

# THE BLUE COMMUNITIES INITIATIVE:

Empowering communities to  
instill the value of water at the  
heart of all they do

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## ABSTRACT

Freshwater plays a vital role in our day to day lives. It provides us with sustenance, acts as a key driver of our economy, and supports the natural resources that often provide us with a sense of place. However, climate change, urban sprawl and a host of related problems threaten to degrade this vital resource. As a result, the Blue Communities Initiative is a framework for collaborative watershed management that aims to promote long-term water stewardship in community decision-making across the Great Lakes, beginning with a pilot in the Grand Traverse Bay region of northwestern Michigan's lower peninsula.

Throughout our project, we identified a set of best practices for sustainable water management relating to water resources management, water-sensitive infrastructure, and collaboration. Through literature reviews, we established a set of principles for water resource management that can be integrated into a Blue Community's decision-making processes, such as the Public Trust doctrine, water values, measurement, and governance. Geospatial analysis and case studies enabled us to evaluate the growing threats of urban sprawl and climate change within the Grand Traverse Bay region and to identify potential green infrastructure solutions to mitigate the impacts. Stakeholder discussions, surveys, and interviews gave us insight into local freshwater issues and collaborative processes. Overall, we were able to identify gaps in current water management and community decision-making processes in order to inform the initial development and next steps of the Blue Communities Initiative. However, the success of a Blue Community ultimately depends on local stakeholders and their concern for water resources, support for collaborative initiatives, continual dialogue and cooperation, and ability to unite behind common water stewardship goals and measures.

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# INTRODUCTION

Freshwater's significance lies in the life-sustaining, economic, cultural, and environmental values that it provides. Given current and emerging threats, such as population growth and climate change, proper water stewardship is becoming more urgent than ever. Although almost three quarters of the Earth is covered in water, less than 1% of it is freshwater and accessible to humans. The rest is saline, locked up in the form of glaciers and ice caps, or difficult and impractical to obtain (Gleick 1993). Furthermore, water use and withdrawals, pollution, invasive species, and continued land development have all contributed to a reduction in potable fresh water (Furniss 2010). Arid regions are most likely to suffer from poor water stewardship practices, with concerns that major conflicts will be fought over water access. For instance, freshwater is often a point of contention in the arid American west, where polluting freshwater sources can bring about huge monetary penalties, cumulative withdrawals often exceed water availability, and limited water resources lead to fierce competition for allocations. Meanwhile, in areas of relative freshwater abundance, negligence and carelessness can have implications for freshwater resources. While areas of aridity hold most of the resource management attention, the Blue Communities Initiative aims to promote proactive water management to sustain freshwater-based quality of life in places where freshwater is seemingly abundant.

Despite the region's humid climate and apparent freshwater abundance, water stewardship in the Great Lakes is urgently needed because: 1) it has a finite water budget, 2) Great Lakes communities depend on the water, 3) much of the water is impaired, and 4) the looming threats of population growth and climate change (Watershed Quality Assessment Report). The Great Lakes hold roughly 20% of the world's supply of surface freshwater and 84% of North America's freshwater resources (Great Lakes Basin Advisory Council 2010). Despite this, the Great Lakes does not receive a huge annual input of water. The water abundance around the lakes lies in the storage capacity, which provides residents with security and stability. However, this humid region typically only receives 32 inches of rainfall per year (Climate Michigan). Withdrawing more water than what is annually replenished by rain would theoretically lead to a depletion of the resource. Furthermore, a whole host of issues already plague this huge freshwater resource, including nutrient runoff, increased urbanization, intense agricultural practices, invasive species, and old, failing infrastructure (Kraff & Steinman 2018).

The Blue Communities Initiative seeks to foster a sustainable water stewardship ethic in communities bordering the Great Lakes. Through the determination of water-based outcomes and goals, the initiative aims to reorient a community's decision-making towards the sustainability of freshwater resources. These water-based outcomes will be determined by local community stakeholders through collaboration and engagement and form the basis for a common agenda. Stakeholders can then develop more concrete steps to achieving this shared vision. In this report, our student team will provide recommendations for best management practices. However, the success of a Blue Community ultimately depends on

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local stakeholders and their concern about water resources, support for a collaborative initiative, sustainable dialogue and cooperation, and unity behind common water stewardship goals and measures.

Due to the care, concern, and support of locals, the Grand Traverse Bay region in northwestern Michigan is the ideal location for the pilot of the Blue Communities Initiative. Threats to the Great Lakes have not completely escaped the public's notice, and many residents are interested in protecting this freshwater resource. Within the Great Lakes basin, a 2018 International Joint Commission (IJC) citizen survey found that about 88% of respondents identified the importance of protecting the Great Lakes in some form or another (International Joint Commission 2018). Similarly, in the Grand Traverse Bay area, our discussions with local organizations and citizens indicated broad support for environmentally-friendly projects. In addition, the project client, For Love of Water (FLOW), speaks highly of the care and concern that local residents, businesses, and tribes have for the surrounding natural resources.

Achieving and sustaining desired freshwater outcomes in the Grand Traverse Bay region will benefit tourism, economy, and drinking water. Due to these land-water interactions, the incorporation of more water-sustainable thinking into urban planning and ordinances is a necessary part of a Blue Community. The region's natural resources have contributed to its status as a premier tourist attraction, bolstering the economies and becoming a huge source of revenue for several townships in the watershed (U'Ren 2005). The area's freshwater resources also support some of the fastest growing counties in the state of Michigan, and growth is expected to continue at a steady pace (Ibid.). However, continued growth will only put more pressure on the natural ecosystem as urban and commercial development vie for land and access to natural resources (i.e., view of the bay, river etc.) and escalate current anthropogenic impacts. Residents require access to clean water for drinking and other basic needs, and the ability to meet this need will be challenged by a growing population and increasingly stressed water resources.

With a growing population and increasing urbanization, the health and sustainability of the region's freshwater resources also depends on the recognition of the connection between surface water and groundwater. Due to an "out of sight, out of mind" mentality, groundwater is often ignored until there is a major problem (Howard & Gerber 2018). Yet, the Grand Traverse Bay watershed holds an immense amount of groundwater important for drinking water and aquatic ecosystems (Howard and Gerber 2018). Some have estimated that the amount of groundwater in the Great Lakes basin is equivalent to the amount of water in Lake Huron, hence the nickname the sixth Great Lake (Dempsey 2018; Grannemann & Van Stempvoort 2015). However, researchers have found that urban communities around the Great Lakes contribute regularly to pollution in shallow aquifers (Howard & Gerber 2018). Traverse City, the largest municipality in the Grand Traverse Bay watershed, is a large urban area that is projected to continue growing (Crissman 2018). More urban growth means more impervious pavement, which reduces groundwater infiltration and increases the amount of pollutants being washed off the surface and contaminating groundwater. Increasing stormwater runoff, which picks up chemicals and other pollutants, could lead to the pollution of local sources of drinking water and negatively affect Great Lakes communities.

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Besides the immediate effect of the pollutants on the drinking water supply, these aquifers empty into and pollute the Great Lakes through tributaries and groundwater discharges along the coast (Howard & Gerber 2018).

Planning for a resilient, water-sustainable future also requires considering climate change impacts and developing the capacity to adapt to these changes. One of the predicted impacts in Grand Traverse Bay is a warmer, wetter winter. A warm winter means that more precipitation falls as rain instead of snow, increasing nutrient runoff into rivers, streams and lakes (Nissen 2017). Nutrient-laden runoff could cause algal blooms in the Great Lakes, which reduces water quality. In places that lean heavily on summer tourism, like Traverse City, planning for increased runoff is paramount for maintaining water clarity. Climate change will also impact Grand Traverse Bay through increasing storm intensity and frequency and greater short-term lake level variability (Hyndman et al. 2016). In addition to direct climate change impacts, the potential for a huge influx of people is an indirect effect of climate change abroad. While climate change will encompass the planet, certain regions, such as the Great Lakes basin and surrounding states, will experience a smaller impact than others because of their location (Usher 2017). While predicting climate-driven migration is very difficult, some experts acknowledge that a warming climate could drive people north, increasing urban development, runoff issues, and natural resource degradation (Ibid.). While it is uncertain what the effects of climate change will be in the state of Michigan or Grand Traverse Bay, what is known for certain is that the way we manage our freshwater resources cannot remain static in these changing times.



Grand Traverse Bay - Photo Credit: Jerry Stutzman



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# WATER FOR ALL

At the heart of a Blue Community is the basic idea that water is a human right. But how can we ensure that water is clean, plentiful, affordable, and accessible to all? This question is difficult to answer, and there is no “one-size-fits-all” solution. As a result, the idea of Blue Communities is based on a set of principles that a community should consider as they establish their own path towards placing water at the forefront of their decision-making. This path will always be a work in progress because a Blue Community is a community that is continually striving to change the way people think about water and their stewardship and management of that water.

Blue Communities is founded on applying the Public Trust doctrine towards preserving water quality, quantity, and accessibility for all. The Public Trust doctrine is a legal doctrine that holds the state government accountable for protecting natural resources, including freshwater, for the enjoyment of current and future generations, thus structuring the relationship between citizens, the government, and natural resources (Smith 2011). In the past, water resources were largely managed through top-down, fragmented approaches. However, these types of approaches may no longer be viable as water systems become increasingly stressed by threats such as population growth and climate change. As beneficiaries of the public trust, communities have a stake in how water resources are managed to address these challenges.

Community involvement, through collaboration, provides opportunities for greater recognition of water’s environmental, social, cultural, and economic values and its overall importance in our society. Every decision that is made regarding water reflects the values that the decision-makers hold. Therefore, values determine what are considered necessary uses of water and what impacts our actions will have on lakes and rivers (Groenfeldt 2013). For instance, prioritizing economic benefits and neglecting environmental or social values may have consequences for aquatic ecosystems or disadvantaged communities. Regardless of our values, humans will impact water resources. We have the opportunity to determine what the impacts will be.

Even so, water values are rarely made explicit in decision-making processes. As a result, water is often undervalued, contributing to its misuse and misallocation (Barnett 2011). Recognizing the undervaluing of water as a global issue, the United Nations Secretary General and World Group President convened the High Level Panel of Water, which developed the Bellagio Principles on Valuing Water to help achieve the United Nations’ Sustainable Development Goals (Table 1) (Global Water Partnership 2017). The Bellagio Principles highlight a need for the explicit identification, incorporation, and reconciliation of different water values in decision-making processes for sustainable water management, whether at a global or watershed scale (Garrick et al. 2017). Recognizing water’s different values in decision-making can help frame problems in a different way, thus promoting creative solutions, creating more optimal tradeoffs, and better informing water allocations across uses and services (Groenfeldt 2013).

**Table 1.** The Bellagio Principles of Valuing Water

1. Recognize Water's Multiple Values	Consider the multiple values to different stakeholders in all decisions affecting water.
2. Build Trust	Conduct all processes to reconcile values in ways that are equitable, transparent, and inclusive of multiple values.
3. Protect the Sources	Value and protect all sources of water, including watersheds, rivers, aquifers and associated ecosystems for current and future generations.
4. Educate to Empower	Promote education and public awareness about the essential role of water and its intrinsic value.
5. Invest and Innovate	Increase investment in institutions, infrastructure, information, and innovation to realize the full potential and values of water.

The integration of water values into management is facilitated by measurement and governance structures. The measuring, modeling, and accounting of water systems is the foundation for water management, as it provides support for management decisions (Garrick et al. 2017). For instance, it allows stakeholders to identify or address current or emerging threats, protect drinking water sources, or ensure the sustainability of allocations. In addition, measurement can be used as a means to water efficiency and sustainability with capable governance structures in place. Governance includes the institutions, infrastructure, and information that facilitates the implementation of policies and management decisions (Ibid.). In governance, there are tangible elements that support collaboration, such as a table to gather around, a common purpose, or defined roles and responsibilities. In addition, there are intangible factors that sustain collaborative efforts, such as people's relationships, a sense of place, and a shared commitment (Wondolleck & Yaffee 2017). A collaborative governance structure provides a strategic approach to water management by incorporating different values into decision-making processes and promoting more efficient data collection and usage.

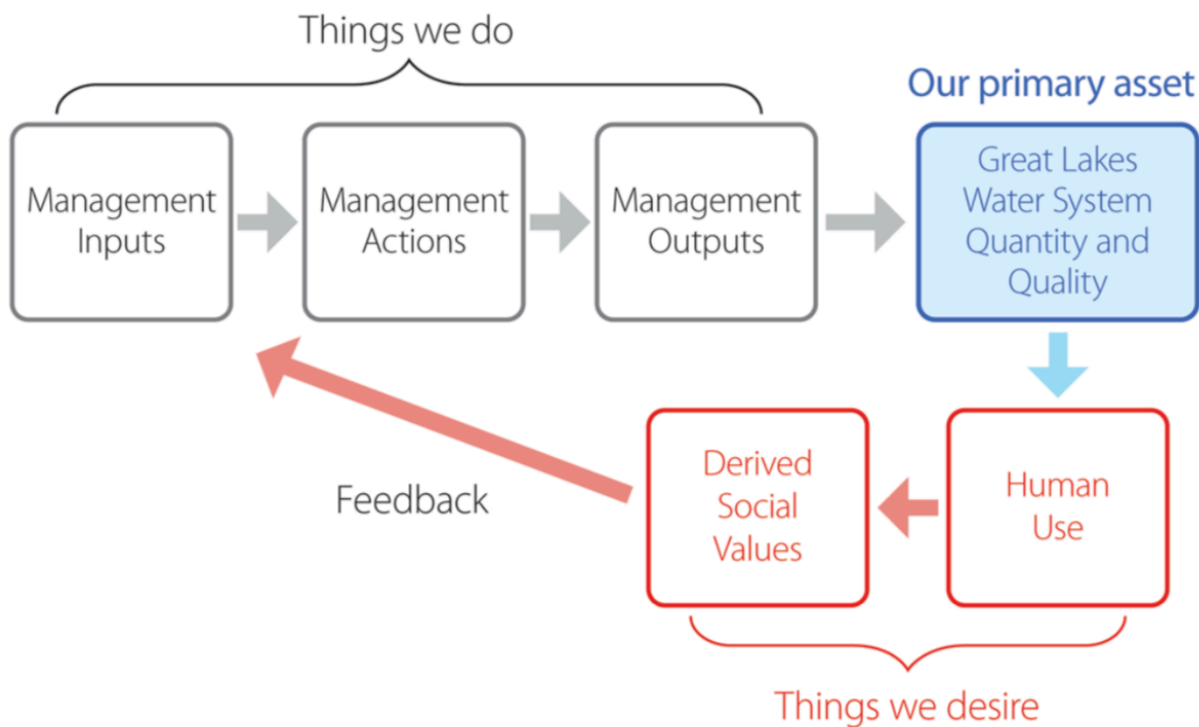
The Great Lakes Blue Accounting Process is an example of a governance structure that incorporates water values and measurements into decision-making processes, while building upon existing institutions and programs. Blue Accounting is a framework that provides a link between current organization-level efforts and a larger, shared vision for the Great Lakes (Seelbach et al. 2014). In Blue Accounting, values are essential to the development of "Desired Outcomes," which are a set of desired uses and values for the Great Lakes that form the basis of a common agenda (Table 2). Once a common goal is established, a set of management actions and metrics for evaluation can be identified. The metrics can be informed by existing measurements, or the process may raise awareness of significant data gaps. Shared metrics allow stakeholders to track progress towards the achievement of common goals and to evaluate and adapt their strategies. As a result, Blue Accounting enables states and provinces to more comprehensively address issues such as invasive species, coastal wetlands, and

nutrients across the Great Lakes basin (Ibid.) The Blue Accounting framework can be modified for collaboration between agencies, businesses, and organizations at the watershed scale (Figure 1).

**Table 2.** Desired Outcomes from Blue Accounting developed through regional vision documents and workgroup discussions across the Great Lakes basin and grouped into three major categories. From Seelbach et al. 2014.

<b>Healthy Aquatic Ecosystems</b>	
1. Functional nearshore and coastal processes	Human activities at the land-water interface, particularly in coastal areas, protect or promote healthy aquatic ecosystem processes
2. Healthy, diverse and connected habitats	Waters sustain or create high-quality and interconnected habitats capable of supporting self-sustaining biota and maintaining the integrity of the food chain and other ecological functions
3. Healthy and abundant wildlife	Populations of fish and other water-dependent wildlife are diverse, abundant, self-sustained, and safe for human consumption
<b>Sustainable Human Uses</b>	
4. Safe and sustainable domestic water supply	Potable water supplies (for drinking and washing) are sustainable and safe for use.
5. Flourishing and sustainable natural resource-based economies	Economic activities based on water-dependent natural resources (such as agriculture, aquaculture, nurseries, forestry, and commercial fishing) are productive, sustainable, and generate value for the region.
6. Flourishing and sustainable water-withdrawing economies.	Economic activities that withdraw, consume, or alter water (such as manufacturing and energy production) are productive, sustainable, and generate value for the region.
7. Flourishing and sustainable non-consuming water-based economies	Economic activities that depend on water, but do not directly withdraw, consume, or alter water (such as recreation, tourism, and shipping) are productive, sustainable, and generate value for the region.
<b>Social Values and Quality of Life</b>	
8. Awareness of water value	Citizens of the Great Lakes Basin recognize the connection between their quality of life and a sustainable Great Lakes system.
9. Stewardship of, and investment in, water resources	Citizens of the Great Lakes Basin exercise stewardship of the Great Lakes water system and grant a social license for investments in shared system priorities.





**Figure 1.** Generalized workflow of the Blue Accounting process. The things we do impact the system, which in turn affects our desired uses or values. Our values have an influence on our management actions by determining what we consider to be worth protecting and the benefits that we obtain from the process. From Seelbach et al. 2014.

Water for all means sustaining water resources for current and future generations, valuing water properly for the many benefits that it provides, understanding our water systems, and strengthening the structures through which we make decisions regarding water resources. All communities are capable of adopting these principles, which can be integrated into current decision-making processes. We live in a time of urgency, as our water resources are impaired from past negligence and challenged by emerging threats. While the path of a Blue Community may be difficult and will take time, the costs of inaction will be much greater.

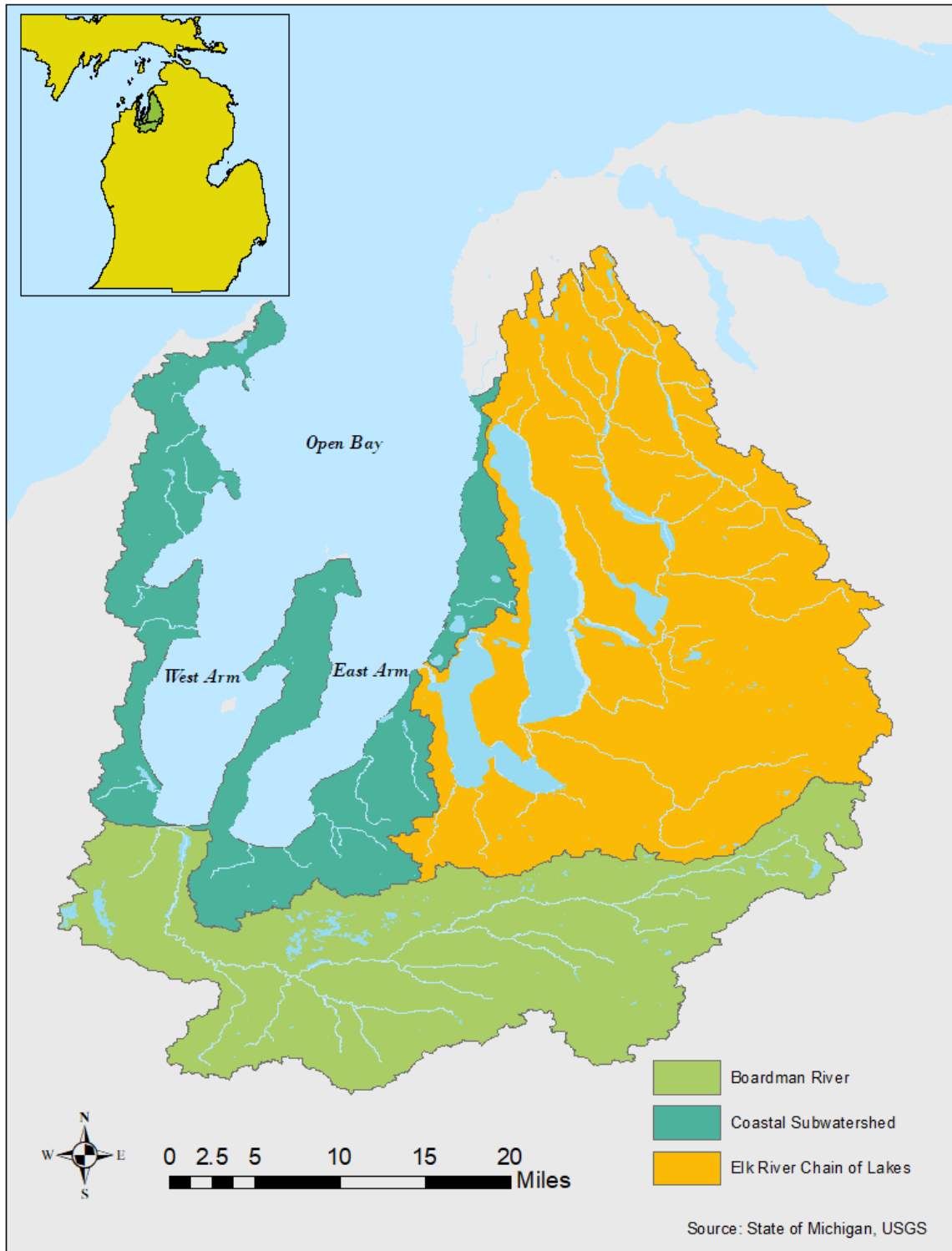
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## UNDERSTANDING THE LOCAL WATER SYSTEM

The sustainable and responsible management of water resources first requires an understanding of the water budget, which quantifies the amount of water entering, being stored in, or leaving the system. Most people have a basic understanding of the water cycle. Precipitation evaporates or is transpired by plants, and the remainder makes its way over or through the ground into rivers or lakes. The water budget can be used to quantify the various components of the water cycle. Precipitation, either as rain or snowfall, inputs water into the system, whereas surface outflows or evapotranspiration from lakes, wetlands, or plants take water out. Within the system, water may be stored in soil, groundwater aquifers, or surface water (Healy et al. 2007). Responsible fiscal management requires an awareness of the money going in and out of your bank account and your overall balance. Similarly, quantifying the inputs, outputs, and storage of water within a system enables water resource managers to ensure that water use does not exceed water availability.

For the Blue Communities pilot in the Grand Traverse Bay region, the system includes both Grand Traverse Bay and the Grand Traverse Bay watershed (Figure 2). Located in northwestern Michigan's lower peninsula, Grand Traverse Bay is a deep, oligotrophic embayment of Lake Michigan (U'Ren 2005). The Bay's deep, steep slopes provide some dilution as nutrients or other contaminants are flushed and mixed into the colder and deeper parts of the Bay. In addition, because the Bay is oligotrophic, it is naturally low in nutrient concentrations and has high levels of dissolved oxygen, characteristics typically associated with high quality, clear waters (Auer et al. 1976). The Bay can be divided into the open bay, which is adjacent to Lake Michigan, and the East and West arms, which are separated by Old Mission Peninsula (U'Ren 2005). The Bay's subsections are not equally challenged by anthropogenic stressors nor do potential threats raise equal concerns. Because the east arm provides drinking water to Traverse City, the watershed's largest municipality, a primary concern is preserving its quality as a drinking water source. Meanwhile, the west arm of the Bay is more developed and is more sheltered from Lake Michigan waves, allowing greater accumulation of nutrients and other contaminants (Ibid.). Differences in currents and circulation patterns between the Bay's three subsections are influenced by the presence of a sill in the northern part of the Bay. The sill generates circular currents and impedes the exchange of water between Grand Traverse Bay and Lake Michigan (Auer et al. 1976). Therefore, although Grand Traverse Bay is part of Lake Michigan, some characteristics of the greater Lake Michigan may not be directly applicable to the Bay. For instance, Great Lakes storms are a big threat to coasts, but the Bay's embayment system helps protect its coastal communities from storm surges.

Aside from precipitation that falls directly onto the Bay, water inputs into the Bay come from the Grand Traverse Bay watershed, which spans a total of 976 square miles of land (U'Ren 2005). The watershed includes significant portions of Kalkaska, Grand Traverse, Antrim, and Leelanau counties and contains more than 50 municipalities and townships, the largest being Traverse City (Ibid.).



**Figure 2.** The Grand Traverse Bay system of the Blue Communities pilot, including Grand Traverse Bay and the Grand Traverse Bay watershed. Note: The easternmost “finger” observed on USGS maps of the Elk River Chain of Lakes watershed was removed. This is part of a small basin that only drains internally via infiltration. We interpret that the portion we removed drains primarily northward into the Jordan River watershed.

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The Bay's watershed can be divided into three major subwatersheds, the Elk River Chain of Lakes, the Boardman River, and the coastal subwatershed (U'Ren 2005).

### Elk River Chain of Lakes

The Elk River Chain of Lakes (ERCOL) is a series of 14 interconnected lakes and rivers that flow in a very sinuous course through Antrim and Kalkaska counties from the headwaters near Beal Lake to the Elk River. The ERCOL discharges into the east arm of Grand Traverse Bay from Elk River in Elk Rapids. At 502.6 square miles large, the ERCOL is the largest subwatershed and approximately 60% of the Bay's drainage area (U'Ren 2005). However, losses from lake evapotranspiration throughout the chain likely results in the ERCOL contributing to less than 60% of the Bay's surface water input.

### Boardman River

The Boardman River subwatershed is a classic, groundwater-driven, cold-water river that flows within a broad valley through Grand Traverse and Kalkaska counties. The Boardman River discharges into the west arm of the Bay from its mouth in Traverse City. With an area of 284 square miles, the Boardman River is the largest contributor to the west arm of Grand Traverse Bay and makes up approximately 30% of the Bay's drainage area (U'Ren 2005). Due to recent dam removals on the Boardman River, the river is now free flowing, with the exception of Union Street Dam remaining on Boardman Lake.

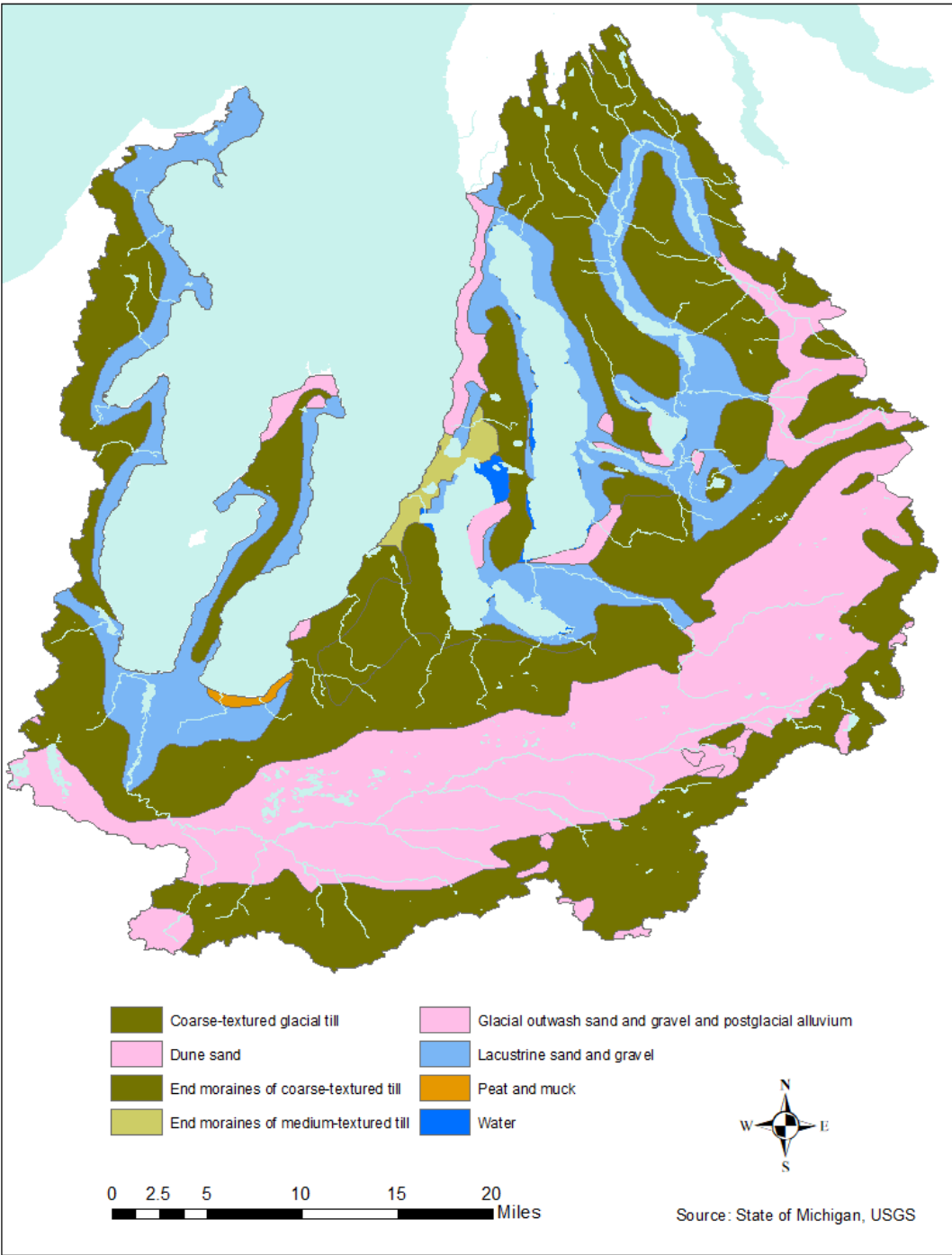
### Coastal Subwatershed

The coastal subwatershed includes some of the smaller tributaries and groundwater discharges along the coast. The coastal subwatershed encompasses the West and East Bay shoreline and tributaries, Old Mission Peninsula, and Mitchell, Yuba, Acme, and Petobego Creeks (U'Ren 2005).

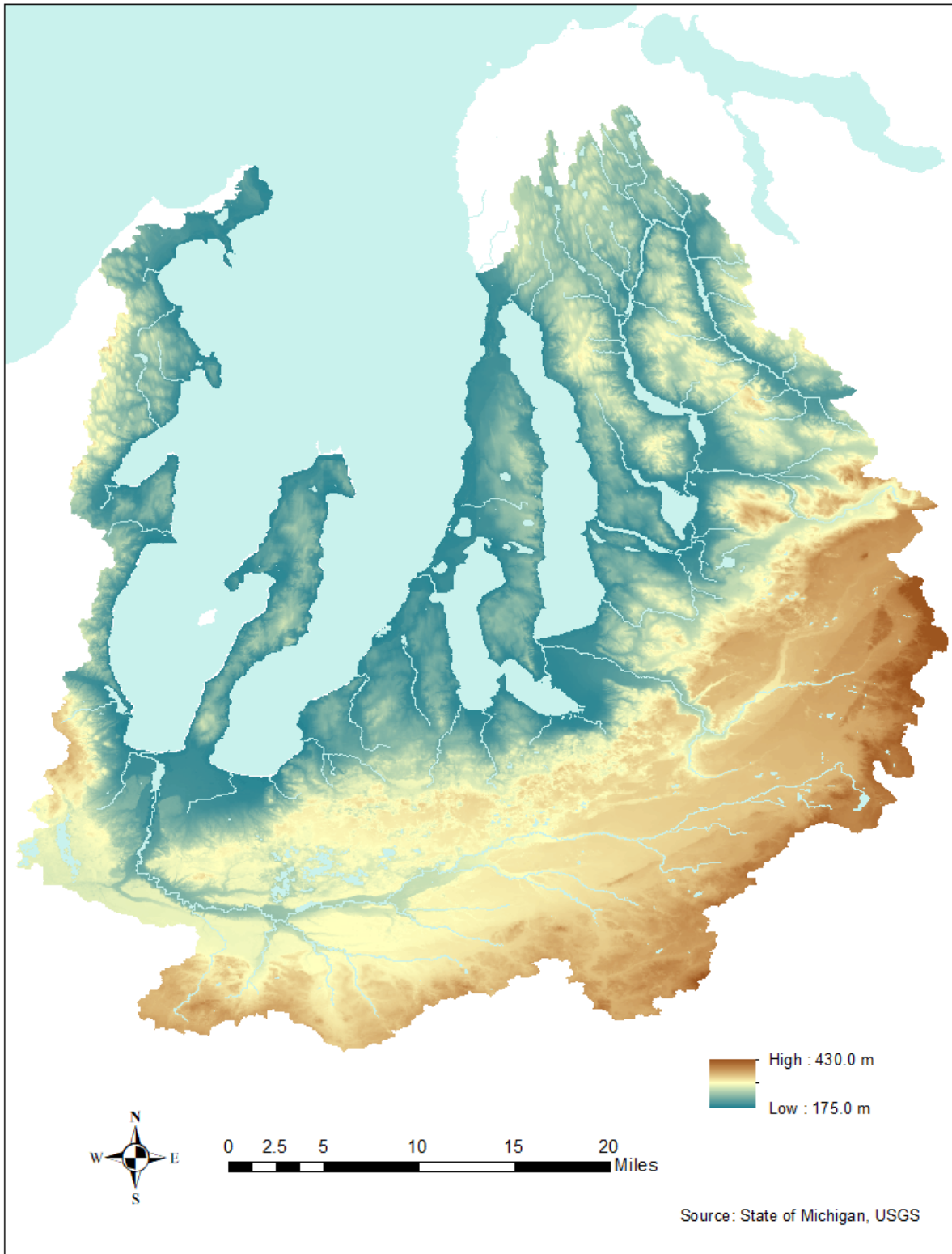
Examining the water budget provides insight into the importance of groundwater in the Grand Traverse Bay watershed. In this watershed, a majority of the water that is not evapotranspired is stored in groundwater (U'Ren 2005). The region's high capacity for groundwater storage is facilitated by the watershed's sandy soils, which allow water to easily infiltrate into groundwater (Figure 3). In addition, high elevation areas towards the edge of the watershed direct both surface and groundwater towards the Bay (Figure 4). These factors play a role in determining the areas where groundwater recharge is greatest, such as in the southeastern edge of the watershed (Figure 5). Of the region's annual average rainfall of 32", approximately 15.5" (or 48%) of the precipitation is lost due to evapotranspiration. From the remaining water, 4.5" (14%) becomes surface runoff that moves through stream and river channels, and 12" (38%) infiltrates into groundwater and slowly feeds surface water bodies (Great Lakes Integrated Sciences and Assessments 2016, U'Ren 2005).

Groundwater plays an important role in the region's social, environmental, and economic health. It is the source of drinking water for a majority of the watershed's residents outside of Traverse City, and it helps support ecosystems and recreation through steady and reliable discharges into rivers and lakes (U'Ren 2005). Groundwater is a large contributor to the flows of both the Elk River Chain of Lakes and the Boardman River. Approximately 64%

of the precipitation that falls within the Boardman subwatershed is retained as water, whereas the average Michigan watershed tends to capture around 30% (Brenden et al. 2006; Seelbach et al. 2011). Due to groundwater discharge into the river, the Boardman River has stable and cool flows, which help support a trout population valued for recreation (Figure 6) (U'Ren 2005).

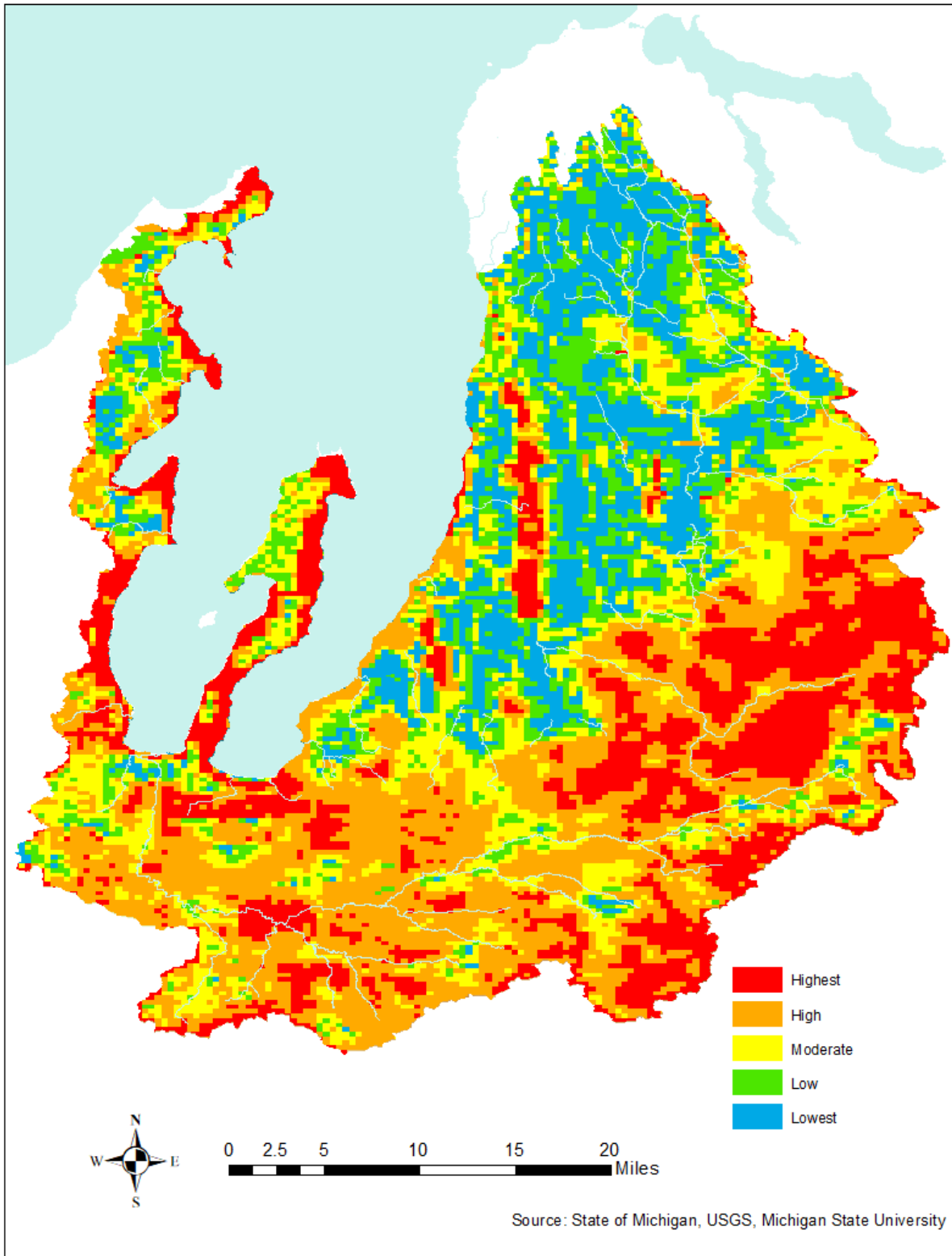


**Figure 3.** Grand Traverse Bay watershed quaternary geology. The most common surficial geology types within the watershed include sand and coarse-textured till.



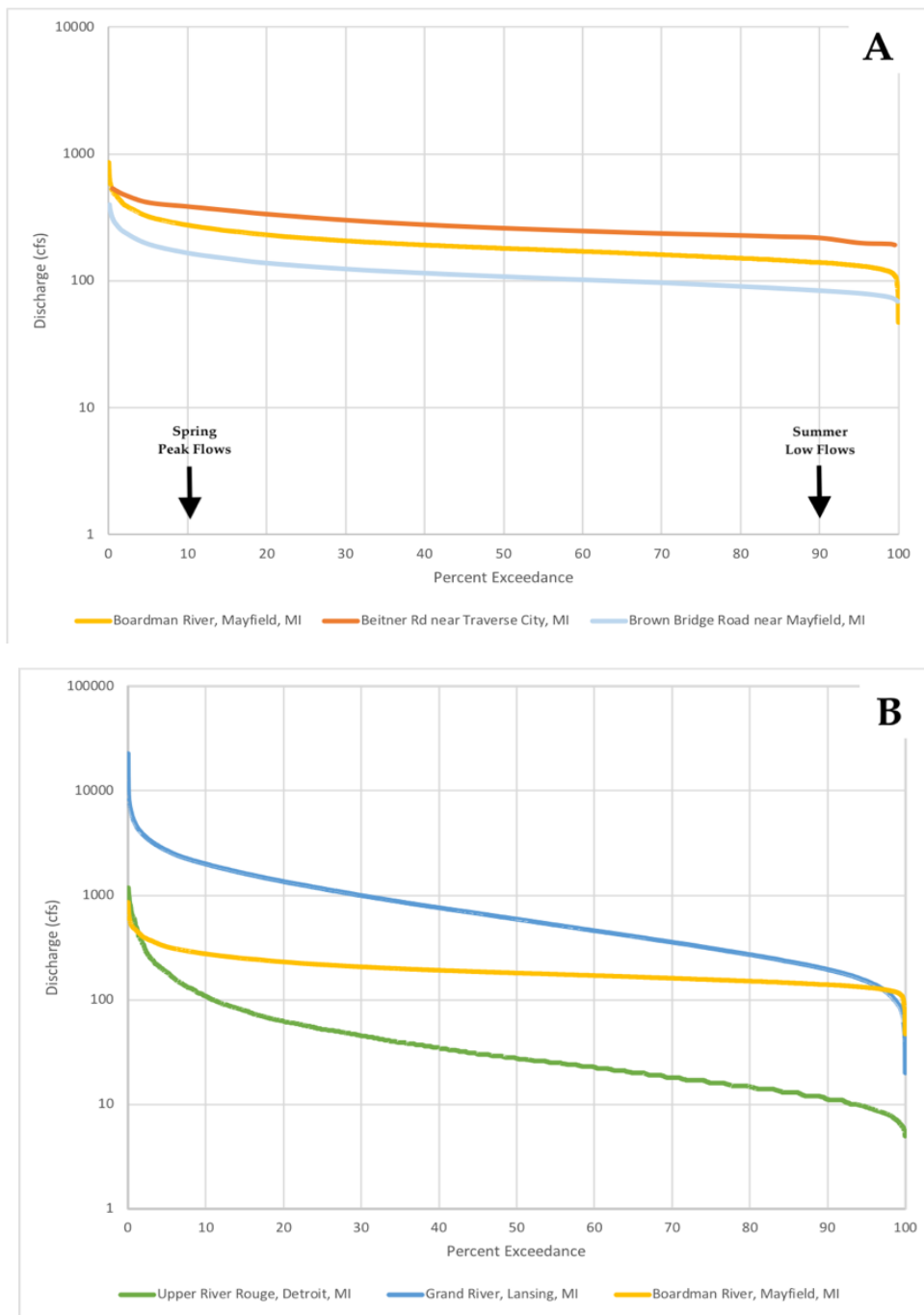
**Figure 4.** Grand Traverse Bay watershed topography. The high elevation areas are primarily located along the edges of the watershed. Water flows from the elevated hilly areas into the valleys where the Boardman River, Elk River Chain of Lakes, and other tributaries are located.





**Figure 5.** Groundwater recharge areas within the Grand Traverse Bay watershed. Due to a combination of high elevation and sandy soils, groundwater recharge is greatest in the hilly moraines of the watershed. Adapted from Hyndman et al. 2016.



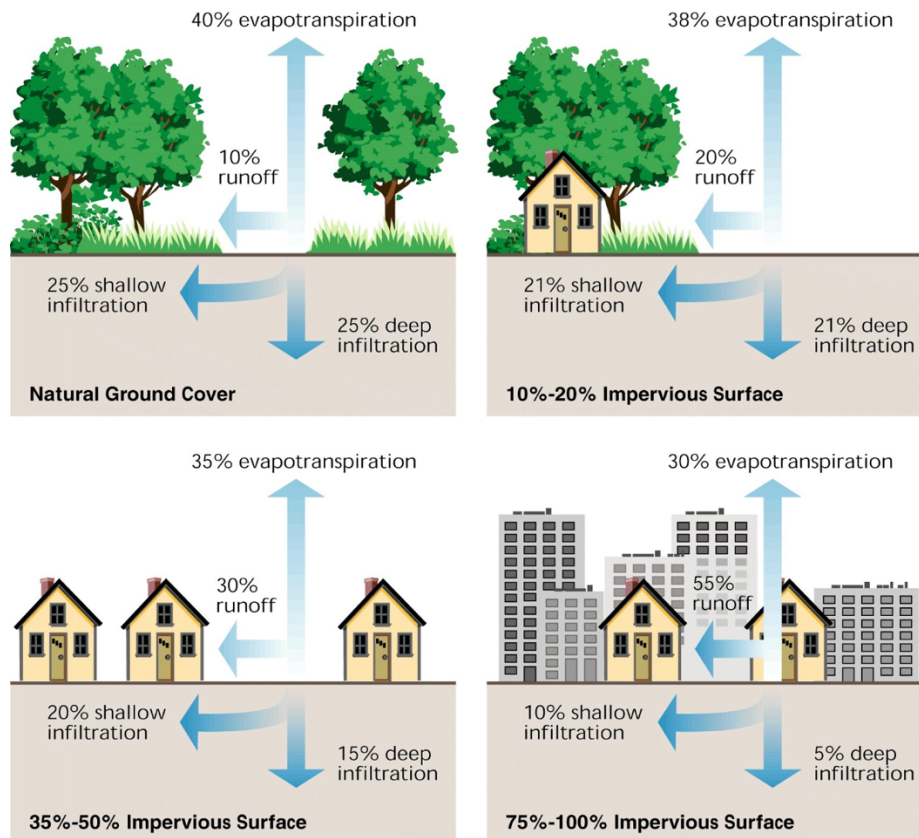


**Figure 6.** Flow duration curves indicate the percentage of time when a certain flow is met or exceeded in a river. The highest flows, which are met or exceeded approximately 10% or less of the time, often occur during the spring. The lowest flows, which are met or exceeded 90% of the time, often occur during the summer. A) The flow duration curves for three segments of the Boardman River indicate that flows are very stable, as the high and low flows are similar. B) In comparison, the Rouge River in Detroit and the Grand River in Lansing, MI have a wider range of flows, as indicated by the curves with steeper slopes.

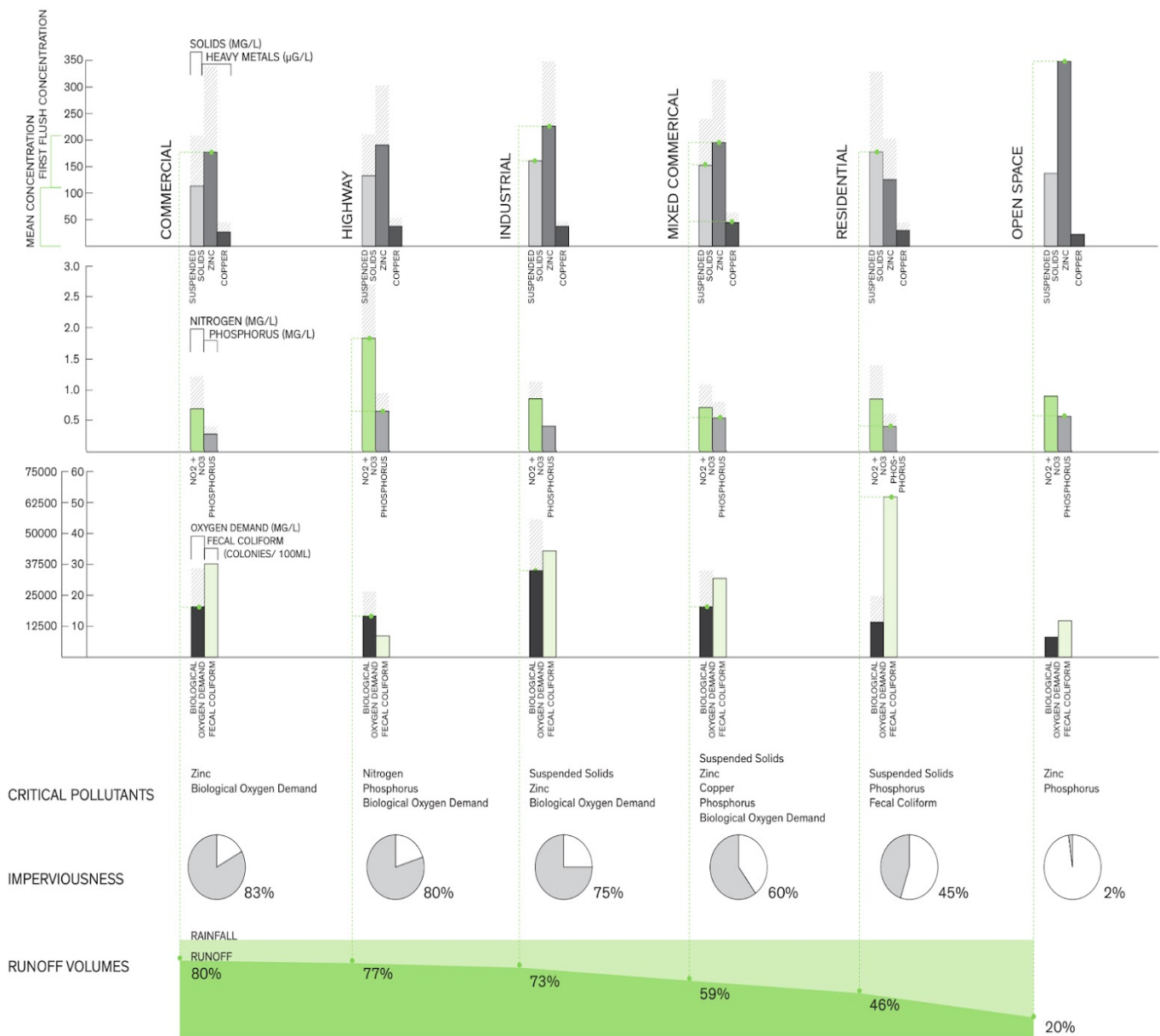
By visualizing and understanding that groundwater and surface water are one system, it becomes clear that protecting areas with high groundwater recharge will help protect the integrity of inland lakes, rivers, and the Bay as well. In the past, land use, surface water, and groundwater were all managed independently. However, a scientific understanding of the water budget and land-water interactions provides the foundation for a sustainable, systems-thinking approach to managing the Grand Traverse Bay watershed, its subwatersheds, and Grand Traverse Bay itself.

# THE THREAT OF URBAN SPRAWL

Urbanization has long been recognized as a major driver of the degradation of aquatic ecosystems (Miltner et al. 2004; Wang et al. 2001). As areas are developed, hard surfaces replace natural ground cover that have a better capacity to capture, filter, and absorb stormwater. As a result, stormwater has increasingly become a threat to cities, suburbs and the natural systems that protect them. When it rains, we see water running off the roof, through the streets, and across parking lots. But the pollutants - garbage, heavy metals, fertilizers and pesticides, bacteria and sediments - which stormwater usually carries across urban surfaces, are not always visible (Guzman 2017). Furthermore, the efficient routing of stormwater from large areas of urban impervious surface into storm sewer systems results in a fundamental change in the flow regimes of downstream rivers (Walsh et al. 2005). Development increases the volume and rate of runoff from a site and reduces groundwater recharge and evapotranspiration. Urbanization has significant effects on stormwater interception, storage, and infiltration processes. Alteration of these hydrological processes can lead to increased surface runoff, greater vulnerability to flooding, and other disturbances. Thus, urban expansion can result in the gradual degradation of the natural hydrological systems of rivers, streams, lakes and wetlands (Guzman 2017).



**Figure 7.** Relationship between impervious cover and surface runoff. As the percentage of impervious surface increases, the amount of surface runoff increases, and less water is infiltrated. From Federal Interagency Stream Restoration Working Group 1998.



**Figure 8.** Stormwater pollution by land use. Mix of stormwater pollutants varies by land use and often exceeds regulatory limits for surface water. From Berger and Kotkin 2017.

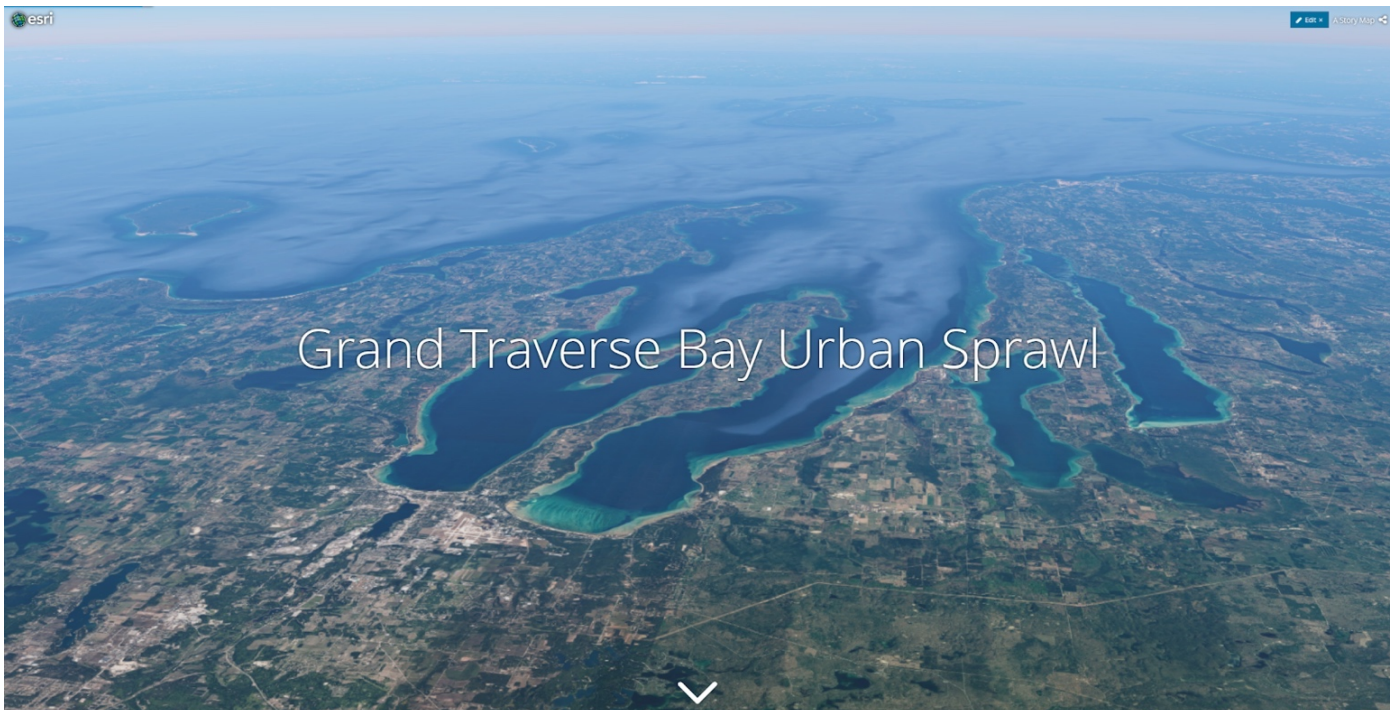
In addition, global climate change is expected to have a profound influence on streams and lakes, from changing temperature and flow conditions to increasing the frequency and intensity of droughts and floods (Bates et al. 2008; Meyer et al. 1999; Milly et al. 2005). In turn, the increased numbers of droughts, severe storms, and flooding events will impact water quality and water infrastructure by increasing the risks of erosion, sewage overflows, transportation disturbances, and flood damages. Furthermore, the coupling of climate change and land use change could result in even stronger effects in some areas.

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## Urban Sprawl and Hydrologic Impact

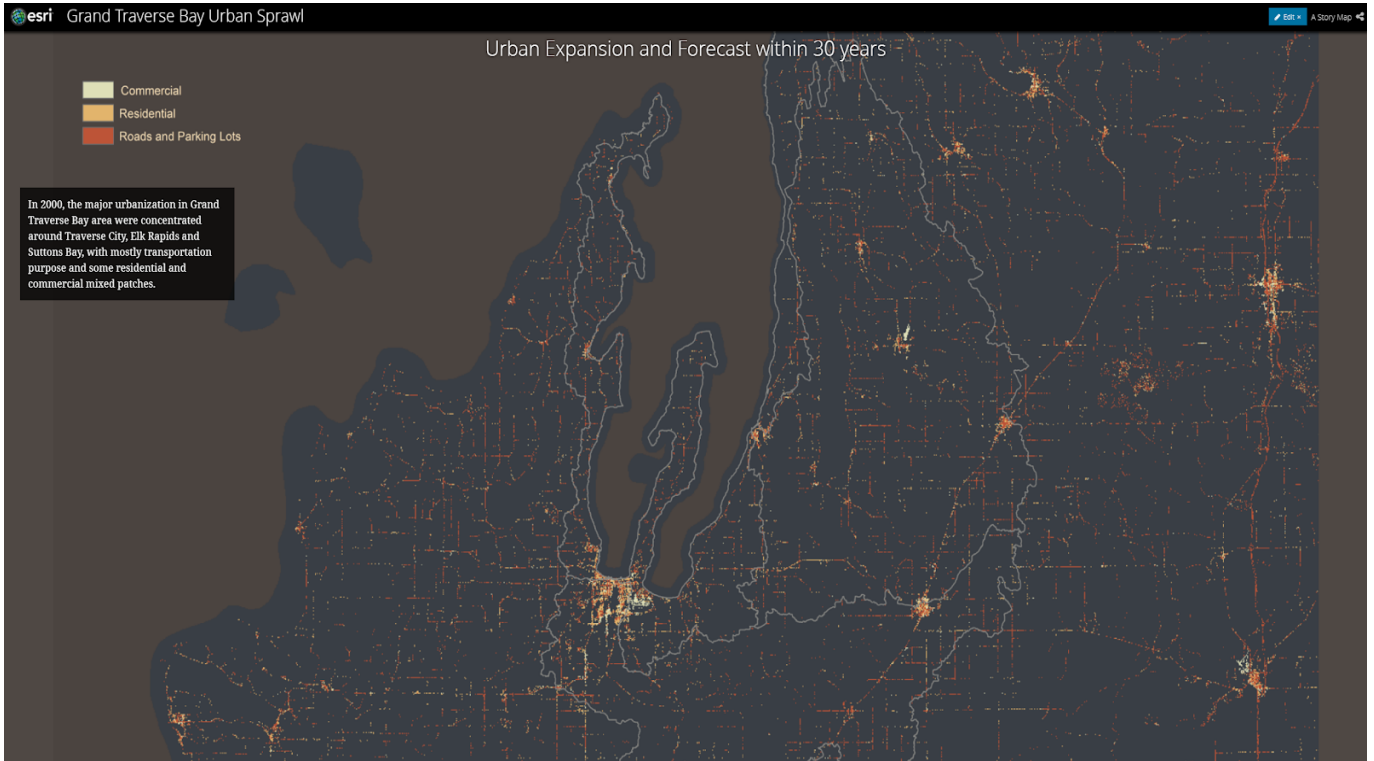
Urban expansion and associated changes in land cover and land use (LCLU) largely alter local and regional hydrology, which affect surface and groundwater availability and quality (Li et al. 2006; Sajikumar & Remya 2015; Tang et al. 2005). Though stakeholders and residents are aware of the potential impacts of urbanization on water, this issue has not been prioritized by municipal decision-makers. Due to the rapid pace of urban growth in the Grand Traverse Bay watershed, there is a need to assess the influence of urban sprawl in terms of land use and land cover.

In order to demonstrate the significance of the watershed's rate of growth, we created an ESRI story map focusing on urban sprawl impact within the Grand Traverse Bay watershed. We utilized Geographic Information Systems (GIS) and ESRI story maps to combine geospatial data with photos, authoritative maps, and narrative text to provide easy access and public engagement for a non-technical audience. We integrated maps and pictures demonstrating current and 30-year forecasts of urban expansion, population and income level changes from 1999 to 2016, soil drainage levels, existing brownfields, as well as conservation and recreation lands.

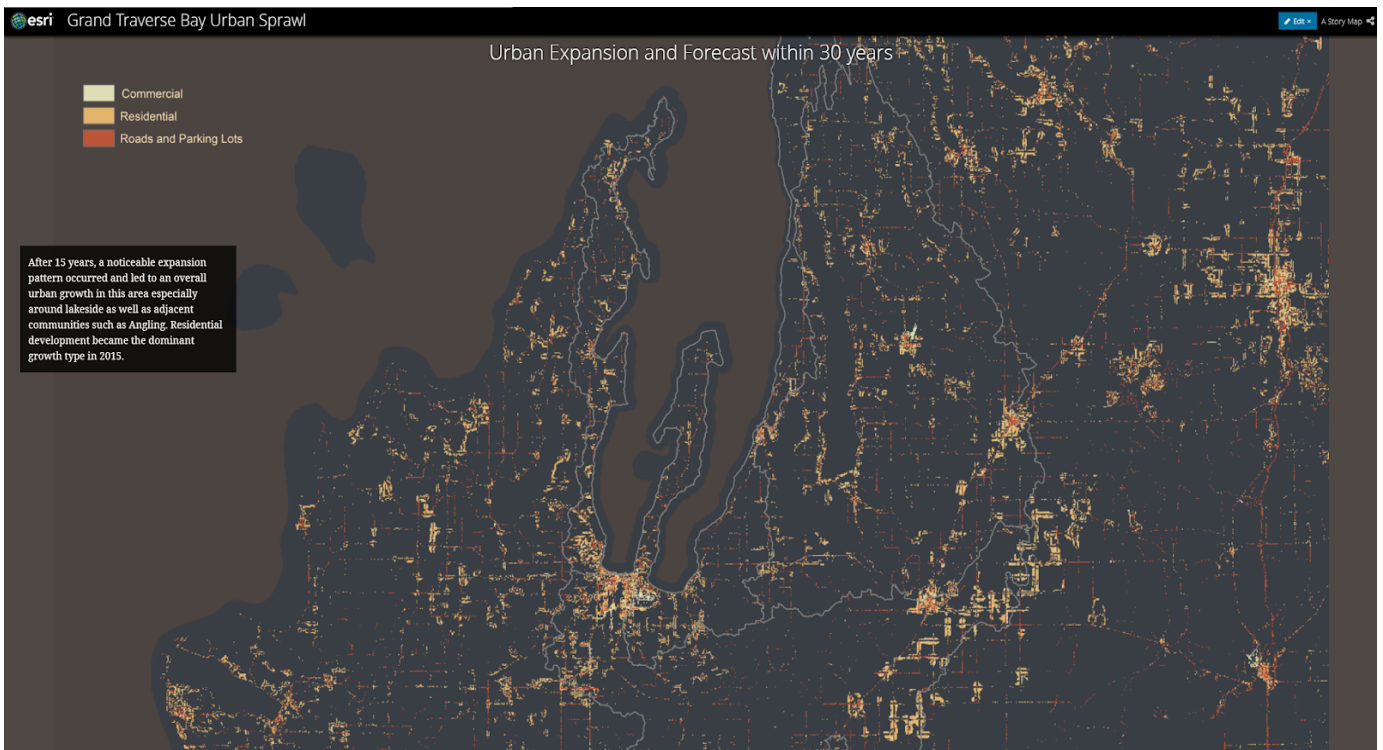


Grand Traverse Bay Urban Sprawl Story Map by Lingzi Liu

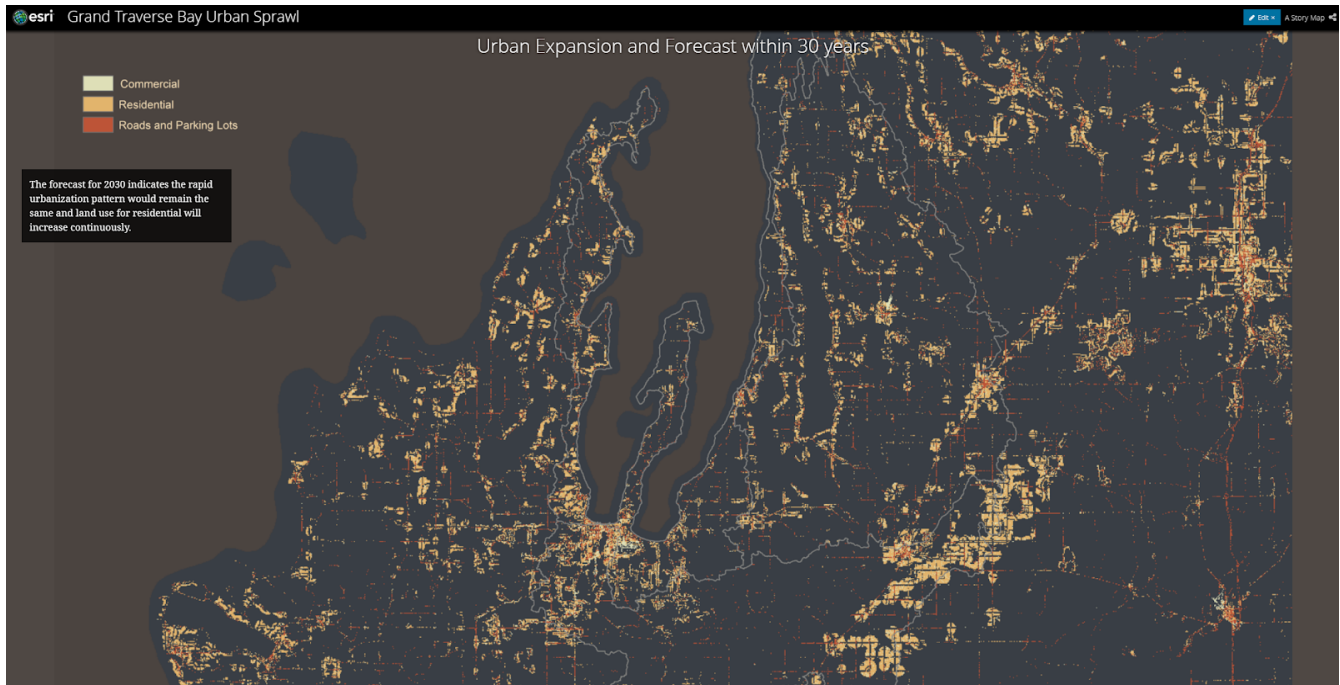




**Figure 9.** Grand Traverse Urbanization in 2000. Data from Pijanowski et al. 2005.



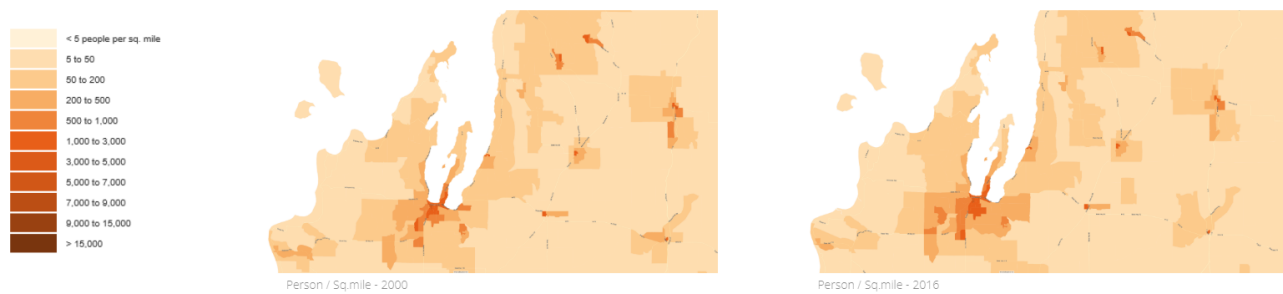
**Figure 10.** Grand Traverse Urbanization in 2015. Data from Pijanowski et al. 2005.



**Figure 11.** Grand Traverse Urbanization forecast in 2030. Data from Pijanowski et al. 2005.

The Grand Traverse Bay urbanization dataset uses the Land Transformation Model (LTM), which couples geographic information systems (GIS) with artificial neural networks (ANNs) to forecast land use changes. ANNs are used to learn the patterns of development in the region and test the predictive capacity of the model, while GIS is used to develop the spatial, predictor drivers and perform spatial analysis on the results. A variety of social, political and environmental factors contribute to the model's predictor variables of land use change. For instance, the model explored how factors such as roads, highways, residential streets, rivers, Great Lakes coastlines, recreational facilities, inland lakes, agricultural density, and quality of views can influence urbanization patterns in this coastal watershed. (Pijanowski et al. 2002).

The Land Transformation Model can be used to visualize current and predicted expansion patterns within the Grand Traverse Bay watershed. In 2000, urbanization in the Grand Traverse Bay area was mainly concentrated around Traverse City, Elk Rapids and Suttons Bay, with mostly transportation-related and some mixed residential and commercial patches (Figure 9). After 15 years, the model predicted a noticeable expansion pattern and an increase in overall urban growth, especially around lakeside areas, which include inland lakes, notably in the Elk River Chain of Lakes and adjacent communities (Figure 10). In addition, residential development was predicted to become the dominant growth type. The forecast for 2030 indicates the same rapid urbanization pattern and continuously increasing residential land use (Figure 11). Furthermore, expansion in the uplands at the southeastern edge of the watershed is critical, considering these areas function as a key recharge zone due to the combination of sand and gravel surficial geology and higher elevation. Upland communities, such as Kalkaska and Mancelona, are not always associated with the bay system, but they represent vital headwater zones.



**Figure 12.** Person/square mile

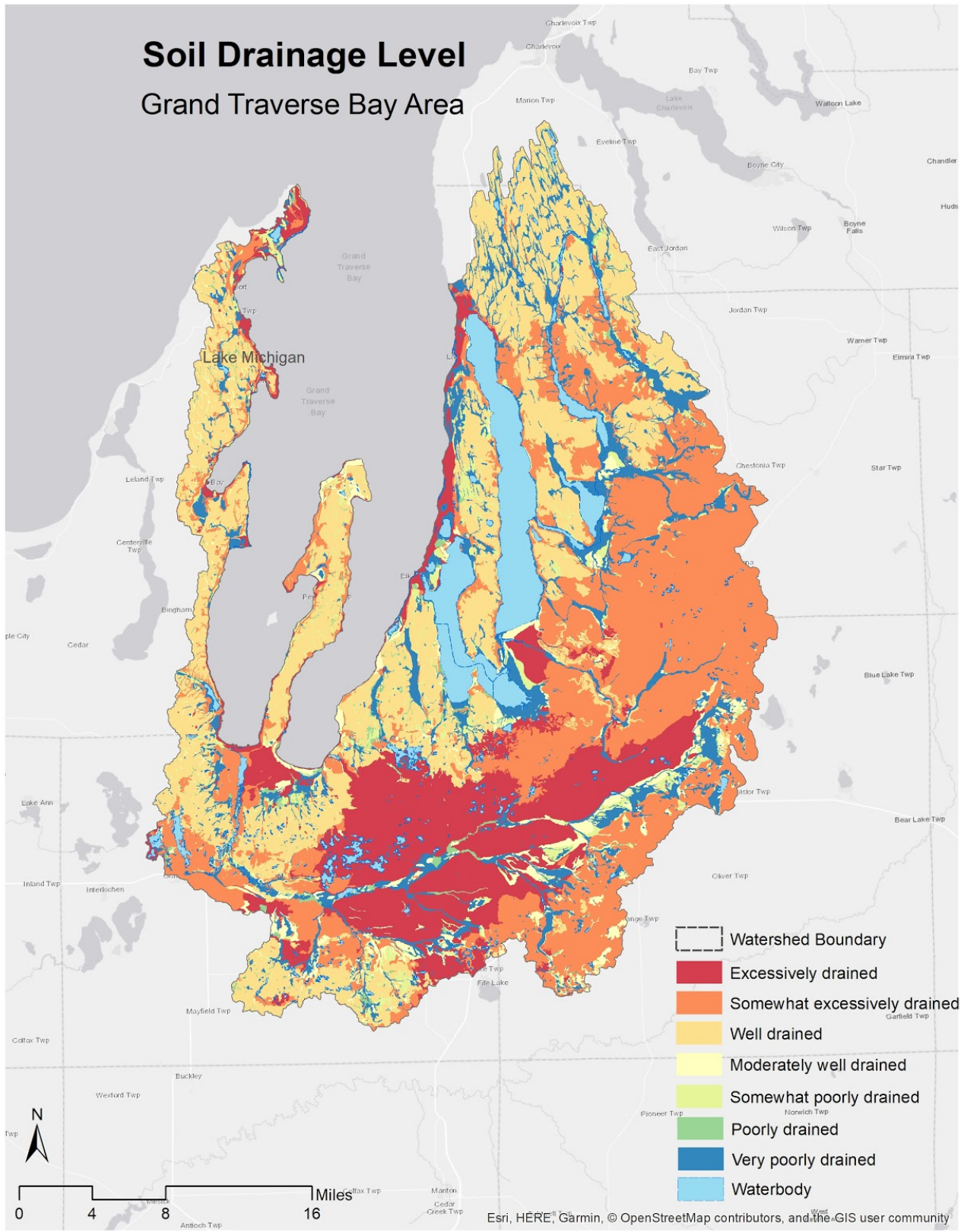


**Figure 13.** Per Capita Income. Data from American FactFinder, Tiger Online Shapefile.

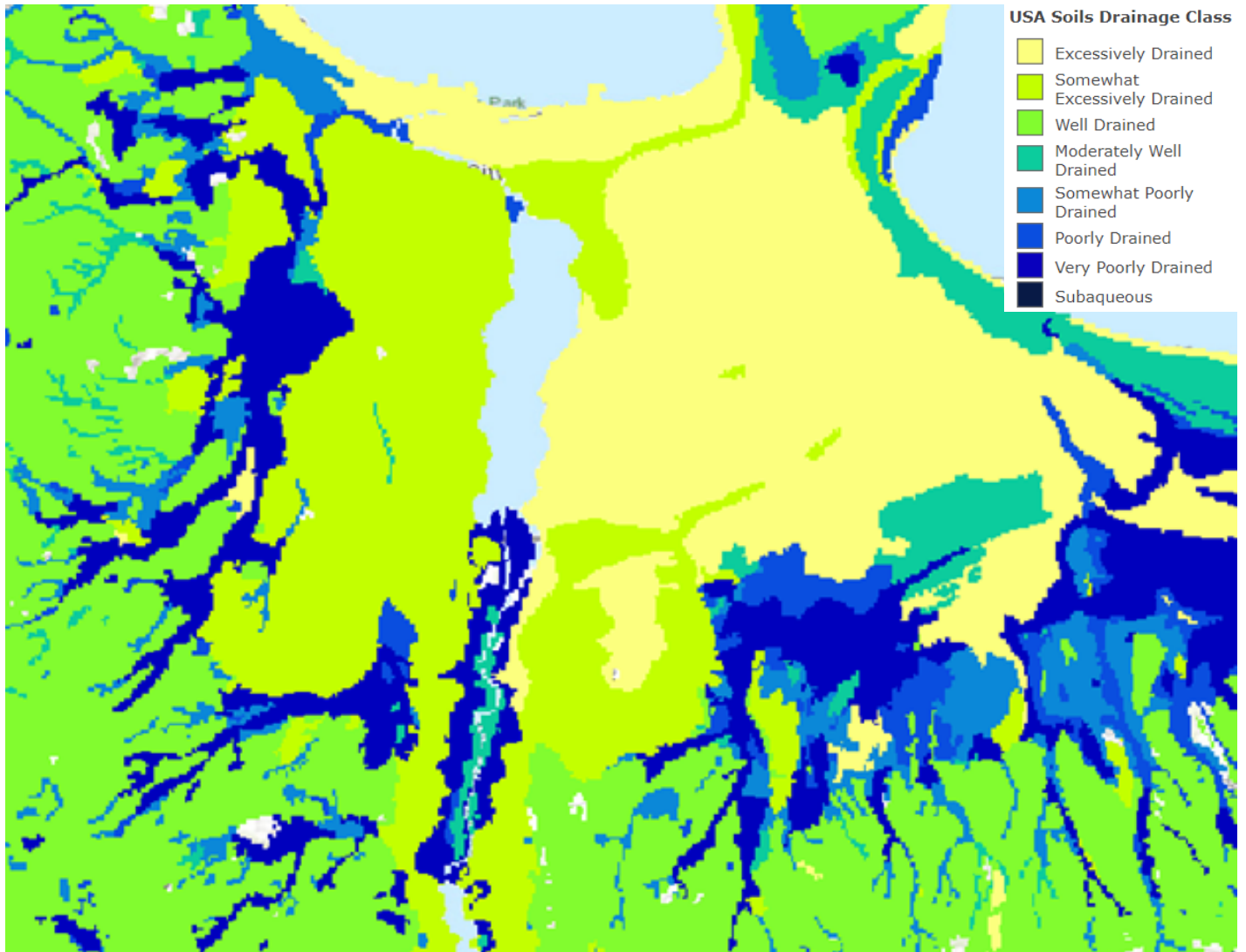
An increasing population is one of the factors contributing to rapid urban growth. Some of this population increase will be the result of high urban fertility rates and reclassification of rural land into urban areas, but a significant portion of future urbanization will be caused by rural-to-urban migration (Buhaug et al. 2012). The proportion of an area's population living in urban areas is highly correlated with its level of income, due to the economic opportunities which further contribute to more development and population pressure within the area. Urban areas offer economies of scale and richer market structures, and there is strong evidence that workers in urban areas are individually more productive, and earn more, than rural workers (Bloom et al. 2008). Population growth and associated urban expansion cause a disproportionate negative impact on the environment, due to increasing development, resource utilization and depletion, and environmental deterioration.

Even though the soil in the Grand Traverse Bay watershed is relatively well drained (Figure 14), lakeside development will still cause urban runoff and affect nearshore water quality. For instance, near Traverse City, the soil is well drained (Figure 15), and there is little worry about potential overflow. However, land cover analysis (Figure 16) indicates that the majority of Traverse City is developed. As a result, water still runs over urban surfaces like city streets, rooftops and parking lots, thus picking up bacteria, heavy metals and nutrients that adversely affect the water quality in the Boardman and the Bay's west arm. Additionally, water that would have been infiltrated and clean becomes stormwater, shifting the hydrological routine of the system away from the groundwater storage that makes the Grand Traverse Bay watershed so special.





**Figure 14.** Soil Drainage Level of Grand Traverse Bay Watershed. Data from SURRGO ESRI.



**Figure 15.** Soils Drainage Class - Traverse City. From USDA, NRCS, ESRI.

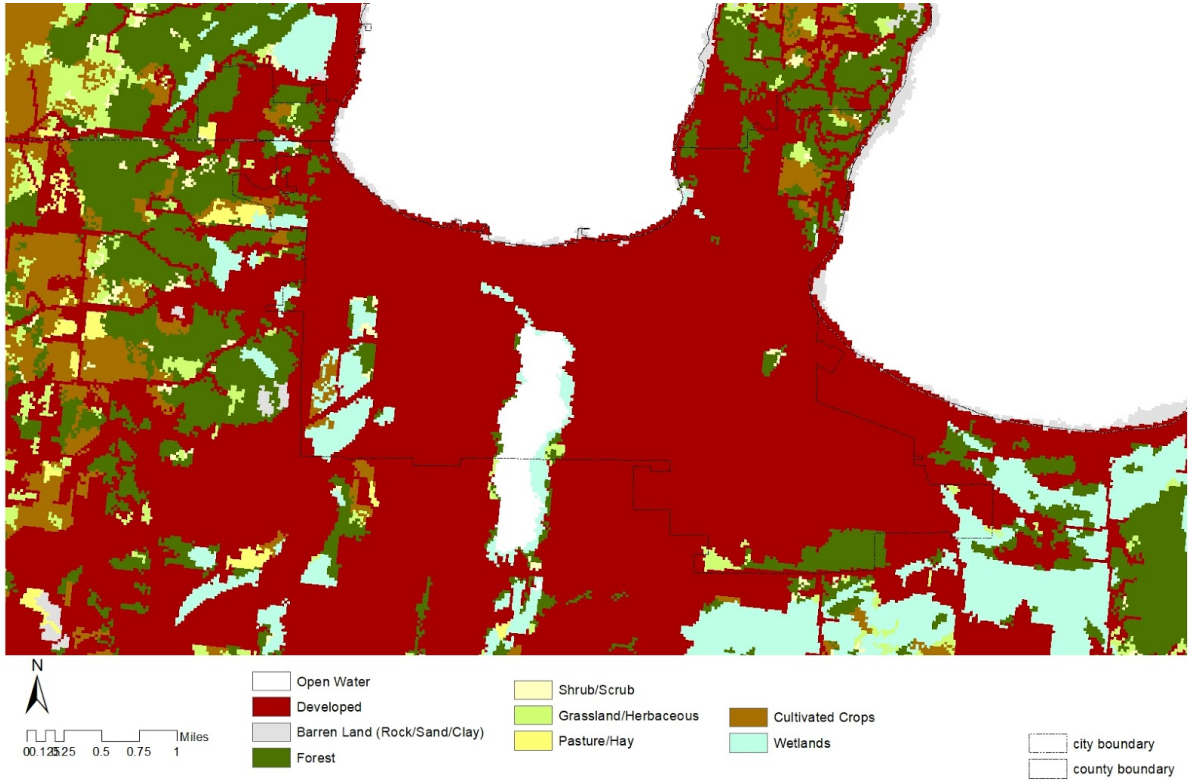


Figure 16. Traverse City Land Cover 2011

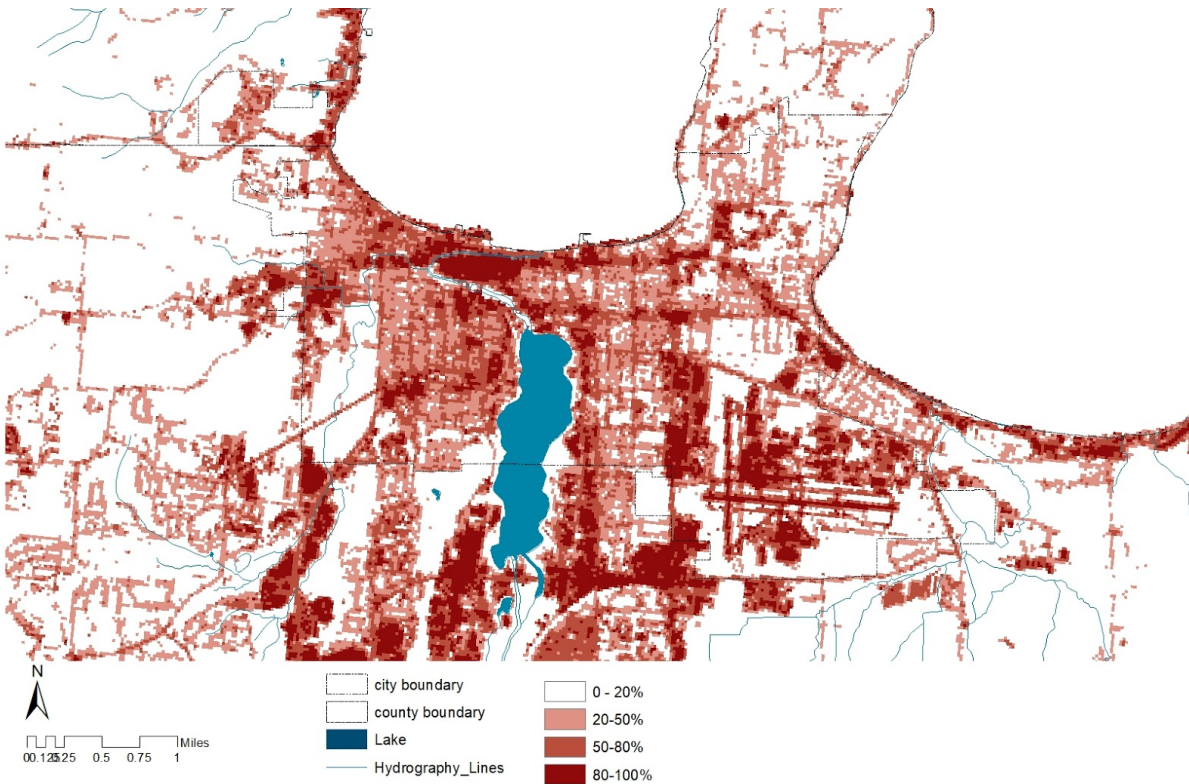


Figure 17. Traverse City Impervious Surface







**Figure 19.** Conservation and Recreation Lands 2017. Data from ESRI.

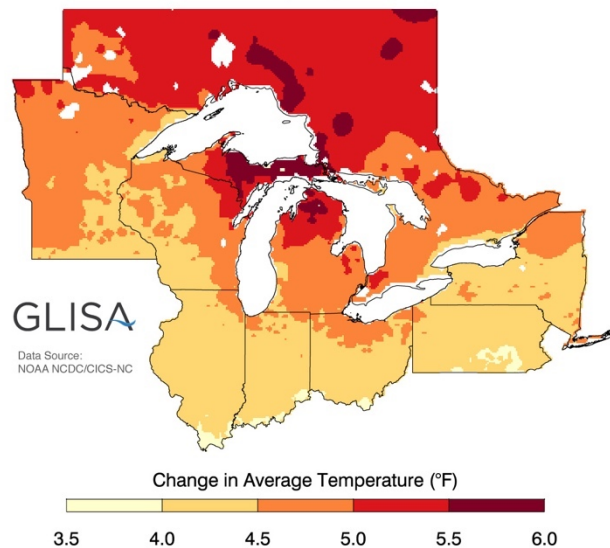
Conservation and recreation lands owned by different groups certainly play an important role in addressing urban expansion and determining the development pattern in our watershed. As shown in Figure 19, some groundwater recharge areas are well protected, but coastal areas and key headwater recharge areas are still exposed to consumption and development.

Because the increasing pace of urbanization in Grand Traverse Bay watershed poses a threat to water resources, urban expansion needs to be taken into consideration in policy, decision-making, and economic, recreational, and educational development. Our story map enables users to visualize spatially and socially concentrated patches with dense urbanization development and to see the pressures of urban expansion in a context beyond their own neighborhood. As a result, stakeholders and residents have the opportunity to learn about the consequences of urban growth and take note of concentrated patches. This awareness is the starting point for minimizing impacts of urbanization and development on freshwater.

## Watershed Threats from Climate Change

According to The Great Lakes Integrated Sciences and Assessments Program (GLISA), recent climate modeling predicts warmer temperature and more heavy precipitation in most parts of Michigan. Impacts on freshwater resources could have an economic impact on Michigan and the country, as shipping and water resources in the state may be compromised, causing billions of dollars in economic losses.

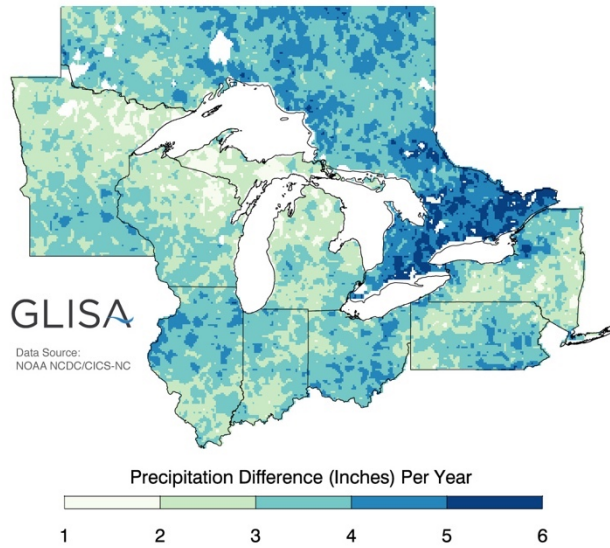
Projected Change in Average Temperature  
Period: 2041-2070 | Higher Emissions: A2



**Figure 20.** Projected change in average temperature 2041-2070 as compared to the 1971-2000 period. The Grand Traverse Bay region is expected to experience warmer temperatures. From GLISA.

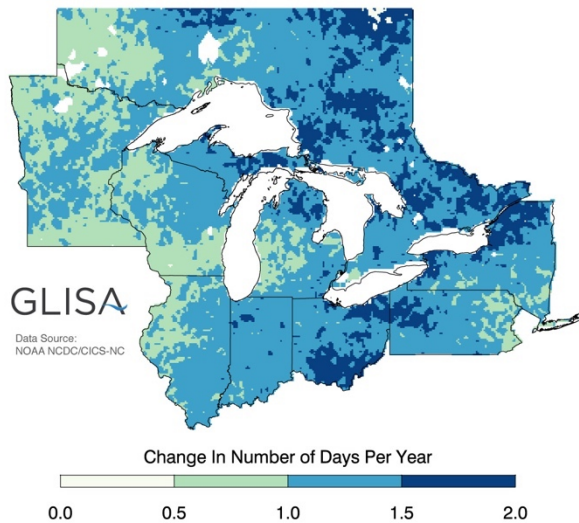


Projected Change in Average Precipitation  
Period: 2041-2070 | Higher Emissions: A2



**Figure 21.** Projected change in average precipitation 2041-2070. There is a projected increase in total annual precipitation by 2041-2070 as compared to the 1971-2000 period. From GLISA.

Projected Change in Number of Heavy Precipitation Days  
Period: 2041-2070 | Higher Emissions: A2



**Figure 22.** Projected changes in average number of days per year experiencing heavy precipitation 2041-2070 as compared to the 1971-2000 period. In the Grand Traverse Bay region, there will be more intense rainfalls. From GLISA.





**Figure 23.** FEMA's National Flood Hazard- Traverse City

A floodplain is an area of land adjacent to a stream or river which stretches from the banks of its channel to the base of the enclosing valley walls, and which experiences flooding during periods of high discharge (Goudie 2004). Due to impervious surfaces and piped stormwater conveyance systems, the increased rainfall intensity caused by climate change will result in even higher increases in peak discharges within floodplains, which will result in higher floodplain elevations and larger floodplains. This trend will continue as we experience further climate change.

## Green Infrastructure

The individual and synergistic impacts of urban sprawl and climate change to freshwater resources has led to an increasing call for the integration of two approaches to mitigate development-related stormwater impacts: the application of best water management practices (BMPs) and a hydrologically sensitive approach to planning development models (Alberti et al. 2007; Brabec 2009). Stormwater BMPs refer to “techniques, measures or structural controls for managing the quantity and improving the quality of stormwater runoff in the most cost-effective manner” (EPA 1999). Development patterns refer to the spatial organization of land uses (Alberti 1999). A Blue Community should consider the interactions between land development, climate change, and water resources, and explore solutions to mitigate these impacts.

## Green Solutions

“Green infrastructure is a cost-effective, resilient approach to managing wet weather impacts that provides many community benefits” (EPA 2015). While single-purpose gray stormwater infrastructure – conventional piped drainage and water treatment systems – is

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designed to move urban stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.

Stormwater runoff is a major cause of water pollution in urban areas. When rain falls on our roofs, streets, and parking lots in cities and their suburbs, the water cannot soak into the ground as it should. Stormwater drains through gutters, storm sewers, and other engineered collection systems and is discharged into nearby water bodies. The stormwater runoff carries trash, bacteria, heavy metals, and other pollutants from the urban landscape. Higher flows resulting from heavy rains also can cause erosion and flooding in urban streams, damaging habitat, property, and infrastructure.

When rain falls in natural, undeveloped areas, the water is absorbed and filtered by soil and plants. Stormwater runoff is cleaner and less of a problem. Green infrastructure uses vegetation, soils, and other elements and practices to restore some of the natural processes required to manage water and create healthier urban environments. At the city or county scale, green infrastructure is a patchwork of natural areas that provides habitat, flood protection, cleaner air, and cleaner water. At the neighborhood or site scale, stormwater management systems that mimic nature soak up and store water. Green infrastructure reduces and treats stormwater at its source while also providing multiple community benefits such as:

- Reducing localized flooding,
- Improving community aesthetics,
- Encouraging more neighborhood socialization,
- Improving economic health by increasing property values and providing jobs opportunities for small businesses, and
- Decreasing the economic and community impacts of flooding, delivering environmental, social, and economic benefits (EPA 2015)

## Types of Green Infrastructure

### Green Roofs



Photo credit: <https://www.greenroofs.com/projects/u-s-coast-guard-headquarters-dhs-st-elizabeths-campus/>



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A green roof is a rooftop that is partially or completely covered with a growing medium and vegetation planted over a waterproofing membrane. It may also include additional layers such as a root barrier and drainage and irrigation systems. Green roofs are separated into several categories based on the depth of their growing media. Extensive green roofs have a growing media depth of two to six inches. Intensive green roofs feature growing media depth greater than six inches (Green Roofs for Healthy Cities). Some benefits of green roofs include:

- Longer lifespan than traditional roofs
- Reduce energy costs
- Buildings with green roofs can command rental premiums
- Vegetation provides habitat for wildlife

### Planter Boxes



Photo credit: <https://theconversation.com/can-trees-really-cool-our-cities-down-44099>

Planter boxes are urban rain gardens with vertical walls and either open or closed bottoms. They collect and absorb runoff from sidewalks, parking lots, and streets and are ideal for space-limited sites in dense urban areas and as a streetscaping element. Planter boxes help:

- Intercept and absorb rainfall
- Reduce urban heat island
- Improve habitat and aesthetic value
- Provide shade in summer and block wind in winter, reducing heating and cooling costs
- Reduce greenhouse gases by absorbing CO<sub>2</sub>
- Capture urban air pollutants (dust, O<sub>3</sub>, CO)



## Bioretention and Infiltration Practices



Photo credit: <https://greenpare.wordpress.com/2013/07/19/uri-the-greenest-college-in-rhode-island/>

Bioretention and infiltration practices come in a variety of types and scales, including rain gardens, bioswales and wetlands. Rain gardens are dug at the bottom of a slope in order to collect water from a roof downspout or adjacent impervious surface. They perform best if planted with long-rooted plants like native grasses. Bioswales are typically installed within or next to paved areas like parking lots or along roads and sidewalks. They allow water to pool for a period of time and then drain and are designed to allow for overflow into the sewer system. Bioswales effectively trap silt and other pollutants that are normally carried in the runoff from impermeable surfaces. Implementing bioretention and infiltration practices can:

- Improve property and neighborhood aesthetics
- Reduce localized flooding
- Promote infiltration and groundwater recharge
- Enhance pedestrian safety when used in traffic calming applications



## Permeable Pavement



Photo credit: <http://pelajaran.me/blog/remodeling-your-kitchen-should-you-hire-a-decorator/>

Permeable pavement allows for the absorption and infiltration of rainwater and snowmelt onsite. There are several different names that refer to types of permeable pavement, including pervious or porous concrete, porous asphalt and interlocking permeable pavers.

- Reduce stormwater runoff and standing water
- Promote infiltration and groundwater recharge
- Improve the longevity of infrastructure
- May be easier to maintain than standard pavement

### Funding Opportunities

(<https://www.epa.gov/green-infrastructure/green-infrastructure-funding-opportunities>)

Federal funding sources:

- Department of Energy (DOE).
- Department of Housing and Urban Development (HUD)
- Department of the Interior (DOI)
- Department of Transportation (DOT)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Department of Agriculture (USDA)
- U.S. Economic Development Administration (EDA)
- U.S. Environmental Protection Agency (EPA)



# Case Studies

## Local – Kids Creek

### Kids Creek Restoration Project

**Goal: To reduce the impact of stormwater and sedimentation on Kids Creek and its tributaries so it can be removed from the State Impaired Waters List**



**Issues:**

- A 3-mile portion of Kids Creek is impaired due to sedimentation, deer rutting activities, and other human-caused sources, all of which relate to stormwater.

**Project Concept:**

- Apply green infrastructure/low impact development concepts to reduce stormwater runoff to creek.
- Improve habitat and stabilize streambanks.

**Funds Raised:**

- State/Federal: \$3.1 million
- Private Grant: \$200,000
- Donations: \$75,000
- Matching Funds (Private Businesses): \$450,000

**Kids Creek Subwatershed**



On State Impaired Waters List (SWQI) List for Aquatic Life and Wildlife

**2017-18 BMP Sites**

1. Installing filtration basins and pervious pavement around the Mission Medical Center hospital parking lot.
2. Installing two box planters or rain gardens to reduce stormwater runoff from Medical Campus Drive.
3. Installing rain gardens to collect and filter runoff, parking lot, and road runoff around the Grand Terrace Pavilion.
4. Excavating and enlarging the wetlands on the corner of Elmwood and Medical Campus Drive so more water can enter during storm events and be slowly released into Kids Creek.
5. Installing a rain garden and bioswale to collect and infiltrate water from Elmwood Avenue and the parking area of the Terrace City State Office Building.
6. Restoring the natural floodplain and installing a buffer on Tributary AA between the Grand Terrace Pavilion and Grand Terrace Commons.
7. Converting Road and rock-filled detention areas off of Cottage Grove Drive into functioning rain gardens.
8. Reducing erosion and runoff issues by paving the dirt road between Scroggins and East East Charley and diverting stormwater into a series of rain gardens.
9. Installing UDI techniques with new parking garage at main Mission parking lot (system TBD).

**What is Green Infrastructure and Low Impact Development?**

- Small-scale, stormwater management practices that encourage onsite infiltration.
- Practices that work with nature to reduce runoff and pollutants.
- Practices that manage rainfall at the source.
- Can include rain gardens, green roofs, pervious pavement, bioswales, infiltration trenches, etc.



**12. Aerial view of Kids Creek Tributary A highlighting and restoration project at Cowell Family Cancer Center site. Top left shows construction of underground infiltration basin; bottom left shows green roof.**



**10. New green roof at Mission's main building.**



**9. Development planter boxes and pervious pavers installed at Building 28 (HHS Medical Campus Dr.).**



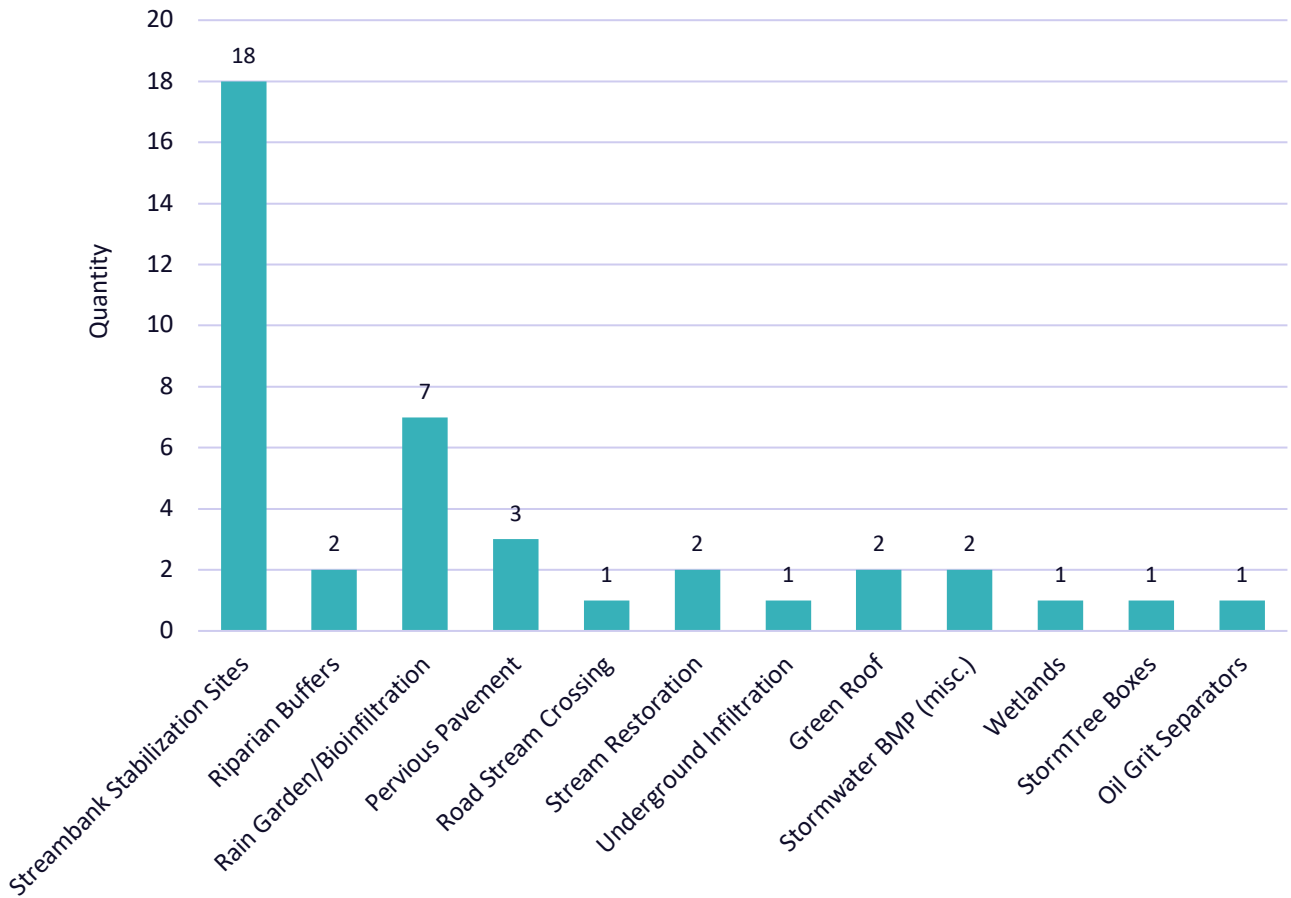
**8. Current condition of Tributary AA by Grand Terrace Pavilion, restoration work started in spring 2017.**

**Completed BMP Sites**

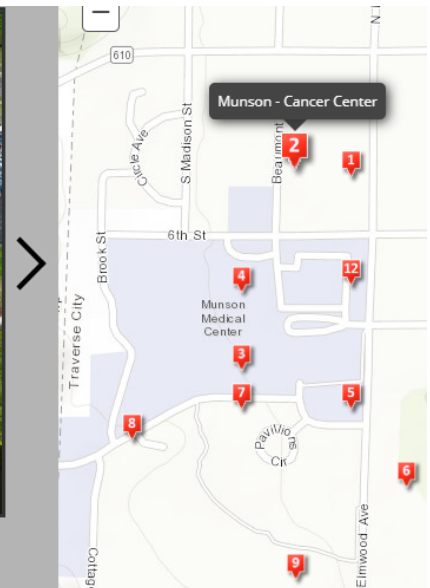
9. Installed a development planter boxes, converted parking lot to pervious pavers, and retrofitted existing basins to a rain garden at Building 28 on west side of parking garage.
10. Retrofitted ~3,000 sq ft of roof on Mission Hospital Tower A to a green roof.
11. Installed green roof, underground infiltration trenches, and rain gardens at the Cowell Family Cancer Center.
12. Reconnected open feet of underground culverts and abandoned detention channel that is 1,000 feet in length and eliminated 10,000 sq ft of impervious surfaces.

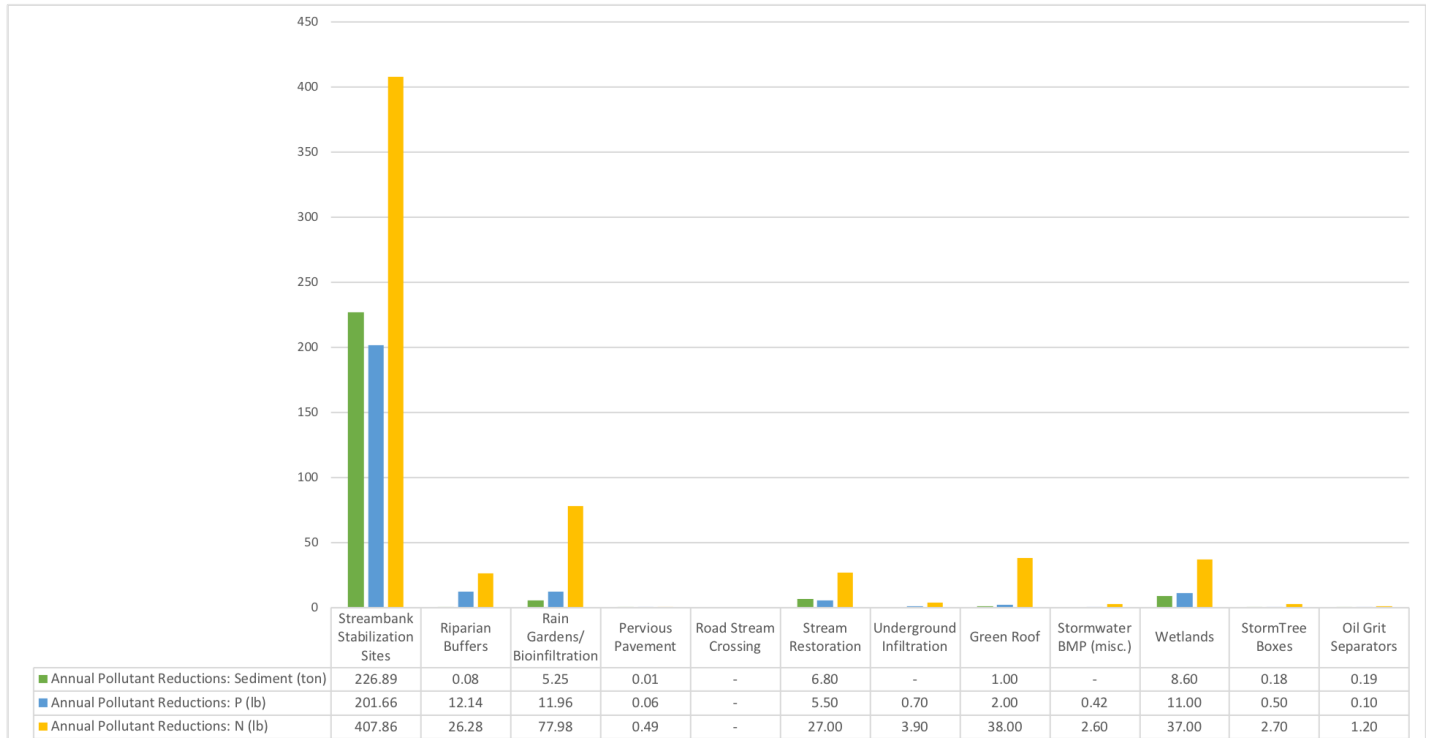
**Key Partners:**

- FFA, DDO, DVR
- Local units of gov. - City of TC, Garfield Twp
- Grand Terrace Conservation District
- Mission Medical Center
- Village of Grand Terrace Council
- Grand Terrace Pavilion (OT County)



Different BMPs used in Kids Creek





Annual pollutant reductions by different types of BMPs built in Kids Creek (related to sizes and quantities).

### Green Infrastructure Used in Parking Facilities



This parking lot drains to a vegetated bioretention area along the perimeter.

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Parking lot pavement at municipal facilities constitutes a substantial portion of urban and suburban impervious surface area. These lots, as well as medians, curbs, and bump-outs, present opportunities for municipalities to incorporate green infrastructure features into new parking lot designs or retrofit existing parking lots with green infrastructure to capture runoff from parking spaces, parking lanes, and buildings before it leaves the site. Greener parking can be used to:

- Reduce effective impervious area
- Infiltrate runoff from parking lanes and stalls
- Improve parking lot drainage
- Provide shade when trees are used
- Improve pedestrian safety with curb bump-outs to reduce crossing distances
- Improve aesthetics
- Provide wildlife habitat

Project Complexity: Medium

Timeframe: 1–3 years

Installation Costs: \$10,000 and up, depending on site and scale

Factors Affecting Costs:

- Scale of the project
- Retrofit, infill, or new development setting
- Green infrastructure practices selected
- If existing utilities require relocation or special designs

Financing Opportunities:

- Capital improvement funds
- Property tax assessments
- Smart growth grants
- State or private grants
- State revolving loans
- Issuing bonds

Necessary Maintenance:

- Hand weeding
- Debris and sediment removal
- Plant trimming and pruning
- Plant replacement
- Vacuum sweeping of permeable pavement

Things to Consider Beforehand

- Select plants that do not impede driver sight lines or hide pedestrians from view.
- Use salt-tolerant plants where salt will be used for snow and ice control.
- Select native or locally adapted plants where possible to reduce maintenance and help to ensure longevity.



- Design practices with sufficient access and features that make maintenance easier, such as paved forebays for easy sediment removal.
- Choose vegetation that is densely rooted to filter debris and pollutants.
- Use wheel stops or curbs with cuts to ensure that cars do not drive over bioretention.
- Grade drainage to slope toward bioretention areas or permeable pavement; avoid concentrated flows.
- Design curb cuts and inflow areas to manage adequate flow.

#### Potential Project Partners

- Seek input from business improvement districts and neighborhood associations regarding desired features and amenities of green parking areas.
- Solicit funding from business associations to improve municipal parking areas serving a commercial district.
- Engage civic leagues, environmental groups, and garden clubs to provide support and volunteers to help build and maintain green infrastructure.
- Provide municipal incentives to private property owners to build new parking with green features.
- Consider provision of design assistance and expedited permit reviews.

#### CASE STUDY: LANCASTER PARKING LOT TRANSFORMATIONS – LANCASTER, PENNSYLVANIA



The City of Lancaster, Pennsylvania has taken on a series of four city-owned parking lot renovations in the city’s southeast region. The renovated parking lot designs incorporate stormwater management features. Stormwater measures added to the parking lots on Plum



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Street, Dauphon Street, Pennsylvania Avenue, and Mifflin Street include repaving with permeable concrete, tree plantings, rain gardens, and reorganization of parking area placement to accommodate additional vehicles without expanding paved surface area (City of Lancaster 2014). The four renovated parking lots are each estimated to intercept between 600,000 and 700,000 gallons of stormwater that drains from surrounding blocks every year. Prior to the renovations, stormwater entered the sewer system and was overwhelming the treatment capacity of the facility, leading to raw sewage discharges into the Conestoga River, and ultimately the Chesapeake Bay (Harris 2011). Each of the parking lot renovations is estimated to cost about \$160,000, with funding provided by a loan from the Pennsylvania Infrastructure Investment Authority and grant funding from the National Fish and Wildlife Foundation. The parking lot renovations are part of a series of green projects that the City of Lancaster implemented as an alternative to a \$300 million grey infrastructure approach of building storage tanks to hold overflow until it could be treated (Harris 2011).

#### CASE STUDY: ST. LANDRY PARISH VISITOR'S CENTER – ST. LANDRY PARISH, LOUISIANA



The St. Landry Parish Visitor Center in Louisiana was constructed to achieve LEED certification by incorporating sustainable materials with both aesthetic and functional purposes. For example, construction incorporated recycled building materials and stormwater control measures including permeable recycled asphalt in the conservatively sized parking lots. Stormwater runoff from the parking lot and roof is entirely retained on site by cisterns, rain gardens, and a series of bog ponds that collect and filter runoff. Native plants landscape the building's exterior, reducing maintenance and eliminating irrigation needs. In addition to stormwater control features, the visitor center incorporates energy saving measures, such as wind turbines, daylighting, low-energy insulated glazing, minimized east and west exposure to reduce solar heat gain, personal temperature controls,

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dual flush toilets, and energy star rated appliances. The resulting visitor center complements the existing landscape in a way that maximizes the natural meadow and landscape space and showcases sustainable strategies that are not only effective from ecological and monetary standpoints, but also serves as an educational example of the benefits of green infrastructure. The project was funded through public funding from federal and parish sources. Costs totaled approximately \$330,000, with \$130,000 allocated to parking sitework, walkways, and bioswales. The remaining \$200,000 was split equally between landscaping, and utilities, drainage, gabion walls, and dirtwork. The stormwater measures incorporated in the visitor center are estimated to provide over 10% savings in construction costs compared to traditional site design and development and should result in long-term savings from landscaping that will not require potable water for irrigation (ASLA).

### Green Infrastructure Used in Public Facilities



This bioretention area captures stormwater and enhances the beauty and wildlife value of the landscape.  
Photo credit: Robert Domm Photography

Municipal buildings, libraries, public parking lots, schools, community centers and parks offer opportunities for highly visible green infrastructure retrofits. Projects can be undertaken as part of the capital improvement process, ideally in conjunction with other needed maintenance such as building additions and modifications, repaving, re-landscaping, or infrastructure repair or replacement. Green infrastructure offers the following benefits:

- Reductions in impervious area
- Infiltration of runoff from paved areas and rooftops

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- Public education opportunities (signage)
  - Shade when trees are used
  - Wildlife habitat
  - Welcoming area
  - Creation of park-like areas

Project Complexity: Medium

Timeframe: 1–3 years

Installation Costs: \$50,000 and up, depending on site and scale

Factors Affecting Costs:

- Scale of the project
- Retrofit, infill, or new development setting
- Green infrastructure practices selected
- If existing utilities require relocation or special designs

Financing Opportunities:

- Property tax assessments
- Stormwater utilities
- Smart growth grants
- State and private grants
- State revolving loans
- Issuing bonds

Necessary Maintenance:

- Hand weeding
- Debris and sediment removal
- Plant trimming and pruning
- Plant replacement
- Vacuum sweeping of permeable pavement

Things to Consider Beforehand

- Retrofitting public property to include green infrastructure features is most efficient and cost-effective when it occurs in conjunction with other needed maintenance and upgrades.
- Incorporate signage to educate the public about how stormwater is managed by the facilities.
- Choose vegetation that is densely rooted to filter debris and pollutants.
- Use salt-tolerant plants where salt will be used for snow and ice control.
- Select native or locally adapted plants where possible to reduce maintenance and help to ensure longevity.
- Where possible, site stormwater retrofits in locations where pavement already drains in the right direction to avoid regrading.
- Site and design practices with sufficient access and features that make maintenance easier, e.g., include paved forebays for easy sediment removal.

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## Potential Project Partners

- School districts and students, parent/teacher associations, friends of the library, and downtown business associations can provide input into the design and placement of the practices for maximum utility and can provide volunteer resources to keep the facilities free of trash and weeds
- Partner groups could apply for grants to assist in the design or installation of key portions of the project or share costs
- Students can study, monitor, and maintain water quality facilities on school grounds as part of their science curriculum.

## CASE STUDY: BAMBOO BROOK HISTORIC WATER SYSTEM RESTORATION – MORRIS COUNTY, NEW JERSEY



Bamboo Brook Outdoor Education Center restoration.  
Photo credit: Patricia M. O'Donnell, Heritage Landscapes LLC.

The Bamboo Brook Outdoor Education Center, formerly Merchinston Farm, underwent a restoration effort in 2009 to restore the existing but deteriorated system of scenic pools, streams, and tanks constructed by the original owner, a pioneer of landscape architecture. The design included water conservation measures such as bioswales, native plants, and rainwater harvesting devices. The system can now capture the runoff generated by a 2-year storm event. The restoration of the stormwater project was estimated between \$1M and \$5M, with public funding from state, local, New Jersey grant and Morris County Park Commission funding. The state estimates that 7 employment years were created by this project. To complete the project, approximately 6,346 hours were needed for planning and design; 6,820 hours for construction, and approximately 4,000 hours needed for annual maintenance (ASLA).



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# REGIONAL AND LOCAL PERSPECTIVES ON WATER STEWARDSHIP

Because the Blue Community approach requires strong support from the community, we decided to explore the opinions and thoughts of citizens and organizations within the Grand Traverse Bay watershed and around the Great Lakes as a whole. We obtained information on citizen opinions from the Second Binational Great Lakes Basin Poll, as reported by the International Joint Commission (IJC 2018). We complemented this information by conducting an online survey of local stakeholder organizations, businesses, and governmental units who operate directly within the Grand Traverse Bay watershed. The IJC survey sampled local citizens around all the lakes for their thoughts and opinions on the state of the freshwater resources in the Great Lakes region. Our local survey focused on several topics that play into the implementation of a Blue Communities approach, including perspectives on the health of the Great Lakes, the difficulties in pursuing freshwater-related organizational goals, and suggestions for how to approach local collaboration.

We created a survey for local organizations, businesses, and units of government that we had interacted with and that had a stake in the Grand Traverse Bay watershed. We conducted our stakeholder questionnaire through a Google Form, which was emailed individually to each potential respondent. In crafting the survey, we sought exemption from the University of Michigan Institutional Review Board (IRB). The IRB is an administrative body tasked with protecting the rights and welfare of human subjects involved in research. This body has the authority to review all research involving human subjects and approve, deny or require modifications of the research. Exemption was granted to our survey on the condition that all respondents were adults. We further specified that there would be no link between responses and the respondent and complete anonymity would be maintained.

## Blue Communities Survey Breakdown

Our survey can be divided into four sections: (1) organizational missions, (2) organizational relationships to water, (3) the stakeholder network and (4) information network. The first section of the survey focused on the missions, goals and challenges of the respondents. The questions in this section were structured to give us an idea of what types of groups we were dealing with in the watershed. One of the questions in this section was meant partly as a reflection and partly as an acknowledgement of the successes achieved by the organization/business/local unit of government. It is important to acknowledge and celebrate the successes of local stakeholders instead of solely focusing on the work that needs to be done. This section of the survey also addressed the roadblocks to achieving future success. Understanding what type of challenges face local organizations/businesses/local units of government is crucial for the collaborative backbone of a Blue Community. Information from this section will help us pinpoint what types of challenges are most prominent in the watershed. Provided with this information, stakeholders can not only anticipate problems, but offer help or collaborate in areas where they are most capable.



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The questions in the second section of the survey gave us an idea of how the stakeholders interacted with freshwater resources in the Grand Traverse Bay watershed. The answers provided informed us which resources were commonly used and hence needed more protection/preservation. This section also gave the respondent a chance to ponder their reliance on freshwater resources within the watershed and hopefully encourage them to think more about the impacts they have on freshwater resources. We included a question about perceived threats to the watershed as a way to inventory perceived freshwater problems in the Grand Traverse Bay watershed. Having a list of perceived threats to freshwater will help us narrow the focus of a Blue Community to those problems recognized by local stakeholders.

The next section of the survey concerns the stakeholder network, the ultimate platform for collaboration. This section was designed to explore how interconnected the stakeholder network is within the watershed and pinpoint organizations that could potentially act as a hub for the Blue Community. A clear understanding of the stakeholder web is vital to establishing a Blue Community. If organizations are not aware of or interacting with neighboring organizations, collaboration will not succeed. We also inquired about what organizations the respondents wanted to work with on a more regular basis. Using this information, we can make an effort in our creation of a Blue Community to invite those listed stakeholders to participate.

The last section focused on the information available within the stakeholder network, which included identifying crucial or missing information upon which the stakeholders relied. This section was meant to give us an idea of what types of information was lacking in the local community. In turn, this information would allow stakeholders to list and share information or resources that they have with the organization/business/unit of government that is in need of that information or resource. Resource and information sharing are critical for a collaborative project to succeed. It is difficult for organizations/businesses/units of government to work together if they are unaware of what types of information are available or needed (Table 3).

## Findings of Local Stakeholder Survey

### Challenges

There are several challenges that hinder local organizations which the Blue Communities Initiative hopes to help solve: money, capacity, and politics. Money is a prominent problem for local organizations. Organizations are often either competing for the same pot of money or the funding is limited. One respondent pointed out that it can be difficult “meeting new demands with limited resources”. If water stewardship is going to grow, then more resources are going to have to be found. Blue Communities can help alleviate this by providing a place where funding information is listed and making organizations more aware of what kind of funding is actually out there. Since a Blue Community is built on collaboration, this would help to reduce competition for funds. Collective impact, another key tenet of a Blue Community, includes the identification of mutually reinforcing activities.

**Table 3.** Blue Communities stakeholder survey sections and questions. The survey consisted of four sections and twelve questions, the first of which ascertained whether the respondent was an adult (18+). See Appendix A for anonymous survey answers.

<i>Organizational Goals and Challenges</i>	1. What are is the goals and mission of your organization/business/local unit of government?
	2. What recent or long-term successes best represent the goals and impact of your organization/businesses/local unit of government?
	3. What is the greatest challenge your organization/business/local unit of government faces in pursuing its goals?
<i>Organizations and Water</i>	4. In what ways, if any, does the work of your organization/business/local unit of government depend on and/or impact the quantity and quality of fresh water resources in the Grand Traverse Bay watershed?
	5. In your opinion, what are the greatest threats to the surface water and groundwater in the watershed and region?
<i>Stakeholder Network</i>	6. Who are your organization’s most important stakeholders and/or partners in the work that you do?
	7. What other partners or stakeholders, if any, would you like your organization/business/local unit of government to work with more frequently and/or more effectively?
	8. What other potential stakeholders should we be talking to?
<i>Information Network</i>	9. What sources and types of information about the region and watershed does your organization rely on to accomplish its goals? Do you have adequate access to that information?
	10. What information does your organization/business/local unit of government have less access to or lacks the capacity to utilize but would benefit your work and your ability to work collaboratively with other partners and stakeholders?
	11. Are you interested and willing to be a part of this Blue Communities Initiative?

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In other words, the group works together to find efficiencies that may not cost more, further helping the organizations involved save money. For instance, the Regional Conservation Partnership Project, a local Grand Traverse Bay Watershed initiative, successfully took competing organizations and gathered them around a common table to seek mutual funding opportunities.

Capacity to nimbly respond to new issues that “pop-up” is important for any organization and was highlighted by a few survey respondents. One respondent pointed out the difficulty in “having enough capacity to meet with enough people to wrangle action and effective partnerships”. Unfortunately, financial restraints mean the budget has to be tight and hiring kept to a minimum. Blue Communities can help alleviate this by providing a structure of communication that would allow organizations to seek or offer help to each other when something comes up.

Finally, respondents listed politics as a barrier to achieving their goals within the region. One stakeholder said that “politics are often very divisive and community members and elected officials are not interested in finding common groups”. While partisan politics can make collaboration difficult, we hope that the emphasis on protecting local resources will strike a chord with people on both sides of the political aisle. In order to accomplish this, a common table needs to be created. A common table is a place where stakeholders can gather and engage with each other (Wondolleck and Yaffee 2017). If stakeholders are not interacting with each other regularly and building relationships and trust, then it will be difficult for them to solve local problems in a collaborative way. Besides a place to gather, a common agenda is also needed to promote collaboration. Having a common agenda means that all stakeholders understand the problem and agree on a collaborative process of trying to solve it (Kania and Kramer 2011). Stakeholders do not need to come from similar perspectives nor agree on every minute detail of the process. They do, however, need to all agree on the ultimate goal of the project. We envision that a Blue Community will strive to create a common table and agenda that will inspire a diversity of partners who are open to the idea of freshwater stewardship to collaborative action.

## **Local Freshwater Concerns**

A benefit to centering a Blue Community around local collaboration and partnerships is that these organizations/businesses/local units of government get to decide which freshwater-related issues are most pressing in their area. Our stakeholder survey explored opinions on what issues threatened the Grand Traverse Bay watershed.

The most common local concern is stormwater runoff and its potential negative effects on local water quality through pollution. This matches with the regional perspective where 30% of IJC survey respondents indicated pollution as the biggest threat to freshwater resources. Most of the problems created by stormwater come from runoff, when rainfall hits dirty impervious surfaces (i.e. sidewalks or roads) picking up pollutants and chemicals before flowing into the sewer system or nearby rivers or streams (Gaffield et al. 2003). This rapid flow of untreated water causes numerous water quality problems (Walsh et al. 2012). Urban stormwater also degrades streams by altering the amount of surface water flowing

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into streams, which can lead to flooding, channel erosion, and adverse impacts on wildlife. One of the local collaboration success stories we investigated involved the restoration of a stream negatively impacted by sedimentation caused by stormwater runoff. Increased stormwater runoff is a cause for concern in a climate that is expected to experience more frequent and more intensive rainfalls (O’Gorman and Schneider 2009). Some of the townships located in and around the watershed are the fastest growing in the State of Michigan (U’Ren 2005). This means an expanding population and more impervious pavement, both of which can potentially increase urban stormwater runoff. More runoff increases the chances of overloading sewer systems and causing sewage overflows. Sewage overflows are a real threat in the Grand Traverse Bay watershed. Traverse City has experienced issues with overflow, including a four-thousand-gallon spill in the summer of 2016 (Kaminski 2016) and an eight-thousand-gallon spill this past year (Travis 2018). Nearby Frankfort, MI experienced a one-million-gallon spill that went unnoticed for several weeks recently as well (Brandt-Burgess 2018). Spills like these not only impact the health of people and the environment, but also the economy. Sewage overflow in Traverse City has led to the closure of beaches, which has the potential to negatively impact the tourism. Traverse City and surrounding towns rely heavily on tourism to bolster their economies (U’Ren 2005). An investment in infrastructure is necessary to help reduce runoff not only for the sake of human health, but also for the environment and economy.

While the surface water in the area gets the most attention from tourists and locals, the immense amount of groundwater and its potential pollution needs to receive more attention. One local survey respondent highlighted their concern for “profound threats to the GL from . . . groundwater contamination”. The Great Lakes basin holds enough groundwater to fill Lake Huron, and this is often the source of human drinking water (Grannemann and Van Stempvoort 2015). Groundwater also serves as the source waters for rivers, lakes, and wetlands. The deep layers of sand and gravel in the Lower Peninsula provide for a large capture and storage of groundwater. However, the disposition of groundwater makes it easy to forget about or take for granted. Groundwater is often out of sight, out of mind until there is a major problem (Howard and Gerber 2018). In the absence of a visible disaster, human disregard and environmental negligence can take hold. In these situations, as pointed out by a survey respondent, “the desire to promote business concerns takes precedence over long term concerns about water, lake, and river care”. Efforts need to be made to not only educate the public about groundwater resources, but also encourage good stewardship of these resources. Good freshwater stewardship will arise from the integration of water values into decision-making.

Water withdrawals, especially those concerning commercial use, present a problem for local and regional stakeholders due to the nature of freshwater availability in Michigan. One local survey respondent noted their concern about “large water withdrawals for commercial use”. Water withdrawal certainly does not seem like a concern in a place that holds roughly 20% of the world’s freshwater supply (Great Lakes Basin Advisory Council 2010). However, even though Michigan has a humid climate, it only receives about 32 inches of rainfall per year (Climate Michigan). Michigan’s water abundance is not found in how much is annually available to use [Precipitation - evapotranspiration loss - some for ecosystem use = how much left for us to use]. Rather, Michigan’s abundance is in the large storage capacity found



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in the Great Lakes and aquifers. Large amounts of storage mean security and stability for local inhabitants because local communities are not at risk of severe floods or droughts. Michigan's water wealth is based on how steady the supply is, not how much water there actually is. With this in mind, impacts of withdrawal need to be considered in the overall picture of capacity and stability. While withdrawals may seem sustainable on a regional scale, the impact on local watersheds where withdrawal occurs can be detrimental (Mubako et al. 2013).

Invasive species have posed a threat to the natural resources of the Great Lakes for decades and are one of the most visible concerns among both local and regional residents. 17% of IJC respondents listed invasive species as the most significant problem facing the Great Lakes and a couple of local stakeholders mentioned their concern for the negative impact of invasive species. Upwards of 25 invasive species of fish as well as myriad invasive plant species plague the Great Lakes region (Environmental Protection Agency). Roughly \$200 millions dollars is lost per year due to damages and prevention strategies (Nature Conservancy). Unfortunately, the problem is predicted to get worse as the climate warms. Warmer water temperatures will facilitate conditions favorable to non-native species while local, cold-water species will struggle (Rahel & Olden 2008). The public awareness surrounding the issue of invasive species means that solutions will continue to be sought.

Understanding regional and local perspectives and concerns about freshwater is crucial when creating a collaborative atmosphere. If a Blue Community is to flourish from the bottom-up, the opinions and perspectives of local stakeholders need to be taken seriously.

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# COLLABORATION FOR THE FUTURE

The combined effects of climate change and urbanization on water are difficult to predict due to the challenges and uncertainties involved in predicting individual and synergistic local impacts. However, action in the face of uncertainty is critical to developing an active strategy to protect water. By linking land-use planning mechanisms with the goal of maintaining water health, collaborative efforts by planners and ecologists are needed to study the impact of alternative local urbanization strategies and to develop site-specific solutions for watershed planning and management.

## Collaboration and Politics

Collaborative efforts give the agencies, organizations, and communities involved the opportunity to transform. Through partnerships and the sharing of expertise and ideas, agencies and organizations can reinvent themselves for the management challenges of the next century, and communities can diversify their economic bases and social values (Wondollock & Yaffee 2000). These collaborative relationships also form the basis for important public services at a societal level by building bridges between individuals, organizations, and agencies in environmental management. Studies have shown that once people are given a goal and the statutes of limitation for how it can be accomplished, they will find a way to accomplish that goal. This exact type of scenario is played out numerous times in collaborative resource management and it helps to rebuild a sense of trust in government institutions and each other. As environmentalist Jack Shipley notes, "It was desperation and gridlock that brought us together, but it is trust and respect that keeps us going" (Wondollock & Yaffee 2000). By forming different kinds of collaborative arrangements, communities and agencies have been able to build a foundation for more effective decision making, expand means for getting work done, and increase support for needed action on-the-ground management. Along the way, collaborative arrangements have improved the capacity of agencies and communities to deal with future problems. Collaboration is not an end in itself, but rather one strategy for achieving more sound and sustainable resource management.

## Types of Collaboration

According to the book Making Collaboration Work by Julia Wondollock and Steve Yaffee, the term collaboration means "a process where two or more individuals or organizations deal collectively with issues that they cannot solve individually". However, not all collaborative initiatives require the same amount of resources, time, and effort to make work. Therefore, social scientists have created five different categories (types) of collaboration based on these key elements (Table 4).

**Table 4.** Types of collaboration and definitions

Types of Collaboration	Definition
<b>Funders Collaborative</b>	Groups of funders interested in supporting the same issue who pool their resources. These participants generally do not adopt an overarching evidence-based plan of action or a shared measurement system. They tend not to engage in any differentiated activities beyond check writing or engaging stakeholders from other sectors
<b>Public-Private Partnerships</b>	Partnerships formed between government and private sector organizations to deliver specific services or benefits. They often have a very narrow target and usually do not engage the full set of stakeholders that affect the issue.
<b>Multi-Stakeholder Initiatives</b>	Voluntary activities by stakeholders from different sectors around a common theme. These initiatives typically lack any shared measurement of impact and the supporting infrastructure to forge any true alignment of efforts or accountability for results.
<b>Social Sector Networks</b>	Groups of individuals or organizations fluidly connected through purposeful relationships whether formal or informal. Collaboration is generally ad hoc, and most often the emphasis is placed on information sharing and targeted short-term actions, rather than a sustained and structured initiative.
<b>Collective Impact Initiatives</b>	Long-term commitments by a group of important actors from different sectors to a common agenda for solving specific social problems. Their actions are supported by a shared measurement system, mutually reinforcing activities and ongoing communication and are staffed by independent backbone organizations.

## Facilitating Collaboration

For a collaborative initiative to be successful, it needs effective leaders who can implement a domain focus and can facilitate the meetings and member communication. We refer to this group of leaders as the backbone organization. This backbone organization will help to focus the project not on the needs and interests defined in terms of one organization but in terms of the interdependencies among stakeholders who are affected by the issue and

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claim a right to influence it (Gray 1965). This kind of focus is referred to as domain focus, which is developed through a process of problem-setting, direction-setting, and structuring.

In the problem setting stage, the main concern is identifying the stakeholders within the domain and a mutual acknowledgement of the issue which joins them. This step is important because unless some consensus is reached about who has a legitimate stake in an issue and exactly what the joint issue is, further attempts at collaboration will be thwarted. In the direction-setting phase, stakeholders articulate the values which guide their individual pursuits and begin to identify and appreciate a sense of common purpose. This phase gives life to the stakeholders' hopes that their desired ends can, in fact be achieved. This process of developing shared interpretations about the future and the articulation of commonly held values or goals serves to correlate the stakeholder's activities toward mutually desirable ends. In the structuring phase, stakeholders generate a system for sustaining coincident values and establish order within the domain. In this phase, specific goals are set, tasks are elaborated, and roles are assigned to stakeholders. This phase is titled structuring because structuring refers to the process of institutionalizing the shared meanings and prevailing norms which emerge gradually as the domain develops.

## Stakeholder Selection

Stakeholder identification is a key part of the development process of these three phases. Stakeholders are people whose expertise is essential to building a solution. However, a more comprehensive understanding of the problem is achieved as more stakeholders share their various appreciations about the problem (Gray 1965). Ultimately, a sufficient variety of information is needed from stakeholders to match the complexity inherent in the issue itself. This means that in order to be perceived as a legitimate stakeholder, this person/organization must have both expertise and the ability to participate. That is, they must possess resources and skills sufficient to justify their involvement in collaborative efforts. When deciding on stakeholders, be sure to include all those who must abide by its outcome. Omission of relevant stakeholders invites political difficulties during subsequent implementation. Efforts to convene all stakeholders simultaneously will likely be thwarted by changing dynamics of the domain. Therefore, inclusion of stakeholders should be viewed as a process of continual adaptation.

## The Collective Impact Framework

From the types of collaboration listed previously, we have learned that most types of collaboration are used for short-term projects, while only the collective impact initiative is primarily used for long-term collaboration. A collective impact initiative is meant for long-term use because of the type of framework it has in place, which includes a common agenda, a shared measurement system, mutually reinforcing activities, continuous communication, and a backbone support organization (Kania & Kramer 2011). In a collective impact initiative, collaboration is built upon a common agenda. This means that all the participants have a shared vision for change, one that includes a common understanding of the problem and a joint approach to solving it through agreed upon action. It does not require all participants to



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agree with each other, but it does require all participants to agree upon the primary goals of the project.

A shared measurement system helps facilitate collaboration between stakeholders. Consistently collecting data and measuring results on a short list of indicators at the community level and across all participating organizations not only ensures that all efforts remain aligned, it also enables the participants to hold each other accountable and learn from each other's successes and failures.

In addition, mutually reinforcing activities and continuous communication promote progress towards the achievement of goals. There are multiple causes for every social problem, and components of their solutions are interdependent. They cannot be addressed by uncoordinated actions among isolated organizations. As a result, there must also be continuous communication. Developing trust among nonprofits, corporations, and government agencies is a monumental challenge. Participants need several years of regular meetings to build up enough experience with each other to recognize and appreciate the common motivation behind their different efforts. For this to happen, monthly or biweekly in person meetings with the same delegates are required. Skipping meetings or sending lower-level delegates is not acceptable. It also helps if these meetings are supported by an external facilitator and follow a structured agenda.

Finally, creating and managing a collective impact initiative requires a separate organization and staff with a very specific set of skills to serve as the backbone for the entire initiative. This kind of coordination requires time, and participating organizations often do not have any to spare. The backbone organization requires a dedicated staff separate from the participating organizations who can plan, manage, and support the initiative through ongoing facilitation, technology, and communication support, data collection and reporting, and handling the myriad logistical and administrative details needed for the initiative to function smoothly. One organization simplified this initial staffing requirement for a backbone organization to three roles: project manager, data manager, and facilitator. In the best of circumstances, these backbone organizations embody the principles of adaptive leadership, which are:

- The ability to focus people's attention and create a sense of urgency
- The skill to apply pressure to stakeholders without overwhelming them
- The competence to frame issues in a way that presents opportunities as well as difficulties
- The strength to mediate conflict among stakeholders

## Local Stories of Collaboration

The idea of community-based conservation or local collaboration, a type of bottom-up approach, is nothing new. Various communities throughout the centuries have developed local rules and rituals to restrict exploitation of local resources (Western & Wright, 2013). A return to community-based management of natural resources has proved successful under some circumstances as a form of bottom-up management. Distrust of governmental agencies

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that deal with natural resources means that environmental improvements are often held up in politics (Leahy & Anderson, 2008). The idea of an agency coming in and telling local residents what to do and how to do it can often result in resentment within the community. Therefore, engaging with local stakeholders and residents to work towards solutions to local environmental issues will help increase environmental benefits and create a more environmentally-conscious populace. Having an environmentally-conscious populace will reduce resentment towards governmental agencies because residents have a better grasp of the underlying environmental problem.

Portland, Oregon has already implemented a locally driven, water stewardship plan that has been very successful. Called the Community Watershed Stewardship Program (CWSP), the program was crafted by a combination of state government agencies, a local university, and the local community (Shandas & Messer, 2008). The program was a change from the status quo, which had implemented a top-down approach that produced negligible results in preserving the watershed. The CWSP embodies what the Blue Communities plan aims to produce: a bottom-up, area-based, flexible community initiative that works to instill values of water stewardship into communities located on and around the Great Lakes.

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#### Community Watershed Stewardship Program (CWSP)

The CWSP is a collaborative partnership between environmental agencies and local citizen groups in Portland, OR. It allows citizen groups and local communities to pursue watershed projects through the use of grants provided by the agencies. The program's goal is to improve local communities and watersheds in order to promote a healthier environment. A strong distrust of government in the 1980s led to the necessity of pursuing more local-based solutions to environmental challenges. The CWSP was a response to this distrust and became a partnership between environmental agencies, a local university, and local residents. The CWSP has succeeded in bringing together local stakeholders behind a common goal of local-based environmental improvement and a common source of funding via the agencies. Local residents have developed a connection with the local watershed because of their new involvement in environmental stewardship and have described a deeper connection between their actions and the environmental consequences.



Photo credit: portlandoregon.gov

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Stories of successful collaboration are not restricted to the American west. As part of our work on the Blue Communities project, we conducted a pair of individual interviews with representatives of local organizations that had participated in some sort of local collaboration project (Table 5). We undertook this task in order to provide local, poignant examples of collaboration that can be used to back up the academic argument for

collaboration. We sought exemption from the University of Michigan Institutional Review Board in order to conduct these interviews.

**Table 5.** List of questions used in local collaboration interviews

<ol style="list-style-type: none"> <li>1. Are you at least 18 years old?</li> <li>2. What was the goal of your project?</li> <li>3. What organizations/businesses/local units of government were involved as partners in the project? Please do not name any individuals.</li> <li>4. What brought all these partners together? What incentive was there to collaborate?</li> <li>5. Had they worked together before?</li> <li>6. What kind of structure existed that allowed partners to communicate and work together?</li> <li>7. Were there relationships between partners that existed before the project? Please do not name any individuals.             <ol style="list-style-type: none"> <li>a. (If not) - How did the partners develop a healthy, working relationship during the process of the project?</li> <li>b. How long did it take for the partners to work together efficiently? Please do not name any individuals.</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>8. What aspects of the collaboration were unexpected?</li> <li>9. In your opinion, was the collaboration a success?             <ol style="list-style-type: none"> <li>a. (If yes) What was the key to the success of this collaboration?</li> </ol> </li> <li>10. How has this experience changed your organization's view on collaboration? Has your organization engaged in another collaborative project since then?</li> <li>11. (If project is over) - To your knowledge, has there been a continued relationship among those involved in this project?</li> <li>12. If an organization approached you today and said they were starting a collaborative project in the region, what advice would you give them?</li> <li>13. Do you have any final thoughts, considerations, suggestions or comments?</li> </ol>
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The first questions dealt with general details about the project: the goal and those involved in the project. The fourth question starts to get into the meat of the interview, aimed at figuring out why organizations come to the table to collaborate. Questions five through seven centered around the relationship and communication aspect of the collaboration, both before and during the collaborative project. Question eight gives the interviewee an opportunity to touch on an aspect of the project that may not be covered by the other interview questions. Questions nine and ten focus on asking whether the project was successful, a potential sign of the organization's openness to more collaborative projects. The next question returns to the idea of relationships, this time looking beyond the current or past project. Finally, the last two questions give the interviewee a chance to offer advice and final thoughts on the topic of collaboration within the Grand Traverse Bay watershed.

We were able to conduct two in-person interviews at the end of August 2018, one with a representative from the Regional Conservation Partnership Program (RCPP) and the other with a representative from the Kids Creek restoration project. The RCPP is a private land conservation and restoration initiative of a multi-tribal fishery in northern Michigan. The project uses federal funds from the Farm Bill to pursue the goals of preventing rural land from becoming urbanized and removing fish passage barriers at road crossings and small dams across a fifteen-county boundary of a multi-tribal fishery. There are four core project partners in the RCPP that have helped this project succeed beyond expectations: The Grand

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Traverse Regional Land Conservancy, Leelanau Conservancy, Grand Traverse Band and Conservation Resource Alliance. Meanwhile, the Kids Creek (KC) project was started by The Grand Traverse Bay Watershed Center and has included federal, state and local partners. The goal of the project is to remove Kids Creek from the State of Michigan Department of Environmental Quality's list of impaired waters. Both interviews were recorded with the consent of the interviewee in order to enhance the quality of the note taking. Once the recordings were transcribed, they were destroyed per the IRB exemption requirements. The identities of the individuals were not attached to the transcripts in order to maintain anonymity.

### **Differences in Local Collaboration**

Analysis of transcripts revealed several differences between the projects, as well as similarities. The differences between the projects boiled down to the different approach each took to collaboration. The RCPP had a meeting/accountability aspect where the KC project was based on component sub-projects. RCPP approached the problem as a single, collaborative entity where the KC project took one piece of the project at a time and worked only with those who needed to be involved with each piece. The KC project managed to keep the initiative manageable by only involving those directly affected by the work. Work proceeded with "The Watershed Center leading the efforts and we meet with this group when we need to and we apply for this grant and so it's really us leading the charge and having individual meetings with whoever we need to, but we don't ever have, like, a big group". While the size and style of the KC project did not necessitate an organizing third party, the RCPP benefited from a neutral backbone organization (Rotary Charities) at the beginning. A neutral backbone organization is a crucial feature of successful collaboration. For partners to work together, there needs to be a table for them to gather around (Wondolleck & Yaffee 2017). The neutral backbone organization provides this table for the partners to convene around. In the RCPP case, Rotary Charities acted in this fashion because they "allowed us as we were developing the proposal idea for the project, they allowed us to utilize their office, free of charge, hold meetings once a month open to the public". As time progressed, the four core RCPP partners became the backbone of the project and Rotary was no longer needed.

Another difference between the two is that the Kids Creek project didn't really pick up until The Watershed Center was approached by a partner. It was an opportunity for collaboration that showed up at their doorstep when Munson "came to us and they wanted to build their cancer center and Kids Creek was in the way". Meanwhile, the RCPP took the approach of seeking out partners for the project. The partners involved in the RCPP project all had the same goal and the same reasons for achieving that goal. However, while partners in the KC project had the same goal, their reasons for pursuing it were often different. Having a different reason for pursuing a goal is not a major issue as long as the end goal is the same, as one interviewee stated that "in a collaboration sense, and this is what I tell people as a key to collaboration is you have to have the same end goal, but your reasons for getting there are fine to be different". A common agenda is crucial for a successful, collaborative initiative, regardless of what motivations the partners have. A common agenda means that all partners have a common understanding of the problem and agree on a joint



approach towards solving the problem (Kania & Kramer 2011). Partners simply need to agree on the primary goals for the initiative.

One last difference between the two projects is that those involved in RCPP came together around a funding opportunity that they would have typically competed for. In other words, “instead of these other organizations competing for the same limited funding, the tribe would have more access to [more funding as a collaborative whole]”.

### Similarities in Local Collaboration

While the differences between the two projects show that collaboration can work successfully under different models, we were more interested in the common themes between the two projects. These common themes will help us provide better recommendations to a Blue Community on how to collaborate in an efficient and successful way (Figure 24).



**Figure 24.** Overlapping themes of collaboration between two local collaborative projects (RCPP and Kids Creek)

#### Small Size

The first similarity is the manageable size of the collaboration. The Kids Creek project moved from partner to partner while the RCPP had a core of four dedicated partners. These partners participated because it made sense for them and the project work aligned with their own organizational missions and goals. Some partners in RCPP were on the fringe, only participating occasionally because they didn’t benefit much, while The Watershed Center in

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the KC project only involved those who specifically needed to be there and benefited directly from it. This does not mean leaving organizations out on purpose or through a lack of exploration. In the case of the RCPP, the interviewee acknowledged that “we just couldn’t bring everyone in. There’s too many different issues and we had to focus in on our two main objectives”. The restricted focus and small group of core organizations have helped the RCPP become a very successful project. The KC project was kept small because “there’s no reason to bring in fifty partners when really only 5 of them are necessary”. A successful collaboration does not involve more partners than absolutely necessary. Otherwise, there is a threat of diluting the project or making it large and unwieldy.

### Lack of New Actions

Neither project required partners to perform many, if any, new actions. Instead, they focus on working within the parameters of their partners’ missions. The core partners of the KC restoration project and the RCPP project all had some “skin in the game”. In other words, the goal of these two projects were extensions of those organizations involved. The RCPP interviewee claimed that “one of the things that made it [RCPP] successful in the first couple years was we didn’t try and do too many things that were new to us. We just highlighted what each individual project partner was successful in doing and we brought it all together”. The Kids Creek project also focused on staying within the partners’ mission, with the interviewee stating that “we don’t want to make somebody do something entirely new”. Organizations are often not interested in expanding their mission just for the sake of collaboration because that means more manpower and more resources in places that they do not prioritize. However, if their mission and goals overlap with the goals of the collaborative project, then organizations are much more likely to become involved. The key when bringing organizations together is to ensure no new actions are required and that all actions taken are mutually reinforcing. The power in collaboration is not in the number of organizations involved. Rather, the power of collaboration lies in the group’s ability to coordinate their activities together to solve a problem (Kania & Kramer 2011). Thus, a successful collaboration would be one that seeks out organizations/businesses/local units of government that have an interest in the project’s goals and then keeps the parameters of the project within the partners’ missions and coordinates these to achieve the larger goal.

### Clear Goals

Both projects have clear, succinct goals. The purpose of clear goals is to help provide partners with an idea of what is expected of them (Wondolleck & Yaffee 2017). The RCPP has only 2 objectives while the KC project has moved from one objective to another, which has kept both the goals and partnerships on a small scale. A clear goal is crucial in order to be able to track progress because, as one interviewee stated, “it’s really satisfying to me to actually see projects getting done. I see the bulldozers, I see the excavators the plants getting planted in the ground, the tree boxes going in. That is really satisfying rather than just sitting around and just talking about collaboration and like, talking about it to death and I think it’s helpful too to the partners”. Without a clear goal, it can be easy to keep on adding more aspects to the project beyond the original scope and “when you start adding more objectives, it dilutes everything so it doesn’t seem like you’re gonna do anything because it’s so vague”.

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With a clear goal, it becomes easier to create a common, shared measurement system (Kania & Kramer 2011). Progress needs to be commonly measured and reported in order to promote a feeling that even if progress is slow, it is at least going somewhere (Wondolleck & Yaffee 2017). Having a clear goal not only helps measure and encourage progress, but it also gives stakeholders an idea of what type of commitment they need to make. Each stakeholder needs to be aware of what exactly is expected of them in the project. Thus, a successful collaboration project is one that has a clear, succinct goal which would allow stakeholders to measure success and plot out the terms of their commitment.

### Federal Funding

Federal funding played a big part in the success of these local collaboration projects. The RCPP project came about largely because of a pot of federal funding from the Farm Bill. While the project has found a lot of its success in matching federal funds with local funds, it was the federal money that jump started this successful project. Meanwhile, the Kids Creek project also benefited immensely from federal money. The KC interviewee pointed out that “we came with a lot of money for Munson and the Pavilions and the Commons to do these things. We had money on the table to say, let’s do these things and here’s how we’re gonna pay for them. If we went ahead without any of the grants we did, I can guarantee you 70-80% of that stuff wouldn’t have gotten done if we hadn’t come to the table with money”. This highlights the role that federal funding plays in a successful collaboration.

### Partnerships

Both local collaboration projects involved old and new partnerships. Successful collaboration projects need manpower and support; this comes from the project partners. Both projects have a mix of old partners as well as new partnerships created through the collaborative work and old relationships go a long way in creating a good partnership. Comfort level in a group is important. Thus, stakeholders who have worked well in the past will often work well in a new group (Wondolleck & Yaffee 2017). Old relationships forged through past collaboration helped propel the RCPP project forward. The RCPP interviewee stated that “I just think past success in collaboration really helped and we just continued that along”. While past collaboration success has helped the RCPP project become a success, new partnerships and types of communication have arisen along the way. For example, “they [the partners involved] held a joint board meeting and that had never happened before”. Past success gave the project a foundation to start on, but new partnerships propelled the project forward. These new partnerships proved fruitful because of the communication structure within the RCPP. Continuous communication is key for creating a successful collaboration project (Kania & Kramer 2011). Without the in-person meetings, there is often little understanding between partners of why they need each other (Wondolleck & Yaffee 2011). Therefore, the relationships between the people involved needs to be maintained with regular communication in order for the project to move forward in a successful manner. The KC project “started that journey with Munson and . . . it led to some great partnerships”. Most of the KC project partners were new and allowed the project to continue in places where it wouldn’t have under normal circumstances. A successful collaboration project needs

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to build off of previous relationships as well as forge new ones all the while maintaining a strong structure of frequent, in-person communication.

### Offered Funds or Services

Finally, both collaboration projects offered funds or services to their partners. The RCPP project offered a pot of federal funding to its partners, who were otherwise often competing with each other for sources of funding. By extending to potential partners a new source of funding that they could utilize, the RCPP project encouraged those organizations to come together and collaborate for the common good. Approaching partners with funds or services played an even bigger part in the KC project. The interviewee pointed out that it's critical to "come at it from the perspective of how can we help you". Instead of pointing fingers at problems or being overly critical of potential partners, it is best to approach them with an offer to help. As the KC project interviewee stated, "it really helps if you can come to them and either have money to do stuff or say I will help you write a grant or how about we work together to write this grant application". For a collaboration to succeed, it is important to be able to attract partners through offered funds or services. This is done by refraining from constant negative criticism and offering to help solve the problem instead of just complaining about it.

It is an encouraging sign for the Grand Traverse Blue Communities pilot that there is a history of collaborative success in the area. Collaboration is not a foreign concept, which means it will be easier to encourage organizations to become involved in a Blue Community. Using the two examples of local collaboration above, we can lay out a foundation and recommendations for what a successful Blue Community collaboration project should look like.



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## RECOMMENDED NEXT STEPS

Identifying and addressing data and governance gaps directs stakeholders towards tools and methods that enable them to better address current and future challenges, such as population growth and climate change. Due to the unpredictability of these threats, a better understanding of Grand Traverse Bay and the watershed's surface and groundwater system will enable stakeholders to make better informed decisions in the face of uncertainty. As the population grows, the drinking water supply needs to be able to meet demand. To maintain the sustainability of our water resources, these needs must be met without exceeding water availability. In addition, population growth is associated with changes in land use, increasing impervious surface, and water quality impacts from stormwater and unregulated septic fields. Climate change will also have impacts on water quantity, as increasing flood frequency and intensity and greater lake level variability will test the watershed's infiltration and buffering capacity. Part of Blue Communities is taking a proactive approach to addressing these problems through the adoption of Blue Solutions, which include principles and practices that promote water stewardship in planning and community decision-making. Through analyses of local and regional surveys and water management literature, our student team has identified recommended next steps and Blue Solutions related to understanding the region's hydrologic system, integrating land use and water management, enhancing collaborative efforts among diverse groups of stakeholders, promoting conversation and education, and integrating freshwater-related principles into community decision-making and ordinances.

### Measuring the Hydrologic System

- **Invest in groundwater and surface water monitoring, and develop a hydrologic monitoring network to improve the measurement systems on which decisions are based.** Partly due to the region's high-quality waters, there is relatively little data available about the quality and quantity of surface water and groundwater. However, improving measurement systems provides the best available science for making better informed and adaptive decisions. The establishment of a long-term hydrologic monitoring network could provide baseline data, an indication of changing trends, and a better understanding of the region's water budget. In addition, data gaps for Grand Traverse Bay and inland water bodies could be identified through the integration of existing sources of data, such as top-down (government) sources, bottom-up (community) efforts, and traditional ecological knowledge.
- **Create a system of information sharing that involves local colleges and universities and establish data standards to further collaborative efforts.** Data and information sharing across municipal boundaries within the local and regional network encourages collaboration at a watershed level, enables data integration, and helps stakeholders recognize significant data gaps. In addition, the establishment of data standards can facilitate the sharing of information across different organizations and agencies. High quality data from a variety of sources provides multiple lines of

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evidence to support management decisions addressing unpredictable threats to freshwater resources. The involvement of local universities in Blue Communities helps address the barrier of accessing the latest academic research. One local survey respondent pointed out that improving access would greatly benefit their mission, noting that “we don't have great access to the latest research being conducted at the University level. Specifically, our information on groundwater is the area where our data is the most lacking.” Northwestern Michigan College, a local college that sits on the Grand Traverse Bay, was listed as one of the organizations that stakeholders wanted to work more with and should be a prominent part of any Grand Traverse Bay Region Blue Community.

### Land Use and Water Management

- **Develop comprehensive land use and water management plans to guide how land use decisions affect the sustainability of water resources.** In the face of expected population growth and urban sprawl, sustainable water use is inextricably linked to sustainable land use. By integrating water sustainability into local land-use planning, impacts from urbanization and changing land use can be better addressed. Furthermore, this planning must occur across municipal boundaries due to the effects that upstream land uses could have on downstream communities and ecosystems.
- **Implement green stormwater infrastructure and plan for long-term stewardship.** Green stormwater infrastructure helps reduce stormwater runoff and pollution by shifting from a centralized system that is vulnerable to huge water events, to a decentralized system with redundancy that can handle surges in water (combined sewer system overflows cause 850 million gallons of pollution annually) (Meerow & Newell 2017). Furthermore, green infrastructure has a myriad of benefits, which includes improved air quality, urban heat island mitigation, improved communities, greater access to green space and increased landscape connectivity (Pugh et al. 2012). Green infrastructure has also been found to cool the surrounding temperature by providing vegetative cover and reducing the amount of impermeable pavement (Bounoua et al. 2015). The sandy soils of Traverse City make green infrastructure an ideal solution to the problem of stormwater in the area. However, plans should be in place for long-term operation and maintenance costs. Furthermore, evaluating current and future green stormwater infrastructure projects can help provide invaluable information such as the amount of groundwater recharge, effectiveness of pollutant filtration, long-term costs, and whether the benefits outweigh the costs.

### Collaboration

- **Explicitly identify water values and integrate these into decision-making.** When decisions are made about water resources, stakeholders always consider their own values. Explicitly identifying the water values already present in decision-making processes enables the inclusion of underrepresented values, such as those of community members that are likely to be impacted. In addition, water values can

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enhance collaboration by forming the basis for common goals and desired uses of freshwater resources.

- **Construct the missing table, a place or mechanism for regular stakeholder interaction.** It is impossible to work together towards common goals without providing a place where stakeholders can convene and conversations can occur, especially between groups that may not normally work together. It takes time to build positive working relationships, and regular conversations can help build trust among stakeholders and enhance collaboration. However, gatherings also require a purpose and structure, which is determined by the stakeholders at the table. This includes understanding the niche and purpose of the collaborative effort, defining the organizational structure, determining how decisions will be made, and defining roles and responsibilities (Wondolleck & Yaffee 2017).
- **Identify and recruit stakeholders that are still missing from the table, ensuring diverse perspectives for more innovative, meaningful solutions.** The identification of missing stakeholders provides the opportunity to develop new, meaningful professional partnerships. In addition, pre-existing relationships can help contribute to successful, collaborative efforts by building upon established positive, working relationships. It is necessary to include organizations with diverse priorities and expertise, especially those that may have conflicting perspectives. Only including participants with similar values may result in greater success in achieving consensus, but this will not be a representative nor a conflict-reducing process away from the table. Disagreements are a part of collaborative natural resource management, but developing patience, civility, and respect can lead to productive dialogue.
- **Develop clear rules of procedure for collaborative governance.** The structure of collaborative efforts develops over time through initial conversations and ongoing dialogue among stakeholders. There is no one right way to proceed, as procedures are tailored to the unique scope and circumstances of the collaborative effort. However, Wondolleck & Yaffee (2017) identified several core elements have been associated with successful collaborative processes, including:
  - Determining the initiative's niche: clarify goals and objectives, recognize authoritative limits, and identify relationship to existing institutions.
  - Establishment of governance infrastructure, with roles such as leaders and policy directors, process managers, advisors and project implementers, and scientists.
  - Codified roles and responsibilities: formal constitutions or charters which may include establishing stakeholder roles, processes for interaction, and decision-making criteria

#### Education and Conversation

- **Promote environmental education opportunities and engage in meaningful conversation with people in the water world to promote a good water stewardship ethic.** In the IJC survey, respondents were unable to draw a connection between

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manure and increased nutrients in lakes or express how important wetlands are for clean water, emphasizing a need for better public education within the Great Lakes region. This was highlighted by one of the local stakeholder respondents, who expressed concern with a “lack of citizen knowledge about the profound threats to the GL from oil pipelines, water withdrawals, invasive species, drinking water infrastructure, groundwater contamination, urban development, etc.” Another local survey respondent pointed out that there is a “need to think long term and to be concerned with the general care of waters rather than short term gratifications. More public education delivered in the right way. Talk to the public(s) in ways they can relate to!!!”. The opportunity for education is there, and between 2015 and 2018, regional stakeholders around the Great Lakes expressed a 10% increase in interest of Great Lakes related news, particularly through the internet and newspapers (IJC). However, education in and of itself is not enough to remedy the problem of human disregard. People learn over time through doing and conversation. We need to actively engage with people in the water world and those in a decision-making capacity in conversations about good freshwater practices and promote listening to others’ concerns and perspectives.

#### Principles and Municipal Ordinances

- **Encourage local units of government to look into the implementation of ordinances that will positively impact freshwater resources.** Freshwater-related ordinances will alleviate some concerns associated with human disregard and urban sprawl. We obtained some limited information about current water-related ordinances around the Grand Traverse Bay from The Watershed Center (Appendix B). Acme Township and the village of Elk Rapids have the most water-related ordinances (6 out of a possible 8 ordinances) on the list. Elmwood, Suttons Bay, and Torch Lake townships have only one ordinance on the list. They all have a water’s edge setback ordinance as well as some light restrictions on riparian buffers (only under certain circumstances). Half of the townships have fewer than 3 ordinances in place. Every township has some sort of water’s edge setback. About 75% of the villages and townships examined have riparian buffer/vegetated strip requirements (although 2 of them are very minimalist). Only the village of Elk Rapids and Milton Township have a septic ordinance. Clearly there is potential for creating and enforcing more ordinances that will protect the surface and groundwater in the Grand Traverse Bay watershed. There is regional interest in increasing water regulations around the Great Lakes. According the IJC survey, over half of the respondents polled claimed there were not enough regulations in place to protect local water quality. Further, about 55% of respondents showed interest in creating more ordinances, even if it means increasing taxes (if it could be clearly established where the tax money was going). It should be noted that lower earners (below \$50,000) were against the idea of creating more ordinances. The impact on the poor of the community needs to be taken into account when considering increasing the number of regulations and/or taxes. An in-depth look into new, local ordinances should be done to determine what freshwater concerns can be alleviated through this avenue.



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- **Integrate freshwater principles, such as the Public Trust doctrine and Bellagio Principles on Valuing Water, into community decision-making and water management.** These principles can also be adopted in a resolution, so that they remain at the forefront of a Blue Community. The Public Trust doctrine and Bellagio Principles (Table 1) have been incorporated into our previous recommendations as a foundation for sustainable water management. For instance, the Public Trust doctrine promotes community involvement in the management of water resources. The explicit recognition of water’s multiple values helps build trust by promoting decision-making processes that are inclusive, equitable, and transparent. An understanding of the hydrologic system allows all sources of water, such as rivers and aquifers, to be protected through a systems-thinking approach. Promoting opportunities for environmental education and having meaningful conversations empowers communities and fosters water stewardship. The direct recognition of where these principles can be applied and integrated into decision-making and water management provides the opportunity to think about how we value and manage water.
  - **Create an office of sustainability and citizen advisory boards for freshwater.** Large cities and towns can create an office that functions as a sustainability-focused, collaborative partner between the city agencies. Citizen advisory boards give local residents the opportunity to hold the local government accountable and assure that measures are being taken to protect local freshwater resources.

While the proposed solutions and recommended next steps listed above are by no means comprehensive, it is our hope that a Blue Community will tackle each problem as best they see fit, utilizing not only academic but also local knowledge.

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## CONCLUSION

The Blue Communities Initiative is a local-based solution to the challenges presented by climate change and urban sprawl. As a Blue Community, local and regional residents can determine what water-based outcomes they desire and work collaboratively and collectively to achieve those goals. As a result, communities can not only react to freshwater threats, but proactively protect their resources from future stressors. Regardless of whether or not local communities take action, the threats of climate change and urban sprawl will affect freshwater resources. Blue Communities is an opportunity for local communities to change or mitigate the impacts these threats will have.

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# APPENDICES

## Appendix A: Blue Communities Survey Answers

(Edited to remove references to name of organization)

**Question 1:** Are you at least 18 years old?

- All answered in the affirmative

**Question 2:** What are is the goals and mission of your organization/business/local unit of government?

- Provide services to the residents and business owners
- To protect the common waters of the Great Lakes Basin through public trust solutions
- Local solutions with an ecological perspective
- The mission of our organization is to protect significant natural, scenic and farm lands, and advance stewardship - now and for all future generations.
- We have a goal of raising awareness about environmental issues and promoting appreciation of the natural environment. Our village planning commission deals with ordinances that include environmental issues.
- We specialize in landscape architecture, planning, and engineering. Our clients are local units of government. My area of focus is master plans, zoning ordinances, general planning services, environmental policy, and local actions to address impacts of climate change.
- To provide safe, reliable and efficient urban services.
- To promote Great Lakes curiosity, stewardship and passion.
- Advocate for clean water in Grand Traverse Bay and work to preserve and protect its watershed.
- To enrich the grand traverse region by providing a network of trails, bikeways and pedestrian ways; and encouraging their use

**Question 3:** What recent or long-term successes best represent the goals and impact of your organization/businesses/local unit of government?

- Construction of a new WWTP and implementation of water system upgrades
- Public awareness of Line 5 and Nestle as key election water/Great Lakes issues
- Fostering the next generation of environmental and social justice advocates
- Our organization has been serving Northwestern Michigan for nearly 27 years. In that time we've protected over 40,000 acres and 124 miles of shoreline and are eager to do more. Recently, we've been working to protect a 1,200 acre parcel containing the ~300 acres of wetland and the headwaters of the Upper Manistee River
- We have about 15 events in 2018 that educate on water related issues, and all were very well attended with very positive feedback. For village planning commission, we have recently passed an ordinance banning coal tar sealants and another on septic inspections at point of sale.
- We wrote the Michigan Resiliency Planning Handbook for local units of government: <http://www.resilientmichigan.org/handbook.asp> and have helped numerous townships adopt ordinances that restrict development along the shoreline and require vegetative buffers.
- Approving a budget to repair and replace aged infrastructure, especially sidewalks.

- Working for 25 years to protect and restore water in the Bay and its watershed. Numerous successes. One important one is the Kids Creek Restoration work we've been doing for 15 years; leverage over \$4 million in local, state and national funding to implement a number of on the ground projects as well as education and advocacy programs.
- My organization is an ex-officio member of the Boardman River Dam Removal Implementation Team. It also manages 3,000 acres of public parkland in Grand Traverse County, much located along the Boardman River or a tributary to the Boardman. The organization is seeking a millage to stabilize funding to properly support its work within the local community.
- The development of the Sleeping Bear Heritage Trail - nearly 20 miles of trail within the lakeshore and the approval of the Boardman Lake Loop Trail with construction estimated to start next year. This trail effort included a joint maintenance agreement between 3 governmental agencies and an \$800,000 maintenance endowment for the trail.

**Question 4:** What is the greatest challenge your organization/business/local unit of government faces in pursuing its goals?

- Politics are often very divisive and community members and elected officials are not interested in finding common groups. Also communicating these issues when there are other very pressing issues local units of government are dealing with
- Meeting new demands with limited resources.
- Diminishing grant funding sources, unengaged citizenry, local units of government appetite or lack thereof for protective ordinances, intense development pressure, failure of state and federal agencies upholding state/federal laws.
- Funding. Also hiring and maintaining well trained, experienced professional staff. Passage of the millage will help with issue. Lastly, many organizations striving for the same sources of funding.
- Working with the multiple government agencies, in particular townships, to provide the non-motorized infrastructure needed to support healthy, active, connected communities
- Funding
- Raising consistent funds and growing capacity to address the huge threats to the Great Lakes
- Having enough capacity to meet with enough people to wrangle action and effective partnerships
- The biggest challenge we face is funding for land protection projects that require immediate action. Historically, we have done well raising money over the life of a planned project, but have difficulty when critical projects "pop-up" from nowhere.
- We frequently lead the way on environmental thinking and attitudes, and present new ideas and try to get the community thinking and acting in a more helpful way. Our community government is represented by many people who do not like regulations, rules, etc., and tends to have short term and profit oriented thinking, rather than long term impacts of their decisions

**Question 5:** In what ways, if any, does the work of your organization/business/local unit of government depend on and/or impact the quantity and quality of fresh water resources in the Grand Traverse Bay watershed?

- The primary way our work impacts water quality is through the protection of public and private land. Private land protection is done through development restrictions and requiring best management practices (BMPs). Both aim to keep land in a natural state which reduces

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impervious surfaces, thus improving infiltration and movement of water. Requiring the use of BMPs, especially on farmland, has direct implications for the health of our waterways.

- We have included water issues in our mission for 10 years. WE present speakers and programs that feature the status and needs of water programs.
- I help communities in NW Michigan write and adopt plans and ordinances to protect water quality and plan for smart growth
- We provide water and wastewater services to the community
- Our policy work and campaigns have tremendous impact on both water quality and quantity
- For life
- Grand Traverse Bay is the Economic Engine for Traverse City
- Work on restoring and protecting clean water through on the ground restoration work, watershed planning, water quality monitoring, citizen engagement, and advocacy.
- For over 25 years we have been "go to" organization for restoration and protection of the Boardman River Watershed. The Boardman River provides 30% of the surface water to the entire Bay. Through our education programs and the Boardman River Nature Center we train the next generation of stewards of this earth.
- The trails provide access to our region's waterways, rivers and bays. they are an important amenity for trail users. they are a place for visitors to enjoy and experience providing visual as well as physical relief.

**Question 6:** In your opinion, what are the greatest threats to the surface water and groundwater in the watershed and region?

- Stormwater
- Untreated storm water runoff, removal of riparian vegetation, disappearing tree canopy, and wetland fill.
- Storm water runoff; Oil & gas exploration (amount of freshwater used for fracking); large water withdrawals for commercial use.
- Poor development (sprawl) patterns and agricultural practices
- Indifference and beliefs that each person or land owner should be able to do as they wish, offer for convenience or for personal aesthetics. There is little concern for shoreline care, for example. Often the desire to promote business concerns takes precedence over long term concerns about water, lake, and river care
- Development, impervious surfaces, nutrient loading from agriculture and other uses, increasing severity and intensity of extreme rain events
- Lack of citizen knowledge about the profound threats to the GL from oil pipelines, water withdrawals, invasive species, drinking water infrastructure, groundwater contamination, urban development, etc.
- Human activity and disregard
- From our standpoint the largest threat to water resources is development of critical natural resources. We are not intrinsically opposed to development, but recognize that some areas absolutely should not be developed and that we can do a better job of developing property with nature in mind.
- Chemicals getting into the water and invasive species

**Question 7:** Who are your organization's most important stakeholders and/or partners in the work that you do?

- Our residents are our stakeholders
- NGOs, tribes, governments, and businesses

- Locals. state agencies
- We work with a vast array of partners depending on the project we are taking on, but some of the most important partners include local governments and state organizations. These include but are not limited to; county equalization, city-town-village representatives, township officials, Michigan Dept. of Nat. Resources, Michigan DEQ. We also work closely with many private organizations from a fundraising perspective.
- I refer to two organizations I am involved with: For one of them the stakeholders are committee members who work to reach all segments of the community. We collaborate with many organizations and try to evolve their thinking. For village planning commission our stakeholders are all the voters. Often we have to contend with business interests taking priority over the environment. (challenging!!!), as the business community has many connections and seems to be more vested in keeping matters focused on business success rather than seeing long term value of maintaining our natural attributes as "tourist attractions"
- Residents, business owners, higher levels of government, adjacent units of government
- Local units of governments, other nonprofits (CRA, SEEDS, Inland Seas, NEMEAC, lake associations, conservation groups, conservancies, etc.), DNR, DEQ, EPA, USDA, Grand Traverse Band of Ottawa and Chippewa Indians, Conservation Districts (GT and Leelanau), DDA's, TC Tourism, TC Chamber of Commerce, many local businesses.
- It would take too long to list all our stakeholders. Suffice to say we've worked with every environmental related organization and local unit of government in the area to encourage responsible stewardship of our natural resources. Most important, Watershed Center GT Bay, Rotary, Garfield Twp, GT County, City of TC, Rec Authority, Adams Chapter Trout Unlimited; MDNR; MDEQ; USF&WS; Grand Traverse Band; farmers and the farming community.
- Our donors, visitors and residents to the region are our most important stakeholders. Our work would not be possible without our volunteers or government partners. Sleeping Bear Dunes National Lakeshore, NPS Rivers, Trails, and Conservation Assistance Program, Cleveland Township, Sutton's Bay, Grand Traverse, Leelanau and Antrim Counties, Townships: Garfield, Grelickville, Garfield, Acme, East Bay, Blair, Elk Rapids, Norwood, Banks, Torch Lake, Milton, Leelanau and Grand Traverse Conservation Districts, TCAPS, Traverse City, Village of Elk Rapids, City of Charlevoix, Top of Michigan Trails Council, MDOT, MDNR, Traverse City DDA, Oryana, Munson, Timber Ridge, Hospitality Association, Iceman, Chamber of Commerce, Consumers, TCLP, Grand Traverse Regional Land Conservancy, Leelanau Conservancy, Rotary Charities

**Question 8:** What other partners or stakeholders, if any, would you like your organization/business/local unit of government to work with more frequently and/or more effectively?

- Northwest Michigan College, MDOT
- More businesses, more local units of governments, more citizens.
- Inland Lake Associations, GTB
- Townships
- The County and the State
- State government legislators and state natural resource agencies
- More staffers of local units of government, including schools. more funders
- I think we could work more closely with the other environmental organizations in our region to raise awareness and provide education to the public about land protection and water resource issues.



- I think we are very inclusive with many organizations regionally that relate to water issues; GTRLC, FLOW and Grand Traverse Bay watershed center. Tip of the Mitt, many times has been guest speaker at planning commission; other local water organizations such as Three Lakes Association, Elk-Skegamog Lakes Association; ETC

**Question 9:** What other potential stakeholders should we be talking to?

- I can't tell based on these questions. maybe some kidz?
- DNR, DEQ, Lake associations, Inland Seas, Drain Commissioners.
- I think all are mentioned in above comments. Thank you!
- Seems like you have a good handle on who you should be speaking with.
- MDOT
- All
- Not sure who's on your entire list, but riparian property owners are key. Also educators, and the farming community (Farm Bureau).
- DPW Superintendent, Watershed Center for starters
- Tribes

**Question 10:** What sources and types of information about the region and watershed does your organization rely on to accomplish its goals? Do you have adequate access to that information?

- We pretty much have access to the necessary information when needed.
- Floodplain information, best management practices for stormwater. Yes, good access
- Regional environmental organizations and State organizations
- We rely on local, state, and national and regional sources of info, including NOAA, IJC Scientific Advisory Councils, universities across the region, state agencies
- We rely on publicly available data, mostly geospatial, for watershed and water information and have adequate access to those resources. As other information is published by public entities we utilize it if applicable.
- We provide a wealth of information. State of Michigan as well
- Water quality data produced by agencies and orgs in the region and state, spatial data from various sources, land use data, demographic data, etc. We have access to a lot of the data we need, and we are realizing that a lot of this data exists, it just needs to be harnessed, organized, and accessible. This is something we are working on as we update the Grand Traverse Bay Watershed Protection Plan. However, capacity to manage, organize and make sense of this data is always and issue.
- We attend many meetings, read extensively, share information at meetings and planning commission.
- It would be great to have a statewide watershed map with all the sub-watersheds listed. Also, a location to reference all watershed plans

**Question 11:** What information does your organization/business/local unit of government have less access to or lacks the capacity to utilize but would benefit your work and your ability to work collaboratively with other partners and stakeholders?

- Not sure
- Economic data on benefits of environmental and public health regulations
- Really high quality infrastructure designers and relevant design examples

- We don't have great access to the latest research being conducted at the University level. Specifically, our information on groundwater is the area where our data is the most lacking. Additionally, having data that better ties the impacts of land protection, green spaces, and green infrastructure to water quality would be helpful
- We just need to promote more awareness of water issues and the need to think long term, and to be concerned with the general care of waters rather than short term gratifications. More public education delivered in the right way. Talk to the public(s) in ways they can relate to!!!
- Grand Traverse County
- Spatial data, land use data.
- Development plans and non-motorized master plans (most townships don't have them) - to support better non-motorized connectivity.

**Question 12:** Are you interested and willing to be a part of this Blue Communities Initiative? If so, may we contact you to learn more about your interests and needs? Please provide contact information we can use to follow up with your organization.

- All answered in the affirmative

## Appendix B: Township Ordinances

Local zoning code and ordinance review for shoreline townships and municipalities for the Grand Traverse Bay Watershed Protection Plan update in 2018/2019. References include online township/municipality resources access February - August 2018. Research conducted by H. Smith and S. Pikora.

Township/ Municipality	Special district for environmentally sensitive area (lake district, overlay, Natural River District, etc.)	Special permitting requirement for environmentally sensitive sites	Riparian Buffer/ Vegetated Strip Requirements	Water's Edge Setback	Stormwater Management/ Control Ordinance	Special Wetland Provisions	Other water quality protection provisions	Septic Ordinance (Mandatory Pumping, Time of Transfer, Point of Sale)
Bingham Township	NO	No	Yes	YES	NO	NO	NO	NO
Elmwood Township	NO	NO	Minimal (only in Clustered Development)	YES	NO	NO	NO	NO

Leelanau Township	NO	YES	NO	YES	NO	NO	NO	NO
Suttons Bay Township	NO	NO	Minimal (only in Open Space Residential Developments/Cluster Housing)	YES	NO	NO	NO	NO
Acme Township	NO	YES	YES	YES	YES	Yes, vegetated wetland setback required.	Limitations on types of developments within a floodplain (Zo Section 7.6.4).	NO
East Bay Township	YES	YES	YES	YES	YES	NO	NO	NO
Garfield Township	NO	NO	YES	YES	UES	Yes, wetland setbacks.	NO	NO
Peninsula Township	NO	NO	YES	YES	YES	Yes, wetland setbacks.	Floodplain restrictions and setbacks (includes Great Lake Floodplains) (ZO Section 4.7.4 B).	NO
Banks Township	NO	NP	YES	YES	NO	NO	NO	NO
Elk Rapids Township	YES	YES	YES	YES	NO	Wetland setback and buffer requirements.	NO	NO

Milton Township	YES	YES	YES	YES	NO	NO	NO	YES
Torch Township	NO	NO	NO	YES	NO	NO	NO	NO
City of Traverse City	NO	NO	NO	YES	YES	NO	Prohibition on open geothermal systems (Ch. 1068)	NO
Village of Suttons Bay	NO	NO	YES	YES	NO	NO	NO	NO
Village of Northport	YES	NO	NO	YES	NO	NO	NO	NO
Village of Elk Rapids	YES	YES	YES	YES	NO	NO	Coal Tar Sealcoat Ban Ordinance adopted Spring 2018.	YES