communities hoping to implement the best practices described in this assessment tool are better positioned to do so when they have a staff that is highly trained in their respective profession. While this may include a formal education in planning, civil engineering or GIS, it is also important that current staff engage in ongoing education as new problems and best practices emerge. Municipal employees may take part in professional organizations, trainings offered by universities and should have certifications that demonstrate a thorough knowledge of topic matter.

	Benchmark	Self-Assessment	Description
31.1	Does the community have staff trained in mapping or monitoring potential hazards such as coastal erosion and/or shoreline change, lake-level rise, coastal flooding and/or storm surge?	Y – Muskegon County has staff trained to use GIS applications	See the Benchmarks for sustainability topic 24 on the importance of accumulating data related to coastal hazards and monitoring these trends over time.
31.2	Does the community have a certified floodplain manager (CFM) on staff?	N –	The Association of State Floodplain Managers has established a national program for professional certification of floodplain managers. By taking part in the program, local, state, federal and private-sector floodplain managers are encouraged to take part in continuing education and professional development.
31.3	Does the community have a floodplain manager or planner who participate in professional organizations or ongoing education?	N –	In addition to the Association of State Floodplain Managers (ASFPM), other relevant professional organizations include the American Planning Association (APA), American Society of Civil Engineers (ASCE) and the American Public Works Association.
31.4	Does the community have technical or computer mapping capabilities?	Y – Muskegon County has staff trained to use GIS applications	There are various GIS software programs. Communities should invest in mapping capabilities to measure coastal data, in addition to other important information such as demographics and land use.
31.5	Are municipal staff encouraged to attend professional conferences and/or trainings from universities and associations?	Y – All senior-level professional staff attend conference/trainings relevant to their position	Conferences and trainings can help introduce staff to emerging concepts related to coastal sustainability. These events also foster information exchanges between professionals.

Y—Yes I — Yes, but should improve N — No ? — Don't know NA — Not applicable

Professional training (continued)

	Benchmark	Self-Assessment	Description
31.6	Does the municipality hire certified building inspectors?	Y –	For developments that require flood-proofing measures or are subject to other zoning regulations related to coastal resilience, the municipality must have staff to enforce the code if it is to be successfully implemented.
31.7	Does the municipality staff an adequate number of people to enforce building codes?	Y –	See Benchmark 31.6
31.8	Does the community have planning commissioners with formal training in planning?	I – no planning commissioners have formal training, however, some are attending training in 2022 and more will attend training at a later time	Many planning commissioners across the U.S. are civically engaged members of the community, but often lack formal training in planning. New planning commissioners without a planning background should be encouraged to take part in trainings or certification courses. The American Citizen Planner program is one example of these.

Y—Yes I— Yes, but should improve N — No ? — Don't know NA — Not applicable

Hazard planning

One of the most important factors in implementing sustainable practices is to ensure that the community identifies goals, objectives and action steps in its plans. This is important for multiple reasons. First, planning processes are intended to engage the public to gather input and build consensus. Both of these planning ingredients help make implementation more likely to occur. Second, the community needs to have a clear direction for how risk averse it wants to be. Plans help to clearly delineate what the community is willing to implement and less willing to implement as it becomes more sustainable. Plans should consider short and long-term risks and, in doing so, should identify short and long-term projects towards increased sustainability.

	Benchmark	Self-Assessment	Description
32.1	Does the community participate in the FEMA Community Rating System?	Y – through Muskegon County	According to FEMA, “The National Flood Insurance Program (NFIP) Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities exceeding the minimum NFIP standards. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS”
32.2	Does the community have a current FEMA-approved All-Hazard Mitigation Plan?	I – through the county, but is currently expired and being updated at the time of this assessment	According to FEMA, “FEMA requires state, tribal, territorial and local governments to develop and adopt hazard mitigation plans as a condition for receiving certain types of non-emergency disaster assistance, including funding for mitigation projects. Jurisdictions must update their hazard mitigation plans and re-submit them for FEMA approval every five years to maintain eligibility.”
32.3	Does the community’s master plan have a coastal planning element or does the land use plan make recommendations to reduce coastal hazard vulnerability through planning?	I – the community is currently undergoing a Master Plan update/rewrite; resilience components being added	A comprehensive snapshot of the community’s past, present and future, the master plan guides the overall direction of areas such as transportation, infrastructure, housing and the environment. It is critical that coastal resilience appear in the plan.
32.4	Does the community have an adopted floodplain management plan?	I – County addresses some floodplain management elements in the Haz. Mit. Plan which is currently being updated; There is a floodplain management plan for the Muskegon River	Building off of the master plan, the floodplain management plan allows for greater detail and action step planning for managing hazardous areas.

Y—Yes I— Yes, but should improve N — No ? — Don’t know NA — Not applicable

Hazard planning (continued)

	Benchmark	Self-Assessment	Description
32.5	Do planning horizons consider potential long-term coastal hazards such as lake-level rise, coastal erosion and increased storm activity and severity?	N – not at this time; LIAA providing information for current Master Plan update	While the master plan and other local plans often consider a 20-30 year perspective for the future, many coastal-related trends require a wider timeframe. It is important to remember that Great Lakes coastal dynamics and changes in the climate are long-term trends and should be planned for with this understanding.
32.6	Does the water and sewer plan include recommendations for relocation, abandonment or protection of infrastructure at risk to coastal flooding or other coastal hazards?	? – online maps of infrastructure available; not able to locate sewer plan	Soil erosion, coastal flooding and lake level fluctuations can expose or cause damage to infrastructure. This poses a risk to public health and can subject the municipality to expenses to repair damaged systems.
32.7	Does the community have a timeline or strategic plan for the relocation, abandonment or protection of buildings in areas at risk of flooding?	I – there are not specific plans to address current buildings at risk of flooding, however, new construction and renovated buildings must meet current codes that do address buildings at risk of funding	The community can get ahead of costly damages when it plans for or anticipates the risks associated with flood-prone sites.
32.8	Have Memorandums of Understanding (MOUs) or Memorandums of Agreement (MOAs) been signed with neighboring communities to help one another during before, during and/or after a disaster event?	? –	It is important to remember that disaster events do not stop at municipal boundaries. Local units of government must recognize the importance of working with neighboring jurisdictions to support regional sustainability.

Y—Yes I— Yes, but should improve N — No ? — Don't know NA — Not applicable

Inventory of Existing Master Plan, Zoning Ordinance, and Hazard Mitigation Plan

Master Plan: Relevant Language

Found in the City of North Muskegon 1998 Master Plan

Future Development – Open Space and Recreation (page 16)

Mentions that waterfront preservation and development is warranted. Priorities for additional open space and recreation land are in residential areas east of Whitehall Road, near the west end of Interlaken and the wetland area east of the Causeway.

The Land Use Plan – Open Space and Recreation (page 21)

Mentions that all land within the coastal areas should be considered for the addition of public open space as land becomes available for purchase or donation to the city or long-term entitlement opportunities.

Goals and Objectives

Found in the City of North Muskegon 1998 Master Plan

Goals and objectives are not outlined in the current Master Plan.

Municipal Ordinances

Found in the City of North Muskegon Code of Ordinances

Title	Location in Code	Ordinance Language
Flood Hazard Areas	Chapter 30 – Floods. Article II; Division 2; Sec. 30-50	<p>DIVISION 2. - ADMINISTRATION AND ENFORCEMENT Sec. 30-50. Designation of regulated flood prone hazard areas. The Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) entitled "Muskegon County, Michigan, All Jurisdictions, effective October 7, 2021 and the Flood Insurance Rate Map(s) (FIRMS) panel number(s) of 26121CIND0B, 26121C0143E, 26121C0144E, 26121C0163E, 26121C0256E, 26121C0257E, effective October 7, 2021 are adopted by reference for the purposes of administration of the Michigan Construction Code, and declared to be a part of Section 1612.3 of the Michigan Building Code, and to provide the content of the "Flood Hazards" section of Table R301.2(1) of the Michigan Residential Code.</p>
Flood Hazard Areas	Chapter 30 – Floods. Article II; Division 3; Sec. 30-71 through Sec. 30-75	<p>DIVISION 3. - FLOOD DAMAGE REDUCTION</p> <ul style="list-style-type: none"> • Sec. 30-71. General standards. • Sec. 30-72. Specific standards. • Sec. 30-73. Mobile homes. • Sec. 30-74. Floodways. • Sec. 30-75. Standards for subdivision proposals and proposals for other developments.
Stormwater Management	Chapter 56 – Stormwater management; Article I; Division 1-6; Sec. 56-1 through Sec. 56-123	<p>Chapter 56 - STORMWATER MANAGEMENT Sec. 56-2. - Findings. The City of North Muskegon finds that:</p> <ol style="list-style-type: none"> (1) Water bodies, roadways, structures, and other property within, and downstream of, the city are at times subjected to flooding; (2) Flooding is a danger to the lives and property of the public and is also a danger to the natural resources of the city and the region; (3) Land development projects and activities alter the hydrologic response of watersheds resulting in increased stormwater runoff rates and volumes, increased flooding, increased stream channel erosion, and increased sediment transport and deposition; (4) Stormwater runoff produced by land development contributes to increased quantities of waterborne pollutants; (5) Increases of stormwater runoff, soil erosion, and non-point source pollutants have occurred in the past as a result of land development, and constitute deterioration of the water resources of the city and downstream municipalities; (6) Stormwater runoff, soil erosion, and non-point source pollution, due to land development activities within the city, have resulted in a deterioration of the water resources of the city and downstream municipalities; (7) Increased stormwater runoff rates and volumes, and the sediments and pollutants associated with stormwater runoff from future development projects within the city will, absent reasonable regulation and control, adversely affect the city's streams and water resources, and the streams and water resources of downstream municipalities, and they

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		<p>exacerbate existing adverse conditions;</p> <p>(8) Stormwater runoff, soil erosion, and non-point source pollution can be controlled and minimized by the regulation of stormwater runoff from development projects;</p> <p>(9) Illicit discharges contain pollutants that will significantly degrade the waterbodies and water resources of the City of North Muskegon, thus threatening the health, safety, and welfare of the citizenry;</p> <p>(10) Illicit discharges enter the stormwater drainage system through either direct connections (e.g., wastewater piping either mistakenly or deliberately connected to the storm drains) or indirect connections (e.g., infiltration into the storm drain system or spills connected by drain inlets);</p> <p>(11) Establishing the measures for controlling illicit discharges and connections contained in this chapter and implementing the same will address many of the deleterious effects of illicit discharges;</p> <p>(12) Any condition caused or permitted to exist in violation of any of the provisions of this chapter is a threat to public health, safety, and welfare, and is declared and deemed a nuisance.</p> <p>Sec. 56-3. - Purpose. It is the purpose of this chapter to establish minimum stormwater management requirements and controls to accomplish, among others, the following objectives:</p> <p>(1) To minimize increased stormwater runoff rates and volumes from identified new land development;</p> <p>(2) To minimize the deterioration of existing watercourses, culverts and bridges, and other structures;</p> <p>(3) To encourage water recharge into the ground where geologically favorable conditions exist;</p> <p>(4) To prevent an increase in non-point source pollution;</p> <p>(5) To maintain the integrity of stream channels for their biological functions, as well as for drainage and other purposes;</p> <p>(6) To minimize the impact of development upon stream bank and stream bed stability;</p> <p>(7) To reduce erosion from development or construction projects;</p> <p>(8) To preserve and protect water supply facilities and water resources by means of controlling increased flood discharges, stream erosion, and runoff pollution;</p> <p>(9) To reduce stormwater runoff rates and volumes, soil erosion, and non-point source pollution, wherever practicable, from lands that were developed without stormwater management controls meeting the purposes and standards of this chapter;</p> <p>(10) To regulate the contribution of pollutants to the stormwater drainage system and waterbodies by stormwater discharges by any user;</p> <p>(11) To prohibit illicit discharges and connections to the stormwater drainage system and waterbodies;</p> <p>(12) To establish legal authority to carry out all inspection, surveillance, and monitoring procedures necessary to ensure compliance with this chapter;</p> <p>(13) To provide appropriate remedies for failure to comply with this chapter.</p>
Zoning	Appendix A – Zoning; Chapter 2; Section 2.20	<p>Section 2.20. - Definitions—S. Shoreline. The edge of a body of water measured at the ordinary high water mark.</p>

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Zoning	Appendix A – Zoning; Chapter 3; Section 3.17	<p>Section 3.17. - Lake Frontage Lots (or waterbody), Requirements.</p> <p>Residential Waterfront Lots. Due to the unique characteristics of waterfront lots, some deviation from the Ordinance standards shall be permitted for lots having frontage on a body of water. Water front lots shall be considered as having both front yards for both the street side of the lot and the waterfront side of the lot. Front yard setbacks shall be provided as required. These are as follows:</p> <ul style="list-style-type: none"> A. Detached Garage Location. <ul style="list-style-type: none"> 1. Street side. A detached garage may be placed in the nonrequired front yard, between the dwelling and street, if there is sufficient room permitting and if one is not on the waterfront side. All detached garages in the nonrequired front yard shall maintain a ten (10) foot separation from the dwelling and a ten (10) foot side yard setback. The garage must have architectural styles to match the principal use. 2. Waterfront side. A detached garage may be placed in the nonrequired front yard, between the dwelling and the waterfront, if there is sufficient room permitting and if one is not on the street side. All detached garages in the nonrequired front yard shall maintain a ten (10) foot separation from the dwelling. B. Other Accessory Buildings. <ul style="list-style-type: none"> 1. Street side. One (1) accessory (storage) building (not including the detached garage) may be placed in a nonrequired side yard or nonrequired front yard if at least fifty (50) feet from the front yard (street) right-of-way line (unless one is present on the waterfront side). Accessory buildings so positioned shall be screened to reduce the open views of said buildings from off-site, with particular attention given to screening that mitigates open views from properties whose front yards face the street side front yards of waterfront parcels. All accessory buildings in the nonrequired front yard shall maintain a ten (10) foot separation from the dwelling and a ten (10) foot side yard setback. The accessory building(s) must have architectural styles to match the principal use. 2. Waterfront side. One (1) accessory (storage) building (not including the garage) may be placed in a nonrequired side yard or nonrequired front yard if at least twenty-five (25) feet from the front yard (street) right-of-way line (unless one is present on the street side). All accessory buildings in the nonrequired front yard shall maintain a ten (10) foot separation from the dwelling. C. A decorative screen shall be used to shield view of accessory buildings from the street. Screens may comprise wood and/or masonry material and/or vegetation. Wood and/or masonry structure must not exceed 6 feet in height. D. The following illustrations depict options associated with placement of accessory buildings in the street side front yard of a waterfront lot. In each case, open views of accessory buildings have been partially shielded through use of a permitted garage, screening, and/or landscaping. The Zoning Administrator shall be authorized to review and approve alternative screening designs, provided, said designs comply with the intent of this section: <i>*see illustrations in Zoning Ordinance</i>
Zoning	Appendix A – Zoning; Chapter 15; Section 15.01	<p>CHAPTER 15. - SCHEDULE OF DISTRICT STANDARDS</p> <p>Section 15.01. - Schedule of District Standards.</p> <p>[2] Shoreline: In instances where the property line is farther from the building foundation than a shoreline, the setback shall be measured from the nearest shoreline floodway designation as shown on a Flood Insurance Rate Map (FIRM).</p>

Hazard Mitigation Plan

Found in the 2015 Muskegon County Hazard Mitigation Plan

Great Lakes Shoreline Hazards (Pages 47-49)

Shoreline flooding and erosion are natural processes that occur constantly, regardless of water levels. However, during periods of high water, the effects of flooding and erosion are more evident, causing serious damage to homes and businesses, roads, water and wastewater treatment facilities, and other structures in coastal communities.

The erosion can be caused from one or several factors, including high water levels, storms, wind, ground water seepage, surface water runoff, and frost. The high risk erosion area regulations require a setback distance to protect new structures from erosion for a period of 30 to 60 years, depending on the size, number of living units, and type of constructions. All five shoreline communities of Muskegon County contain one or more sections of high-risk erosion areas. These areas can be viewed on the Hazard/Risk maps found within Appendix B. In addition, the MDEQ also designated flood risk areas along Michigan's shoreline, meaning that they have floodplain-like areas with a 1% annual chance of a designated flood level being exceeded. Most of Muskegon County's coastline has received this designation. In general, low-lying lands along the coastline are prone to shoreline flooding during both high and low lake water periods.

Building or Site Modification (Retrofitting) (Page 128)

The intent of these and other applicable building restrictions is to minimize the extent and magnitude of shoreline flooding and serious erosion problems along the Great Lakes shoreline. Although shoreline flooding and erosion is inevitable, severe damage can be avoided if prudent shoreland management practices are followed and adequate emergency procedures are implemented. Coordination of federal, state and local shoreland management and emergency preparedness efforts is vital to keeping shoreline areas as safe and undamaged as possible.

Flood retrofitting measures include dry floodproofing where all areas below the flood protection level are made watertight. Walls are coated with waterproofing compounds or plastic sheeting. Openings (doors, windows, and vents) are closed, either permanently, or with removable shields or sandbags. Sump pumps are used to remove any water that enters. Dry floodproofing of new and existing nonresidential buildings in the regulatory floodplain is permitted under state, FEMA and local regulations. Dry floodproofing existing residential buildings in the floodplain is also permitted as long as the building is not substantially damaged or being substantially improved. Dry floodproofing is also a viable option for homes located outside the regulatory floodplain.

The alternative to dry floodproofing is wet floodproofing, where water is let in and everything that could be damaged by a flood is removed or elevated above the flood level. Structural components below the flood level are replaced with materials that are not subject to water damage. For example, concrete block walls are used instead of wooden studs and gypsum wallboard. The furnace, water heater, and laundry facilities are permanently relocated to a higher floor or raised on blocks or platforms where the flooding is not deep. Simply moving furniture and electrical appliances out of a basement can prevent a great deal of damage. A third flood protection modification addresses flooding caused by overloaded sanitary or combined sewers. Four approaches may be used to protect a structure against sewer backup: floor drain plugs, floor drain stand-pipes, overhead sewers, and backflow protection valves. The first two devices keep water from discharging out of the lowest opening into the building, the floor drain, and are inexpensive. However, if water becomes deep enough in the sewer system, it can flow out of the next lowest opening, such as a toilet or tub, or it can overwhelm a drain plug by hydrostatic pressure and flow into the building through the floor

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drain. The other two measures, overhead sewers and backflow protection valves keep water in the sewer line during a backup. They are more secure but more expensive.

Other considerations for the minimization of flooding damages include: stronger anchoring requirements for propane tanks and hazardous materials in the floodplain/floodway; assurance of proper location, cleaning and maintenance of septic tanks; and back-up power for sump pumps. Critical facilities should have written flood response and recovery plans to identify the equipment and materials necessary to protect them. Cost-sharing programs, such as rebates, to encourage low cost (under \$10,000) property protection measures on private property (surface and sub-surface drainage, sewer back-up protections, berms and regrading, sewer back-up protection, furnace and water heater relocations, lightning rods, etc.) should be considered.

Resource Protection (Page 132)

Resource protection activities are generally aimed at preserving (or in some cases restoring) natural areas as development occurs so that these areas can, in turn, provide hazard protection. For instance, watersheds, floodplains, and wetlands can reduce run-off from rainwater and snow melt in pervious areas; reduce overland flood flow and store floodwaters; remove and filter excess nutrients, pollutants and sediments; absorb flood energy and reduce flood scour; and recharge groundwater.

This section discusses topics that are related to flooding, erosion, and shoreline protection under the topics A) Wetland Protection, B) Soil Erosion and Sedimentation Control, and C) River Restoration.

Sand Dune and Shorelands Protection and Management (Page 135)

According to MDEQ, Michigan's sand dunes are a resource of global significance since they are the largest assemblage of fresh water dunes in the world. The Michigan Legislature has found that critical dune areas of this state are "unique, irreplaceable, and fragile resources that provide significant recreational, economic, scientific, geological, scenic, botanical, educational, agricultural, and ecological benefits to the people of this state and to people from other states and countries who visit this resource."

Michigan's Shorelands Protection and Management legislation determines if a high-risk erosion area shall be regulated to prevent property loss or if suitable methods of protection shall be installed to prevent property loss. A permit is required for the erection, installation, or moving of a permanent structure on a parcel of land where any portion is a designated high risk erosion area. Examples include homes, porches, septic systems, additions, substantial improvements of existing structures, and outbuildings.

Threat Recognition – Watch (Page 136) and Warning (Page 137)

Flood threat predictions are broadcasted on the NOAA Weather Wire and Weather Radio, the official source for weather information, to those who have equipment to receive it (state police, 911 and dispatch centers, municipalities, and critical facilities). Weather radios can be tone-activated through the Emergency

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Alert Radio System (EARS). Predictions are also transmitted through social media, and by television, radio, and cable television through the Emergency Alert System (EAS), previously known as the Emergency Broadcast System. When the National Weather Service determines that a flood, tornado, thunderstorm, winter storm or other hazard has been observed or is coming, a warning is issued to take immediate action and the systems described above are again utilized to notify police, 911 and dispatch centers, municipalities, the public, and staff of other agencies and critical facilities. Early warning allows for a greater number of people to implement protection measures. More specific warnings may be issued through NOAA All Hazards Radio, the Weather Channel, or public radio or TV stations.

Goal 1 – Promote growth in a sustainable, hazard-free manner (Page 144-146)

This section outlines objectives to assure that hazard prevention is mitigated through local ordinances and building codes and that local infrastructure that may be impacted is included in a communities Capital Improvement Plan to assure that critical services are maintained or available in the event of a hazard. Another objective within the section encourages hazard mitigation considerations be incorporated into local land-use decision.

Objective 4.3 Encourage cooperation and communication between planning and emergency management officials (Page 152)

Action Item 97. Utilize the County Geographic Information System (GIS) capabilities to support predisaster planning (such as the creation of flood stage forecast maps, and maps showing the locations of secluded, gated, and seasonal homes), disaster response activities, and post-disaster recovery activities.

City of North Muskegon Community Profile (Pages 196-198)

List of critical community services and infrastructure such as emergency service buildings (police, fire) vulnerable populations (schools, daycares, senior care facilities) and public works facilities.

Natural Hazards and Infrastructure (Pages 298-302)

Historical record of natural hazards and a map of critical community infrastructure is provided on pages 298-302

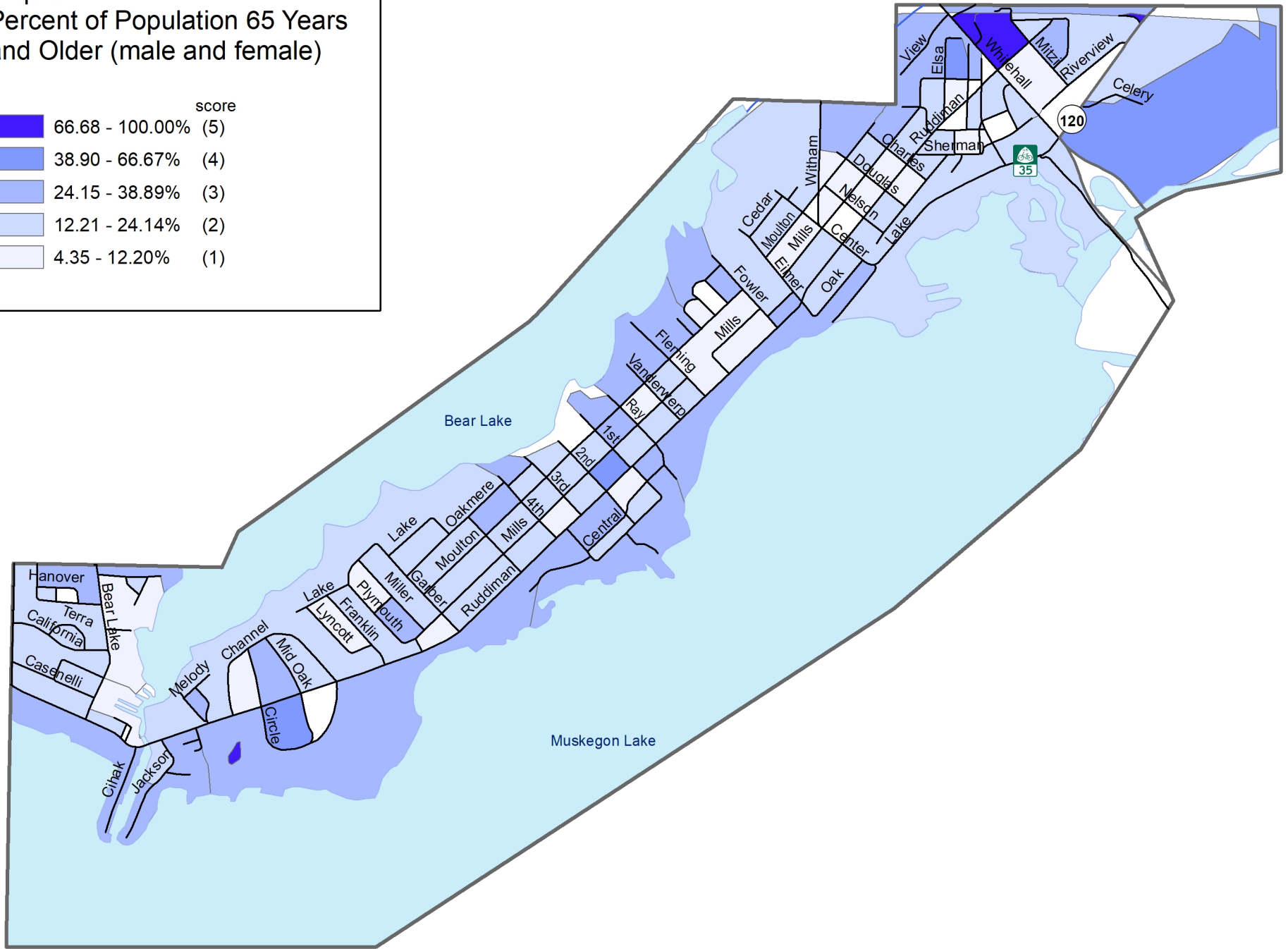
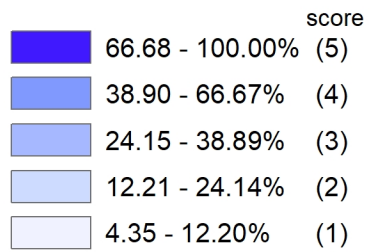
Planning Commission

Discussion from Planning Commission Meeting held on November 9, 2022

The following feedback/comments were received during the November 9, 2022 City of North Muskegon Planning Commission Meeting:

- **Question 1: What are the current challenges the community is facing because of changes in the Great Lakes (Muskegon Lake)?**
 - Certain facilities are purposely located in areas that flood during high waters or heavy rains such as the Marina, Waterfront Sports Park and the Department of Public Works yard.
 - There is a lot of inflow in the low sewer lines. Several sewers have upgraded backflow preventers installed while several more still need upgrades.
- **Question 2: Is the community doing everything it might to address coastal community resiliency through its planning and zoning? If not, why not?**
 - The community currently requires a 30-foot setback from the Ordinary High-Water Mark (OHWM).
 - Older neighborhoods flood when water in Lake Michigan/Muskegon Lake rise.
- **Question 3: What changes could help the community do more to promote coastal resilience?**
 - More educational materials or make information available to people living on lakefront property that may be new to the community – particularly Bear Lake (to the north of the city – also tied into coastal dynamics).
 - Provide some type of touch-point with new residents move in or property owners change hands (such as homes passed down within a family through generations).
- **Question 4: Who should take the lead in making difficult decisions like that — local or state government?**
 - Acknowledges State approval is required for rip-rap or shoreline hardening, but wishes the local community had input that could result in permits being denied or held until an appropriate plan could be submitted.
 - The process to receive approval for seawall installation could be improved through better coordination with governmental agencies.
 - Local government has zoning requirements that are generally supported and understood within the community – better coordination with the State may result in more desirable results.

Map 1 Percent of Population 65 Years and Older (male and female)

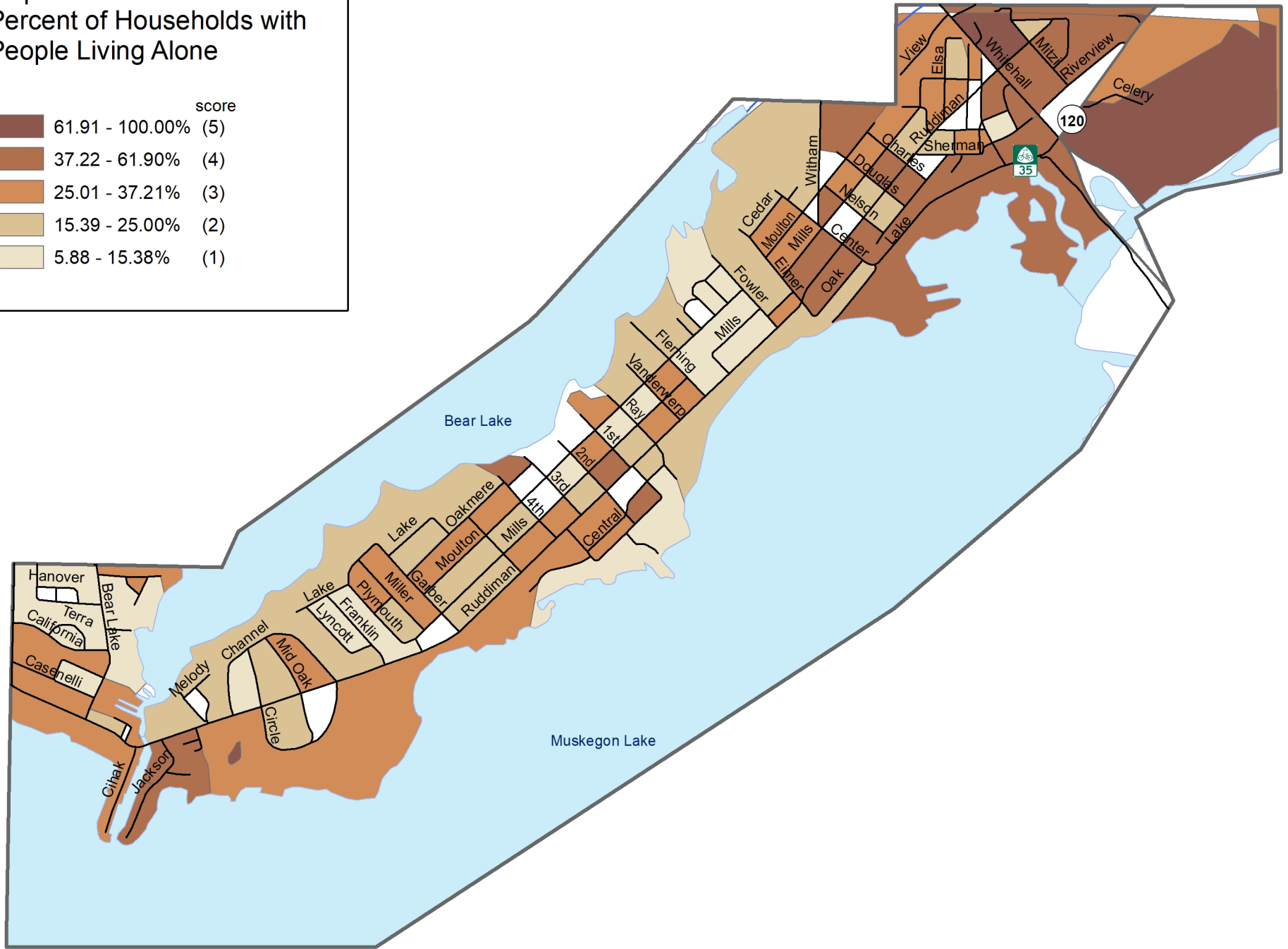
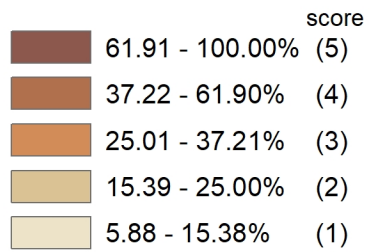


Data Sources:
 U.S. Census Bureau, Block Level Data (2010), ACS (2016-2020)
 Michigan Geographic Data Library

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Map 2 Percent of Households with People Living Alone

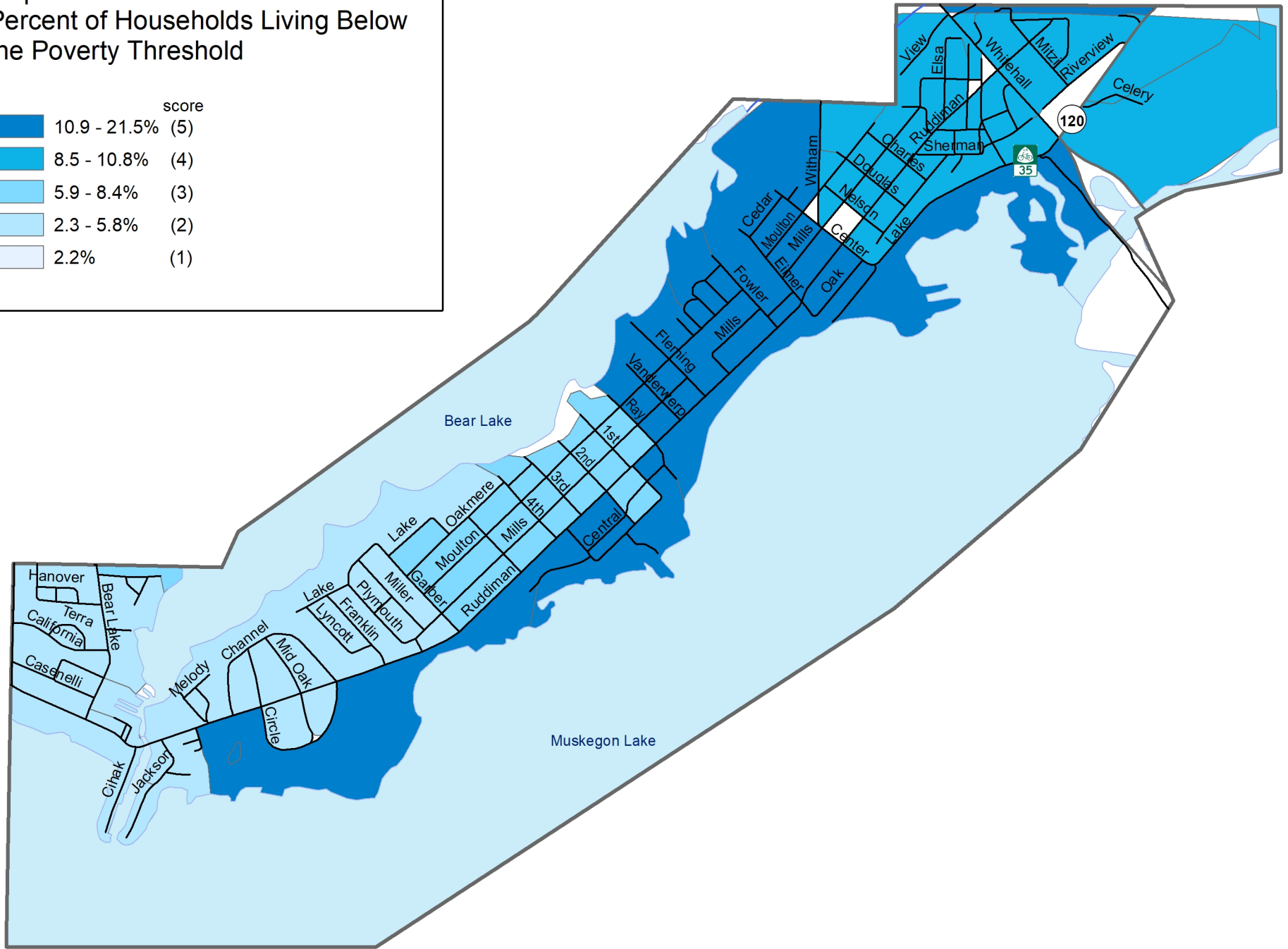
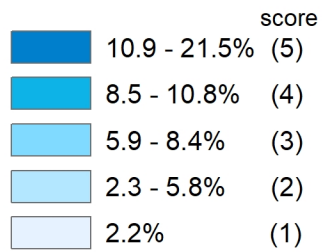


Data Sources:
 U.S. Census Bureau, Block Level Data (2010), ACS (2016-2020)
 Michigan Geographic Data Library

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Map 4 Percent of Households Living Below the Poverty Threshold

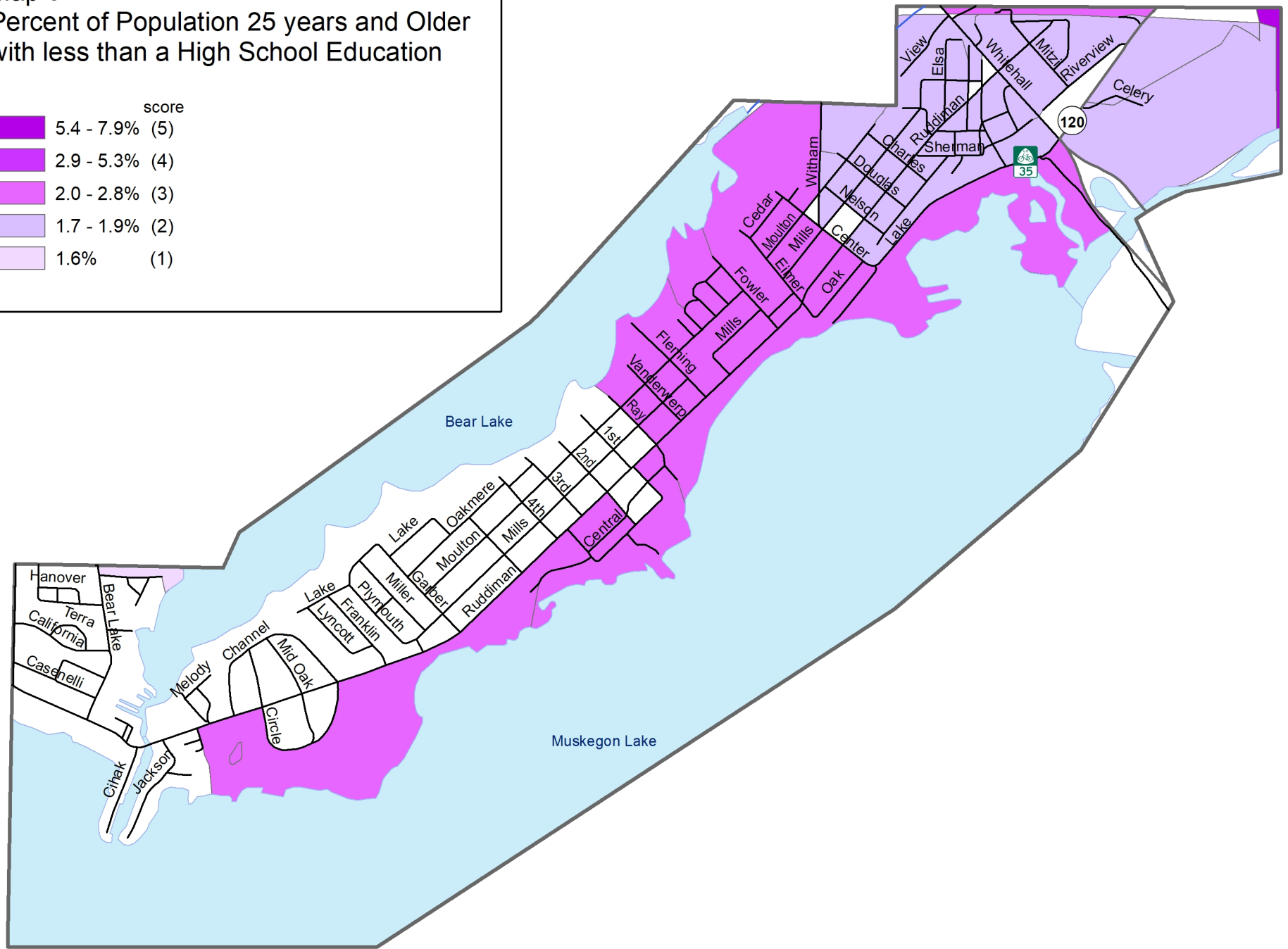
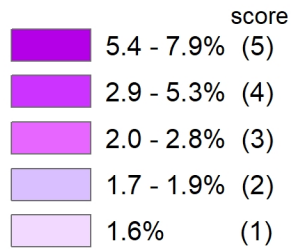


Data Sources:
 U.S. Census Bureau, Block Level Data (2010), ACS (2016-2020)
 Michigan Geographic Data Library

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Map 5 Percent of Population 25 years and Older with less than a High School Education

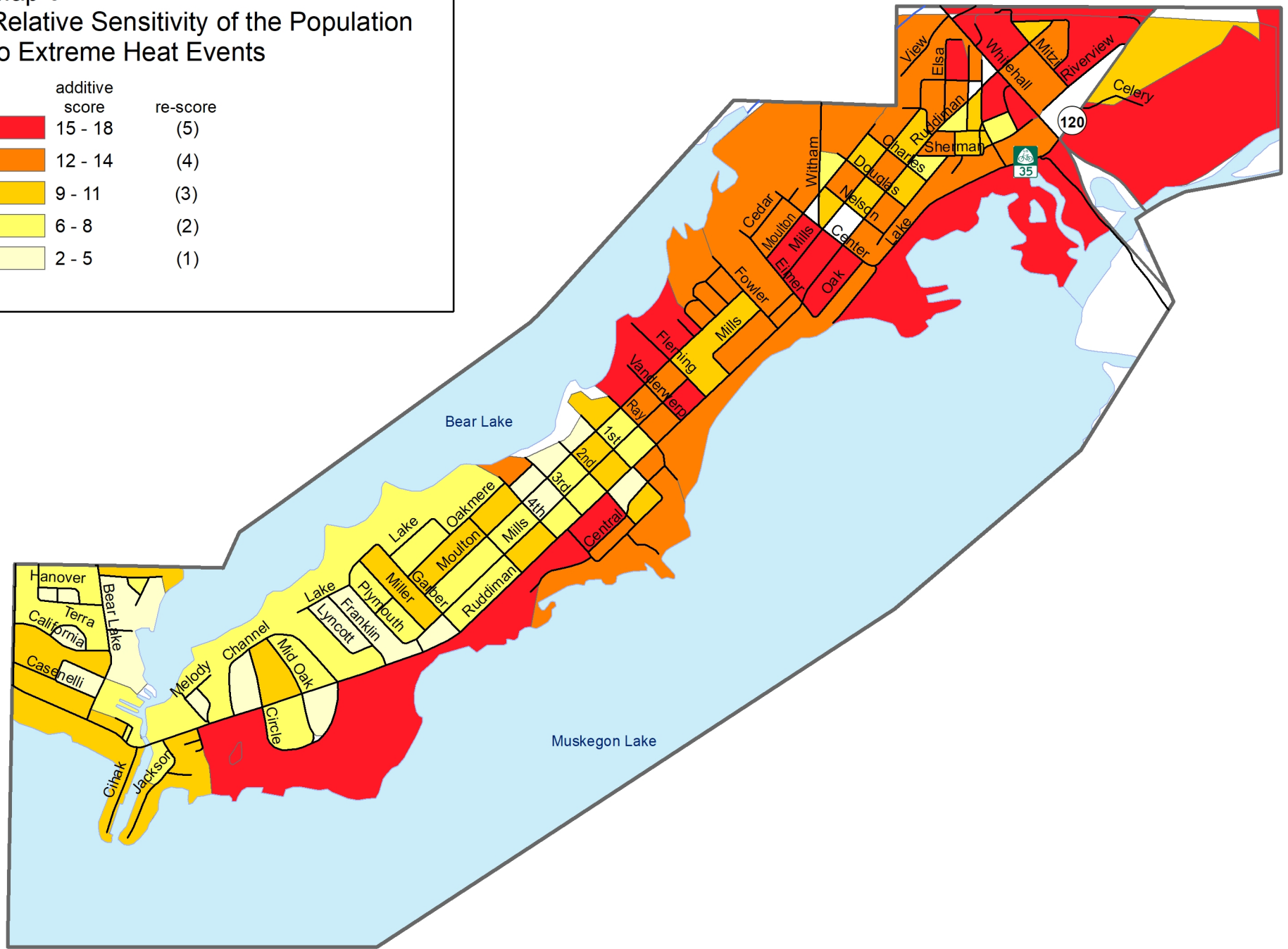
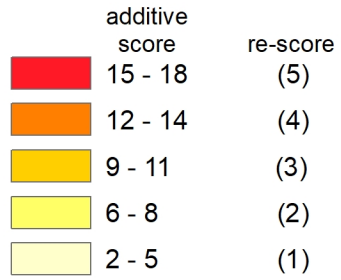


Data Sources:
 U.S. Census Bureau, Block Level Data (2010), ACS (2016-2020)
 Michigan Geographic Data Library

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Map 6 Relative Sensitivity of the Population to Extreme Heat Events






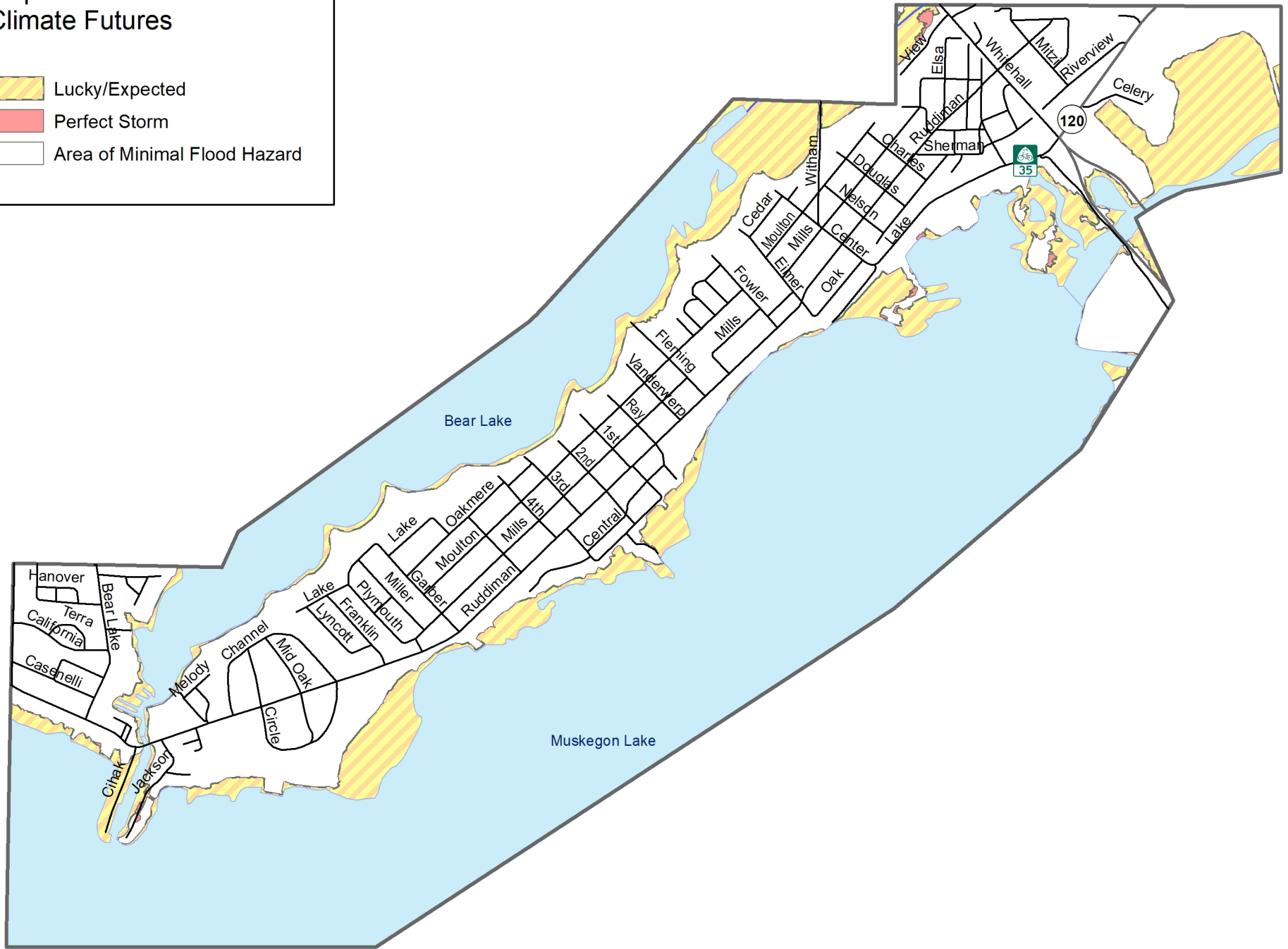
Data Sources:
U.S. Census Bureau, Block Level Data (2010), ACS (2016-2020)
Michigan Geographic Data Library

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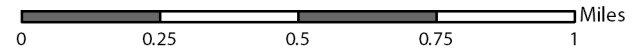
Map 11 Climate Futures

-  Lucky/Expected
-  Perfect Storm
-  Area of Minimal Flood Hazard







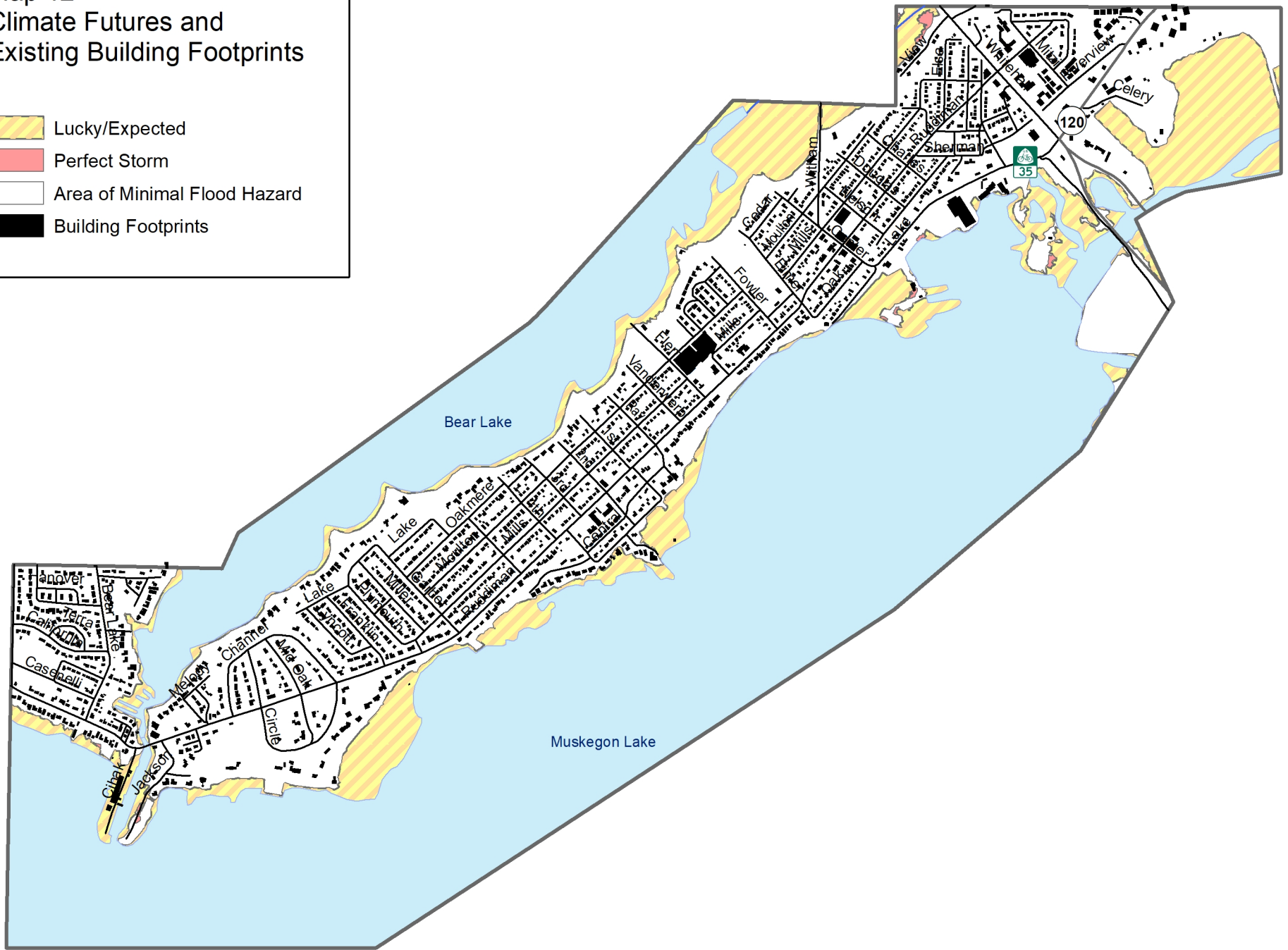
Data Sources:
FEMA, U.M., LIAA
Michigan Geographic Data Library

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Map 12 Climate Futures and Existing Building Footprints

-  Lucky/Expected
-  Perfect Storm
-  Area of Minimal Flood Hazard
-  Building Footprints

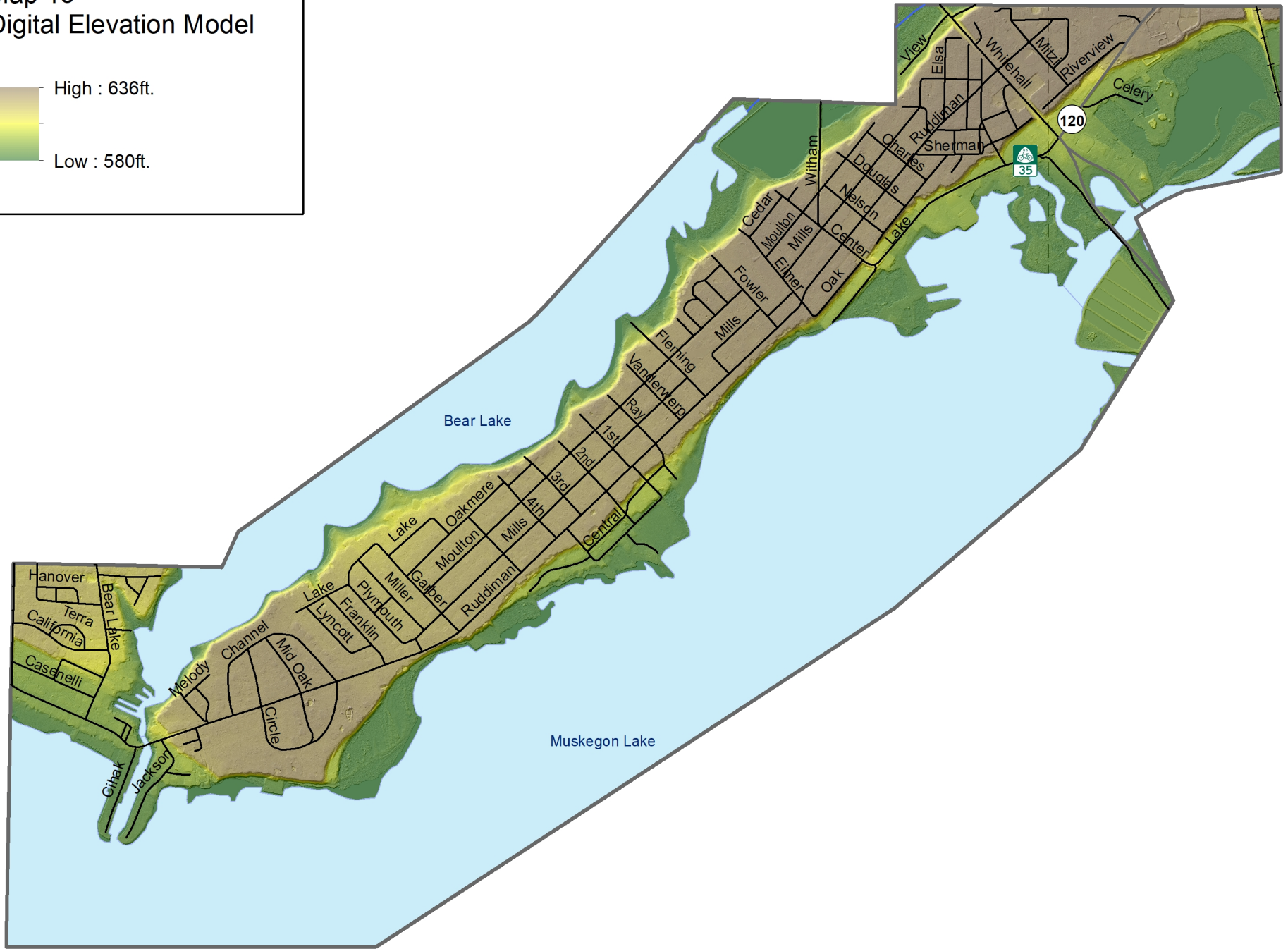
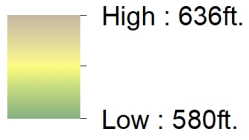


Data Sources:
FEMA, Microsoft, U.M., LIAA
Michigan Geographic Data Library

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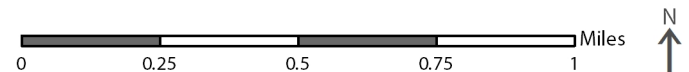


Map 13 Digital Elevation Model






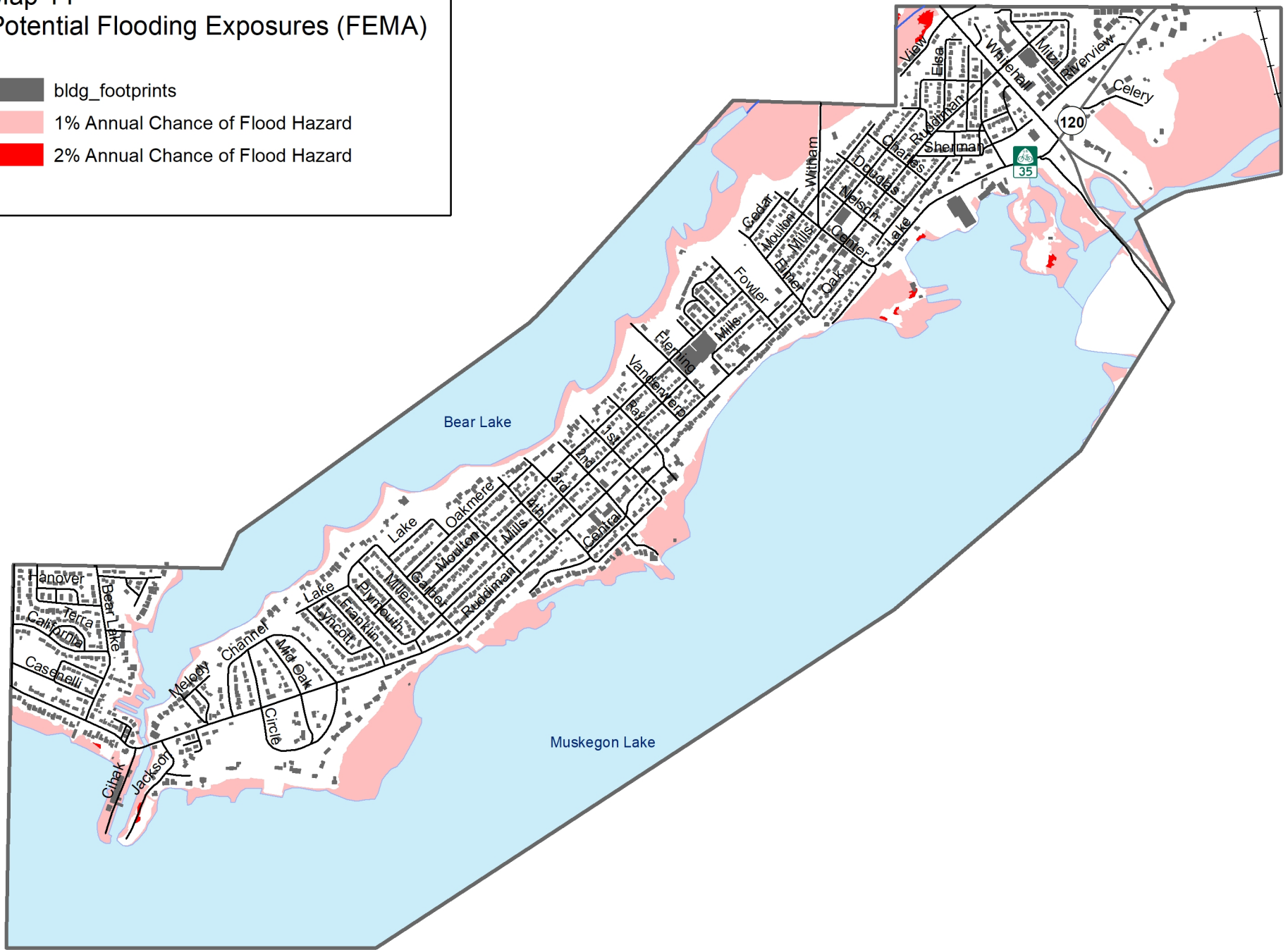
Data Sources:
USDA Geospatial Data Gateway,
DTMB - Michigan Geo-Data Explorer
Michigan Geographic Data Library

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Map 14 Potential Flooding Exposures (FEMA)

-  bldg_footprints
-  1% Annual Chance of Flood Hazard
-  2% Annual Chance of Flood Hazard



Data Sources:
FEMA,
Michigan Geographic Data Library

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