Environmental Planning

for the

Grand Traverse Regional Community Foundation

ENGAGED MICHIGAN PARTNER

University of Michigan

Urban and Regional Planning Program

Michigan Engaging Community through the Classroom

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Executive Summary

Northern Michigan enjoys a uniquely rich environment. The majesty of the vast Great Lakes and towering forests in Northern Michigan create a one-of-a-kind "Up North" experience that local residents cherish and far-traveling visitors revel in. Not only is the region aesthetically beautiful, the environment of Northern Michigan is closely intertwined with the region's economy. The tourism, logging, and agricultural sectors are but a few of the industries that rely on the environmental health of the region for their success. The continued prosperity of these industries critically depends on long-term environmental sustainability, and thus on the implementation of development policies that promote sustainability, as the region comes to address increasing climate and social change.

The Grand Traverse Regional Community Foundation (GTCRF, henceforth the Community Foundation) has already been proactive on this front. In 2019, the Community Foundation commissioned the creation of a Community Scorecard to evaluate the social, economic and environmental health of Antrim, Benzie, Grand Traverse, Kalkaska, and Leelanau counties, reinforcing its commitment to the region by including proven environmental planning techniques in the scoring system. This report, which includes the addition of easily implemented methods for local **land suitability analysis** and **environmental impact assessment** to the Community Foundation's local development framework, evaluative scorecard, and related guidance materials is intended to help ensure the sustainability of the environment that residents "Up North" treasure and rely upon.

Land Suitability Analyses (LSAs) and Environmental Impact Assessments (EIAs) provide the objectivity that decision makers need to find the appropriate balance between development and environmental goals. The addition of an LSA to the local community planning process gives policymakers straightforward information on the suitability of larger areas or even individual parcels for different kinds of land development or conservation, while EIAs help a locality determine how significantly a given development might affect its surrounding environment. Our report explains each of these practices, and it presents simplified methodologies and processes local jurisdictions can adopt to undertake effective suitability analyses and impact assessments across the Grand Traverse region, leveraging best-practices and tools. By including these environmental planning tools alongside their Community Scorecard, the Community Foundation furthers its commitment to improving the social, economic and environmental well-being of its members.

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"The hope of the future lies not in curbing the influence of human occupancy—it is already too late for that—but in creating a better understanding of the extent of that influence and a new ethic for its governance." —Aldo Leopold

The health of the natural environment is imperative for human life. On a basic level, the clean air we breathe and water we drink are direct results of a well-functioning and well-stewarded environment. Sometimes less apparent, though, is the importance of the natural environment to our economic health. The environment is inextricable from our economy, whether it be our need for healthy soils to support agriculture or our dependence on naturally fluctuating water levels to sustain recreational beaches. Yet despite these benefits, tensions between economic progress and environmental sustainability still exist and can be difficult for policymakers to navigate. Fortunately, environmental planning provides many tools to inform the decisions required to address new development. These tools help policymakers and communities striving to produce win-win scenarios for both the economy and the environment, making sure that the tradeoffs involved are fully and well understood by all involved.

Why is Environmental Planning Important?

The proper balance between the consumption and preservation of natural resources is often subjective. Policymakers bring their own opinions about the best balance of consumption and preservation to every environmental and economic decision they face. Some people see the environment as precious in its own right, while others see it strictly as a means to benefit humanity. Where these subjective values conflict, objective decision-making tools become increasingly useful. Environmental planning best-practices and tools, such as land suitability analyses (LSAs) and environmental impact assessments (EIAs), provide the objectivity and clarity that decision makers need, especially when confronted by multiple opinions— including their own.

The use of tools like LSA and EIA during development projects is especially critical in Northern Michigan, given its especially unique and rich ecosystems. Endowed with an abundance of natural beauty and resources, Northern Michigan's economy and environment are highly interconnected. The vibrant forests, dunes, and lakes of the region support a unique "Up North" lifestyle that has garnered national

attention.[1] With the word out about the area's environmental value, development pressures have increased dramatically throughout the region.[2] The region is now faced with development decisions that often place the environment and the economy at odds. Oftentimes economic gains are increased at the cost of the environment. In these instances, and where so much of the economy is tied to the region's natural beauty and pristine environment, such decisions often sacrifice the long term health and prosperity of the region for short-term economic gain. The realm of environmental planning endeavors to strike a more equitable balance between development and the environment.[3]

The most obvious connection between the environment and the economy in the region is the strong recreation and tourism industry. Tourists from across the country travel to Northern Michigan to enjoy the exceptionally pristine waters and forests of the area. According to an economic impact study commissioned by Traverse City in 2012, 3.3 million visitor trips were made to Traverse City, resulting in $1.18 billion in total spending at local businesses.[4] Moreover, the report found that nearly 12,000 jobs in the region were supported by the tourism industry.[5] Although a tourism-based economy may yield some environmental harms, a high-quality environment is the amenity that draws many tourists to the Grand Traverse region. For local residents, the environment not only supports the tourism industry but also forestry, agriculture and game hunting. These cornerstone industries of Northern Michigan are dependent on the health and well-being of the environment. Sustainable actions taken now will help ensure the way of life "Up North" for generations to come.

The tensions that exist between the maintenance of the natural world in the region and the opportunities for tourism and development in such a desirable location are immense. Pro-growth advocates will point to the need to build more homes and businesses to widen the tax base. Environmentalists argue against decreasing natural habitats that are vital to sustaining clean air and water, reducing the risk of flooding, and sustaining local ecosystems. There is no singular correct answer when trying to strike a proper balance between development and conservation. However, the implementation of environmental planning tools such as LSA and EIA can help.

1 (n.d.). Retrieved April 1, 2020, from https://abcnews.go.com/Travel/best_places_USA/sleeping-bear-dunes-michigan-voted-good-morning-americas/story?id=14319616

2 Bradley, B. (2020). Small-Town America Is Facing Big-City Problems. Nextcity.org. Retrieved 2 April 2020, from https://nextcity.org/features/view/traverse-city-small-cities-growth-planning.

3 Saad, L. (2020). More Americans Still Prioritize Economy Over Environment. Gallup. Retrieved 2 April 2020, from https://news.gallup.com/poll/161594/americans-prioritize-economy-environment.aspx.

4 Anderson Economic Group. (2013). Executive Summary: Tourism-Related Benefits in Traverse City's Economy. East Lansing. Retrieved from https://res-2.cloudinary.com/simpleview/image/upload/v1/clients/traversecity15/Executive%20Summary_0081c124-1ba4-4b54-8054-a9b3b86b6254.pdf

5 Ibid.

These tools help policymakers balance the development and environmental pressures that are pervasive in an environmentally-rich community and ensure the sustainability of the region.

History of Environmental Planning in the Region

To find out why the Grand Traverse region cares so much about clean, fresh water and protecting pristine land, one only needs to look at the geography of the region. The five-county region served by the Community Foundation includes Antrim, Benzie, Grand Traverse, Kalkaska, and Leelanau Counties. The same glaciers that created the Great Lakes also shaped the region, leading to its unique ecosystem. In Antrim and Kalkaska County, there are lush forests of pine and hardwood trees as well as vast stretches of sandy ridges. A large portion of the land in Kalkaska County is home to vital marshlands and the Pere Marquette State Forest, in addition to over 80 lakes and many rivers. Grand Traverse County alone is home to 4 rivers, 45 creeks, and 69 lakes. The Sleeping Bear Dunes, located in Leelanau County, has been proclaimed one of the most beautiful places in the United States. Leelanau County is also a popular summer home location, boasting 26 wineries thanks to the rich, fertile soil and ideal climate for growing grapes. The Grand Traverse region is known for its cherry orchards lining the coast, leading some to call it the cherry capital of the world. And of course, all of this is before even mentioning the Lake Michigan coastline itself, which brings beauty, prosperity, and ongoing change to these lands.

Clearly, water and natural land are very important to these communities. Not only do these features provide a good quality of life for citizens, but the area's natural beauty also draws in tourists and new residents. It is hard to deny the economic benefit of tourism and new residential development to the region, though tourism can bring challenges to the community as well. It is important that communities' concerns about development and tourism be handled with tact and understanding. While some may wish to have the pristine waters and beautiful forests to themselves, or feel uncomfortable with the influx of tourists, a sentiment of sharing should be encouraged. Growth cannot be stopped when new residents want to move in, given that those residents have as much legal right to be in the region as anyone else, and forcing workers to travel long distances for affordable housing has both negative environmental and economic consequences.

This is a difficult topic to breach, yet it is a concern for highly-sought-after communities all over the world. The beauty of life is in the continuous change we all witness. In cases such as this, the individual has little choice over whether the change is to happen; instead, their choice lies in how they respond to that change.

For communities that are experiencing amenity-based growth, like the Grand Traverse region, the strong consensus among planners today is that concentrating new development within existing urban centers is the ideal approach, both economically and environmentally. New developments that are concentrated in this way will be situated close to already existing infrastructure such as utilities, transportation, and shopping. Additionally, new developments can take place where structures had once been built, but now lay empty, thus reducing the need to build on green lands. Redeveloping and densifying areas that are already developed helps to reduce the use of undeveloped lands, protects valuable ecosystems, and ultimately keeps development and maintenance costs low over the long term, especially when compared to the full costs of ongoing urban expansion into more rural areas.

Many organizations in the region work tirelessly to protect the environment, engage with communities, and promote sustainable growth. Their goals range from educational programs on healthy eating to the protection of heritage sites. While their efforts reach too far and wide to address, this report focuses on the environmental subset of goals for the five-county region. Such goals include improving and maintaining water quality, protecting important ecosystems, and protecting farmland. Some of the organizations working in the region include FLOW (For Love of Water), Networks Northwest, the Grand Traverse Bay Land Conservancy, and the Watershed Center of Grand Traverse Bay.

The Community Foundation also works to improve the five-county region of the Grand Traverse Bay. Among its countless projects in the region, they have worked to create the Community Scorecard tool, the result of a collaborative effort with a team of University of Michigan graduate students in the Fall of 2019. This scorecard outlines many objectives for improving the region, which range from transportation to environmental protection to economic development. Each category features a goal, a metric by which to measure progress, and an indication of how well communities are currently doing.
The goal of this report is to provide planning tools that will aid communities in achieving these scorecard objectives, specifically the environmental objectives of improving water quality, reducing emissions, and protecting open space and farmland. Many citizens have expressed concerns about the environment and

the potential for environmental impacts from new development, enforcing the importance of working towards the completion of objectives. Using this report, local officials will be better able to respond to these concerns and set the foundation for the Scorecard's long term goals. We hope the methods presented here will spark meaningful conversations among local officials and residents, and that they will provide useful information for updating masterplans, amending zoning codes, planning out capital improvements, and making other development-related decisions.

Environmental Planning in the Region Now

Environmental planning is currently being conducted throughout the region to various degrees and in different ways. Local master plans, municipal zoning codes, and other local ordinances give insight into municipalities' priorities concerning the environment. To better understand environmental planning efforts currently underway throughout the region, our team conducted a systematic evaluation of the master plans of fourteen coastal municipalities within the five-county region. To this end, we evaluated the plans in six subject areas suggestive of favorable environmental sustainability practices. These included two aspects of the ***analytical*** quality of the plans— the use of Land Suitability Analysis and Infrastructure Capacity Analysis— and four measures of ***policies*** a plan might advance, including Vital Urban Centers, Conserved Rural Areas, Water Quantity and Quality Management, and Coastal Area Management Policy.[6] The results of the plan evaluations prepared for this report are shown in **Tables 1.1** and **1.2**.

The fourteen master plans were evaluated using established coding protocols consistent with master plan evaluation best-practices.[7] The evaluation metrics used are listed in **Appendix A**. Each plan was evaluated independently by two trained evaluators and each set of evaluations was then reconciled to produce a single set of scores for all evaluation items. Index scores were standardized on a scale of 0–10, with 0 being the lowest score possible and 10 being the highest.

While these scores should be helpful to the region's municipalities in better understanding their progress toward environmental goals and best practices, it's important to remember that they are not the whole picture! Not every

6 See the following article for an explanation of these concepts and the methods used to measure them: Norton, R., David, N., Buckman, S., & Koman, P. (2018). Overlooking the coast: Limited local planning for coastal area management along Michigan's Great Lakes. Land Use Policy, 71, 183-203. https://doi.org/10.1016/j.landusepol.2017.11.049

7 Ibid.

Table 1.1

Municipality	County	Land Suitability Analysis	Infrastructure Capacity Analysis	Plan Policy Focus: Vital Urban Centers	Plan Policy Focus: Conserved Rural Areas	Plan Policy Focus: Water Quantity and Quality Management	Plan Policy Focus: Coastal Area Management Policy
Acme Township	Grand Traverse	3.57	8.89	4.00	2.14	3.89	3.33
Banks	Antrim	6.43	3.33	2.00	2.86	2.22	1.67
Bingham	Leelanau	2.86	7.78	1.00	2.14	5.56	2.78
Blaine	Benzie	8.57	6.67	1.50	2.86	1.67	2.22
Cleveland	Leelanau	2.14	6.67	1.50	0.71	2.22	2.78
Crystal Lake	Leelanau	5.71	6.67	2.50	5.00	3.33	0.00
East Bay	Grand Traverse	1.43	0.00	4.50	7.14	2.78	0.00
Elk Rapids	Antrim	2.86	6.67	6.00	5.71	2.22	1.67
Frankfort	Benzie	6.43	7.78	8.00	5.71	3.89	3.89
Gilmore	Benzie	6.43	5.56	4.50	0.00	3.33	1.11
Glen Arbor	Leelanau	2.86	0.00	0.50	5.71	1.67	0.00

				Plan Policy Focus			
Municipality	County	Land Suitability Analysis	Infrastructure Capacity Analysis	Vital Urban Centers	Conserved Rural Areas	Water Quantity and Quality Management	Coastal Area Management Policy
Leelanau Township	Leelanau	6.43	7.78	1.00	0.00	5.56	3.33
Traverse City	Grand Traverse	0.00	0.00	4.50	4.29	2.22	5.00
Leland Township	Leelanau	5.00	8.89	4.00	0.00	0.00	0.00
N/A	Antrim	4.64	5.00	4.00	4.29	2.22	1.67
N/A	Benzie	7.14	6.67	4.67	2.86	2.96	2.41
N/A	Grand Traverse	1.67	2.96	4.33	4.52	2.96	2.78
N/A	Leelanau	4.17	6.30	1.75	2.26	3.06	1.48
N/A	Average Score for MI Coastal Comm-unities*	N/A	N/A	2.93	3.54	1.62	0.61

*Norton et al., 2018

Table 1.2

County	Land Suitability Analysis	Infrastructure Capacity Analysis	Plan Policy Focus: Vital Urban Centers	Plan Policy Focus: Conserved Rural Areas	Plan Policy Focus: Water Quantity and Quality Management	Plan Policy Focus: Coastal Area Management Policy	Overall Plan Quality
Antrim	4.64	5.00	4.00	4.29	2.22	1.67	5.97
Benzie	7.14	6.67	4.67	2.86	2.96	2.41	6.49
Grand Traverse	1.67	2.96	4.33	4.52	2.96	2.78	8.68
Leelanau	4.17	6.30	1.75	2.26	3.06	1.48	5.61
Average Score for MI Coastal Comm-unities*	N/A	N/A	2.93	3.54	1.62	0.61	5.60

*Norton et al., 2018

community's plan needs to score a 'perfect 10' on every dimension measured to be a good plan for that community, given differences across communities in terms of the resource base they hold and the development pressures they face. Even so, these scores do provide a sense of what the communities have chosen to focus on through their planning efforts, both in terms of their analysis of current conditions and their stated policies for managing future development. As shown in **Tables 1.1** and **1.2**, scores varied across municipalities and counties. While scores may initially appear low on a 10-point scale, they are on par with scores throughout Michigan's Great Lakes coastal communities, as shown in **Table 1.2**. This range of scores suggests that different localities and counties within the same region place more value on certain aspects of the environment than others. The evaluation also shows that even within a single community, different emphasis and value is placed on different facets of environmental protection. For example, Frankfort Township scores very high in its analysis and emphasis on "Vital Urban Centers," both internally and compared to the other plans that were evaluated. Frankfort Township scores are lower, however, for "Water Management" and "Coastal Management." This kind of analysis, and follow-on assessments like those presented by this report, can provide a useful way for localities to evaluate their internal environmental policies and for regional organizations to look at environmental protection efforts throughout the area holistically.

Starting from that baseline assessment, the inclusion of LSA and EIA in municipal and regional planning efforts can help bolster environmental protection. While municipalities do not need to score a "10" in all measured indices, the master plan evaluations show that municipalities have significant room for improvement concerning environmental protection, specifically concerning water quality management and shoreline protection. As **Tables 1.1** and **1.2** suggest, and consistent with findings from prior research on coastal Michigan communities, localities throughout the region appear to not be conducting the kinds of analyses and adopting the kinds of policies needed to advance an environmentally sustainable future--especially for a region like the Grand Traverse Bay area. Because ecosystem functions are interdependent, comprehensive environmental planning throughout the entire region must be executed to truly protect the environment at large. The procedures outlined in this report offer straightforward and thorough methods that can enable good comprehensive environmental planning. The implementation of LSA and EIA throughout the GTRCF region will safeguard not only the environment, but the economy with which it is so intertwined.

Land Suitability Analysis

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Introduction to Land Suitability Analysis

The Grand Traverse Region offers freshwater beaches, charming architecture, and coastal views. As resident and tourist populations grow, developers and policymakers must consider these voices as well as the pressures on the natural environment. One technique that can weigh varied interests and environmental factors is Land Suitability Analysis (LSA). LSA is defined as "a tool used to identify the most suitable places for locating future land uses."[8] Such a tool has relevance and utility for a region like the Grand Traverse area, which seeks to protect the clean water that is integral to its aesthetic identity and tourism while also satisfying the land development appetites of its seasonal and residential populations.

Aerial view of Grand Traverse Region, colored postcard, ca. 1910. Image courtesy of Tom Olds, Traverse Area District Library Local History Collections, http://localhistory.tadl.org/items/show/2115.

8 Collins, Michael G., Frederick R. Steiner, and Michael J. Rushman. "Land-Use Suitability Analysis in the United States: Historical Development and Promising Technological Achievements." Environmental Management 28, no. 5 (November 2001): 611–21. https://doi.org/10.1007/s002670010247.

This section offers guidance for how to conduct LSA in the Grand Traverse Region. It provides an introduction on the basics of LSAs, and their potential and relevance for the Grand Traverse Region, respectively. First, we offer a brief overview of the analysis process and recommended weighting methods. Then, we summarize current use of this tool in Michigan communities, recent case studies, analysis factors and their sources, and frameworks for eliciting and facilitating community input. The goal of this section is to inform future LSAs, and to facilitate its incorporation into local planning discussions.

Overview

Land Suitability Analysis (LSA): "a tool used to identify the most suitable places for locating future land uses".

An LSA is a tool typically employed by public officials and land developers to determine the "best" or most efficient development action for a given land area. The process typically involves aggregating and mapping the factors most relevant to the development action(s) at hand, weighting their importance, and then overlaying maps of each to reveal cumulative suitability. Establishing relevant factors and weighting their importance can be accomplished through various means, including by eliciting expert opinion, employing mathematical models, or through surveys and discussion.

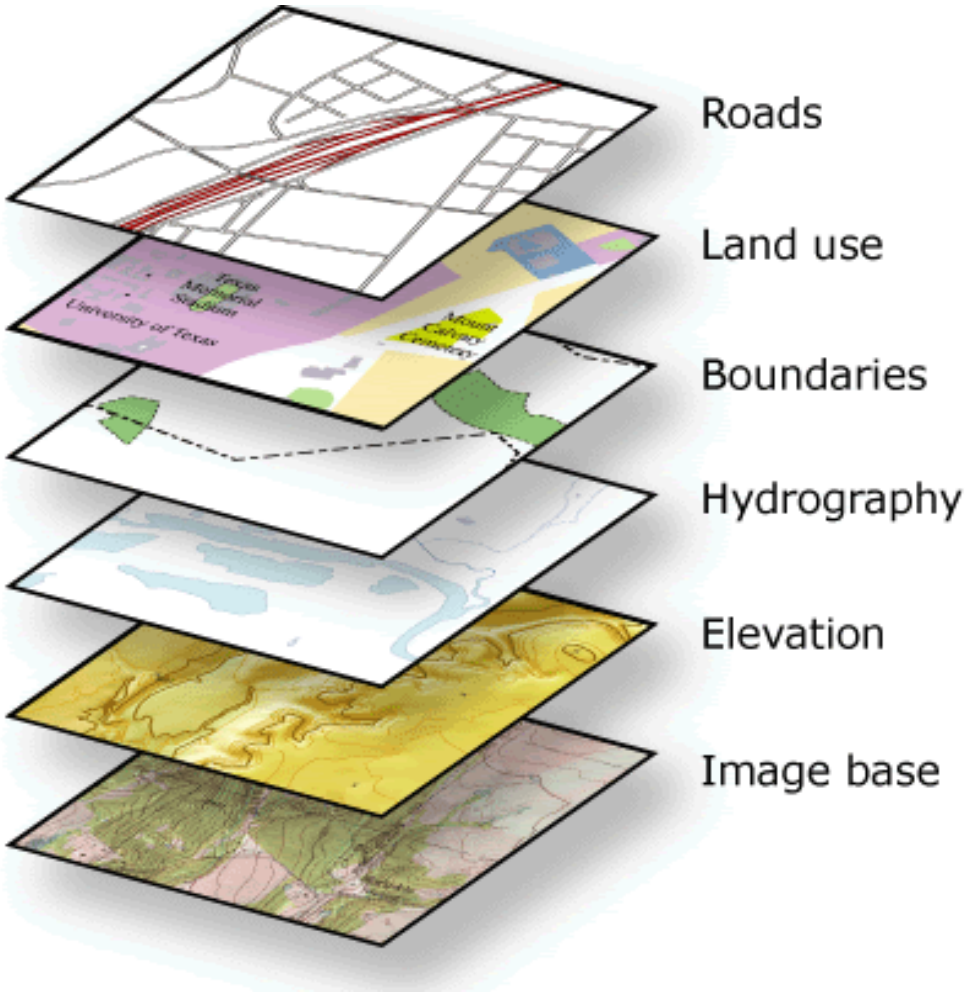
Basic Process Steps

1. Determine Factors

2. Weight Importance

3. Compare & Overlay Maps

Historically, LSA grew out of the "overlay method," which involved placing maps drawn on transparent paper over one another. This continued until the 1970s, when computer assisted mapping was first used. The late 1990s saw the growth of computer-assisted models using boolean and fuzzy logic, as well as the use of artificial intelligence models. Today, the most common method is still computer assisted mapping in the form of ArcGIS and aggregated data from open source databases.[9] This technique— computer aided GIS mapping— is what we recommend, and it is the premise for supplying open source databases for regional data on each of the listed factors in **Appendix B**.



From ArcGIS Server 10.3 Guide

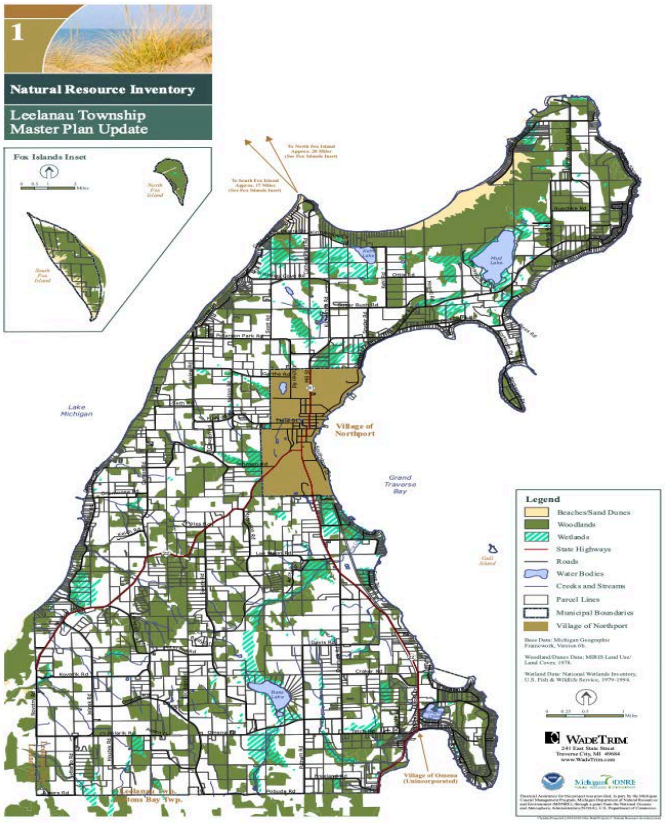
9 Collins, Michael G., Frederick R. Steiner, and Michael J. Rushman. "Land-Use Suitability Analysis in the United States: Historical Development and Promising Technological Achievements." Environmental Management 28, no. 5 (November 2001): 611–21. https://doi.org/10.1007/s002670010247.

Land Suitability Analysis in Michigan

Communities in the Grand Traverse region face different levels of development pressure. As some communities see increased levels of tourism and others start to attract other types of economic development, it may be wise to prepare for a wave of region-wide growth. Conducting a land suitability analysis is one way that communities can ensure that future development is responsible and protects the natural areas, farmlands, water bodies, and other areas valued by the region. For example, if a community wants to preserve existing undeveloped green space, they can conduct an analysis that prioritizes those areas by identifying responsible development locations that are close to urban centers and other existing development.

In Michigan, as in other states, almost all communities engage in some type of assessment or exercise to identify locations for specific land uses, even if they don't necessarily call it "land suitability analysis." The output is typically some sort of map, but some communities provide a textual narrative of natural features (see **Elmwood Township case**, page 24). A map may take the form of a natural features inventory (see **Leelanau Township sidebar**), which can then be used to inform a future land use map in a master plan. As communities implement their master plans, they can then adopt zoning ordinances that reflect those land use maps. Furthermore, planners, public officials, and zoning administrators can consult the inventory when considering a given development proposal near environmentally sensitive areas, when considering a new public development, or when drafting a Capital Improvements Program (CIP).

Leelanau Township Master Plan



The Leelanau Township Master Plan (revised in 2010) includes a steep slopes map and a natural features inventory, building on a resource lands inventory developed by the Center for Applied Environmental Research at the University of Michigan-Flint. The final inventory includes wetlands, other water bodies, woodlands, and beaches/sand dunes. It was used by the township as a starting point for evaluating appropriate future land uses.

This document provides guidance for conducting a more systematic analysis from an environmental planning perspective.

A number of communities in the Grand Traverse region are pursuing some form of land suitability analysis in their master planning processes. A survey of master plans in the area found that communities are including narratives and/or maps of physical limitations, floodplains, steep slope, fragile natural area, manmade hazards, and regional unique features (**Table 2.1**). For more information about how Michigan communities are using land suitability analysis, refer to the case studies on page 24. See also the summary analyses provided by the introduction to this report.

Table 2.1

Municipality	County	Floodplain	Steep Slope	Fragile Natural Areas
Acme Township	Grand Traverse	0	2	2
Banks Township	Antrim	1	3	3
Bingham Township	Leelanau	0	1	1
Blaine Township	Benzie	2	3	3
Cleveland Township	Leelanau	0	1	1
Crystal Lake	Leelanau	1	3	3
East Bay	Grand Traverse	0	0	1
Elk Rapids	Antrim	0	0	3
Frankfort	Benzie	0	3	3
Gilmore Township	Benzie	1	3	3

Municipality	County	Floodplain	Steep Slope	Fragile Natural Areas
Leelanau Township	Leelanau	1	3	2
Traverse City	Grand Traverse	0	0	0
Leland Township	Leelanau	1	3	1

Key

Not identified	0
Identified, not detailed	1
Identified, detailed	2
Mapped	3

Process

There are a variety of land suitability analysis methods for communities that are interested in protecting natural areas and identifying locations for responsible development, ranging from basic to highly complex. Each involves the selection of factors to include in the analysis and decisions about how to weigh factors against one another based on community and expert opinion. Every community's unique circumstances and histories lead them to value and prioritize different factors when it comes to land use planning. For instance, as the hospitality industry has a significant influence on the economy of Traverse City, development actions might prioritize tourism-related uses. In contrast, communities that depend on the fruit industry might prioritize agricultural uses.

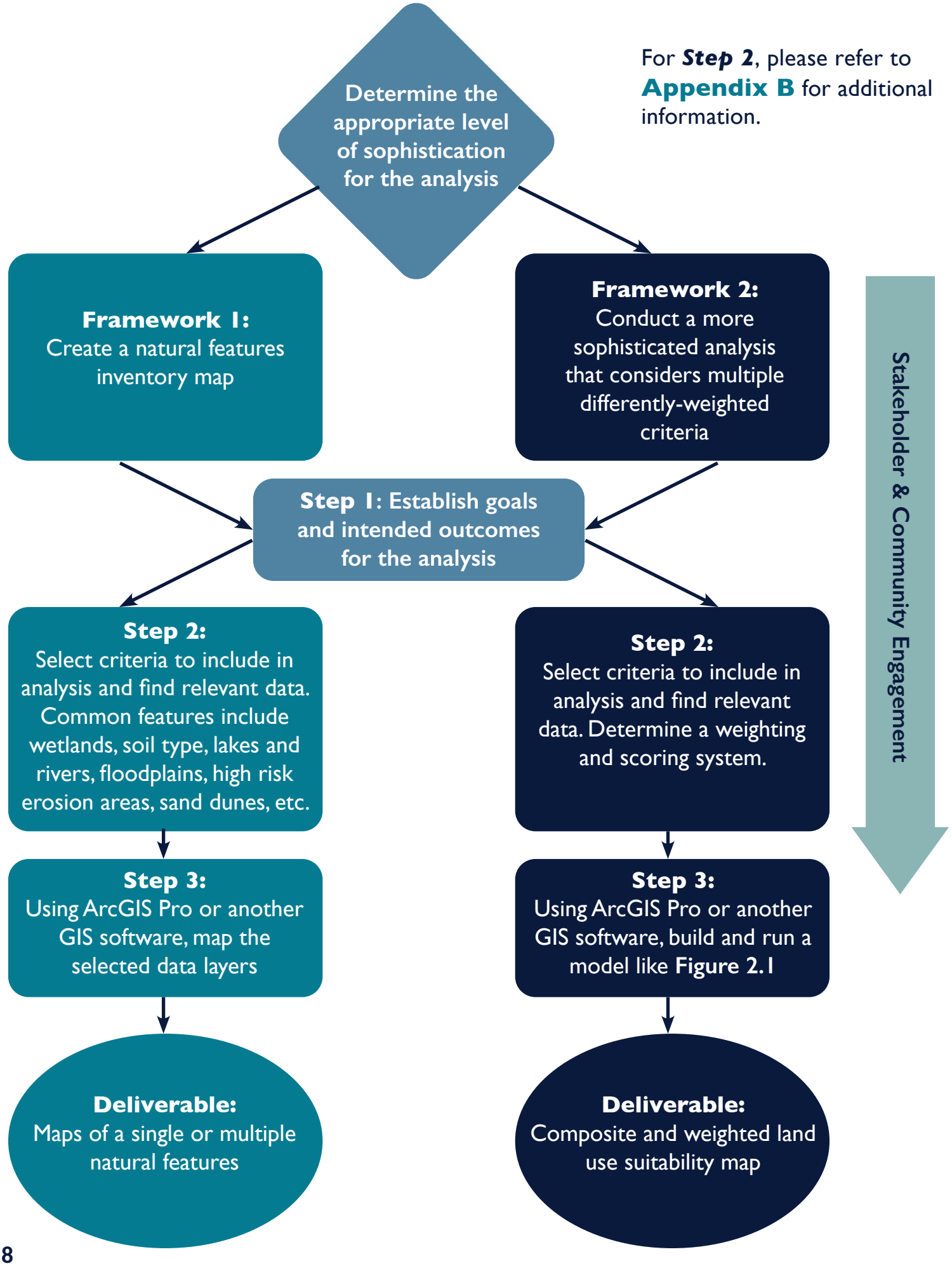
When conducting an LSA, different mathematical methods can be used to weigh the importance of these kinds of socioeconomic or environmental factors (**Framework 2**, outlined below, is based on weighted linear combination, which is a commonly used LSA method that can be adapted based on a community's needs.[10] For an overview of the pairwise comparison method, see **Appendix C**.)

These various land suitability analysis options can be pursued in a variety of ways. Some communities may have the staff capacity to conduct a land suitability analysis in-house, for example, while others may work with private consultants, county or regional planning organizations, nonprofit groups, or universities. (For a list of potential partner organizations, see **Appendix D**). After deciding who will conduct the analysis, the community must determine the level of sophistication for the analysis and the intended outcomes and deliverables. In this section, we have outlined two potential frameworks for applying LSA at different resource and ability levels. **Framework 1** provides a straightforward way to highlight natural areas that should be protected from future development, easier both to do and to explain. **Framework 2** provides a more sophisticated method that weighs multiple criteria to create a composite map that shows areas that are best suited for protection or development, based on the goals of your analysis. This option requires a better understanding of GIS tools and may require more explanation for constituents, but it provides a more nuanced assessment that can be helpful for making more rigorous decisions.

These methods were developed with inspiration from Tom Daniels' Environmental Planning Handbook For Sustainable Communities and Regions, a technical paper from the Hurricane Matthew Disaster Recovery and Resilience Initiative at University of North Carolina – Chapel Hill,[11] and interviews with planning professionals in the Grand Traverse region.

10 Malczewski, Jacek. "GIS-Based Multicriteria Decision Analysis: a Survey of the Literature." International Journal of Geographical Information Science 20, no. 7 (February 20, 2006): 703–26. https://doi.org/10.1080/13658810600661508.

11 "Land Suitability Analysis for Post-Disaster Housing Relocation", Hurricane Matthew Disaster Recovery and Resilience Initiative, University of North Carolina – Chapel Hill (2018)


Determine the appropriate level of sophistication for the analysis
For Step 2, please refer to Appendix B for additional information.
Framework 1: Create a natural features inventory map
Framework 2: Conduct a more sophisticated analysis that considers multiple differently-weighted criteria
Stakeholder & Community Engagement
Step 1: Establish goals and intended outcomes for the analysis
Step 2: Select criteria to include in analysis and find relevant data. Common features include wetlands, soil type, lakes and rivers, floodplains, high risk erosion areas, sand dunes, etc.
Step 2: Select criteria to include in analysis and find relevant data. Determine a weighting and scoring system.
Step 3: Using ArcGIS Pro or another GIS software, map the selected data layers
Step 3: Using ArcGIS Pro or another GIS software, build and run a model like Figure 2.1
Deliverable: Maps of a single or multiple natural features
Deliverable: Composite and weighted land use suitability map

	Framework 1	*Framework 2*	
Step 1	Establish goals and intended outcomes for the analysis		Stakeholder and Community Engagement
Step 2	Select criteria to include in analysis and find relevant data. Common features include wetlands, soil type, lakes and rivers, floodplains, high risk erosion areas, sand dunes, etc. See **Appendix B** for additional potential factors.	Select criteria to include in analysis and find relevant data. ***Determine a weighting and scoring system***. See **Appendix B** for potential factors.	
Step 3	Using ArcGIS Pro or another GIS software, map the selected data layers.	Using ArcGIS Pro or another GIS software, build and run a model like **Figure 2.1**.	
Deliverable	**Maps of a single natural feature, or composite map of multiple natural features**	**Composite and weighted land use suitability map**	
Case Study	Leelanau Township **(page 26)**	Kalamazoo River Watershed Conservation Plan **(page 29)**	

STAKEHOLDER AND COMMUNITY ENGAGEMENT

By engaging stakeholders through a collaborative planning process, planners can ensure that community values are reflected in the LSA. It is common to conduct an LSA during the same time as a master planning process. LSAs are uniquely suited to helping with future land use planning, zoning adoption, and the rezoning process.

There are four general stages to any collaborative planning effort: Starting, Exploring, Tradeoffs and Packaging, and Deciding Agreement.[12] Each stage should be completed before moving onto the next. During each stage, community meetings should be held to both inform residents of progress and solicit feedback. One stage may take multiple meetings and multiple outreach events to complete.

Pre Stage - Recruitment: The core planning group should engage with other stakeholders and solicit their input. During this point, it is important to ask: Who will benefit from these decisions? Who will be harmed by these decisions? Who has meaningful resources, knowledge, and experience that could contribute to this effort? ***Deliverable: List of stakeholders that should be consulted.***

Stage 1 - Starting: In this stage, the core and expanded planning group should clarify the purpose and needs of the group, understand the process, and establish familiarity amongst the stakeholders. Introductions are an excellent time for the participants to establish their values. A value is a frame of reference, while a solution is a recommended action or decision. A value statement would be "I support clean water," while a solution would be "I don't want any more of _____ to keep the water clean." Use the list of potential criteria in **Appendix B** as a starting point, but additional criteria may arise. ***Deliverables: groups should have an understanding of one anothers values and the protocols for the meetings.***

12 Julia Wondolleck and Steven Yaffee, University of Michigan, School for Environment and Sustainability, EAS 533 Negotiation Skills, Fall 2019

STAKEHOLDER AND COMMUNITY ENGAGEMENT

Stage 2 - Exploring: Exploring is about clarifying the problem and helping stakeholders gather and share information. This is a time to bring up issues and sub-issues, and to present visuals. Solutions may be drawn out at this time; however it is important not to pick any solutions at this stage, but rather only discuss benefits and trade offs, and how each potential solution does or doesn't align with one's values. ***Deliverable: all parties have a strong understanding of LSAs as well as the pros, cons, and viewpoints of others on the various possible criteria that may be used in an LSA in the given community.***

Stage 3 - Tradeoffs & Packaging: This stage is marked by creative thinking and brainstorming. It is where the stakeholders put together ideas and options. It is important not to create a final option during this stage. Multiple options and understanding how each stakeholder is balancing the options and their values. ***Deliverables: a few possible packages of criteria and weightings should be established.***

Stage 4 - Deciding Agreement: Deciding agreement is about selecting the final package and fine tuning it to be acceptable to the parties. Many planning processes are plagued with various levels of uncertainty. Adding conditions is a potential way to help parties reach an agreement when dealing with uncertainty, in this case applying scenario planning as a method of dealing with uncertainty. Such a condition might be, for example, "if X happens then we will institute Y." ***Deliverables: selected criteria and their allocated weights for the LSA.***

Post Stage: In some cases, the stakeholders may agree to meet on a regular basis. This may be to view the final LSA, monitor the implementation of their plan, or even to simply maintain rapport between the members for future planning efforts.

Land Suitability Analysis In Practice: *A Hypothetical Assessment of Suitable 'Greenbelt' Properties in Grand Traverse County*

This fictional assessment of Grand Traverse County serves as a walk-through of "Framework 2" process described above. The process is similar to the Grand Traverse Regional Land Conservancy conservation priority map and the Kalamazoo River Watershed Land Conservation Plan, summarized on page 28.

Step 1: Establish goals and intended outcomes

The county is interested in protecting farmland, open spaces, and water bodies from future development and sprawl. To accomplish these goals, public officials want to establish a greenbelt program. They decide to conduct a land suitability analysis to identify properties that should be targeted through the program.

Step 2: Identify criteria, find relevant data, and determine a weighting and scoring system

Because the proposed greenbelt program would protect farmland, open space, and water bodies, the map layers to include are Land Cover, Coastal Wetlands, and Streams. The proposed protected features in each inventory map would be given higher scores in the analysis process. In the Score column, for example, forested, agricultural, wetland, and stream parcels are given high scores. Wetland and stream buffers are scored slightly less, open water on the Land Cover layer is scored 0, and all developed areas are removed from the map.

The community might decide to adopt different weights for various features, using the collaborative process described above. Two weighting schemes are shown here to illustrate how changing the weights can change the outcome of the analysis. In weighting scheme 1, open spaces and agricultural land are prioritized, so the land cover layer would be given a higher weight. In weighting scheme 2, the community decides to prioritize protection of water bodies, so the wetland and stream layers are given higher weights. The results show that there is little variation between the two schemes in the highest priority areas, but the medium priority areas are distinct.

Step 3: Using ArcGIS Pro or another GIS software, build and run a model like Figure 2.1.

The final deliverable will look like the rightmost image in **Figure 2.2** and **2.3**, where the darkest areas on the maps are the most suitable for inclusion in the proposed greenbelt program.

Data Layer	*Weighting Scheme 1*	*Weighting Scheme 2*	*Score (High = 3 & 2, Med = 1, Low = 0)*
Landcover	0.4	0.2	Forest & Woodland = 2 Agricultural = 2 Recently Disturbed = 1 Open Water = 0 Developed Areas - removed from map
Coastal Wetlands	0.3	0.4	Coastal Wetland = 3 Buffer Zone = 2
Streams	0.3	0.4	Stream = 3 500m Buffer = 2 1000m Buffer = 1

Figure 2.1: Model Diagram

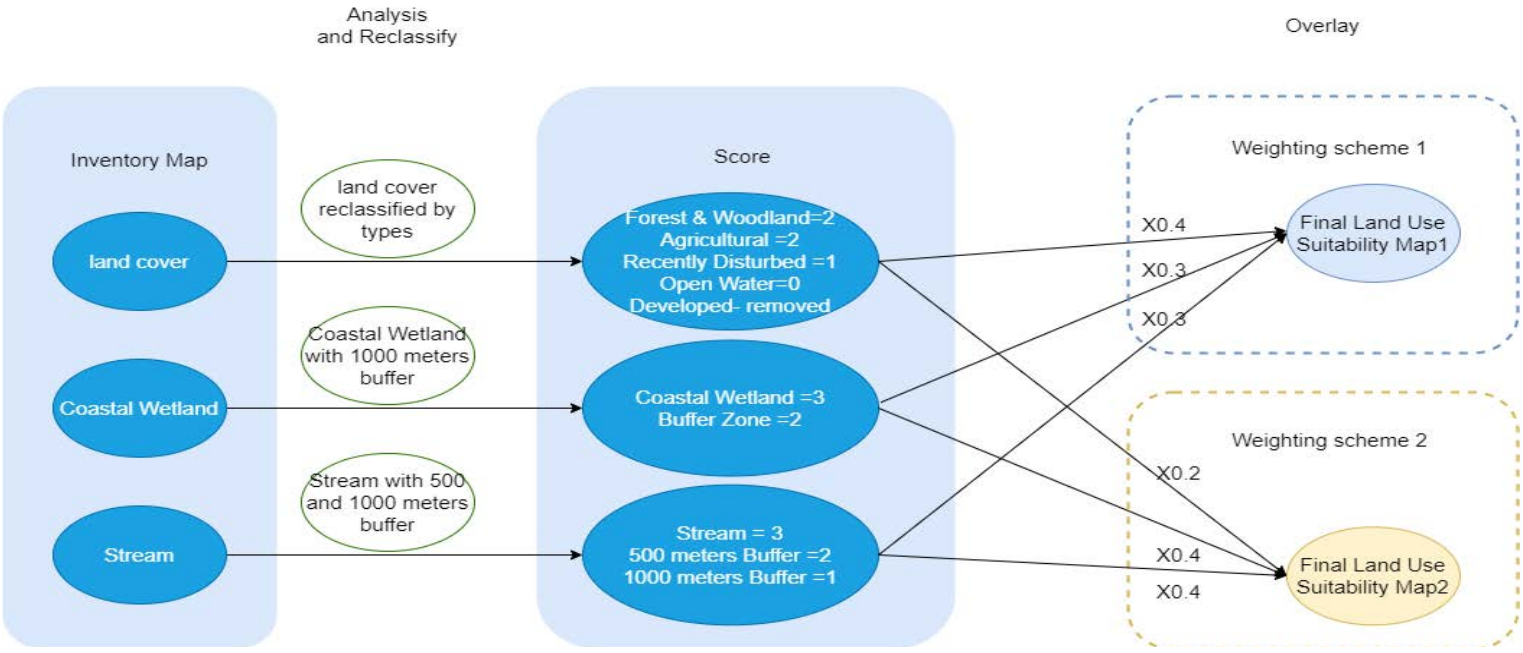


Figure 2.2: Land suitability analysis layer framework with weighting scheme 1

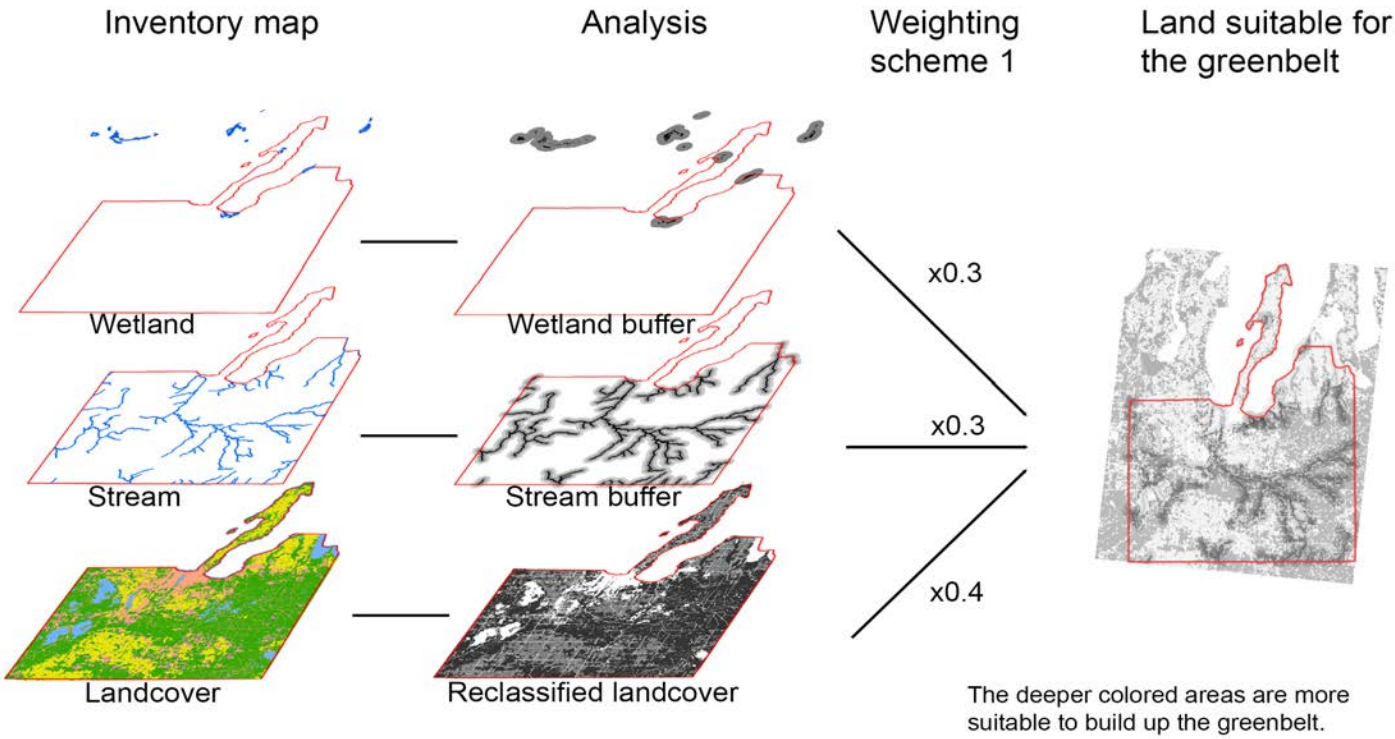
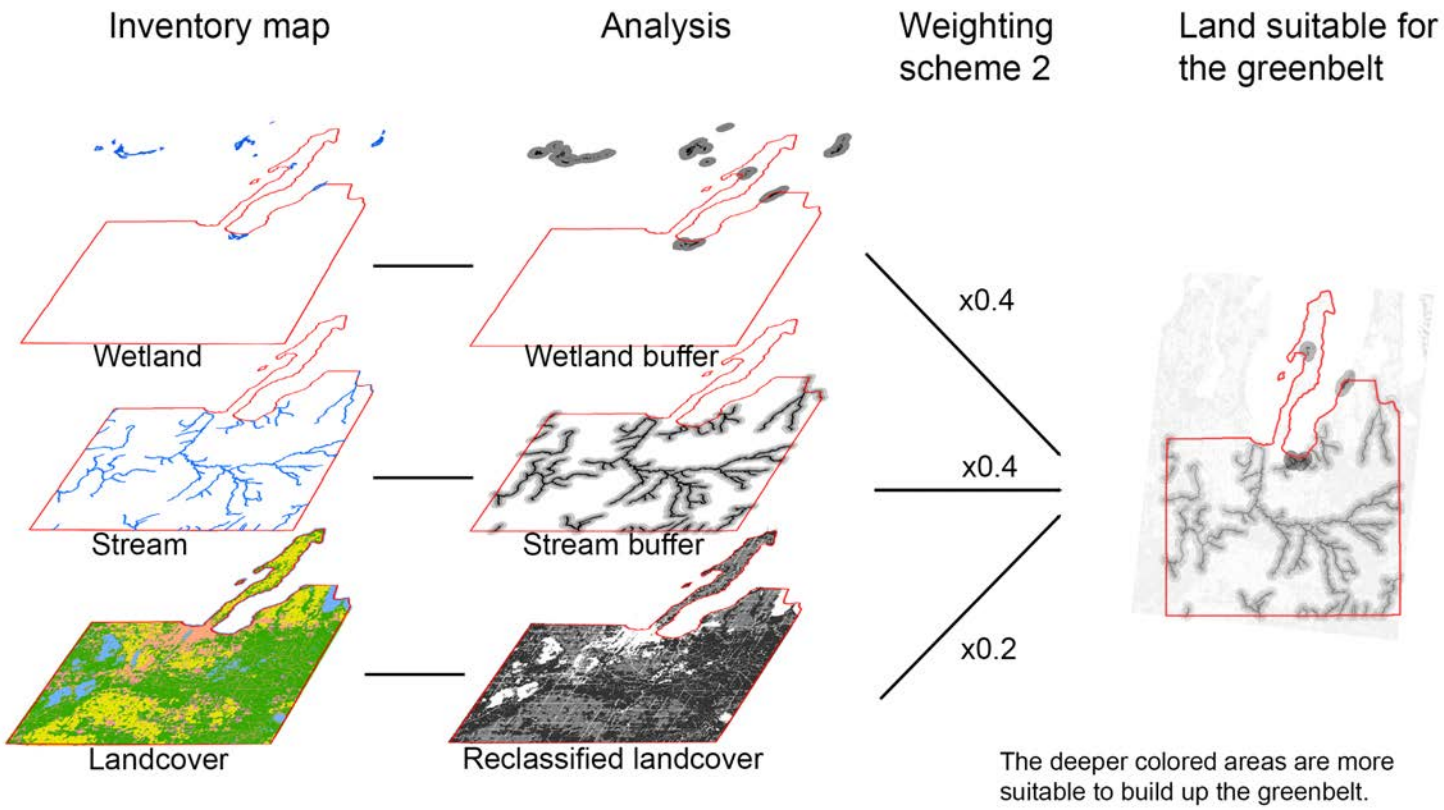
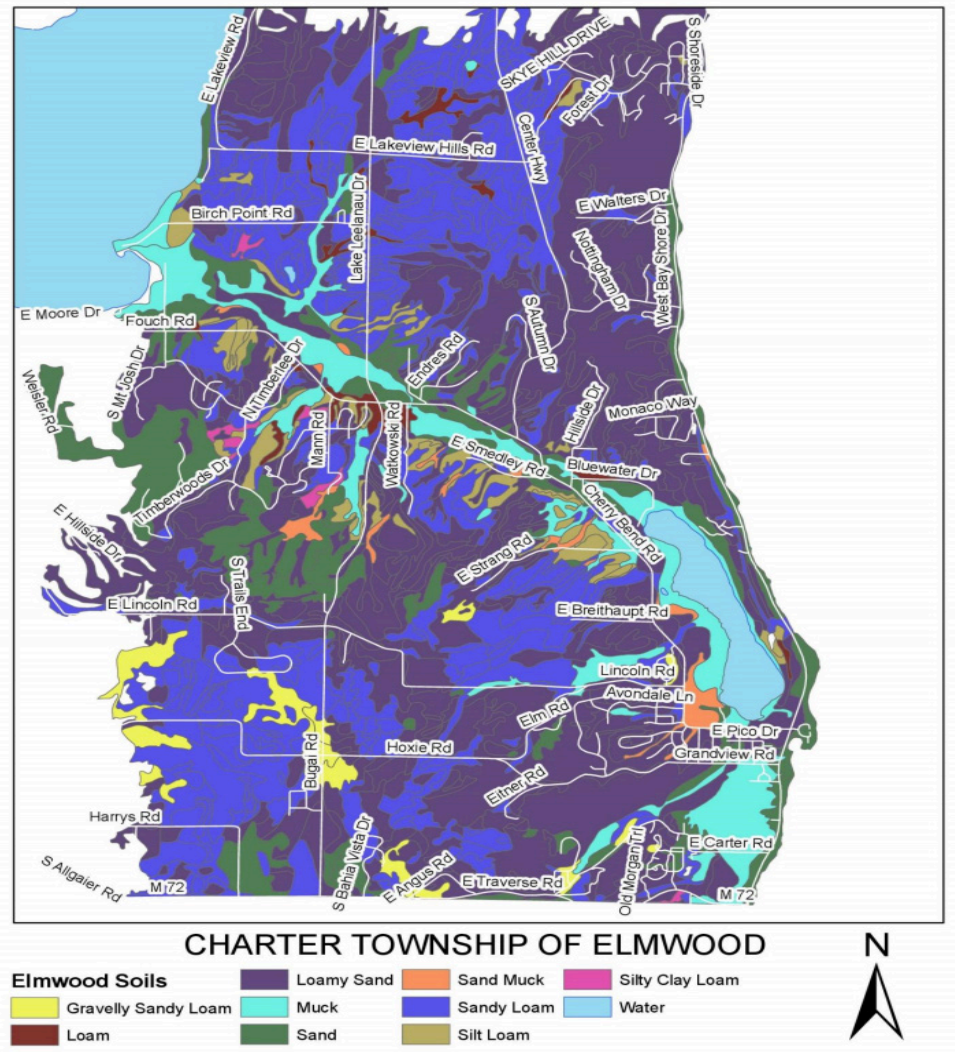


Figure 2.3: Land suitability analysis layer framework with weighting scheme 2



Case Studies

This section highlights examples of how other communities in the region and elsewhere in Michigan have used some form of land suitability analysis. They represent the broad range of techniques that vary from relatively simple (e.g. mapping soil type) to more complex (e.g. considering multiple criteria, weighting them, etc.)



Elmwood Township

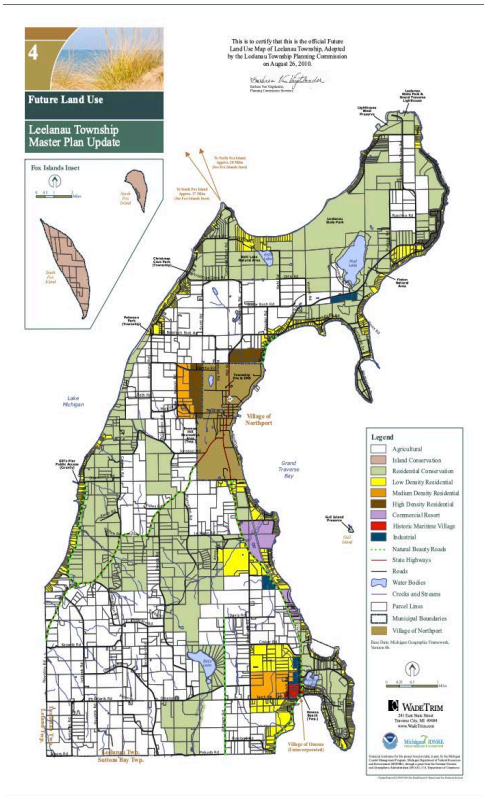
The Elmwood Township master plan includes a map of soil type, and text inventories of topography, natural habitats (i.e. woodlands), wetlands and other water bodies. According to the plan, these inventories help the community "channel, or encourage, development into areas which are the least environmentally sensitive" and "work to minimize adverse impacts to these areas."[13]

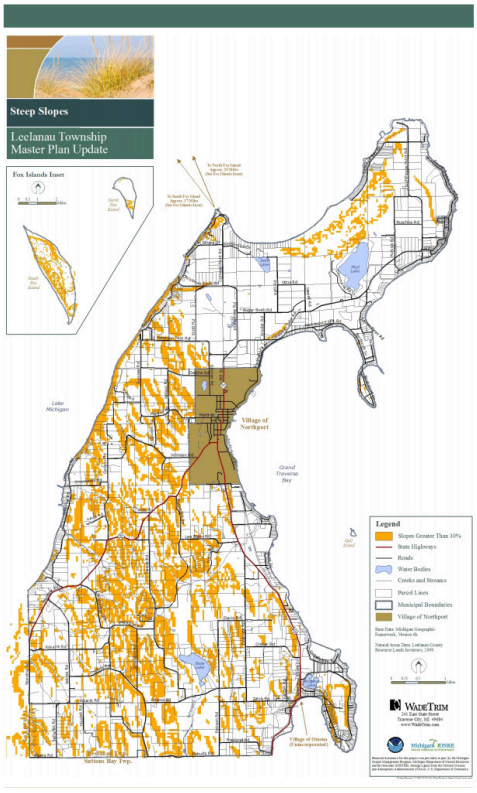
13 Elmwood Township, Michigan, Elmwood Township Master Plan. Adopted March 20, 2018. Retrieved from https://www.leelanau.cc/downloads/mp_approved_032018.pdf.

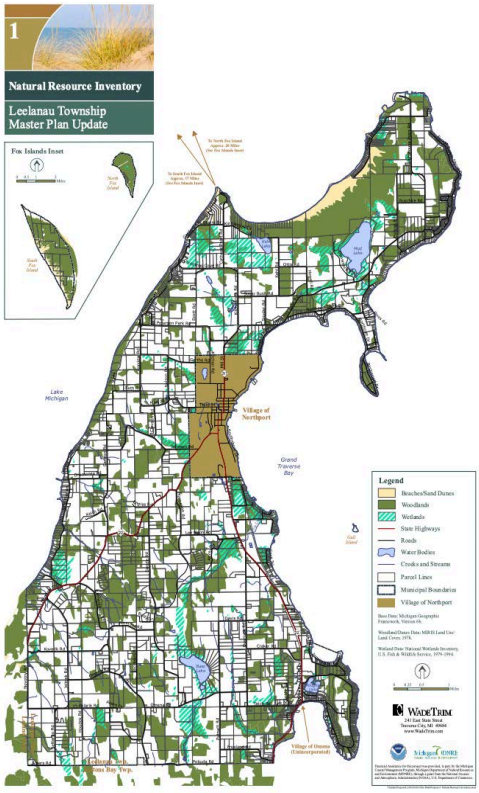
Leelanau Township

The Leelanau Township Master Plan (revised 2010) includes a steep slopes map and a natural features inventory that incorporate a resource lands inventory developed by the Center for Applied Environmental Research at the University of Michigan-Flint.[14] The final inventory includes wetlands, other water bodies, woodlands, and beaches/sand dunes. It was used by the township as a starting point for evaluating appropriate future land uses.

14 Leelanau Township, Michigan, Leelanau Township Master Plan Update. Adopted August 26, 2010. Retrieved from https://www.leelanau.cc/downloads/2010_master_plan_final_document.pdf.



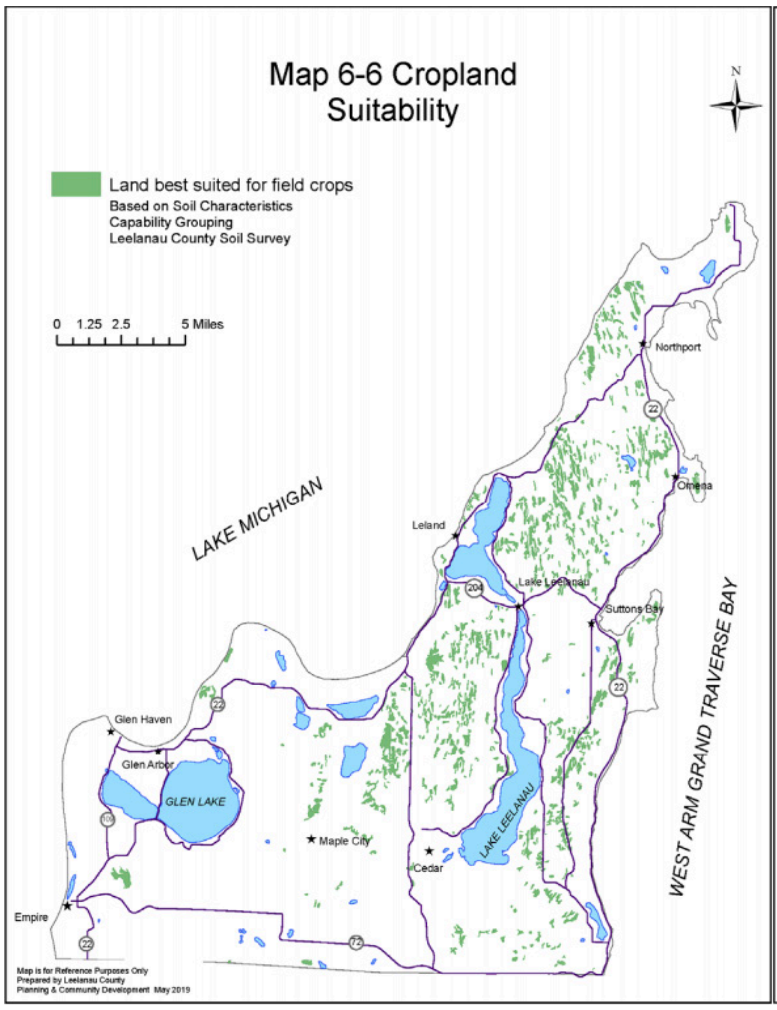


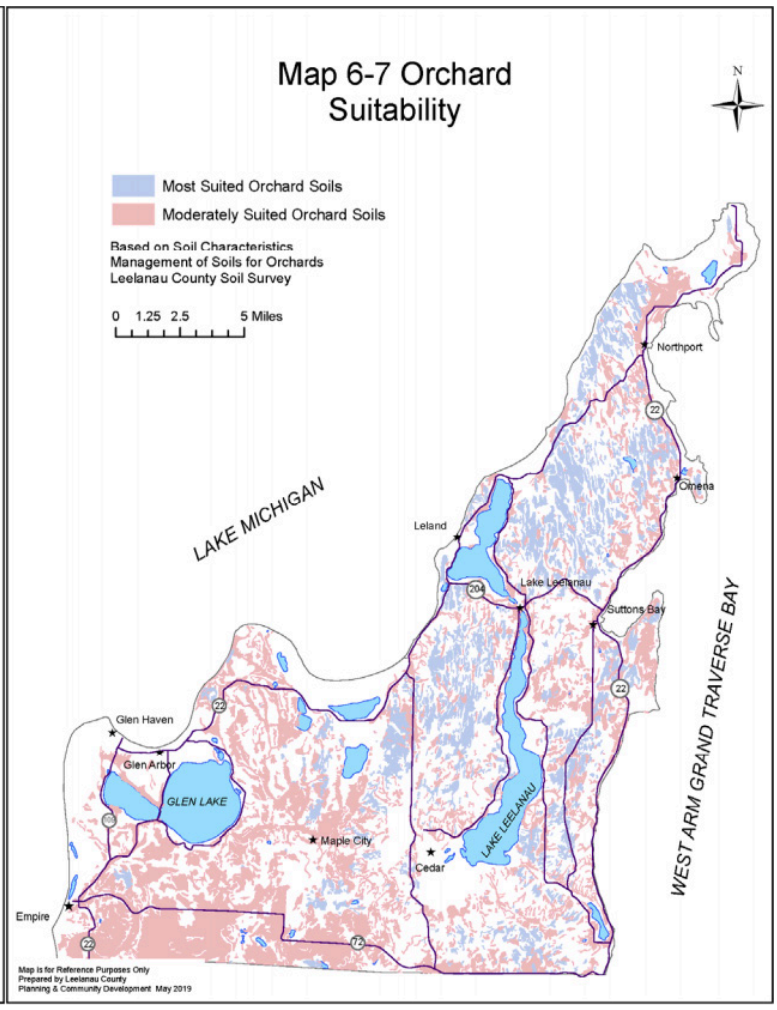


Leelanau County

The Leelanau County General Plan (revised November 2019) includes maps depicting areas that are suitable for cropland and orchards. The maps support one of the plan's primary objectives: "Protect farmland and minimize consumption of open space, including scenic vistas and corridors, from loss through land fragmentation and/or development."[15]

15 Leelanau County, Michigan, The Leelanau General Plan: Policy Guidelines for Managing Growth In Leelanau County. Adopted 1995, last amendment 2019. Retrieved from https://www.leelanau.cc/downloads/final_gp_nov_2019.pdf.





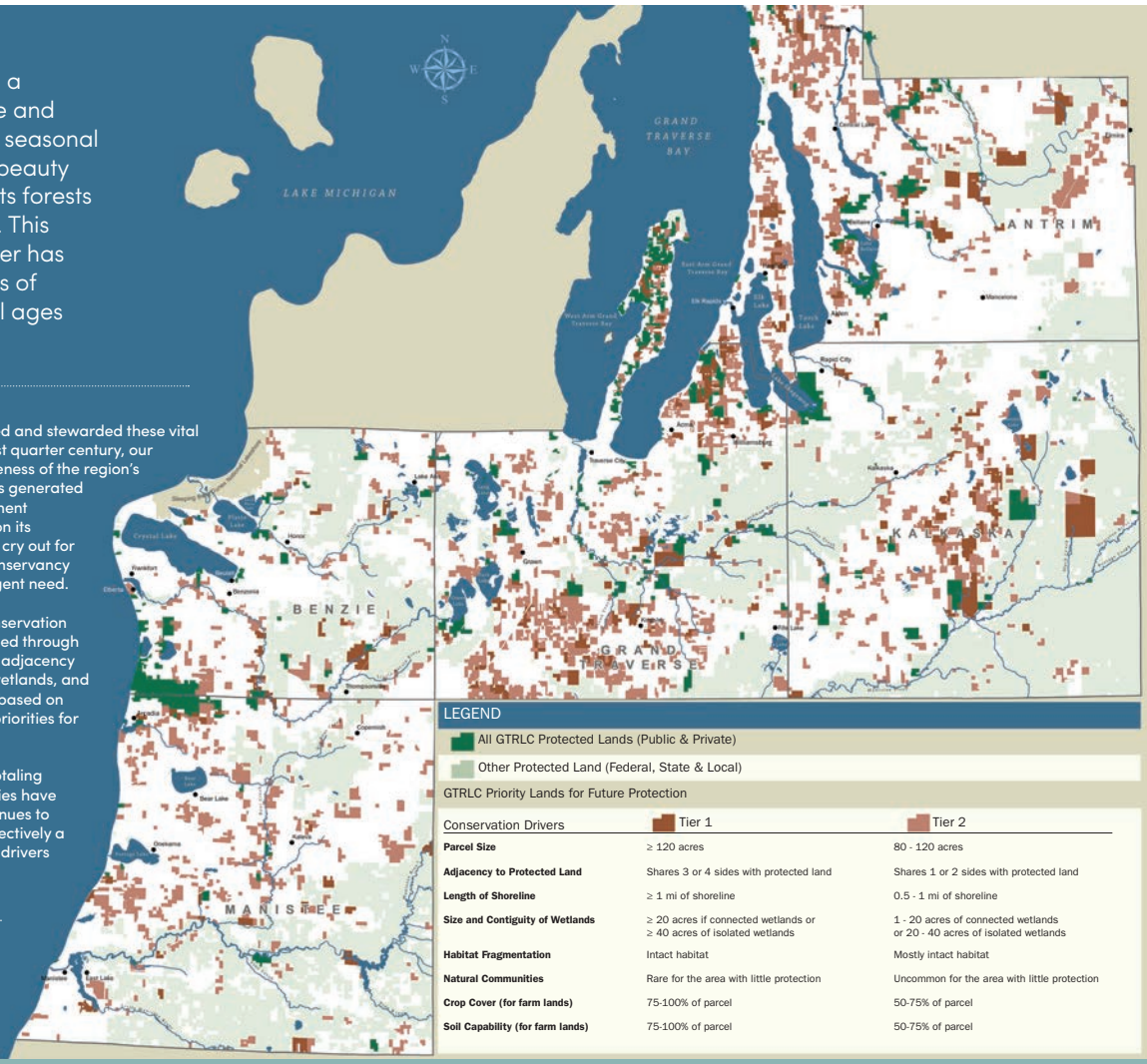
The Grand Traverse Region has long held a special spot in the hearts of those who live and visit here. Generations of year-round and seasonal residents have savored the breathtaking beauty of its Lake Michigan bluffs and beaches, its forests and farmlands, its inland lakes and rivers. This spectacular combination of land and water has provided the backdrop for countless hours of recreation and relaxation for people of all ages and walks of life.

The Grand Traverse Regional Land Conservancy has protected and stewarded these vital assets since 1991. Despite our many achievements over the last quarter century, our mission is more important today than ever. The very attractiveness of the region's natural features, in combination with a growing economy, has generated development pressure on critical properties worthy of permanent protection. The region's growth has placed additional stress on its lifeblood of clean lakes and streams. In a place and time that cry out for strategic conservation, the Grand Traverse Regional Land Conservancy stands ready to work with willing landowners to meet that urgent need.

We use a scientific approach to identifying land with high conservation value within our service area. Conservation value is determined through a scoring process based on five criteria including parcel size, adjacency to protected land, length of shoreline, size and contiguity of wetlands, and habitat fragmentation. Parcels are ranked in a tiered system based on their cumulative scores with the highest scores representing priorities for protection.

Since designing this Priority Land Atlas in 2004, 133 parcels, totaling over 17,000 acres previously identified as conservation priorities have been protected. Updated in 2016, the Priority Land Atlas continues to be a valuable tool to help evaluate potential projects. It is effectively a "living document" and can be amended as new conservation drivers are identified.

GRAND TRAVERSE REGIONAL land CONSERVANCY



LEGEND

All GTRLC Protected Lands (Public & Private)

Other Protected Land (Federal, State & Local)

GTRLC Priority Lands for Future Protection

Conservation Drivers	Tier 1	Tier 2
Parcel Size	≥ 120 acres	80 - 120 acres
Adjacency to Protected Land	Shares 3 or 4 sides with protected land	Shares 1 or 2 sides with protected land
Length of Shoreline	≥ 1 mi of shoreline	0.5 - 1 mi of shoreline
Size and Contiguity of Wetlands	≥ 20 acres if connected wetlands or ≥ 40 acres of isolated wetlands	1 - 20 acres of connected wetlands or 20 - 40 acres of isolated wetlands
Habitat Fragmentation	Intact habitat	Mostly intact habitat
Natural Communities	Rare for the area with little protection	Uncommon for the area with little protection
Crop Cover (for farm lands)	75-100% of parcel	50-75% of parcel
Soil Capability (for farm lands)	75-100% of parcel	50-75% of parcel

Grand Traverse Regional Land Conservancy

The Grand Traverse Regional Land Conservancy uses a type of LSA to identify areas with high conservation value in order to prioritize conservation projects:

"Conservation value is determined through a scoring process based on five criteria including parcel size, adjacency to protected land, length of shoreline, size and contiguity of wetlands, and habitat fragmentation. Parcels are ranked in a tiered system based on their cumulative scores."

Kalamazoo River Watershed Land Conservation Plan

The Kalamazoo River Watershed Land Conservation Plan was developed to choose conservation targets among ownership parcels in the Kalamazoo River Watershed (MI).[16] The method of protecting and enhancing the river watershed condition is conserving surrounding natural lands.

> ***"To facilitate the permanent protection of these lands, this plan was developed using an ArcGIS-based analysis based on the following conservation criteria: land cover, presence of wetlands, proximity to hydrology, proximity to existing conserved lands, presence of cold lands, and presence of threatened and endangered species habitat."***

16 Alexander, Kyle; Jackson, Jamie; Kikuyama, Fumi; Sasamoto, Ben; and Alison Stevens. Kalamazoo River Watershed Land Conservation Plan. Kalamazoo River Watershed Council & Southwest Michigan Land Conservancy, 2014. Retrieved from http://kalamazooriver.org/wp-content/uploads/2015/08/KRWLCP_Final.pdf

Table 2.2: Criteria Weighting and Ranking for the Kalamazoo River Watershed Plan

Data Layer	Weighting (10 in sum)	Reclassified Categories (Within Attribute)	Ranking High=3 Medium=2 Low=1, 0
Land Cover	2.75	Forested (all types), Grasslands	3
		Others	0
Wetlands	3.0	Presence (all types)	3
		Others (open water)	0
Hydrology Buffer	2.0	Within 1000ft of hydrology	3
		Within 2000ft	2
		Within 3000ft	1
		> 3000ft from hydrology	0
Proximity to Conserved Land	1.0	Within 1 mile of conserved lands	3
		Within 2 miles	2
		Within 3 miles	1
		> 3 miles from conserved lands	0
Trout Streams	0.75	Cold streams	3
		Others	0
Threatened and Endangered Species	0.50	High	3
		Moderate	2
		Low	1
		N/A	0

Highest Priority Sub-Watersheds

A 2014 assessment model, created by watershed experts and local stakeholders, identified the top 10% priority parcels for conservation. The sub-watersheds with the greatest concentration of these parcels were combined into eight priority areas for protection.

Pottawatomie Marsh

Before draining into Lake Michigan, the Kalamazoo River flows through a large wetland complex and forms Kalamazoo Lake. Marshes in this area serve as important habitat for waterfowl and migratory birds. This area is also notable for its remarkable, yet fragile, sand dunes. Protecting land in this area is important to conserving large tracts of wetland and paleodune habitat.

Swan Creek & Lake Allegan

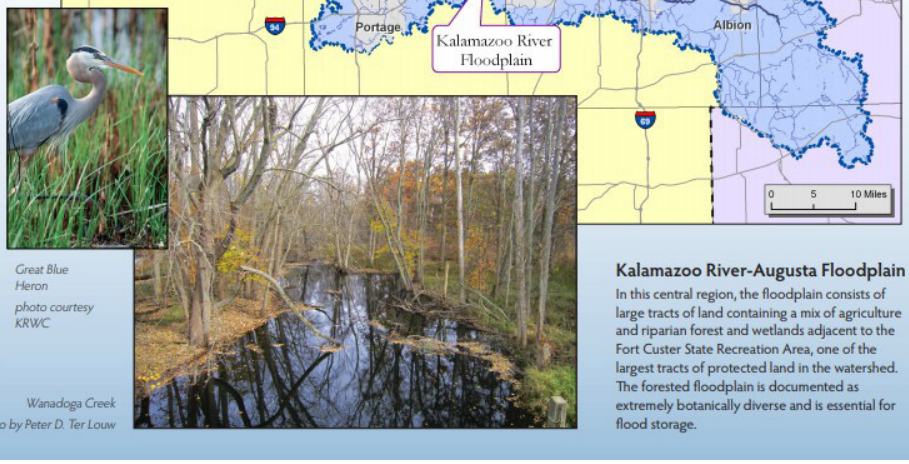
Swan Creek flows north into the Kalamazoo River below the Lake Allegan dam. The headwaters area consists primarily of farmland, with the downstream portion of the creekshed permanently conserved and surrounded by the Allegan State Game Area and designated as a Natural River under the Natural Rivers Act.

Pine Creek

This small creek is located at the intersection of Kalamazoo, Van Buren, and Allegan Counties and flows north into the Kalamazoo River, downstream of Otsego. Land use consists of small headwater lakes, with associated wetlands surrounded by farmland. The creek's documented fish community has remained unchanged for over 50 years with some natural reproduction of brown trout in the headwaters.

Fish Lake Area

Set in Barry County, this small creekshed contains the Fish Lake section of the Barry State Game Area that flows west into Gun River. While most of the Gun River watershed consists of agriculture, pockets of important wetlands and forested floodplain can be found around Fish Lake. Much of the area has natural land cover and a variety of unique plant and animal species.



Great Blue Heron

photo courtesy KRWC

Wanadoga Creek

photo by Peter D. Ter Louw

Kalamazoo River-Augusta Floodplain

In this central region, the floodplain consists of large tracts of land containing a mix of agriculture and riparian forest and wetlands adjacent to the Fort Custer State Recreation Area, one of the largest tracts of protected land in the watershed. The forested floodplain is documented as extremely botanically diverse and is essential for flood storage.

Augusta Creek

This spring-fed creek flows south through Barry and Kalamazoo counties on the eastside of Gull Lake, a primarily rural area dotted by residential homes, conserved parcels of land, and agricultural fields. Augusta Creek contains a rich diversity of habitats, especially wetlands, and a variety of rare and uncommon plants and animals – including at least 16 different species of fish, two of which are species of greatest conservation need, the lake chubsucker and the tadpole madtom. A focus for conservation, over 1,800 acres have been conserved between MSU, DNR and SWMLC.

Gilkey Lake Headwaters of Augusta Creek

photo by Emily Wilke

Silver Creek & Spring Brook

Silver Creek and Spring Brook are two separate - yet adjacent tributaries - to the Kalamazoo River, located in the corner where Allegan and Kalamazoo Counties meet. Both are recognized as high quality trout streams with top-quality coldwater designation. The headwaters are a combination of fallow farmland and scrub shrub wetland; the lower reaches are dominated by active farmland and the Kalamazoo River floodplain.

Battle Creek River Headwaters

This headwaters area includes Ackley Creek, Big Marsh Lake, Wanadoga Creek & Clear Lake. The area boasts numerous lakes and wetlands, including Big Marsh Lake, home to a sandhill crane migration stopover site that is largely protected by Michigan Audubon's 898-acre Bernard W. Baker Sanctuary. Portions of Wanadoga Creek and the area surrounding Clear Lake have tracts of undeveloped forests and wetland complexes. Wanadoga Creek is characterized as a cool to cold water system supporting mottled sculpin, blacknose dace, and white sucker.

The final strategy includes a 2014 assessment model, which was created by watershed experts and local stakeholders and identifies the top 10% priority parcels for conservation.

Environmental Impact Assessments

ENGAGED MICHIGAN
PARTNER

Environmental Impact Assessments in the Grand Traverse Region: Overview

An **Environmental Impact Assessment (EIA)** provides an evaluation of the impact a project or development will likely have on the natural environment, along with related socio-economic, cultural, and human health considerations. While a land suitability analysis is used to determine the best land areas for a development to occur more broadly or regionally, EIAs approach environmental protection from the opposite direction and evaluate the potential long- and short-term effects of a particular development at a particular site. Both tools should be used in tandem to ensure that a piece of land and its anticipated use under proposed development are in harmony with one another. Attempting to predict hazards in the early stages of development—before projects are even begun—can help mitigate serious, long-term negative impacts on communities and save on future treatment and cleanup costs.

A typical EIA looks at a broad range of possible impacts and aims to answer questions like:

- To what degree will a development destroy or displace ecologically vital species or wetlands?
- How much energy will a development consume and how much pollution will it produce?
- Will a development be constructed on culturally significant land?

In a typical EIA, the developer is asked to quantify the expected impacts of the planned development. Effective EIAs for small developments can often be completed simply by ranking impacts on an ordinal scale. For large-scale developments, more granular data might be required, and developers may wish to rely on outside consultants to quantify the exact benefits, impacts, and costs the project will produce.

It is important to note that the legal requirements for EIAs vary throughout the country. While the U.S. has released guiding legislation for how to require EIAs similar to those required for federally funded or permitted projects under the National Environmental Policy Act, only five states (California, Georgia,

Minnesota, New York, and Washington) have actually codified this requirement in their own legislation. As such, no statewide requirements for EIAs exist in Michigan, leaving local authorities to implement any such regulations under their own authorities, if they desire them.

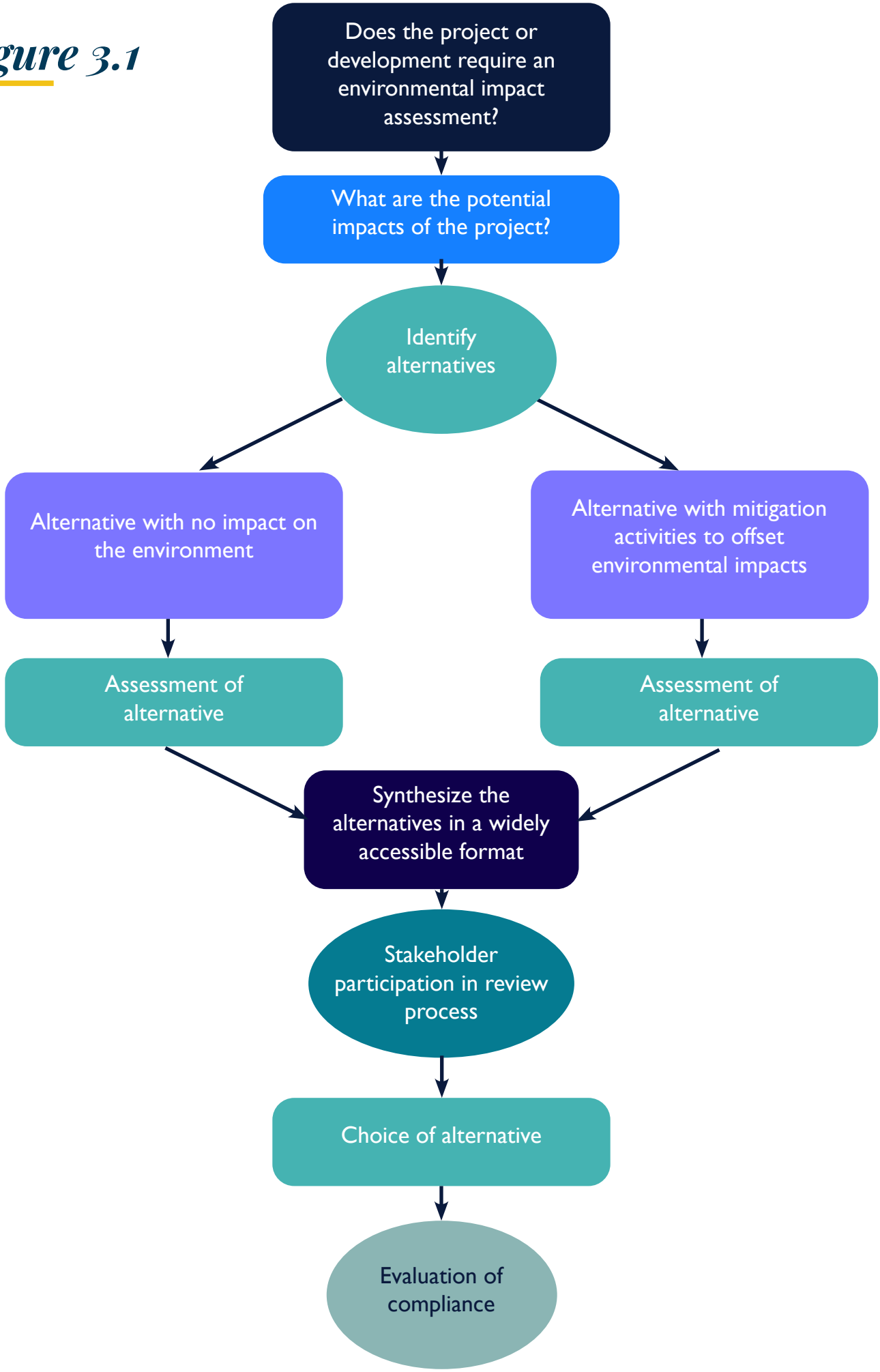
No matter where development is taking place, setting requirements for and conducting EIAs should be a relatively straightforward and streamlined process for both city officials and developers, even with a limited budget or capital resources. This section will cover more of the legal background for EIAs, provide guidance on how northwest Michigan communities can implement EIA requirements in their own municipal code, and discuss some of the ways EIAs have already been successfully incorporated in other Michigan municipalities. **Appendix E** provides a sample tool that can be used to help guide developers through a simple, low-budget EIA process.

Steps to Include in an EIA Process

There are certain steps that a comprehensive Environmental Impact Assessment should go through. **Figure 3.1**, adapted from the ***Convention on Biological Diversity***, outlines the process of an EIA.[17]

17 Convention on Biological Diversity. "What Is Impact Assessment?" UN Environment Programme, April 27, 2010. https://www.cbd.int/impact/whatis.shtml.

Figure 3.1


Does the project or development require an environmental impact assessment?
What are the potential impacts of the project?
Identify alternatives
Alternative with no impact on the environment
Alternative with mitigation activities to offset environmental impacts
Assessment of alternative
Assessment of alternative
Synthesize the alternatives in a widely accessible format
Stakeholder participation in review process
Choice of alternative
Evaluation of compliance

How Can Michigan Cities and Townships Conduct Environmental Impact Assessments?

Michigan has no state-level environmental impact assessment requirements.[18] However, Michigan municipalities can build EIA components into Master Plans, municipal codes, and site plan reviews. Several state policies, including the Michigan Natural Resource and Environmental Policy Act, the Michigan Zoning Enabling Act, and the Michigan Planning Enabling Act provide municipalities with the authority to integrate environmental assessments into their decision-making processes.[19]

Municipal Codes

Environmental impact assessments can be included in municipal zoning codes.[20] Ann Arbor stands as a strong example of a Michigan municipality that has incorporated EIA into its zoning code, referencing their legal mandate under the Michigan Zoning Enabling Act.[21] Ann Arbor's Unified Development Code includes a Natural Features Ordinance that requires all new developments to submit a site plan that evaluates the natural features (such as endangered species habitat, woodlands, and wetlands) on a proposed site.[22] Additionally, developers must submit potential effects of the development on identified natural features, as well as mitigation or damage minimization strategies to avoid those effects.[23] The Ann Arbor City Council and City Planning Commission are allowed to consider a Natural Feature site plan when approving a development.[24]

Some Michigan municipalities have incorporated overlay districts that prioritize sensitive environmental areas into their municipal codes. The City of Grand Haven has created a Sensitive Area Overlay that protects areas of

18 Bass, Ronald E., Albert I. Herson, Kenneth M. Bogdan, and Ronald E. Bass. The NEPA Book: A Step-by-Step Guide on How to Comply with the National Environmental Policy Act. 2001 (2nd) ed. Point Area, Calif: Solano Press Books, 2001.

19 Rotrosen, Anna. "Memorandum on Local Governments' Authority to Environmental Review in Michigan." Ann Arbor, MI: University of Michigan Law School, Environmental Law & Sustainability Clinic, December 13, 2019.

20 Ibid.

21 Ibid.

22 City of Ann Arbor. Unified Development Code, Chapter 55 Code of Ordinances, City of Ann Arbor, Michigan § 5.23 (n.d.).

23 Rotrosen 2019

24 Ibid.

the City that have notable wetlands, dunes, and other environmental areas of concern (see ***Michigan Environmental Impact Assessment In Practice*** below).[25] Overlays such as Grand Havens' that prioritize natural resource conservation can give municipalities the authority to scrutinize development proposals in identified sensitive areas.

Where did Environmental Impact Assessments come from?

Environmental Impact Assessments were first introduced at a federal level in the 1969 **National Environmental Policy Act (NEPA)**. NEPA requires federal projects, federal agency decisions, and federal legislation to undergo an environmental review.

The most rigorous form of environmental review that NEPA requires is an Environmental Impact Statement (EIS), which weighs the direct, indirect, and cumulative environmental effects of a federal project, decision, or legislation. If a project requires an EIS, a draft version must be released for public comment with alternatives to the proposed federal project, decision, or legislation. Only then may the federal project, decision, or legislation move forward.

Several states have adopted EIA requirements as **State Environmental Policy Acts (SEPA's)**, including three states neighboring Michigan: Minnesota, Wisconsin, and Indiana. However, Michigan has not adopted EIA legislation and has no state-level EIA requirements.

From ***Bass et al. 2001***

25 City of Grand Haven. SA. Sensitive Areas Overlay district, Chapter 40 Code of Ordinances City of Grand Haven, MI § 40-422 (n.d.).

Site Plan Review

One strategy that a municipality can employ is to require developers to expand their site plans, typically prepared for zoning approvals, with a modified EIA when submitting plans for permitting. This would move the EIA cost from the municipality to the developer, saving taxpayer dollars. If doing so, an important aspect of conducting an EIA is ensuring enough time for site plan review. For example, in Traverse City, only 14 days are permitted for departmental review of a site plan, and this is not enough time for the city to conduct a thorough environmental review. Allowing more time for review can help a community reach its full potential for sustainable development.

Additionally, dedicating time and space to public feedback on the development and its environmental impacts is an important consideration. As demonstrated by the federal standards for conducting an EIA, involving stakeholders in the process can provide better understanding of environmental issues, offer more creative solutions, and ultimately lead to better

What are "Reasonable Alternatives" in an EIS?

NEPA guidelines direct Environmental Impact Statement (EIS) authors to propose **"reasonable alternatives"** to their proposed project, decision, or legislation. At least one of the alternatives has to be a **"no action alternative."** This is an alternative where the proposed project, legislation, or decision does not change any activities; for example, an alternative scenario if a proposed dam were not built, or an alternative scenario where a project to mitigate coastal erosion was not put into place. EIS authors also must include an **"environmentally preferable alternative"** that is the most sound environmental scenario of a federal project, legislation, or decision in alignment with NEPA.

All of these alternatives are weighed when the authors state their **"proposed action"**: what the authors believe would be the best alternative with which to move forward.

From *U.S. Fish and Wildlife Service. "NEPA's Forty Most Asked Questions." NEPA Handbook. U.S. Department of the Interior, n.d.*

decisions in the end.

Legal precedent in Michigan also allows municipalities to hold fees in escrow from a developer submitting a plan for review (if they are fulfilling an ordinance).[26] These fees can be used to hire an outside consulting firm to assist resource-limited municipalities with site plan review.[27]

Authority	*Allows Municipalities to:*	*Prevents Municipalities from:*	*Authority Silent*
Michigan Natural Resource and Environmental Policy Act	Create a zoning ordinance mandating an EIA from developers in critical dune areas	N/A	Zoning ordinances for areas outside critical dunes
Michigan Zoning Enabling Act	Require an environmental assessment when permitting development	N/A	EIA not explicitly enabled, but not prohibited
Michigan Planning Enabling Act	Build environmental procedures into a Master Plan	N/A	N/A

From *Rotrosen 2019, unpublished. Please contact the Community Foundation to see a copy.*

State and County Assistance

The **Michigan Zoning Enabling Act** allows municipalities to "condition approval of zoning permits generally and site plan review specifically, on approvals under statutes administered by other governmental agencies."[28] This gives municipalities the ability to condition site plan approval on a permit from a state agency, placing the onus for a development decision on the agency rather than on a municipality.[29] This option requires developers to get site plan approval from both local municipalities and the state.[30] Additionally, there are some state requirements for developing in

26 Ardizone, Katherine A., and Mark A. Wyckoff. Filling the Gaps: Environmental Protection Options for Local Governments. 2nd ed. Michigan Department of Natural Resources and Environment, Coastal Management Program with financial assistance from the National Oceanic and Atmospheric Administration, authorized by the Coastal Zone Management Act of 1972, 2010.

27 Ibid.

28 Ibid.

29 Ibid.

30 Ibid.

protected environmental areas, such as wetlands and state-designated critical dune areas (CDA's).[31] In order to build in these sensitive environmental areas, developers need to apply for permits from the Department of Environment, Great Lakes and Energy (EGLE).[32]

County and municipality Brownfield Redevelopment Authorities also have the ability to assist developers and communities with brownfield remediation and revitalization projects.[33] There are several Brownfield Redevelopment Authorities in the Grand Traverse region at both the county and municipality level.[34]

Municipal environmental review tool	***Requirements***	***Regulatory force***	***Timeframe***
Master Plan	Any municipality that undertakes master planning	Not legally enforceable	Long-range planning
Municipal Code	Only municipalities with EIA-focused ordinances or conservation/natural resource overlays	Legally enforceable *(municipality)*	Part of development approval process
Site Plan Review	Only municipalities with site plan review ordinances, or review requirements used to administer zoning	Legally enforceable *(municipality)*	Part of development approval process
State Assistance	Development project must have state permit requirements	Legally enforceable *(state)*	State, not municipality, controlled
County Assistance	Development project oversight from a county or municipality Brownfield Redevelopment Authority	Legally enforceable *(state)*	Brownfield development process only

31 Michigan Department of Environment, Great Lakes and Energy. "EGLE - Critical Dunes Area Program." Michigan Department of Environment, Great Lakes, and Energy. Accessed April 15, 2020. https://www.michigan.gov/egle/0,9429,7-135-3311_4114-9832--,00.html.;
———. "EGLE - Local Wetland Regulations." Michigan Department of Environment, Great Lakes, and Energy. Accessed April 15, 2020.
32 Ibid.
33 "Brownfield Redevelopment Authority." Michigan Economic Development Corporation, April 2014.
34 Michigan Department of Environment, Great Lakes and Energy. "Michigan Brownfield Redevelopment Authority List - June 2019." Michigan: Michigan Department of Environment, Great Lakes and Energy, June 2019.

Sample EIA Tool

ment on any given development project. This tool was developed using the EIA framework published in Tom Daniels' ***Environmental Planning Handbook For Sustainable Communities and Regions***, as well as information from local news sources, such as Bridge Magazine and the Record Eagle, on which environmental issues are emerging in the Grand Traverse region.

This sample tool effectively takes the form of a worksheet that's designed to weight various impacts on environmental health resulting from a given development. Each potential impact listed has been selected as a factor that is specifically important to the Grand Traverse Region as a whole; however, not every factor will necessarily be impacted by every development, nor will every impact be considered significant by the surrounding community. To this end, the sample tool provided allows for ranking impacts on an objective scale based on their magnitude, as well as on a subjective scale according to their perceived importance in the community (each on a 0-4 scale). The objective and subjective ranks are multiplied for each factor listed, and all resulting numbers are then added together to create a sum total score that represents how significantly the development will affect the overall surrounding environment. A higher total score equates to a heavier environmental impact. (For complete instructions on using this sample EIA tool, see **Appendix E**.)

As an example, say that a developer in the Traverse Bay area is considering building a new condominium on the lakefront and has been asked to perform an EIA as part of the site approval process. Using this sample tool, the developer may find that the new structure, where sited, will not impose on wetlands or other ecologically valuable land but may increase the risk of beach erosion and runoff water pollution.[35] The developer would fill out all objective impact scores, while the presiding municipality would be responsible for deciding the subjective importance of each factor to the community (perhaps in conjunction with a community engagement process). The resulting overall score from these assessments can then be expressed numerically (and ideally, would be accompanied by a narrative description of

35 Visit http://resilientgreatlakescoast.org for guidance that can help communities better plan for coastal hazards like erosion.

the foreseen impacts). This score may go on to influence the site's approval, or prompt the developer to plan to adopt new mitigation measures.
The above example will, of course, play out differently for different kinds of developments. The goal of this sample tool, however, is to be applicable to a wide range of environmental concerns across the region— as well as to serve as a starting point for municipalities and developers to come together and realistically evaluate (and mitigate) potential impacts. Municipalities, developers, and other involved organizations alike should feel free to adapt or repurpose this sample tool according to their needs, or use it as a model for creating their own standardized format for EIA.

Furthermore, it's important to stress that the EIA process is not complete once an assessment has been conducted. The most important part of EIA is, in fact, what takes place ***after*** the initial assessment— a combination of municipal review, community engagement, and consensus building on next steps. Similar to land suitability analysis, community engagement in particular is a vital part of the process, as it provides community stakeholders and citizens with agency and the ability to voice concerns about the environmental impacts that could result from the proposed development. If nothing else, municipalities should at least seek to disclose likely impacts found through use of the EIA so that the community at large can be aware of what tradeoffs between the environment and the development are being made. Depending on whether or how the EIA has been formalized in municipal codes or site plan review processes (as described above), these assessments also have the potential to require— or at least induce— developers to mitigate harmful impacts or even relocate projects entirely. Hence, EIA can be a powerful tool for not only examining future environmental outcomes, but also for shifting those outcomes to ones more ecologically and socially preferable to a community.
Several communities in Michigan provide good examples of how different aspects of EIAs can be implemented at the local level. For example, the City of

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Grand Haven included a "Sensitive Areas Overlay" in its zoning ordinance to conserve and protect areas within the city that have environmental or cultural significance.[36] These sensitive areas include floodplains, wetlands/streams, dunes/Lake Michigan shoreline, species of concern, and slopes. Any potential development in these areas must be approved by the planning commission, and a public hearing must be held in the same way that is required for any re-zoning. Similar to the purpose of an EIA, This "Sensitive Areas Overlay" helps ensure that ecosystems and natural areas are preserved and remain unharmed by development.

Northville, MI provides another example of successful inclusion of EIA components in planning efforts. Article 32 of the city's zoning ordinance details the requirements for an impact assessment for particular types of developments, including projects that will generate 100 directional vehicle trips, manufactured housing developments, and sand and gravel mining operations.[37] A written impact assessment is also required and must include things like land use maps, a description of the site's natural features, and an explanation of any potential hazardous substances that will be used.

36 City of Grand Haven. SA. Sensitive Areas Overlay district, Chapter 40 Code of Ordinances City of Grand Haven, MI § 40-422 (n.d.). https://library.municode.com/mi/grand_haven/codes/code_of_ordinances?nodeId=PTIICOOR_CH40ZO_ARTIVZODI_S40-422SASEAROVDI.

37 Northville Township. Article 32 - Impact Assessment, Chapter 170 Township of Northville, MI Code § Chapter 170, Article 32 (n.d.). https://www.ecode360.com/8501076.

What's Next?

ENGAGED MICHIGAN
PARTNER

As noted in the opening to this report: the health of the natural environment is imperative for human life—both in terms of supporting us directly with clean air and water, as well as indirectly by allowing for economic development and growth. The environment and the economy are therefore inextricably linked, and present us with tension in terms of deciding how to balance their respective needs. And in Northern Michigan, a place brimming with both astounding natural beauty as well as economic resources, this balancing act can be particularly challenging.

Planning for long-term environmental (and economic) health of such a region is not easy, but it will be essential for promoting the sustainability and resilience of the Grand Traverse Region into the future. It will require strength, tenacity, deliberation, and debate. Broad consensus building between municipalities, developers, citizens, stakeholders, and the numerous organizations already hard at work—like the Community Foundation—will be imperative, and will take time to coordinate. Environmental planning necessitates a keen sensitivity not only to the needs of the environment, but for all of us who make our home in it. To build a true region-wide coalition, planners need to be able to react and respond to the many environmental viewpoints every one of those inhabitants brings to the table.

In creating this report, we hope that by highlighting some of the most important background factors on environmental protection in the Grand Traverse Region, as well as by presenting standard practices like land suitability analysis and environmental impact assessment, we've helped provide solid foundations for the Community Foundation and other regional players to begin interfacing with pressing issues and with each other. These tools offer especially effective ways of not only generating objective information on our surrounding environment, but also in prompting us to think about how we each individually value the environment as well. By equipping themselves with this knowledge, residents of the Grand Traverse Region can ensure its continued sustainability and prosperity for generations to come.

Appendix A: Evaluation Metrics

Land Suitability Analysis	*Evaluation Criteria*
Physical Limitations for Development	Discussed/analyzed? 1=yes; 0=no
Floodplains	Identified? 0 = no; 1 = yes, not detailed; 2 = yes, detailed; 3 = mapped
Steep slopes	Identified? 0 = no; 1 = yes, not detailed; 2 = yes, detailed; 3 = mapped
Fragile natural areas	Identified? 0 = no; 1 = yes, not detailed; 2 = yes, detailed; 3 = mapped Sensitive, stressed, dunes, bluffs, wetlands
Manmade hazards and hazardous activities	Discussed? 1 = yes; 0=no
Regional critical or unique natural resources	Discussed? 1 = yes; 0=no
Site review requirements/ procedures	Discussed? 1 = yes; 0=no

Infrastructure Capacity Analysis	*Evaluation Criteria*
Auto/roadway system quality no	Discussed? 1 = yes; 0=no
Drinking water supply	Discussed? 1 = yes; 0=no
Stormwater management system capacity	Discussed? 1 = yes; 0=no
Wastewater management	Discussed? 1 = yes; 0=no
Police and fire protection	Discussed? 1 = yes; 0=no
Greenways/greenspaces	Discussed? 1 = yes; 0=no
Active recreation facilities (e.g. soccer fields)	Discussed? 1 = yes; 0=no
Community facilities (Schools, parks, recreation centers)	Discussed? 1 = yes; 0=no
Analysis: population and infrastructure	Discussed? 1 = yes; 0=no

Vital Urban Centers	*Evaluation Criteria*
Walkable communities	Specificity: 0 = not present; 1 = present, 2 = detailed
High density concentrated with urban services	Specificity: 0 = not present; 1 = present, 2 = detailed
Investment/reinvestment in developed areas	Specificity: 0 = not present; 1 = present, 2 = detailed
Growth directed to existing urban areas	Specificity: 0 = not present; 1 = present, 2 = detailed
Compact development	Specificity: 0 = not present; 1 = present, 2 = detailed
Socially/environmentally responsible business/ industry	Specificity: 0 = not present; 1 = present, 2 = detailed
Mixed income development	Specificity: 0 = not present; 1 = present, 2 = detailed
Use of local resources (businesses, products, ag.)	Specificity: 0 = not present; 1 = present, 2 = detailed
Natural resource protection w/economic activity	Specificity: 0 = not present; 1 = present, 2 = detailed

Conserved Rural Areas	*Evaluation Criteria*
Low density expansion controlled or limited	Specificity: 0 = not present; 1 = present, 2 = detailed
Growth directed away from resource areas	Specificity: 0 = not present; 1 = present, 2 = detailed
Protection of natural areas, open spaces	Specificity: 0 = not present; 1 = present, 2 = detailed
Tools for ag./OS preservation (e.g. TDR, PDR)	Specificity: 0 = not present; 1 = present, 2 = detailed
Annexation plans/policies	Specificity: 0 = not present; 1 = present, 2 = detailed
Mapping of conservation and development zones	Specificity: 0 = not present; 1 = present, 2 = detailed

Water Quantity and Quality Management	*Evaluation Criteria*
Water Feature Overlay Zone/District	Specificity: 0 = not present; 1 = present, 2 = detailed
Buffer zones near sensitive/unique natural areas	Specificity: 0 = not present; 1 = present, 2 = detailed
Surface water protection, including wetlands	Specificity: 0 = not present; 1 = present, 2 = detailed
Groundwater protection	Specificity: 0 = not present; 1 = present, 2 = detailed
Floodplain development restrictions	Specificity: 0 = not present; 1 = present, 2 = detailed
On-site stormwater management systems	Specificity: 0 = not present; 1 = present, 2 = detailed
Controls on polluting activities	Specificity: 0 = not present; 1 = present, 2 = detailed
Reclamation of brownfield/AOC sites	Specificity: 0 = not present; 1 = present, 2 = detailed
Remediation and/or reuse of brownfield/AOC sites	Specificity: 0 = not present; 1 = present, 2 = detailed

Coastal Area Management Policy	*Evaluation Criteria*
Shoreline protection/ hazard area zoning overlay district	Specificity: 0 = not present; 1 = present, 2 = detailed
Shoreline erosion best management practices	Specificity: 0 = not present; 1 = present, 2 = detailed
Shoreline erosion setback requirement (zoning or other)	Specificity: 0 = not present; 1 = present, 2 = detailed
Public access/ use restrictions	Specificity: 0 = not present; 1 = present, 2 = detailed
Coastal wetlands protection	Specificity: 0 = not present; 1 = present, 2 = detailed
Erosion and sediment control (ESC) ordinances	Specificity: 0 = not present; 1 = present, 2 = detailed
Controls on new septic installation	Specificity: 0 = not present; 1 = present, 2 = detailed
Dune management	Specificity: 0 = not present; 1 = present, 2 = detailed
Public education on coastal management	Specificity: 0 = not present; 1 = present, 2 = detailed

Appendix B: *Potential Criteria for Land Suitability Analysis & Data Sources*

Categories	Criteria	Sources
Topology	**Proximity (Distance to coastline)**	GIS Open Data State of Michigan: http://gis-michigan.opendata.arcgis.com/datasets/counties-v17a
	Slope	USGS 3D Elevation Program: https://viewer.nationalmap.gov/basic/?basemap=b1&category=ned,nedsrc&title=3DEP%20View
	Elevation	USGS 3D Elevation Program: https://viewer.nationalmap.gov/basic/?basemap=b1&category=ned,nedsrc&title=3DEP%20View
	Rock type	GIS Open Data State of Michigan: http://gis-michigan.opendata.arcgis.com/datasets/bedrock-geology
	Soil type	USGS Michigan geologic map data https://mrdata.usgs.gov/geology/state/state.php?state=MI
	Land cover	National Land Cover Database Landcover types: https://www.mrlc.gov/data?f%5B0%5D=category%3Aland%20cover

Categories	Criteria	Sources
Planning	**Zoning**	Michigan GIS Open Data Traverse City zoning map (PDF): http://www.traversecitymi.gov/downloads/zoning_master_may2019_11x17.pdf
	Proximity to greenspaces	Michigan DNR Open Data Landcover types (interactive web map): http://gis-michigan.opendata.arcgis.com/datasets/midnr::mi-hunt-landcover-types Recreation search (interactive web map): https://www2.dnr.state.mi.us/parksandtrails/Default.aspx#map-tab
	Proximity to bus stop (public transportation)	BATA Bay Area Transportation Authority https://www.bata.net/maps-schedules/city-loops.html
	Access to main roads	MDOT Lane Mile Inventory: http://gis-michigan.opendata.arcgis.com/datasets/mdot::mdot-lane-mile-inventory-lmi
	Road density/ accessibility	GIS Open Data State of Michigan: http://gis-michigan.opendata.arcgis.com/datasets/all-roads-v17a
	Proximity to utility services	Consult with local utilities

Categories	Criteria	Sources
Planning	**Proximity to infrastructure**	Health Care: GIS Open Data State of Michigan: http://gis-michigan.opendata.arcgis.com/datasets/health-care Water Wells: Michigan.gov: https://www.michigan.gov/som/0,4669,7-192-78943_78944_78955-427312--,00.html Rest Areas MDOT: http://gis-michigan.opendata.arcgis.com/datasets/mdot::mdot-rest-areas
Environment	**Conservation area**	GIS Open Data State of Michigan: https://gis-michigan.opendata.arcgis.com/datasets/midnr::conservation-easements
	Coastal wetlands	GLAHF- Great Lakes Coastal Wetland Consortium: https://www.glahf.org/data/
	Habitat	MI DNR: https://www.midnr.com/Publications/pdfs/ArcGISOnline/interactivemaps/licenserevenue/ Invasives: GLAHF: https://www.glahf.org/data/

Categories	Criteria	Sources
Environment	**Base flow of streams**	GIS Open Data State of Michigan: https://gis-michigan.opendata.arcgis.com/datasets/midnr::base-flow-of-michigan-streams?geometry=-86.154%2C44.634%2C-84.847%2C44.805
	Water quality	MI DNR: https://gis-michigan.opendata.arcgis.com/datasets/midnr::dnr-drinking-water Michigan surface water information management system: http://www.mcgi.state.mi.us/miswims/
	Flood Zone	FEMA 100 Year (1%) Flood Zones in the U.S.A: https://www.arcgis.com/home/item.html?id=fb549956916548aeb35b33d-86cd90679
	Coastal erosion	MI DNR: https://gis-michigan.opendata.arcgis.com/datasets/midnr::stream-crossing-erosion-information-2/data
	Proximity to pollution source	GLAHF- U.S. EPA Great Lakes National Program Office: https://www.glahf.org/data/

Categories	Criteria	Sources
Demographic	**Population density**	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/
	Community composition	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/
	Race	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/
	Income	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/
	Parcel value	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/

Categories	*Criteria*	*Sources*
	Jobs/Employment	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/
Socioeconomic factors	**Development preference**	Community survey/Vote

Criteria for Prioritizing Land for Conservation

LSAs can be used to prioritize conservation action, including site remediation, invasive species removal, and habitat protection. Below are five criteria that can be used to identify specific threats and recommended conservation areas. See the Grand Traverse Regional Land Conservancy (page 27) and the Kalamazoo River Watershed case studies (page 28) for other examples.

Criteria	*Sources*
Chemicals and pollutants	GLAHF- U.S. EPA Great Lakes National Program Office: https://www.glahf.org/data/
Vulnerable areas including coastal areas, wetlands, and streams	GLAHF- Great Lakes Coastal Wetland Consortium: https://www.glahf.org/data/ GIS Open Data State of Michigan: https://gis-michigan.opendata.arcgis.com/datasets/midnr::base-flow-of-michigan-streams?geometry=-86.154%2C44.634%2C-84.847%2C44.805
Habitat	GLAHF- U.S. EPA Great Lakes National Program Office:: https://www.glahf.org/data/
Invasive species and location	MI DNR https://gis-midnr.opendata.arcgis.com/datasets/cb6fe59fc82240e8a663351fcd7c50db
Land use and management	National Land Cover Database Landcover types: https://www.mrlc.gov/data?f%5B0%5D=category%3Aland%20cover

Criteria for Prioritizing Land for Compact Development

LSAs can also be used to prioritize areas for compact residential and commercial development. Below are criteria that can be used to identify areas that are easily accessible, close to existing development, and close to amenities.

Criteria	*Sources*
Zoning	Michigan GIS Open Data Traverse City zoning map: http://www.traversecitymi.gov/downloads/zoning_master_may2019_11x17.pdf
Demographics	TIGER/Line Shapefiles https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html United States Census Bureau's data https://data.census.gov/cedsci/
Public transportation	BATA Bay area transportation authority https://www.bata.net/maps-schedules/city-loops.html
Accessibility	GIS Open Data State of Michigan: http://gis-michigan.opendata.arcgis.com/datasets/all-roads-v17a
Parcel size and value	Grand Traverse County Mapping Gallery http://www.co.grand-traverse.mi.us/467/Mapping-Gallery
Proximity to utility services	Consult with local utilities
Soil type	USGS Michigan geologic map data https://mrdata.usgs.gov/geology/state/state.php?state=MI

Appendix C: Pairwise Comparison

Pairwise Comparison is another LSA method that involves survey and ranking of factors by regional experts. Factors are ranked against one another using numbers from 1 to 9. A rank of 1 denotes low importance, while 9 denotes high importance. Given two factors, for example, an expert might rank them as follows:

- 1/1 = Equally low importance
- 9/9 = Equally high importance
- 1/9 = First factor is of very low importance compared to the second
- 9/1 = First factor is of very high importance compared to the second
- 7/5 = First factor is of somewhat higher importance compared to the second

	Criteria A	Scale									Scale								Criteria B
		9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
1	Slope																		Elevation
2	Slope																		Land Type
3	Slope																		Top Soil Texture
4	Slope																		Soil pH
5	Slope																		Flood Prone
6	Slope																		Temperature
7	Slope																		Rainfall

Appendix D: Other Resources

Reports and Guidebooks

- Filling the Gaps: Environmental Protection Options for Local Governments
- Protecting Michigan's Wetlands: A Guide for Local Governments

Organizations and Consultants

- Networks Northwest
- LIAA
- Michigan universities
- MSU Michigan Natural Features Inventory: Communities can contract with MSU to create a comprehensive natural features inventory.
- Planning consultants

Appendix E: *Sample Environmental Impact Assessment Tool*

Purpose of Tool

- Quantify the potential impact a given development will have on its surrounding natural and built environment (including related social/cultural and economic features).
- Aid public understanding and increase the transparency of the potential impact by expressing it through descriptive categories, which range from no-impact to high-impact.
- Facilitate comparison between different development projects or between multiple possible locations for a single development project to better inform community land use decisions and policy.

Instructions

1. Read through all the Development Description categories and the Severity Ratings. Determine how important each category is to your community and fill in the Importance Rating column accordingly, assigning each category a level of importance between 1 and 3 (refrain from using decimals). Once completed, make a copy of the Environmental Impact Assessment Tool, now tailored to your community, for future use on all developments to be assessed.

   Tip: *To determine the importance of each category to your community, consider a variety of options - a community-wide survey, council session, and/or municipal staff meeting could be used to determine importance.*
2. Begin the Environmental Impact Assessment. If a category is not applicable to the development being assessed, cross out the row for that impact and alter your final cumulative impact score ranges (instructions for how to do this included in the **Final Summed Impact Score** section*).

Example: *If a category says "Development is located on a coastal bluff" but the development you are evaluating is located inland, cross out that category.*

3. Proceed down the list starting with the first category. Read the Development Description, review the Importance Rating which you have assigned for that impact, then circle the anticipated severity of the impact as described in the Severity Rating column. Use only whole numbers ranging from 0 to 3 and refrain from using decimals – if a description does not
   perfectly fit the anticipated scenario, select the closest one. Then, multiply the Importance Rating and the Severity Rating together, and write your result in the Impact Score column. Complete the described procedure for every category on the list until you reach the bottom.
4. Add together all your impact scores and write the result in the Total box at the bottom.
5. Compare your final score to the categories under the Final Summed Impact Score section to determine the anticipated impact of the development on the environment and its associated economic and social/cultural features.
6. Include your results with the development proposal as presented to the community's elected officials or planning department and make it available to the general public so they can provide public comment on the development (either at a public meeting or as written feedback).

Environmental Impact Assessment

Development Project:
Developer:
Location:
Date Assessed:
Assessor:

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is habitat for game animals that rely on the site for shelter, food, mating, or as a migratory location.		**0** – Development does not affect the game species or its habitat. **1** – Development displaces some of the game population but suitable land/habitat is available nearby to accommodate the change. With little management the population remains stable. **2** – Development displaces some of the game population and little suitable land/habitat is available nearby. The population's numbers decline somewhat and careful management is needed to keep the population stable. **3** – Development displaces all of the game population and no suitable land/habitat is available nearby. The population's numbers plummet and severe management is needed to keep the population stable.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is habitat for a protected species of plant or animal.		**0** – Development does not affect the protected species or its habitat. **1** – Development displaces some of the protected species but suitable land/ habitat is available nearby to accommodate the change. With little management the species' population remains stable. **2** – Development displaces some of the protected species and little suitable land/habitat is available nearby. The protected species' numbers decline somewhat and careful management is needed to keep the population stable. **3** – Development displaces all of the protected species and no suitable land/habitat is available nearby. The species' numbers plummet and severe management is needed to keep the population stable.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is habitat for an unprotected species of native plant or animal.		**0** – Development does not affect the native species or its habitat. **1** – Development displaces some of the native species' population but suitable land/ habitat is available nearby to accommodate the change. With little management the population remains stable. **2** – Development displaces some of the native species' population and little suitable land/habitat is available nearby. The native species' numbers decline somewhat and careful management is needed to keep the population stable. **3** – Development displaces all of the native species' population and no suitable land/habitat is available nearby. The population's numbers plummet and severe management is needed to keep the population stable.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site with healthy topsoil suitable for agriculture.		**0** – Development does not affect or displace topsoil. **1** – Development displaces some topsoil, but it is successfully relocated to another site for agricultural use with little management. **2** – Development displaces some topsoil and it is not relocated to another site for agricultural use. Management is needed to mitigate the effect of the loss on the local agricultural system. **3** – Development displaces all or almost all topsoil and is it not relocated to another site for agricultural use. Intensive management is needed to mitigate the effect of the loss on the local agricultural system.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site currently occupied by forestland used for timber production.		**0** – Development does not affect the timber capacity of the site. **1** – Development marginally reduces the capacity of the site to produce timber and minimal to no management is needed to compensate for the loss. **2** – Development significantly reduces the capacity of the site to produce timber but, with careful management, the loss can be compensated for nearby. **3** – Development significantly reduces or entirely eliminates the capacity of the site to produce timber and extreme management is needed to mitigate the loss.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site currently occupied by natural open space (forest, meadow, marsh, etc.) that is used for recreation.		**0** – Development does not affect the use of the site for recreation. **1** – Development mildly impacts the quality of the site for recreation AND/ OR marginally reduces the area available for recreation. Minimal to no management is required to compensate for the effects on recreation. **2** – Development substantially impacts the quality of the site for recreation AND/OR substantially reduces the area available for recreation. Careful management is required to compensate for the effects on recreation. **3** – Development severely diminishes the quality of the site for recreation AND/OR almost or completely eliminates the area available for recreation. Extreme management is required to compensate for the effects on recreation.	

Impact *Description of development feature to be assessed.*	Importance Rating *1 – not very important* *2 – somewhat important* *3 – very important*	Severity Rating	Impact Score *(Importance Rating x Severity Rating)*
Development is on a site currently occupied by natural open space (forest, meadow, marsh, etc.) that is used for cultural/spiritual practices.		**0** – Development does not affect the use of the site for cultural/spiritual practices. **1** – Development mildly impacts the features of the site used for cultural/ spiritual practices AND/OR marginally reduces the area available for cultural/ spiritual practices. Minimal to no management is required to compensate for the effects on cultural/ spiritual heritage. **2** – Development substantially impacts the features of the site used for cultural/spiritual practices AND/OR substantially reduces the area available for cultural/spiritual practices. Careful management is required to compensate for the effects on cultural/ spiritual heritage. **3** – Development severely diminishes the features of the site used for cultural/spiritual practices AND/OR almost or completely eliminates the area available for cultural/spiritual practices. Extreme management is required to compensate for the effects on cultural/spiritual heritage.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site currently occupied by natural open space (forest, meadow, marsh, etc.) that provides a biological service, such as pollination or stormwater sequestration, for the community.		**0** – Development does not affect the capacity of the site to perform its biological service. **1** – Development mildly impacts the capacity of the site to perform its biological service. Minimal to no management is required to compensate for the effects on the ecosystems and humans benefiting from the services. **2** – Development substantially impacts the capacity of the site to perform its biological service. Careful management is required to compensate for the effects on the ecosystems and humans benefiting from the services. **3** – Development severely diminishes or completely destroys the capacity of the site to perform its biological service. Extreme management is required to compensate for the effects on the ecosystems and humans benefiting from the services.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is not currently serviced by existing road infrastructure.		**0** – Development does not require the extension of road infrastructure OR the development is already encompassed by, and is consistent with, the Capital Improvements Plan. **1** – Development is adjacent to a site that is already serviced by road infrastructure and will require a minor expansion of the Capital Improvements Plan. **2** – Development is not adjacent to a site that is already serviced by road infrastructure and will require moderate expansion of the Capital Improvements Plan. **3** – Development is very far from any site that is already serviced by road infrastructure and will require substantial expansion of the Capital Improvements Plan.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is not currently serviced by existing water infrastructure.		**0** – Development does not require the extension of water infrastructure OR the development is already encompassed by, and is consistent with, the Capital Improvements Plan. **1** – Development is adjacent to a site that is already serviced by water infrastructure and will require a minor expansion of the Capital Improvements Plan. **2** – Development is not adjacent to a site that is already serviced by water infrastructure and will require moderate expansion of the Capital Improvements Plan. **3** – Development is very far from any site that is already serviced by water infrastructure and will require substantial expansion of the Capital Improvements Plan.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is not currently serviced by existing energy infrastructure.		**0** – Development does not require the extension of energy infrastructure OR the development is already encompassed by, and is consistent with, the Capital Improvements Plan. **1** – Development is adjacent to a site that is already serviced by energy infrastructure and will require a minor expansion of the Capital Improvements Plan. **2** – Development is not adjacent to a site that is already serviced by energy infrastructure and will require moderate expansion of the Capital Improvements Plan. **3** – Development is very far from any site that is already serviced by energy infrastructure and will require substantial expansion of the Capital Improvements Plan.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is not currently serviced by existing natural gas infrastructure.		**0** – Development does not require the extension of natural gas infrastructure OR the development is already encompassed by, and is consistent with, the Capital Improvements Plan. **1** – Development is adjacent to a site that is already serviced by natural gas infrastructure and will require a minor expansion of the Capital Improvements Plan. **2** – Development is not adjacent to a site that is already serviced by natural gas infrastructure and will require moderate expansion of the Capital Improvements Plan. **3** – Development is very far from any site that is already serviced by natural gas infrastructure and will require substantial expansion of the Capital Improvements Plan.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is not currently serviced by existing sewer infrastructure.		**0** – Development does not require the extension of sewer infrastructure OR the development is already encompassed by, and is consistent with, the Capital Improvements Plan. **1** – Development is adjacent to a site that is already serviced by sewer infrastructure and will require a minor expansion of the Capital Improvements Plan. **2** – Development is not adjacent to a site that is already serviced by sewer infrastructure and will require moderate expansion of the Capital Improvements Plan. **3** – Development is very far from any site that is already serviced by sewer infrastructure and will require substantial expansion of the Capital Improvements Plan.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that includes a unique landform (e.g., steep bluffs, special rock formations, caverns).		**0** – Development does not affect the unique landform. **1** – Development mildly diminishes the quality of the unique landform. Minimal management is needed to mitigate any effects. **2** – Development significantly diminishes the quality of the unique landform. Careful management is needed to mitigate any effects. **3** – Development severely diminishes the quality of, or completely eradicates, the unique landform. Extreme management is needed to preserve or mitigate any effects on the landform.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on or adjacent to a site that includes a wetland, marsh, pond, vernal pool, or other water-based natural feature under 5 acres (not protected under state law) that provides ecosystem services (habitat for animals and plants, scenic views, water filtration, carbon sequestration, etc.).		**0** – Development does not affect the water-based natural feature. **1** – Development encroaches on the water-based natural feature and marginally diminishes its quality and/or size. Minimal management is needed to mitigate any impact on the feature or the ecosystem services it provides. **2** – A moderate to substantial portion of the water-based feature is degraded or eradicated to accommodate the development. Careful management is needed to mitigate any impact on the feature or the ecosystem services it provides. **3** – A substantial portion or all of the water-based feature is degraded or eradicated to accommodate the development. Extreme management is needed to mitigate any impact on the feature and to maintain the ecosystem services it provides.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on or adjacent to a site that contains a creek or other flowing surface water source.		**0** – Development does not affect the flowing surface water source. **1** – Development mildly impacts the flowing surface water source (e.g., mild sedimentation during construction or slight change in shape of the creek's banks). Little to no management is needed to maintain the quality of the water source. **2** – Development moderately to substantially impacts the flowing surface water source (e.g., creek's banks start eroding, path of creek has to be changed, water chemistry notably changes). Careful management is needed to maintain the quality of the water source and avoid affecting those downstream. **3** – Development severely impacts the flowing surface water source (e.g., creek is completely covered and diverted, heavy pollution runs off the site into the water source). Extreme management and treatment is needed to maintain the quality of the water source and avoid affecting those downstream.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development includes impervious surfaces (pavement, lawn, shingles, and compacted dirt).		**0** – Development's increase in impervious surface area does not result in increased runoff from the site. **1** – Development's increase in impervious surface area mildly increases the amount of runoff from the site but the runoff is very low in pollutants and of low enough volume that it can be absorbed by natural features. Little to no management is needed to mitigate any effects from the runoff. **2** – Development's increase in impervious surface area substantially increases the amount of runoff, which has a moderate pollutant load and cannot readily be accommodated by natural features. Moderate or careful management is needed to collect and treat the runoff. **3** – Development's increase in impervious surface area severely increases the amount of runoff, which is high in pollutants. Extreme management (e.g., installing storm sewers or extensive green infrastructure) is needed to collect and treat the runoff.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that is a stormwater source for sustaining a nearby hydrologic feature (e.g. pond, wetland).		**0** – Development does not affect the stormwater drainage patterns of the site and thus does not affect the nearby hydrologic feature. **1** – Development mildly affects the stormwater drainage pattern on site. Minimal alteration of drainage patterns is needed so they continue to support the hydrologic feature. **2** – Development substantially affects the stormwater drainage pattern on site. Careful management and alteration of drainage patterns is needed so they continue to support the hydrologic feature. **3** – Development severely affects the stormwater drainage pattern on site. Extreme management and alteration of drainage patterns is needed so they continue to support the hydrologic feature.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development requires site regrading.		**0** – Regrading is extremely minimal and does not produce any erosion or sedimentation in nearby water bodies. No management is needed. **1** – Regrading is moderate and produces some erosion or sedimentation in nearby water bodies. Minimal management during construction is needed to maintain the quality of the affected ecosystem or water body. **2** – Regrading is substantial and produces notable erosion or sedimentation in nearby water bodies. Careful management during and after construction is needed to maintain the quality of the affected ecosystem or water body. **3** – Regrading is severe and produces a heavy amount of erosion or sedimentation in nearby water bodies, permanently threatening their quality. Extreme management during and after construction is needed to maintain the quality of the affected ecosystem or water body.	

Impact *Description of development feature to be assessed.*	Importance Rating *1 – not very important* *2 – somewhat important* *3 – very important*	Severity Rating	Impact Score *(Importance Rating x Severity Rating)*
Development is near a coastal bluff subject to great lakes shoreline erosion.		**0** – Development is far back enough that it is not at any risk from rising lake levels and requires no mitigation/ adaptation. **1** – Development is at a distance which puts it at some risk from rising lake levels. Minimal management (e.g., green infrastructure along the shore) is needed to protect it from erosion and falling off the bluff. Without management, there is a chance the development would be damaged but not destroyed. **2** – Development is at a distance which puts it at substantial risk from rising lake levels. Careful or severe management (e.g., bank reinforcements, large-scale green infrastructure) is needed to protect it from erosion and falling off the bluff. Without management, the development would certainly be damaged and likely be destroyed. **3** – Development is at a distance which puts it at very high risk of damage from rising lake levels. Extreme management (e.g., armoring) is needed to protect it from erosion and falling off the bluff. Without management, the development would certainly be destroyed.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is near or in a floodplain. **NOTE**: Foremost, obey FEMA specifications for construction in a floodplain.		**0** – Development is far back enough that it is not at any risk of flood damage. **1** – Development is close enough that it is at some risk of flood damage. Minimal management is needed to mitigate any effects from a flood event. **2** – Development is close enough that it is at moderate or substantial risk of flood damage. Careful management is needed to mitigate any effects from a flood event. **3** – Development is close enough that it is at high risk of flood damage. Extreme management is needed to mitigate any effects from a flood event.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site above an aquifer or other groundwater source for the community.		**0** – Development does not affect the quality/quantity of groundwater available to the community. **1** – Development requires more water than the average site AND/OR slightly contaminates the g roundwater, mildly affecting the quality/quantity of groundwater available to the community. Moderate management is needed to mitigate any effects on groundwater quality/quantity. **2** – Development requires substantially more water than the average site AND/OR moderately contaminates the groundwater, significantly affecting the quality/quantity of groundwater available to the community. Careful management is needed to mitigate any effects on groundwater quality/quantity. **3** – Development requires an extreme amount of water compared to the average site AND/OR heavily contaminates the groundwater, severely (or permanently) affecting the quality/quantity of groundwater available to the community. Extreme management is needed to mitigate any effects on groundwater quality/quantity.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site that hosts a scenic view or access (visual or physical) to a scenic view.		**0** – Development does not block the scenic view or access to it. **1** – Development marginally blocks the scenic view or access to it and the experience is largely unaffected. **2** – Development significantly blocks the scenic view or access to it and the experience is moderately diminished. **3** – Development severely blocks, or completely eradicates, the scenic view or access to it and the experience is completely diminished.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development produces air pollution.		**0** – Air pollution is extremely minimal (e.g., a wood stove) and does not affect overall air quality, human health, or the health of other species. **1** – Air pollution is mild and has a small effect on overall air quality, human health, or the health of other species. Minimal management is needed to mitigate any effects from the pollution. **2** – Air pollution is substantial and has a notable effect on overall air quality, human health, or the health of other species. Careful management is needed to mitigate any effects from the pollution. **3** – Air pollution is severe and has a dramatic effect on overall air quality, human health, or the health of other species. Extreme Management is needed to mitigate any effects from the pollution.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development produces noise pollution.		**0** – Noise pollution is extremely minimal (e.g., a lawn mower) and does not affect human health or the health of other species. **1** – Noise pollution is mild and has a small effect on overall human health or the health of other species. Minimal management is needed to mitigate any effects from the pollution. **2** – Air pollution is substantial and has a notable effect on human health or the health of other species. Careful management is needed to mitigate any effects from the pollution. **3** – Air pollution is severe and has a dramatic effect on human health or the health of other species. Extreme Management is needed to mitigate any effects from the pollution.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development produces light pollution.		**0** – Light pollution is extremely minimal (e.g., a flood light) and does not affect human health or the health of other species. **1** – Light pollution is mild and has a small effect on human health or the health of other species. Minimal management is needed to mitigate any effects from the pollution. **2** – Light pollution is substantial and has a notable effect on human health or the health of other species. Careful management is needed to mitigate any effects from the pollution. **3** – Light pollution is severe and has a dramatic effect on human health or the health of other species. Extreme Management is needed to mitigate any effects from the pollution.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development discharges heated effluent (heat pollution) into a nearby surface water body.		**0** – Heated effluent does not affect the temperature of the water body into which it is discharged. **1** – Heated effluent is low in temperature and/or volume and slightly raises the temperature of the water body into which it is discharged, threatening some species. Minimal management is needed to mitigate any effects on the water body or aquatic ecosystems. **2** – Heated effluent is moderate in temperature and/or volume and substantially raises the temperature of the water body into which it is discharged, threatening many species. Careful management is needed to mitigate any effects on the water body or aquatic ecosystems. 3 – Heated effluent is high in temperature and/or volume and dramatically raises the temperature of the water body into which it is discharged, threatening almost all species. Extreme management is needed to mitigate any effects on the water body or aquatic ecosystems.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development discharges pollution directly into a nearby surface water body.		**0** – Direct pollution is extremely minimal (e.g., bath-tub water) and does not affect the health of the water body, the ecosystems it supports, or the other humans that use it. **1** – Direct pollution is low in quantity and/or toxicity and mildly affects the health of the water body, the ecosystems it supports, or the other humans that use it. Minimal management is needed to mitigate any effects on the water body or its users. **2** – Direct pollution is moderate in quantity and/or toxicity and substantially affects the health of the water body, the ecosystems it supports, or the other humans that use it. Careful management is needed to mitigate any effects on the water body or its users. **3** – Direct pollution is high in quantity and/or toxicity and severely affects the health of the water body, the ecosystems it supports, or the other humans that use it. Extreme management is needed to mitigate any effects on the water body or its users.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development contains a septic system.		**0** – Septic system is designed to high standards and in a proper location (e.g., good soil type, correct depth) to ensure it does not affect the health of nearby humans or ecosystems through leakage. **1** – Septic system is designed to high standards, in a poor location (e.g., bad soil type, incorrect depth), and mildly affects the health of nearby humans or ecosystems through leakage. **2** – Septic system is designed to low standards (e.g., too small), in a poor location, and substantially affects the health of nearby humans or ecosystems through leakage. **3** – Septic system is completely inadequate for the development, in a poor location, and severely affects the health of nearby humans or ecosystems through leakage.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development will produce solid waste.		**0** – Solid waste production is extremely minimal (e.g., household trash), does not require special accommodations, and does not affect the health of nearby humans or ecosystems. Contamination of the environment is negligible. **1** – Solid waste production is low in quantity and/or toxicity, requires some special accommodations (e.g., dumpster pickup), and mildly affects the health of nearby humans or ecosystems. Contamination of the environment is mild and minimal management is needed. **2** – Solid waste production is moderate in quantity and/or toxicity, requires special accommodations (e.g., unique trucks and storage), and substantially affects the health of nearby humans or ecosystems. Contamination of the environment is notable and careful management is needed. **3** – Solid waste production is high in quantity and/or toxicity, requires some special accommodations (e.g., on-site treatment, underground storage), and mildly affects the health of nearby humans or ecosystems. Contamination of the environment is severe and extreme management is needed.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site with a historical structure and/or archeological artifact.		**0** – Development is constructed in a way so that it does not affect the historical/archeological feature of the site. **1** – Development requires some minor alteration to or moving of the historic/ archaeological feature, but with management it remains largely intact and unaffected. **2** – Development requires substantial alteration to or moving of the historic/ archaeological feature and with careful management it remains partially intact. **3** – Development eradicated the historic/ archeological feature completely.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development has the potential to spur additional peripheral development in the area.		**0** – Development's influence on development in the area is negligible. **1** – Development is unlikely to spur additional peripheral development in the area. **2** – Development is likely to spur additional peripheral development in the area. **3** – Development is almost certain to spur additional peripheral development in the area.	
Automotive travel to and from the development site will occur (whether it is residential, industrial, commercial, or otherwise).		**0** – Development's use will not result in an increase in local/regional traffic volume, congestion, or typical commute distance. **1** – Development's use will mildly increase the local/regional traffic volume, congestion, or typical commute distance. **2** – Development's use will substantially increase the local/regional traffic volume, congestion, or typical commute distance. **3** – Development's use will dramatically increase the local/regional traffic volume, congestion, or typical commute distance.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
Development is on a site currently occupied by workforce housing.		**0** – Development does not displace existing workforce housing nor raise its price above that considered to be workforce-accessible. **1** – Development displaces a small amount of workforce housing and/or marginally raises its price above that considered to be workforce-accessible. A small number of housing units are needed elsewhere to compensate. **2** – Development displaces a moderate amount of workforce housing and/or significantly raises its price above that considered to be workforce-accessible. A substantial number of housing units are needed elsewhere to compensate. **3** – Development displaces all workforce housing and/or raises its price completely beyond that considered to be workforce-accessible. An equal number (all) of housing units are needed elsewhere to compensate.	

Impact *Description of development feature to be assessed.*	**Importance Rating** *1 – not very important* *2 – somewhat important* *3 – very important*	**Severity Rating**	**Impact Score** *(Importance Rating x Severity Rating)*
			TOTAL:

*Final Summed Impact Score**

No/Very Mild Impact *(Score From 0-15)*

Most of the development's anticipated impacts on the natural environment (including related social/cultural and economic features) are nonexistent or mild.

Mild Impact *(Score From 16-57)*

Many of the development's anticipated impacts on the natural environment (including related social/cultural and economic features) are mild and some are moderate.

Moderate Impact *(Score From 58-94)*

Most of the development's anticipated impacts on the natural environment (including related social/cultural and economic features) are moderate.

Substantial Impact *(Score From 95-120)*

Many of the development's anticipated impacts on the natural environment (including related social/cultural and economic features) are moderate and some are severe.

Severe Impact *(Score From 121-315)*

Most of the development's anticipated impacts on the natural environment (including related social/cultural and economic features) are severe.

If you removed any impacts altogether because they were not applicable to your community, please use the following instructions to alter your final cumulative impact score ranges:

- *Count the number of impacts removed and multiply the total by 3 (the maximum severity rating a given impact can have).*
  Example: Four impacts were removed so 4 x 3 = 12.
- *Deduct your resulting number from each of the score ranges' high and low values, excluding 0 in the No/Very Mild Impact category.*
  Example: No/Very Mild Impact score range is now from 0 to 3 (calculated as 15 – 12 = 3).
  Substantial Impact score range is now from 95 to 108 (calculated as 95 – 12 = 83 and 120 – 12 = 108, respectively).

***Note**: If you removed so many categories that the maximum score for the No/Very Mild score range is a negative number, you may readjust the categories as needed to fit your community's unique scenario.*

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