

**RECOMMENDATIONS  
FOR  
NATURAL RESOURCE MANAGEMENT  
IN THE  
BEAVER ARCHIPELAGO**

**Beaver Island Natural Resources & Ecotourism Steering Committee**

**(Appointed by Peaine and St. James Townships)**

**June 29, 2013**

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To the Peaine and St. James Township Boards:

The Beaver Island Natural Resources and Ecotourism Steering Committee (NRESC) is pleased to transmit to you our final recommendations for natural resources management of the Beaver Archipelago.

These recommendations respond to the township boards' request that the NRESC undertake a planning effort with substantial input from community members and the many stakeholders, on- and off-Island, who care about and support the natural resources. During the approximately year-and-a-half effort, the NRESC's members consulted frequently with their own organizations and community members, including students at the Island's two schools. In mid-May the NRESC circulated its draft recommendations in the community and received feedback that was considered at its June 29 meeting. (Feedback is contained in a separate file.)

The recommendations describe a direction for natural resource management that would build on and expand previous efforts of Islanders and stakeholders, making it more consistent and science-based, and maintaining a balance between economic development and environmental protection. The report provides details about what this direction might look like in action. NRESC members believe that moving in this direction would benefit the Island community as a whole, as well as a broad range of stakeholders and interests.

In a June 4<sup>th</sup> communication, Russ Mason, chief of the Wildlife Division of the Michigan Department of Natural Resources, complimented the report: "Your Goals and Objectives parallel and in some cases are the same as both Department and Wildlife Division Goals and Objectives. Once again the Beaver Island community has distinguished itself as a leader and innovator in resource conservation. I look forward to increasing our partnerships with organizations on the island to meet our mutual and parallel goals."

The report does not address implementation of the recommendations. The NRESC believed that first it was important to see if the township boards, the community's elected officials, agree with the direction that it has laid out. If so, then the boards would address the question of how to move forward in this direction.

The NRESC asks that the township boards accept this report and adopt it formally as a desirable direction for natural resource management of the Beaver Archipelago.

## **Members of the Beaver Island Natural Resources and Ecotourism Steering Committee (NRESC)**

Peaine and St. James Townships appointed the following organizations/members to the NRESC:

- Beaver Island Association's–Craig Schrottenboer
- Beaver Island Community School–Dan Martel
- Beaver Island Wildlife Club–Jeff Powers
- Michigan Department of Natural Resources–Brian Mastenbrook
- Little Traverse Bay Bands of Odawa Indians–Bill Parsons and Archie Kiogima, Sr.
- Peaine Township Trails Committee–Doug Tilly
- Peaine Township Board–Sandra Birdsall
- St. James Township Board–Peter Plastrik
- Peaine Township Planning Commission–Bill Markey
- St. James Township Planning Commission–Linda McDonough
- Beaver Island Chamber of Commerce–vacant
- Beaver Island Contractors and Realtors Group–vacant
- At-large members from the community: Bill Cashman, Jim Gillingham, Pam Grassmick, Seamus Norgaard

## **About the Beaver Island Natural Resources and Ecotourism Steering Committee (NRESC)**

The Peaine and St. James Township Boards created the NRESC in the fall of 2011 as an advisory and planning body, and at about the same time asked the NRESC to conduct a natural resource management planning process suggested by the Michigan Department of Natural Resources.

The NRESC is a public body; all meetings are posted and open to the public, meeting agendas, minutes, annual reports to the townships, and accompanying documents are posted at the NRESC's official Web site, <http://binresc.org>.

The NRESC organizations select their representative to the NRESC. All appointments must be approved by both townships. Board members serve three-year terms.

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Public comments on draft report and NRESC responses are available at [http://binresc.org/?page\\_id=650](http://binresc.org/?page_id=650).

## Introduction

“Extraordinary” ... “unique” ... “world-class” ... “sacred” – residents of and visitors to Beaver Island use these and similar words to describe the Beaver Archipelago’s natural resources. Eleven small islands peek above the fresh waters of northeast Lake Michigan, far enough from the mainland to be environmentally distinct and relatively well preserved. An abundance of natural life thrives: 19 mammal species and thousands of fish, bird, insect, reptile, amphibian, and plant species, all supported by a remarkable variety of beaches, forests, wetlands, and other habitats. And on the biggest island, Beaver, stands the great lake’s largest settlement – a year-round community for seven generations, distinct for its relaxed pace, quality of life, and resilience.

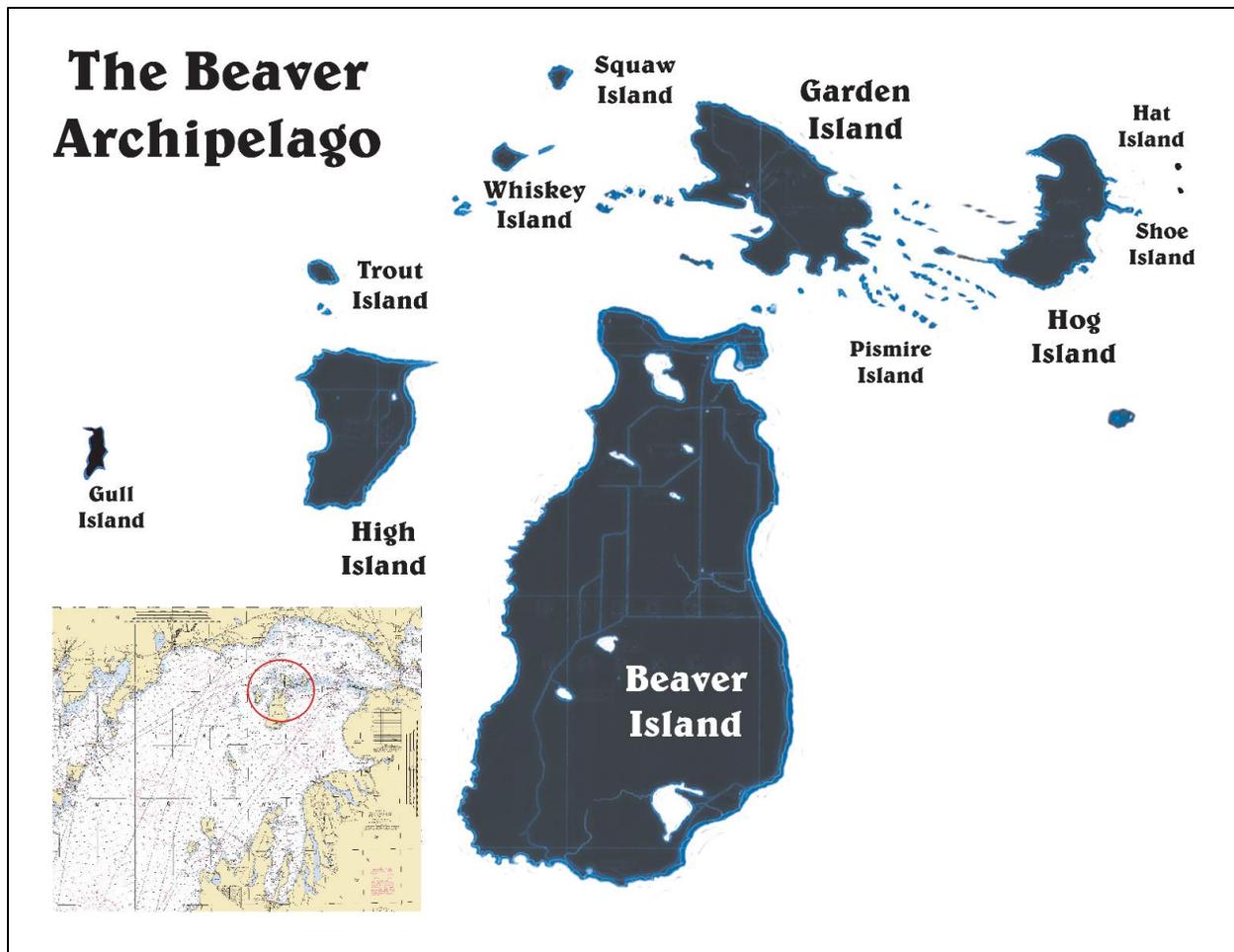
Over the years, the Archipelago has benefited from the decisions of people here and afar: decisions to protect the Lake Michigan waterfront from rampant commercial development; to place outer islands in the public trust for conservation; to use conservation easements and public land acquisition to maintain natural beauty and environmental health; to develop land with environmentally friendly practices; to monitor, enhance, and carefully manage the deer herd, fishery, and eagles.

This happened because a great many people cared deeply about the Beaver Archipelago’s natural resources: year-round residents and seasonal residents, business people and contractors, property owners, wildlife devotees, Indian tribes, school teachers, local and state government officials, academic researchers and students, retirees, tourists, and others. They cared, they decided, and they acted.

Our committee’s membership reflects much of this diversity and during the past year we enhanced our understanding of the Archipelago and the community’s concerns. We talked with and heard from hundreds of Island residents, including middle- and high-school students, and the many nonprofit organizations and state and federal entities that have an important stake in the Archipelago’s natural resources.

From out of this assortment of voices we heard a single message that goes like this:

- We, Islanders and stakeholders, know that the Archipelago’s natural resources are a foundation of our economic activity and our community’s well-being.
- We don’t want to lose what we have – the community’s quality of life and the resources’ beauty and value.
- But we also want it to get better. The economy must improve so that existing businesses can grow and new ones can start, so the community grows. And the condition of the natural resources, while good, must also get better – protected from threats, restored where needed, and preserved for the future.
- What we don’t know for sure, what the community hasn’t figured out and agreed to, is how to do this – how to improve our economy and natural resources.



This document offers the NRESC's "how to" recommendations: How to manage our natural resources more effectively. How to grow the part of our economy derived from our natural resources. How to make sure Island residents and visitors are well informed about our environment and how to sustain its beauty and health. These recommendations – 38 actions-- come from the many ideas we heard in the community forums and focus groups we conducted and from the many discussions among NRESC members. They have been carefully developed and reviewed by the Beaver Island Chamber of Commerce, the Beaver Island Association, the Beaver Island Wildlife Club, the Beaver Island Contractors and Realtors Group, the Michigan Department of Natural Resources, and other organizations.

These recommendations are not just meant for the townships' elected officials or for state government officials. They are a call to action for every member of the Beaver Island community, young and old, to step up, support, and take practical, doable actions that will make our lives, our community, our economy, and the natural resources we cherish even better. These recommendations offer a balanced and fairly comprehensive approach. They respect private property rights, the values of diverse stakeholders, the awesome potential of an

engaged community, the importance of thoughtful government policies, and the impact of philanthropic investment.

The recommendations follow a framework structure that is fairly typical:

- A Vision for the future we desire for the Beaver Archipelago's natural resources.
- Three broad Goals for efforts to achieve the Vision.
- A number of Objectives – concrete results – for each Goal.
- Strategies or Action Steps for accomplishing each Objective.

We also added a Glossary that defines key words in the recommendations and Appendices of relevant information and where to find relevant reports and other material online.

It may be that not everyone will agree with every recommendation, but we believe that anyone who cares about the Archipelago's natural resources will find proposed actions to embrace and commit to implement. We also believe that a community commitment to most, if not all, of these recommendations will help the Island to develop partnerships and attract the resources – funding and expertise – needed to move forward quickly and effectively.

The process that resulted in these recommendations started in late 2011, stimulated by leadership and funding from the Wildlife Division of the Michigan Department of Natural Resources. Much of the process of gathering community input was facilitated by two professors from Michigan State University, John Beck and Julie Brockman. We thank John and Julie for their invaluable assistance.

## Vision

The Beaver Archipelago’s natural resources – habitats and wildlife – will provide a strong foundation for an economically thriving, sustainable community with a unique character and satisfying quality of life. The community will share a reverence for the natural environment and a commitment to preserve it for future generations.

## Goals for Natural Resource Management

Effective Management of the Beaver Archipelago’s Natural Resources	Economic Growth Derived from Our Natural Resources	An Environmentally Informed Public
<p style="text-align: center;">Habitats and wildlife, including rare and endangered species, are monitored, protected, preserved, and restored for their ecological and economic value and the well-being of the Island community.</p>	<p style="text-align: center;">Island business owners, residents, and developers value and protect the Beaver Archipelago’s natural resources and beauty as a sustainable source of economic benefits, while expanding traditional and new economic activities. These include, but are not limited to, recreation, ecotourism, home and business development, and subsistence, commercial, and recreational hunting and fishing.</p>	<p style="text-align: center;">Island residents and visitors value, learn about, and experience the Beaver Archipelago’s natural, historical, and cultural resources, and participate in and support efforts to sustain their beauty and health, which may be enhanced through collaboration with off-Island organizations.</p>

# Effective Management of the Beaver Archipelago's Natural Resources: Overview, Objectives, and Strategies

## Goal

Habitats and wildlife, including rare and endangered species, are monitored, protected, preserved, and restored for their ecological and economic value and the well-being of the Island community.

## Overview

Island residents and visitors recognize the natural uniqueness of the Beaver Archipelago: the clear blue waters of Lake Michigan, the iconic Great Lakes dunes and forests, inland lakes, wildlife-plants and animals---all of it relatively unspoiled and easily accessible to the public. These natural resources define our community's sense of place; we value them as a source for beauty and spiritual well-being, economic activity and recreation, scientific knowledge and cultural heritage, and because they provide food and fuel. The Archipelago's natural endowment is well known worldwide. It contains species of global significance, is listed as a high-value conservation area, and is one of the highest ranked of 32,000 Great Lakes islands for its biodiversity. Designated as an Important Birding Area, the Archipelago provides significant habitat for colonial water birds, neo-tropical migratory songbirds, and rare plants, and serves as an important fish spawning and nursery area.

It's easy to imagine that all of this will remain much as it has been without anyone having to make an effort. It's so vast and beautiful – what could go wrong? But we saw in the last century, with the historic decline of fishing and the end of virgin timber logging, that this uniqueness and abundance of natural resources can be seriously damaged when it is not carefully maintained.

By their nature, the islands of the Beaver Archipelago are more vulnerable to external environmental threats than comparable mainland areas. Although islands appear to be remote and less susceptible to environmental distress, the living natural resources on islands tend to have smaller populations and are confined by finite topographical boundaries. These factors make animals and plants more easily affected by environmental disturbances and subject to drastic population shifts. For these reasons, preservation of the living natural resources of the Beaver Archipelago requires our ongoing monitoring and scrutiny.

Today, decisions about managing the Archipelago's natural resources are fragmented: the Island's two townships, the State of Michigan, several federal agencies, tribes, universities, businesses, and thousands of landowners control the use and protection of natural resources. Although a great deal is known about the ecosystems and species of the Beaver Archipelago by long-time residents, nature lovers, and scientists, much of this information is not used to make decisions about managing the natural resources, and there are big gaps in what we know. At the same time, we recognize that there are threats – imminent and long-term risks – to the

health of these natural resources on which we depend: exotic invasive plant and animal species, contamination of the lakes, inappropriate uses that unnecessarily degrade resources, climate change, and more.

What's needed is coordinated, well-informed and funded natural resource management that supports both the biological and economic value of the natural resources. To achieve this:

- We should identify and monitor key species and their habitats that may be common or at risk of disappearing from the islands. Otherwise it's impossible to know how to protect and sustain – to manage – them effectively.
- We should set priorities that allow us to focus on key projects and action plans and define clear responsibility for carrying out that work. If we can't do everything, we'd better do what's most important.

**Objective 1: Select, manage, and monitor key species and their habitats on public and private lands with the landowners' permission.**

Since the list of natural resources within the Beaver Archipelago is enormous, plans for their conservation and management must first prioritize them to develop a concise list with which we can more easily monitor and manage. Such a list would essentially consist of what we might call *Key Species* and would include their respective habitats and ecosystems.

1. **Identify Key Species and their habitats.** Key Species are animal and plant species that, due to their impact on other species, the economy, and/or the environment, should be subject to long-term scientific monitoring of their condition. Key Species may fall into one or more of five categories:

- Economic – Organisms that due to the interest of hunters, fishermen, birders, botanizers, trappers, and others generate revenue for businesses and residents of Beaver Island.
- Rare – Organisms that due to their rarity (they are less common than similar species) are state or federally listed as endangered, threatened, or of special concern or are considered locally to be of special concern.
- Exotic Invasive – Non-native (alien) organisms whose introduction does or is likely to cause economic or environmental harm or harm to human health.
- Biological – Organisms which, should they become less numerous or extirpated, would have a profound effect on the surrounding species and/or whose numbers act as an indicator of environmental conditions.
- Cultural – Organisms which, for traditional, historical, and/or spiritual reasons, are held in high regard by the Tribes and other stakeholders.

Construction of an initial Key Species list will use the knowledge and expertise of the NRESC, wildlife professionals, the Beaver Island Wildlife Club, the Tribes, the Michigan Department of Natural Resources, The Nature Conservancy, Michigan Natural Features Inventory, and others. The initial list will undoubtedly be quite long and will require prioritization to reduce it to a

workable size. When the initial list has been prioritized, the Key Species list for the Beaver Archipelago will reflect a unified view of which species need conservation and management attention and can be affected using available resources. This list will change over time based on changing economic, ecological, or social conditions. *(See page 28 for a sample listing of Beaver Island Archipelago Key Species, the habitats/ecosystems in which they typically thrive, and the defined category or categories into which they have been placed.)*

2. **Prioritize Key Species and their habitats.** The following criteria are suggested for use to prioritize an extensive initial Key Species list so as to reduce it to a workable size. These and other prioritization criteria may be added or removed as future analysis and evaluation indicates.

- A Key Species whose habitat leads to ecosystem connectivity. A Key Species' importance here is based on its habitat, which serves as a bridge or corridor between two or more other priority Key Species habitats. If this species is chosen, its habitat will link previously separated ecosystems and can lead to management of multiple contiguous systems. If large enough, such tracts may be suitable to be called a Core Wild Area, an area designated with the specific management objective of providing baseline data for studying healthy functioning natural ecosystems. The species that might fit this criterion may be found in any of the five Key Species categories.
- Urgency based on threat(s) to and vulnerability of the species. These are species that are identified as being susceptible to specific threats such as encroachment by invasive species, habitat degradation, species competition, and more. In most cases these organisms are categorized as Rare Key Species.
- Urgency based on the species potential threat to the ecosystem. These species are important because of the threat they pose to other species, their habitats, and the ecosystem as a whole. Because these species are non-native to the ecosystem and have generally been recently introduced, native species have not had time to adapt to their presence. Such organisms are categorized as Exotic Invasive Key Species.
- Urgency based on the current high level of health and viability of the species. These species are doing very well and are not currently under threat by any factor and are found in what appears to be stable habitat and ecosystem. However, for a variety of reasons, biologically or aesthetically, it is deemed that they should remain at this level of health and viability. These species may also be considered "indicator species" whose numbers indicate the state of the living or nonliving environment. Often, these species are categorized as Biological Key Species.
- Controllability or the ease of management, monitoring, and measuring. From one species to another, there exist great differences in the ease with which they may be monitored. Some organisms are easily observable and readily counted, while others are far more hidden and timid and are therefore much more difficult to study. Plants, not being able to move from place to place, or flee from danger, are much more easily monitored than the highly mobile animals.

- Fundability or the availability of monetary or other resources for management, monitoring and measuring. Depending on the species, management may require funding, and development of a management plan would then include possible funding sources. For a variety of reasons, studies on some species are more likely to be funded. In addition to searching the more common organizations for funding potential (state, local and tribal governments, foundations and trusts, conservancies), the use of volunteers, school groups, university student research projects, organizations such as the scouts, 4H, and service clubs, etc. should not be overlooked as resources for implementing these management plans.
- The economic/commercial value to the Beaver Island community. A number of species are important in generating revenue for the Beaver Island community. Some provide a source of food or fuel that is utilized by Beaver Island seasonal or permanent residents. Others may be used in crafting products to be marketed on and off the island. Many species attract revenue-generating visitors to the island for hunting, fishing, birding, botanizing etc. These organisms would be categorized as Economic Key Species.
- Social concern, cultural and/or aesthetic importance. Some species are important to stakeholders, community members and/or visitors for aesthetic reasons. They may have spiritual, historical, geographic or even political significance, and for that reason may merit managing and monitoring. These organisms are categorized as Cultural Key Species.

### 3. **Use the Adaptive Management of Natural Resources model to achieve Key Species goals.**

Monitoring and adaptive management are nothing new on Beaver Island; they have been done with the invasive Phragmites and Emerald Ash Borer control efforts, the Wildlife Club's Quality Deer Management program and the local efforts to improve the sports fishery. What the Island needs now, however, is to pay attention to a broader set of Key Species that drive the natural systems' healthiness, and to muster a better resourced, more disciplined, and sustained monitoring within an adaptive management framework.

In 2007 the Open Standards for the Practice of Conservation developed a tool for species management (see [www.conservationmeasures.org](http://www.conservationmeasures.org)). This model will be used to manage the prioritized Key Species list. (*See page 35 for examples of preliminary management plans for three key species: White-tailed Deer, non-native Phragmites, and Black-throated Blue Warbler.*) This prioritized list will contain species of greatest importance, and each will then be surveyed and censused to determine its current status. In most cases, this will involve specific survey, census, and sampling methods that will be tailored to the Key Species in question. Such techniques may be as simple as a tally of personal observations or as complex as transects, mark-recapture studies, and aerial surveys. New funding may or may not be needed. If the species is found to utilize habitat on private land, proper protocol for

voluntarily gaining permission to survey will be followed. For a given key species and its habitat, an Adaptive Management plan would proceed according to the following steps:

- Identify the current status of the Key Species and its habitat and determine where it should be in the future. This will provide the target for the management plan and it may be determined either scientifically or aesthetically, or both.
- Determine management actions, timeline, and funding necessary to reach targets. Develop a strategic and operational plan for reaching the projected target. This would include the actions and monitoring plan that would bring about the changes necessary to reach the target, an action timeline, and a plan to insure appropriate funding.
- Implement the strategic operational plan. This will include monitoring Key Species and their habitats. Following the scheduled timeline, species will be monitored in order to detect change in their status
- Analyze, communicate, and evaluate the results. The results will determine the future course of action. For example, if the appropriate target is reached, then the plan might be continued without change. If the target is not reached, the plan might be modified, or a new plan could be developed. This step that makes the adaptive management plan adaptive.

Adaptive Management works most efficiently when all available knowledge is used in formulating the plan. We have to have strong coordination and collaboration among the many local, tribal, state, and national entities that participate actively in natural resources management, including the Wildlife Club, Beaver Island Association, Little Traverse Band of Odawa, Central Michigan University, Little Traverse Conservancy, Michigan Department of Natural Resources, The Nature Conservancy, and the Conservation Resource Alliance. No one group can achieve this Effective Management Goal alone; it takes an island community willing to work together and reach out for expertise and obtain funding. If the knowledge required is limited or not available, this should not preclude moving ahead with a plan based on common sense and practical general knowledge. As with the initial construction of a prioritized key species/habitat list, input from ALL stakeholders is a must in the development of any management plan.

# **Economic Growth Derived from Our Natural Resources: Overview, Objectives, and Strategies**

## Goal

Island business owners, residents, and developers value and protect the Beaver Archipelago's natural resources and beauty as a sustainable source of economic benefits, while expanding traditional and new economic activities. These include, but are not limited to, recreation, ecotourism, home and business development, and subsistence, commercial, and recreational hunting and fishing.

## Overview

The future of Beaver Island's economy depends to a great extent on the natural beauty, environmental quality, and low-impact uses that attract visitors, property- and home-buyers, seasonal and full-time residents. Spending by summer visitors and construction/remodeling of homes generate the great majority of the Island economy, while property is the main long-term financial asset for Islanders. This means that the vitality of the small Island economy depends heavily on economic conditions elsewhere. The prolonged recession in Michigan and the collapse of the national housing/property markets have hurt the Island's economy, forcing some Islanders to seek work away, slashing property values and sales and new construction, constraining the townships' financial resources, and raising fears that young Islanders will not find economic opportunity here. Unless demand increases significantly, it is difficult for the Island economy and its businesses to become stronger. However, the limited size and availability of the Island's infrastructure for visitors – the supply of lodging, transportation, food, and other services – may also constrain growth.

The Island has important potential to tap into a large regional market for destination tourism and recreation; to revive its housing sector as the economy rebounds; to support small-scale businesses that provide natural-resource experiences and products; and to expand the economic impact of the unique environmental research and teaching pioneered by Central Michigan University. But the community also has to pay attention to a clear message from Islanders far and wide: Don't let unlimited economic development "kill the golden goose" of Beaver Island's beautiful, conserved natural setting and don't try to turn peaceful, natural Beaver Island into a hyper-busy, manicured Mackinac Island. A great deal of land is available for new construction – an estimated 25% of all buildable lots have been developed – but it's essential for the community, contractors, and property owners to manage development in ways that won't ruin natural beauty and environmental quality. In addition, it's important to recognize that the use of state-owned land in the Beaver Archipelago is guided and protected by long-standing government policies to benefit the citizens of the state.

Existing efforts to enable economic activity show the way: Island businesses, working mostly through the Beaver Island Chamber of Commerce, and non-profit organizations have increased the amount and sophistication of marketing for visitors. Various Island organizations and individuals have expressed support for particular sorts of new or expanded eco-tourism activities, especially a bird-watching festival, because they marry education about natural resources with potential economic benefits. Peaine Township's recent effort to acquire land on Fox Lake extends the Island's strong tradition of ensuring public access to inland lake and Lake Michigan frontage. In the last few years the Island has seen a surge of interest in and activity to expand and promote bicycle trails, with the advent of a summer bike festival and a trail-making and promoting effort led by the Top of Michigan Trails Council. St. James Township has made progress in developing a public boat launch, an important way of enhancing the harbor's recreational endowment. Recent telephone company interest in expanding cell-phone access to the entire Island promises to deliver communications access to boaters in the Archipelago, an important improvement in safety. The Island community has long supported and benefited from the research/teaching activities of CMU's Biological Station, which have been growing, and now Northern Michigan University is creating a research/teaching outpost on the Island. When the Island's natural resources attract the interest of researchers/educators, this generates economic activity, as well as introduces new people to the Island. Local tribes and conservation organizations have raised and provided hundreds of thousands of dollars to support environmental research, restoration, and protection – with much of the money spent in the Island economy.

The recommended Objectives and Priority Strategies for the economic growth goal would help the Island community to grow the economy in ways that value and protect natural resources and beauty.

These recommendations won't solve all of the Island's economic problems, but they will help. A great many of the ideas that Islanders have for economic development are not natural-resources related, for instance, improvements in Internet access and transportation infrastructure. Those ideas and these recommendations could be part of a larger economic-development plan for Beaver Island, should the township Boards decide this is needed.

**Objective 1: Promote awareness of natural-resource based opportunities for ecotourism, recreation, hunting and fishing, and other recreational activities for visitors, seasonal residents, and businesses.**

This objective will benefit from recommendations elsewhere to promote wildlife and biodiversity.

1. Expand resources for producing a comprehensive, sustained "best in class" publications and online campaign, along with high-quality guides, that promotes hunting and fishing, recreation (including campgrounds and marinas), eco-tourism, cultural/historical events and assets, and the Island as a visitor destination. More can be done to pool and coordinate

marketing resources and efforts, develop a set of high-quality marketing materials and guides for the Island, increase use of the Internet (Web sites and mobile apps) for marketing, to bolster marketing campaigns for specific events, and to convert marketing into sales by providing potential visitors with easy access to transportation, lodging, and more.

2. Coordinate and expand the Beaver Archipelago's eco-tourism events, activities, and assets, starting by holding an annual Beaver Island bird watching festival in May 2014, becoming an official "dark-sky" designated site, enhancing the nature segment of Museum Week every summer, working with, for example, the Beaver Island Music Festival, annual bike festival, and Baroque on Beaver to provide their customers with nature experiences, and designation of easily accessible shorelines, Core Wild Areas and Old Growth Forest and Tree sites. These ideas won't become reality unless there's leadership to make them happen. For each of the specific activities mentioned, a team would be formed to plan, develop, promote, and launch the event, and then sustain it for the initial years typically needed to build an audience. Resources for some of these events may be available from the BI Chamber of Commerce and other sources. Although the Island traditionally uses unpaid volunteers to spark activities of this sort, it might be possible to organize a business model (nonprofit or for-profit) around event development and management, since financial revenues are likely to flow to Island businesses.
3. Study the potential economic benefits, possible environmental risks, and enforcement requirements of setting aside a small portion of state land and/or trails for use by Off Road Vehicles (ORV), and assess community opinion about such a plan. The BI Chamber of Commerce recommended this study. Recognizing that much of the state land on Beaver Island managed by the Michigan Department of Natural Resources may not be legally usable by ORVs because it was purchased or supported with funds exclusively for wildlife enhancement, Islanders interested in promoting ORV use could evaluate potential areas that could be so designated for the potential economic benefits, environmental risks, and enforcement requirements, determine the degree of community support, and apply to the DNR for the appropriate trail designation.

**Objective 2: Increase housing construction and remodeling, building in places and ways that maintain the Island's natural beauty and protect environmentally sensitive areas.**

This objective will benefit from recommendations under Objective 1 that increase the number of visitors to the Island, some of whom could become property buyers/home builders, and from recommendations elsewhere that combat invasive species and thereby protect Island's natural beauty and property values.

1. Enforce existing zoning/ordinances governing property development and construction and consider historical- and restoration-style architecture in remodeling projects. The townships should consider authorizing a process that ensures landowners are aware of how they

might modify their construction plans – for example, the location and design of planned structures, driveways, and setbacks – to better preserve the Island’s natural beauty and environmental condition, ensuring development fully meets the townships’ intentions.

2. Develop and provide property owners and developers/building contractors with a “how to” manual about environmentally friendly and value enhancing ways to design and implement property development and construction projects. Island realtors, developers, and contractors are aware of many practices that can help landowners and home builders do a better job of protecting the Island’s natural beauty and environmental health, which enhances property values. A small group could develop a how-to publication that, at low cost, could be printed and distributed.
3. Building on existing ordinances, adopt and enforce an Island-wide anti-blight strategy and work with property owners to address blight, especially in St. James, which is in view of every visitor to the Island. Working with the BI Chamber of Commerce and other interested parties conduct the research needed to develop an approach that gets property owners to address blight concerns, likely using a combination of enforcement and incentives.
4. Increase collaboration with the Little Traverse Conservancy (LTC) and others to encourage private landowners on the Island to use conservation easements – especially voluntary restrictions on future subdivision – as a way of preserving (a) forestland, (b) water frontage on Lake Michigan and (c) frontage on inland lakes. Two models for increasing conservation easements, both discussed by the NRESC subcommittee on conservation easements, could be pursued. One would be a campaign to engage property owners who might be inclined to use an easement and get them to do so over the next year or two. A target might be owners of large parcels of forest land. A second approach is a longer-term and more comprehensive campaign that educates land owners about a variety of practices they might adopt – from land stewardship and habitat improvement to various types of easements – and at the same time identifies key parcels for which there might be a community interest in land conservation through easements. LTC has worked with the DNR and other stakeholders on this approach in the Pigeon River area. Either approach or both could be adopted and linked to monitoring/protection of key species identified in the Effective Management goal.
5. Work with the state Department of Natural Resources and others to increase public access to Lake Michigan and inland lakes by identifying, acquiring, and conserving additional key parcels for public use – and to ensure the Island community and stakeholders are consulted when the state considers the sale or transfer of ownership of public land in the Archipelago. It is time to conduct a comprehensive assessment of what more should be done, since this sort of access is an important drawing card for visitors.

**Objective 3: Enhance public access, infrastructure, and educational capacity that showcase the rich diversity of natural resources**

1. Expand, improve, and maintain hiking and biking trails, connect them into an Island-wide system (of public and private lands with owners' permission), and develop a waterways trail that includes the outer Islands. Surveys of Islanders in 2011-12 identified biking and hiking as one of the community's most important recreational activities. The community should also explore the feasibility of developing an even more comprehensive, multi-use, Island-wide and archipelago-wide trail system. And promoting Island trails will mean also needing a way to ensure that trails are well-maintained throughout the year. It seems unlikely this can be done with just the occasional volunteer effort.
2. Complete development of a public boat launch site at St. James Harbor, with a boat-washing facility to prevent spread of invasive species.
3. Expand and complete Island-wide signage for natural, historical, cultural sites and features. Existing efforts to place historical signage in places of interest can be enhanced to include a broader signage plan that includes natural and cultural sites and features – coordinated with maps – and uses the latest technologies to provide visitors with a fuller experience without cluttering the landscape. A broader effort would probably involve coordination of various organizations, including the tribes, which might contribute.
4. Clean up debris on Garden and High Islands and promote services to take visitors to the outer islands for eco-tourism experiences. First step is to work with state and federal governments, as well as other owners of outer island property, to determine the extent and nature of the debris problem and develop a plan for removal and/or burial, as appropriate – and then to implement the plan.
5. Expand investment in improving access to recreation and natural sites for people with special needs/disabilities. The Beaver Island Human Services Commission has developed recommendations and priorities for these improvements, some of which are referred to in both townships' recreation plans. They require funding and implementation.

**Objective 4: Increase value-added businesses using natural resources, such as forest products and food processing, as well as research, and investigate the potential of Beaver Island as a model for local food and energy production and self-sufficiency.**

1. Market "Made on Beaver" crafts and foods to mainland customers by running a sales and information booth at farmers markets in Traverse City, Charlevoix, and other communities, and initiating an online advertising campaign. Some Island craftsmen/women and businesses that sell crafts as well as food products have been marketing on the Internet. But few have tried to take their products into the mainland summer markets – farmers markets

and festivals. A coordinated effort to take products to these markets – a booth, or kiosk – and sell them could have the double benefit of increasing sales and increasing awareness of the Island as a visitor destination. In addition, a coordinated online advertising campaign, rather than each craftsman/merchant having their own web page, might allow for greater targeted reach into digital markets. All of this could be done under a “Made on Beaver” banner.

2. Work with a mainland packager/operator of eco-tourism trips to develop and market Beaver Island eco-tourism packages for summer and shoulder seasons. The Beaver Archipelago’s natural eco-tourism attractions are not well known or marketed. One way to try to develop stronger recognition is to work with an eco-tourism operator who would market eco-tourism trip packages to the Island, much as is now being done for carp fishing around the Island. Eco-tourism packages for Isle Royale and several other North Country areas suggest there’s a market for what Beaver Island can offer. Approaching some of these operators to better understand what they might be interested in doing and what the arrangements might be seems to be a worthwhile effort.
3. Work with Central Michigan and other universities, government agencies, tribes, and conservation organizations to increase research work on the Beaver Archipelago that brings more visitors, commerce, and national attention to the Island. The community can work with universities, governments, and nonprofits to find ways to further encourage environmental, cultural, and historical research/teaching and the economic benefits they bring. In addition, the community should explore ways to increase research consistent with Beaver Island’s state designation as a Wildlife Research Area, and the potential of new local/state/national/international government and nonprofit conservation designations that could both stimulate tourism and additional research.
4. Develop a Beaver Island Conservation Corps to provide year-round part-time employment maintaining trails, restoring natural settings, and other environment-enhancing activities. As the Island increasingly recognizes the economic value of preserving its natural beauty and resources, it will have to find ways to get environmental conservation, restoration, and protection work done, and to promote greater understanding and appreciation of the natural resources. This could create employment and business-development opportunities, perhaps even year round – but this may require a combination of business, non-profit, and township resources to pull off.
5. Ensure effective forest management such that prescribed treatments, clear-cutting, or selective harvesting, contribute to the Island economy, control the spread of invasive species, and produce the results desired for the selected key species in the Effective Management Goal.

## **An Environmentally Informed Public: Overview, Objectives, and Strategies**

### Goal

Island residents and visitors value, learn about, and experience the Beaver Archipelago's natural, historical, and cultural resources, and participate in and support efforts to sustain their beauty and health, which may be enhanced through collaboration with off-Island organizations.

### Overview

People have a natural affinity for and reverence of natural resources, so the more sustained contact they have with them, the more they feel called on to *support* them. And the more they understand how natural systems work, the more effectively they *try* to protect those systems' health and beauty. More contact with nature and more understanding of nature will reinforce the desire and ability of Islanders and visitors to advance the goals of effectively managing the Beaver Archipelago's natural resources and using them in a balanced way to grow the Island economy. What's clear, though, is that as much as members of the Island community may appreciate and know about the Archipelago's natural resources, there's always more – much more – to learn and value. Scientific research provides new understanding nearly every day. Changing conditions alter the usefulness of what we already know and require new thinking. And an everyday walk in the woods or on the beach can spur new feelings and reveal new insights.

The Beaver Archipelago is abundant with opportunities for experiencing and learning about natural resources, and many people take advantage of this. Just being here can be enough. But much also exists to support the curious: guided field trips, guide books and publications, art work and videos, presentations, ecotourism services, knowledgeable locals, various restoration activities, fishing and hunting guides, and more – nearly all of it provided by volunteers: the Beaver Island Wildlife Club, the CMU Biological Station, and many others.

The Great Outdoors is also a Great Classroom. Becoming more environmentally informed is not just about book or classroom learning – although they have a role; it's about providing people with opportunities to be in nature and learn for themselves, sometimes with guidance, sometimes without. But in modern society so many things vie for our attention that it's essential to be equally competitive. In addition to straightforward educational opportunities, it's necessary to incorporate proven methods for attracting and engaging people, such as expanding on their existing interests, providing well-designed materials paired with digital versions, and using contests and games to generate excitement. Even the time it takes to travel to Beaver Island offers an opportunity to provide thousands of people with educational information. And the increased monitoring of natural resources proposed under the Effective Management Goal

is yet another opportunity to engage people in working with and understanding the Archipelago's natural resources.

Although many of the recommendations that follow call for undertaking particular events and activities, what's proposed needs more than just a few people to organize another happening on Beaver Island. As people get more interested in the Archipelago's natural resources, they will need ways to act on their interest and to spread their enthusiasm. They may want to donate time or money. They may want to plan or implement an event, or take part in a work crew, or measure the effectiveness of a project. They may want to make suggestions, report their observations, or pass on information they have received. To really cash in on the investment in events and activities that might be tried, we will need an ongoing capacity that engages people as learners and doers.

**Objective 1: Increase educational opportunities for Islanders and visitors to understand, appreciate, and protect the unique natural, historical, and cultural features of the Beaver Archipelago.**

1. Create and distribute several guides: an Island-wide driving guide; an Island-wide trails guide; guides to various kinds of natural resource based experiences, and a guide to the Beaver Archipelago's flora and fauna.
2. Start to publish a journal of Island nature studies, drawing on writing of researchers, journalists, naturalists, and others.
3. Create a new Web site about the Beaver Archipelago's natural resources, which includes an online public archive of Island research and Great Lakes research and links to existing sites, and provide online opportunities (e.g., webinars) for residents and visitors to learn more about the research.
4. Design, distribute, and publicize natural resource-oriented games, including a summer-long scavenger hunt with prizes.
5. Develop and distribute educational materials that encourage cultural understanding of native animal and plant species in the Beaver Archipelago.
6. Establish informational kiosks on ferries and/or ports of entry to educate visitors on the unique nature of the Beaver Archipelago and the Great Lakes islands.
7. Increase and regularize expert presentations on interesting or important aspects of the Beaver Archipelago's natural resources.

8. Establish a summer-only nature center at the Beaver Island Community School, staffed by volunteer naturalists.

**Objective 2: Increase community and stakeholder awareness of conservation threats and best practices to sustain the natural features and species diversity of the Beaver Archipelago.**

1. Develop booklets for Island property owners about stewardship practices for the following Island types of land: interior lakes, streams, fields, forests, and Great Lakes shoreline – in addition to the property owners’ manual about environmentally friendly construction described in Goal 2.
2. In conjunction with developing Beaver Island as a unique bird-watching site, provide land owners with advice about bird-friendly habitat management.
3. Encourage participation in collaborative Invasive Species monitoring efforts through monitor training programs.
4. Increase efforts to support voluntary landowner management of wildlife (animals and plants) and rare or endangered species through cooperative agreements, conservation easements, and technical assistance.
5. Develop a program for private landowners to increase awareness of menu of stewardship options, from food plots and timber harvesting to conservation easements and identifying threatened and endangered species.
6. Design key species monitoring so that there are opportunities for landowners, visitors and youth to participate in a meaningful way.

**Objective 3: Increase engagement of the Island community’s youth in activities that manage natural resources and enhance learning about the Beaver Archipelago’s wildlife and habitats.**

1. Urge the Beaver Island Community School to give credit for student participation in Beaver Archipelago natural resource activities.
2. Urge the Beaver Island Community School to invite Beaver Archipelago natural resource researchers to present their work and their results to students and visiting youth, and their parents.
3. Urge donors to create special youth internships for assisting the organizing and enacting of Beaver Archipelago natural resource oriented activities.
4. Encourage students to produce poster presentations, videos, and other creative products about Beaver Archipelago’s natural resources, perhaps using a contest to stimulate interest.

5. Explore possibilities for involving Beaver Island Community School students and visiting youth in off-Island, natural resource-oriented, volunteer projects.

## Glossary

**Adaptive:** The ability to respond to and adjust to changes in conditions, situations or the environment.

**Beaver Archipelago:** The 11 islands in northeast Lake Michigan: Beaver, Garden, Gull, Hat, High, Hog, Pismire, Shoe, Squaw, Trout, and Whiskey.

**Biodiversity:** Biological diversity or the number and variety of species.

**Community:** An assemblage of two or more populations of different species occupying the same geographical area.

**Conservation Priorities:** Key species or natural areas, strategically selected by the Island community and stakeholders, for monitoring, planning, and coordinated actions to ensure they are maintained in or restored to optimal condition. (See Key Species.)

**Conservation Threats:** Activities or exotic invasive species that are identified as degrading and eliminating or having the potential to degrade and eliminate Key Species. (See Key Species – Exotic Invasive Key Species.)

**Core Wild Area:** An area designated with the specific management objective of providing baseline data for studying healthy functioning natural ecosystems.

**Ecosystem:** A biological community of interacting organisms and their physical environment. *A note of clarification: A community has only living things in it and an ecosystem has living and non-living things in it. A community is made up of all the individual animal species living within a specific geographical area. For example, in a tide pool the community would be the starfish, barnacles, crabs, algae, etc. An ecosystem is all the individual species living within a specific geographical area plus all abiotic (non-living) factors with which they interact. Using the tide pool example, an ecosystem includes all the animals and plants above but also the seawater, rocks, minerals, wind, sunlight, etc.*

**Ecotone:** Edge area between two distinctive habitats or ecosystems.

**Ecotourism:** Tourism activities and related businesses involving visiting natural areas resulting in beneficial educational impact on the visitor but with minimal impact on the environment.

**Game Species:** Any animal hunted for food or sport, and not normally domesticated. Beaver Archipelago species are as follows: beaver, brant, coot, coyote, crow, white-tail deer, ducks, fox, geese, snowshoe hare, muskrat, pheasant, raccoon, ruffed grouse, snipe, sora rail (a wading bird), gray squirrel, weasel, wild turkey, woodchuck, woodcock and Virginia rail.

**Habitat:** Place where an organism or a community of organisms lives, including all living and nonliving factors of conditions of the surrounding environment. A host organism inhabited by parasites is as much a habitat as a place on land such as a grove of trees or an aquatic locality

such as a small pond. The habitat is linked to a given species. “Microhabitat” refers to the conditions and organisms in the immediate vicinity of a plant or animal.

**Inventory:** Lists of Beaver Archipelago’s historical, cultural, and natural features that will be used for natural resource management planning.

**Key Species:** Animal and plant species that, due to their impact on other species, the economy, and/or the environment, should be subject to long-term scientific monitoring of their condition. Key species fall into five categories:

- **Economic Key Species**—*Organisms that due to the interest of hunters, fishermen, birders, botanizers, trappers, and others generate revenue for businesses and residents of Beaver Island.*
- **Rare Key Species**—*Organisms that due to their rarity are state or federally listed as endangered, threatened, or of special concern.*
- **Exotic Invasive Key Species**—*Non-native (alien) organisms whose introduction do or are likely to cause economic or environmental harm or harm to human health.*
- **Biological Key Species**—*Organisms which, should they become less numerous or extirpated, would have a profound effect on the surrounding species and/or whose numbers act as an indicator of environmental conditions.*
- **Cultural Key Species**—*Organisms which, for traditional, historical, and/or spiritual reasons, are held in high regard by the tribes and other stakeholders.*

**Monitoring:** Observation and measurement of condition of species and natural areas to set baselines and assess progress toward goals in natural resource management plans. Monitoring makes it possible to assess the effectiveness of actions initiated under plans, and to improve them.

**Natural Areas:** An area of unique scenic, historic, geologic or ecological value and of sufficient size and character so as to allow its maintenance in a natural condition by the operation of physical and biological processes, usually without direct human intervention. These areas are set aside to provide locations for scientific observation of natural systems, to protect outstanding examples of natural interest and beauty.

**Population:** A group of organisms of one species that interbreed and live in the same place at the same time.

**Public Access:** The right of members of the public to enter and use public lands and waterways. Use of some lands may be limited by public agencies that manage the lands and waterways if the proposed activity and management objectives for the land are conflicting.

**Public Lands:** Land and waterways owned by township, county, state, or federal governments.

**Research:** Scientific investigation to provide answers to questions about biological, historical, cultural, and natural features of the Beaver Archipelago.

**Stakeholders:** Organizations or individuals who have an interest in the long-term welfare of natural resources of the Beaver Archipelago, including nonprofit organizations (conservation, environment, recreation, ecotourism); tribal entities; local, county, state, and federal government agencies.

**Target:** The desired goal in terms of species and/or habitat management.

**Value-Added Businesses:** For-profit and nonprofit entities that process natural resources, such as trees, to create and sell products worth more than the raw material.

**Wildlife:** All living things (plants, animals, and other organisms) that are undomesticated.

## Appendix A

### Information Resources

NRESC Resource Library: Beaver Island Specific, Deer Management, Forests, Great Lakes/Islands, Misc. [http://binresc.org/?page\\_id=206](http://binresc.org/?page_id=206)

Report on Results of NRESC Focus Groups & Community Forums (April 16, 2012)  
<http://binresc.org/?p=376>

## Appendix B: Sample Key Species/Habitat Table

The following table is a sample listing of Beaver Island Archipelago Key Species, the habitat(s)/ecosystem(s) in which they typically thrive, and the defined category or categories into which they have been placed. Habitat/Ecosystem designations are included to demonstrate the tremendous diversity and importance of natural environments exhibited within the Beaver Archipelago. This sample list is a draft list resulting from multiple inputs from the Beaver Island Wildlife Club, the Beaver Island Association, the Tribes, projects already in place and from subcommittee ideas. Further, the species listed are but a fraction of the total that inhabit and breed in the Beaver Archipelago. This is by no means meant to be a final list.

### *Economic Key Species*

Animal Species	Habitat/Ecosystem	Category
Beaver	Second growth or early successional forest adjacent to creeks, streams, rivers, or bodies of water with suitable year-round depth	Economic Biological Cultural
Black-throated Blue Warbler	Northern hardwood or mixed coniferous forests dominated by maples, birches, beech, and other northern hardwoods, with varying amounts of eastern hemlock, spruce, and fir. Also must include a dense shrubby understory, especially consisting of hobblebush and other <i>Viburnum</i> species, as well as striped maple, <i>Rhododendron</i> , or regenerating conifers.	Economic Biological
Coyote	Generalized habitat including a variety of forest types, old field situations, shrubland, ecotones, and even suburban areas. Human tolerant	Economic
Double-crested Cormorant	Open or forested shoreline of lakes with a depth to 35 feet or greater.	Economic Biological
Mallard Duck†	Almost any wetland habitats, including permanent and ephemeral wetlands such as marshes, bogs, prairie potholes, river floodplains, beaver ponds, lakes, reservoirs, ponds, city parks, farms, and estuaries.	Economic
Muskrat	Wetlands: Swamps, freshwater marshes, lakes, ponds, and slow-moving streams	Economic
Ring-necked Pheasant	Open field edges, cultivated farmland, woodland undergrowth	Economic
Ruffed Grouse	Young aspen stands following clear-cut, mixed forest with dense undergrowth of hazelnut, ironwood, dogwood.	Economic
Smallmouth Bass	Cool, clear water of permanent lakes and streams with rocky, gravelly to sandy substrate and abundant cover (boulders, rocks, crevices, stumps, root masses)	Economic Biological
Snowshoe Hare	Early successional deciduous, mixed and conifer forests with abundant cover, cedar swamp, shrubby old field.	Economic
Walleye	Moderate to large, cool temperature lakes and rivers with moderately turbid (cloudy) conditions, and firm, gravel/rock bottom with some aquatic plants and structure.	Economic

Whitetail Deer*	Mixed woodlands, old field, forests with multiple successional stages, ecotonal areas and lowlands, Beech-Maple climax forests, cedar swamps and other lowlands.	Economic Biological
Wild Turkey	Mixed hardwood and mixed conifer-hardwood forests with scattered scattered openings such as pastures, fields, orchards and seasonal marshes	Economic
Woodcock	Young, dense, hardwood forest with moist soil. Mixed forest with crabapple, alder, birch, apple, aspen and/or dogwood.	Economic Rare
Yellow Perch	Warm to cool, soft-bottomed lakes, ponds and streams with rooted abundant aquatic vegetation	Economic
<b>Plant Species</b>	<b>Habitat/Ecosystem</b>	<b>Category</b>
Paper Birch	Will grow in a variety of soil types on open slopes, flood plain, swamp/bog margins with early successional associations. Shade intolerant.	Economic Cultural
Sugar Maple	Moist, fertile soil, sunny to full shade, associated with other hardwoods including American Beech and Red Oak. Shade tolerant.	Economic
Northern White Cedar	Swamps, glacial depressions, lake and stream margins, all with moist, but well-drained limestone (alkaline) soil.	Economic Biological
Wild Cranberry	Open acid wetlands and sphagnum bogs.	Economic Cultural
Wild Blackberry	Open areas with moist to mesic black soil, woodland edges, old fields	Economic
Wild Raspberry	Open areas with moist to mesic black soil, woodland edges, old fields	Economic
Wild Strawberry	Mesic black soil prairies, openings and edges of woodlands (including drier areas), savannas, limestone glades, and areas along railroads. Somewhat shade tolerant.	Economic Cultural

† Although the Mallard Duck is listed in this table as an economic Key Species, a number of other duck species might also be considered here due to their status as game animals. The Mallard is used as a typical example.

### **Rare Key Species**

<b>Animal Species</b>	<b>Habitat/Ecosystem</b>	<b>Category</b>
American Bittern	Freshwater wetlands, including wetland fringes, shorelines, bogs, swamps, wet meadows	Rare
Bald Eagle	Wetlands associated with large streams or large bodies of water with an abundance of fish for foraging and old-growth or mature stands of hardwoods or conifers for nesting.	Rare Cultural
American Bullfrog	Permanent freshwater ponds, swamps and lakes closer to the banks rather than out in the open water. Little or no water current and abundant aquatic vegetation.	Rare
Common Loon	Clear, relatively non-acidic, freshwater lakes with islands or isolated, floating vegetation mats. Lakes must have abundant fish. Non-human tolerant.	Rare Cultural
Common Tern	Close to freshwater on almost any open flat habitat, including sand or <u>shingle beaches</u> , firm dune areas, <u>salt marsh</u> , or, most commonly, islands.	Rare

Grasshopper Sparrow	Grassland, upland meadow, pasture, hayfield, and old field with medium-height bunch grasses interspersed with patches of bare ground, a shallow litter layer, scattered forbs, and few shrubs.	Rare
Hine's Emerald Dragonfly	Calcareous spring-fed marshes & sedge meadows	Rare
Meadowlark (Eastern & Western)	Farm fields, grasslands, and wet fields.	Rare
Merlin	Coniferous forest for breeding. Open fields, grasslands, marshlands, and lakeshores for foraging.	Rare
Northern Goshawk	Mature coniferous, deciduous and mixed forests	Rare
Northern Harrier	Open grasslands, wetlands, wet meadows, cultivated lowland areas.	Rare
Northern Leopard Frog	Permanent ponds, swamps, marshes, and slow-moving streams with abundant aquatic vegetation and adjacent to open fields.	Rare Biological
Piping Plover	Open sand, gravel, or cobble beaches on islands, lake shores, coastal shorelines, and river margins.	Rare
Red Fox	Diverse habitat: Grasslands, old field, ecotone, thick forests even urban areas. Human tolerant	Rare
Red-headed Woodpecker	Deciduous woodlands with oak or beech, groves of dead or dying trees, river bottoms, burned areas, recent clearings, beaver swamps, orchards, parks, farmland, grasslands with scattered trees, forest edges, and roadsides.	Rare Cultural
Red-shouldered Hawk	Bottomland hardwood stands, flooded deciduous swamps, and upland mixed deciduous-conifer forests, all stands with an open subcanopy.	Rare
Whip-poor-will	Early successional uplands, primarily deciduous and mixed forest adjacent to large clearings and open margins.	Rare
Woodcock	Young, dense, hardwood forest with moist soil. Mixed forest with crabapple, alder, birch, apple, aspen and/or dogwood.	Economic Rare
<b>Plant Species</b>	<b>Habitat/Ecosystem</b>	<b>Category</b>
American Chestnut	Full morning sun in coves or sloping, well-drained lands with acid soils	Rare
Calypso Orchid	Swamp forest dominated by Northern White Cedar	Rare
Canada Yew	Well-drained slightly acidic silt loams; near bogs. Very shade tolerant	Rare Biological
Dwarf Lake Iris	Close to the Great Lakes shores on sand or in thin soil over limestone rich gravel or bedrock. Old beach ridges of former shores of the Great Lakes. Full sun to near complete shade.	Rare
Houghton's Goldenrod	Narrow bands of open, calcareous Great Lakes shoreline. Moist sandy beaches and shallow depressions between low sand ridges along the shoreline (i.e. interdunal wetland).	Rare
Lake Huron Tansy	Foredunes and active dunes, old, stabilized dunes, and sandy or even substantially cobbly beaches. Withstands substantial wave action.	Rare
Michigan Monkey Flower	Mucky soil and sand that is saturated or covered by cold, flowing spring water near present or past shorelines of the Great Lakes.	Rare
Milkweed (Common and Swamp)	Fields, open woods, roadsides, railroads, waste ground.	Rare Biological
Pitcher's Thistle	Open sand dunes and low open beach ridges of the Great Lakes'	Rare

	shores.	
Ram's Head Lady Slipper	Cool, dense white cedar/balsam/spruce swamps or Nearly pure sand over limestone beach cobble or bedrock, mulched with juniper or mesic soil of sandy loam, or clay under the partial shade of mixed forest.	Rare
Wild Rice	Rivers, streams, lakes, and ponds, in water no more than about two feet (0.6 m) deep, and with a slow current flowing over a mucky or silty bottom with little competition from other plants.	Rare Cultural
Yellow Lady Slipper	Mesic to dry deciduous woodlands, sandy woodlands and savannas, thinly wooded bluffs along rivers, and shady areas of bogs.	Rare Cultural

### *Exotic Invasive Key Species*

<b>Animal Species</b>	<b>Habitat/Ecosystem</b>	<b>Category</b>
Emerald Ash Borer	Stands of White, Green or Black Ash trees.	Exotic Invasive
Round Goby	Generally near shore freshwater lakes with rocky or gravel substrate.	Exotic Invasive
Quagga Mussel	Freshwater lakes, rivers and streams to a depth of greater than 100m. Attach to any solid substrate.	Exotic Invasive
Mute Swan	Shallow coastal ponds, estuaries, ponds, bogs, and streams flowing into lakes, with available aquatic vegetation.	Exotic Invasive
Rusty Crayfish	Freshwater northern lakes and streams of the Great Lakes region with rocky substrate and logs or debris as cover. Pools of still water or fast-flowing streams.	Exotic Invasive
Zebra Mussel	Freshwater lakes, rivers and streams to a depth of greater than 60m. Attach to any solid substrate.	Exotic Invasive

<b>Plant Species</b>	<b>Habitat/ecosystem</b>	<b>Category</b>
Autumn Olive	Old fields, thickets and forest edges.	Exotic Invasive
Garlic Mustard	Moist, calcareous, shaded soil of river floodplains, forests, roadsides, edges of woods and trails edges, forest openings and disturbed areas.	Exotic Invasive
Japanese Knotweed	Near water sources, such as along streams and rivers, in low-lying areas, waste areas, and around old home sites. Tolerant of a variety of adverse conditions, including deep shade, high temperatures, high salinity and drought.	Exotic Invasive
Marsh or European Swamp Thistle	Moist acidic soils, such as ditches, wetlands, swamps, fens. Shade intolerant.	Exotic Invasive
Narrow-leaved Cattail	Wetlands, ditches, stream and lakeshores and wet depressions. Tolerates high levels of silt, nutrients and salt.	Exotic Invasive
Non-native (Eurasian) <i>Phragmites</i> *	Moist ditches, wetlands, wet swales, stream, pond and lake shores, especially nutrient rich areas. Tolerant of salt.	Exotic Invasive
Oriental Bittersweet	Grasslands, undisturbed open woods, ecotones, roadsides and fence rows. Shade intolerant.	Exotic Invasive

Purple Loosestrife	Primarily organic soils in disturbed wetlands and moist ditches. Open sun to partial shade.	Exotic Invasive
Scot's Pine	Acidic well-drained soils, freely drained sands and gravels, often on knolls and terraces. Shade intolerant.	Exotic Invasive
Spotted Knapweed	Open, sunny areas with dry, sandy soils, pastures, hayfields, rights of way, roadsides and pastures. Tolerant of a wide range of soils. Shade intolerant.	Exotic Invasive

### **Biological Key Species**

<b>Animal Species</b>	<b>Habitat/Ecosystem</b>	<b>Category</b>
Beaver	Second growth or early successional forest adjacent to creeks, streams, rivers, or bodies of water with suitable year-round depth	Economic Biological Cultural
Black-throated Blue Warbler	Northern hardwood or mixed coniferous forests dominated by maples, birches, beech, and other northern hardwoods, with varying amounts of eastern hemlock, spruce, and fir. Also must include a dense shrubby understory, especially consisting of hobblebush and other <i>Viburnum</i> species, as well as striped maple or regenerating conifers.	Economic Biological
Double-crested Cormorant	Open or forested shoreline of lakes with a depth to 35 feet or greater.	Economic Biological
Fat Mucket Clam	Freshwater lakes and headwaters of medium sized rivers with quiet water on sandy-mud bottoms. Occasionally it is found in riffles, but usually in waters below riffles, or slowly running water with fine gravel, sand and mud.	Biological
Leopard Frog	Permanent ponds, swamps, marshes, and slow-moving streams with abundant aquatic vegetation and adjacent to open fields.	Rare Biological
Pileated Woodpecker	Mature deciduous or mixed deciduous-coniferous woodlands of nearly every type, from hemlock to beech and maple to cypress swamps. Also, younger forests that have scattered, large, dead trees or a ready supply of decaying, downed wood.	Biological
Red-backed Salamander	Mixed woodlands, deciduous forest, upland and lowland cedar stands, all with thick leaf litter and numerous decaying logs or stumps.	Biological
Smallmouth Bass	Cool, clear water of permanent lakes and streams with rocky, gravelly to sandy substrate and abundant cover (boulders, rocks, crevices, stumps, root masses)	Economic Biological
White-tail Deer*	Mixed woodlands, old field, forests with multiple successional stages, ecotonal areas and lowlands, Northern hardwoods forests, cedar swamps and other lowlands.	Economic Biological
Wood Thrush	<u>Deciduous</u> and mixed late-successional, upland mesic forests with trees over 50 feet tall, a moderate understory of saplings and shrubs, an open floor with moist soil and decaying leaf litter, and water nearby.	Biological

<b>Plant Species</b>	<b>Habitat/ecosystem</b>	<b>Category</b>
Canada Yew	Well-drained slightly acidic silt loams; near bogs. Very shade	Rare

	tolerant	Biological
Milkweed	Fields, open woods, roadsides, railroads, waste ground.	Rare Biological Cultural
Northern White Cedar	Swamps, glacial depressions, lake and stream margins, all with moist, but well-drained limestone (alkaline) soil.	Economic Biological Cultural

### *Cultural Key Species*

<b>Animal Species</b>	<b>Habitat/Ecosystem</b>	<b>Category</b>
Bald Eagle	Wetlands associated with large streams or large bodies of water with an abundance of fish for foraging and old-growth or mature stands of hardwoods or conifers for nesting.	Rare Cultural
Brown Bullhead	Shallow, warm water situations of ponds, small lakes, shallow bays of larger lakes, and larger slow-moving streams with abundant aquatic vegetation, and sand to mud bottoms.	Cultural
Common Loon	Clear, relatively non-acidic, freshwater lakes with islands or isolated, floating vegetation mats. Lakes must have abundant fish. Non-human tolerant.	Rare Cultural
Common Snapping Turtle	Marshes, shallow <u>ponds</u> , shallow lakes, or slow-moving creeks, streams or rivers.	Cultural
Belted Kingfisher	Inland bodies of unclouded water (streams, rivers, ponds, lakes) that allows them to see prey below the surface, with perches nearby but minimal vegetation obstructing the water. Vertical earthen banks for nesting.	Cultural
Sandhill Crane	Open fresh water wetlands, bogs, sedge meadows, and fens to open grasslands, pine savannas, and cultivated lands.	Cultural
White-tail Deer*	Mixed woodlands, old field, forests with multiple successional stages, ecotonal areas and lowlands, Beech-Maple climax forests, cedar swamps and other lowlands.	Economic Biological Cultural

<b>Plant Species</b>	<b>Habitat/ecosystem</b>	<b>Category</b>
Milkweed	Fields, open woods, roadsides, railroads, waste ground.	Rare Biological Cultural
Northern White Cedar	Swamps, glacial depressions, lake and stream margins, all with moist, but well-drained limestone (alkaline) soil.	Economic Biological Cultural
Wild Cranberry	Open acid wetlands and sphagnum bogs.	Economic Cultural
Wild Strawberry	Mesic black soil prairies, openings and edges of woodlands (including drier areas), savannas, limestone glades, and areas along railroads. Somewhat shade tolerant.	Economic Cultural
Yellow Lady Slipper	Mesic to dry deciduous woodlands, sandy woodlands and savannas, thinly wooded bluffs along rivers, and shady areas of bogs.	Rare Cultural

*\*See sample Adaptive Management Plan below*

## Appendix C: Examples of Adaptive Management Plans

Below are three examples of preliminary management plans for selected Key Species. These are strictly examples, they are incomplete and actual management plans would be a great deal more detailed and complicated. They are by no means meant to be final, workable management plans.

Example: **White-tailed Deer, *Odocoileus virginianus***

**Key Species Category:** Economic, Biological, Cultural

**Rationale:** As one of Michigan’s most popular big game animals, found in every Michigan county, the White-tailed Deer is a Key Species of top priority. The Beaver Island Wildlife Club has been taking measures to insure a healthy herd for several years. White-tailed Deer meet the majority of the listed criteria for prioritization including exhibiting multiple habitat/ecosystem matches with a number of other Economic Key Species, and would therefore contribute to bringing about ecosystem contiguity. Further, the White-tailed Deer is an indicator species as it can profoundly affect ecosystem vegetation (Northern White Cedar, Canada Yew) and animal species as well. Because White-tailed Deer are present on Beaver and Garden Islands and due to its widespread popularity as a game animal, it may be determined that this status should be maintained. Whitetails have been well -studied and a variety of relatively easy survey methods are available for monitoring and evaluation. There has been a fair amount of past funding for management efforts on this species, which include the Michigan Department of Natural Resources, U.S. Fish and Wildlife Service, National Fish and Wildlife Foundation, and the Wildlife Management Institute. Again, because it is a sought after game and/or subsistence species, it has residual value to the economy of Beaver Island. Finally, this species has aesthetic value to the community because of its designation as Michigan’s state game animal. White-tailed Deer meets 6 of 8 **Priority Key Species Criteria:** a,d,e,f,g,h.

### Development of Adaptive Management Plan for White-tailed Deer:

<p><b>Identify the current status of the Key Species and its habitat and determine where it should be in the future.</b></p>	<p>The aesthetic goal for the management of White-tailed Deer on Beaver and Garden Islands is to maintain current herd size, improve deer habitat, reduce deer effect on habitat and produce quality bucks. White-tailed deer will be surveyed using summer driving counts. Hunting season checks and a DNR mail survey of deer hunters will provide information of current deer population size. With these herd estimates, the following targets will be established: A 2:1 doe to buck ratio, hunting season kill numbers between 140-180 with equal buck/doe ratio, creation of 500 acres/decade of early successional habitat on state land and maintain private land food plots at 100 acres.</p>
<p><b>Determine management actions, timeline and</b></p>	<p>The current ongoing antler point restriction (APR) program as a part of the Quality Deer Management (QDM) approach will be continued. The White-tail Deer target numbers requires summer and hunting season</p>

<b>funding necessary to reach targets.</b>	annual survey data gathered over a three year period. Funding needs to be acquired for non-commercial timber harvest on public land and for private land food plots, from a variety of sources: B.I. Wildlife Club, Michigan Department of Natural Resources, private sources, etc.
<b>Implement this strategic operational plan.</b>	Utilize volunteers for summer driving surveys and hunting season deer checks. Use acquired funding to undertake non-commercial timber harvests and development of private land food plots.
<b>Analyze, communicate and evaluate the results.</b>	Prepare annual report that includes current year's data and data trends. Information in Annual report made available electronically and through hard copy. After three years, summarize data using a running average. Evaluate three year data in terms of targets, and adjust accordingly.

**References:** <http://deer.fw.msu.edu/>; Sargent, M.S and Carter, K.S., ed. 1999. Managing Michigan Wildlife: A Landowners Guide. Michigan United Conservation Clubs, East Lansing, MI. 297pp.; Frawley, Brian J. 2001. Michigan Deer Harvest Survey Report - 2000 Seasons. Michigan Department of Natural Resources (MDNR) Wildlife Division Report number 3344. State of Michigan, MDNR, Wildlife Division, Lansing, Michigan, United States of America; <http://www.dnr.state.mi.us/Game.asp?Animal=52&LinkID=4&sec=hunt> .

Example: **Non-Native *Phragmites* (*Phragmites australis*)**

**Key Species Category:** Exotic Invasive, Economic

**Rationale:** The Beaver Island community and partners have been engaged over the past 6 years in control of non-native *Phragmites* on the archipelago. *Phragmites* has the capacity to degrade vital Great Lakes coastal habitats, interior lakes and wetlands. It is an exotic invasive species of great concern due to the ability to aggressively form a monoculture which effects nesting habitat, plant and animal species, emerging fish fry, and limits recreation and decreases property values. Early detection and rapid response has controlled the Beaver Island coastal *Phragmites* infestation from the initial 27.3 acres to an anticipated < ½ acre of new growth in 2013. Non-native *Phragmites* meets 4 of 8 **Priority Key Species Criteria:** c, e, f, and h.

**Development of Adaptive Management Plan for *Phragmites*:**

<b>Identify the current status of the Key Species and its habitat and determine where it should be in the future.</b>	The interior wetlands of Beaver Island and High Island’s Lake Maria along with the archipelago’s coastal shoreline will be surveyed/monitored using hunt-and-search methods. Because of the ongoing <i>Phragmites</i> control program, earlier surveys will now be used to determine the containment target of maintaining 43 miles of Beaver Island coastal shoreline at <1 acre of <i>Phragmites</i> . The Nature Conservancy contracted with Cardno JF New for an interior survey of <i>Phragmites</i> sites in 2012. The survey indicated several acres on Beaver Island with the largest being located in the Greene’s Lake bog.
<b>Determine management actions, timeline and funding necessary to reach targets.</b>	The sites identified by the Cardno JF NEW survey will be treated in 2013. The outer islands will be maintained as funding allows. Funding should be continued through the townships, private donations, and by pursuing grants with partners-TNC, MIDNR, and LTBB. Securing adequate funding for invasive species treatment for those species that have the highest threat to degrade high value habitats of the archipelago should be a priority.
<b>Implement this strategic operational plan.</b>	The joint townships’ <i>Phragmites</i> Administrator will be responsible for survey, organizing treatment, and follow-up of results with collaborating organizations.
<b>Analyze, communicate and evaluate the results.</b>	A yearly written report with recommendations regarding treatment recommendations will be submitted to the townships, tribal governments, and the MI DNR. The results of this report and available funding will determine future archipelago action.

**References:** TNC 2012 Invasive Species Survey, 2011 *Phragmites* Survey, 2010 *Phragmites* survey. Refer to Beaver Island *Phragmites* Administrator’s Manual. Maps are available through Charlevoix County GIS. Beaver Island Association’s web site:

[www.beaverislandassociation.org](http://www.beaverislandassociation.org)

Example: **Black-throated Blue Warbler, *Dendroica (=Setophaga) caerulescens***

**Key Species Category:** Economic, Biological

**Rationale:** This small warbler has an extensive breeding range using the interior of deciduous and mixed hardwood forests in eastern North America, including the Beaver Archipelago. The black-throated blue warbler has been observed on both Beaver and Garden Islands and has been ranked by the bird conservation organization, Partners in Flight (PIF), as a species of moderately high priority for conservation action due to its very restricted wintering range. The PIF watch list includes those birds of the continental United States not already listed under the Endangered Species Act that warrant conservation attention. Its distinctive color pattern and breeding song make it a target of bird-watchers and therefore it merits Economic Key Species status. Similarly, as an indicator of healthy northern hardwood forest status, it can most definitely be categorized as a Biological Key Species. An extensive scientific literature exists on the ecology and behavior of this warbler, including a long term study conducted on it within the Beaver Archipelago. This study showed a heavy preference for the presence of Eastern Hemlock stands adjacent to mature Beech-Maple forest. Inclusion of this warbler as a priority species, along with the Pileated Woodpecker and Wood Thrush, fulfills the requirements of priority criterion “a” above. The Black-throated Blue Warbler meets 7 of 8 **Priority Key Species Criteria**: a,b,d,e,f,g,h.

<b>Identify the current status of the Key Species and its habitat and determine where it should be in the future.</b>	Establish and survey transects in appropriate Beaver Island Archipelago habitat to establish presence/and absence. Use DNR inventory data and aerial imagery to determine areas of hardwood forest >100 years old and 250 acres in size. When located, utilize call playback techniques to estimate population density.
<b>Determine management actions, timeline and funding necessary to reach targets.</b>	Over the next five years, maintain stable breeding populations in 4000 acres of state and private land (the priority area). Maximize the forest interior area with a well-developed shrub understory. Maintain habitat with birds present in location with easy accessibility to residents and visitors. Identify volunteers capable of undertaking annual censusing of warbler population.
<b>Implement this strategic operational plan.</b>	Verify bird densities on an annual basis early in the breeding season. Simultaneously evaluate condition of hardwood habitat including understory suitability.
<b>Analyze, communicate and evaluate the results.</b>	Annual reports on warbler population density and habitat condition will be evaluated. No action will be taken if the population trend is stable or increasing. If population density decreases, the possibility of habitat adjustments will be considered.

**References:** Holmes, R.T., Marra, P.P. and T.W. Sherry. 1996. Habitat-Specific Demography of Breeding Black-Throated Blue Warblers (*Dendroica caerulescens*): Implications for Population Dynamics. *Journal of Animal Ecology* 65:183-195; Holway, David A. 1991. Nest-site selection and

the importance of nest concealment in the Black-throated Blue Warbler. *Condor* 1991: 575-581.;

Patterson, R.L. 1981. Characteristics of the nesting habitat of the black-throated blue warbler. Unpublished dissertation, Virginia Polytechnic Univesity, Blacksburg, Virginia. 88pp.

Steele, B. B.1993. Selection of foraging and nesting sites by Black-throated Blue Warblers: their relative influence on habitat choice. *Condor* 1993: 568-579.

## **Appendix D: Press Release from Beaver Island NRESC: Explanation of the Natural Resources Management Planning Process**

*This press release was unanimously adopted by the NRESC during its meeting on October 13, 2012.*

### **What is the NRESC?**

The Peaine and St. James Township Boards unanimously created the NRESC in September 2011 – to “develop a balanced plan for promoting preservation and achieving sustainable economic growth and development for the Island.” The townships appointed NRESC members representing the Chamber of Commerce, Wildlife Club, real estate and construction businesses, Beaver Island Association, the school, both townships' planning commissions, and the Peaine Trails Committee, as well as at-large community members, the DNR, and the Little Traverse Odawa tribe – a balanced group of citizen-volunteers with different points of view, interests, and expertise.

At the same time, the township boards asked the new NRESC to develop for the boards' consideration a comprehensive management plan for the natural resources of the Beaver archipelago, with support from the DNR and MSU facilitators. The NRESC agreed and began a planning process that it decided would rely heavily on consultations with community members and other stakeholders.

### **What are the benefits of developing a Beaver Island natural resource management plan?**

It goes without saying that most residents of and visitors care about the Beaver archipelago's unique natural beauty and varied marine and land environments. They recognize that these natural resources are a foundation of economic activity and community well-being – and they want them to stay as they are and/or be restored for years to come. It's also true that many different entities – the state of Michigan, the townships, thousands of individual property owners, local businesses, the school, Indian tribes, conservancy organizations, state universities, and the federal government – control the use of different parts of the Islands and that some volunteer organizations, such as the Wildlife Club and the Beaver Island Association, undertake many activities to enhance, restore, and protect the environment.

Given the importance of Beaver's natural resources, the fragmentation of control over them, and the many stakeholders with keen interest in them, developing a comprehensive natural resource management plan with Goals, measurable Objectives, and action Strategies should have the following benefits:

- 1. State land management.** Provide strong community input to the state DNR – owner of a third of Beaver Island, and all of High, Hog, Squaw, and Whiskey Islands – about the desired goals for its management of state lands.
- 2. Economic development.** Identify ways that all of the interested parties can work together to increase natural-resource based economic activity – home construction, recreation, and eco-tourism – and showcase the Island's assets to attract visitors, residents, and investment.
- 3. Invasive species.** Respond more effectively to current and future threats to the quality of natural resources, such as invasive species.
- 4. Funding.** Increase the financial resources available for managing the natural resources by showcasing for governments at all levels and philanthropic organizations the uniqueness of the natural resources and the shared goals of the community and other stakeholders.

**5. Effective organizations.** Help government and nonprofit organizations prioritize and more effectively use their volunteers and funding to achieve results the community wants.

**6. A model for other communities.** Provide a model of community/DNR collaboration and planning that other communities can adopt, which would reflect well on Beaver Island.

**Where is the NRESC in the process of natural resource management planning?**

During the spring and summer of 2012 the NRESC conducted community forums and multiple focus groups that engaged about 150 year-round and summer residents and middle-and-high school students of the Island, as well as some off-Island stakeholders, to discuss their views about the Island's future and its natural resources.

Since then, NRESC members have been developing a set of goals and objectives for a natural resource management plan that reflect the community's desire for a balanced plan to support economic development and preservation of natural beauty and the environment. The process is based on reaching consensus, meaning all of NRESC's members must buy in to all aspects of the plan.

When the NRESC members reach agreement on draft goals and objectives, they will seek extensive feedback from the community – and ideas about what actions could be taken to achieve the objectives and goals. Only after the feedback process will NRESC members start to draft a full-scale plan to be presented to the community and the township boards for discussion and, perhaps, adoption. This will not happen until sometime in 2013, but it's not yet known precisely when.

## Appendix E: Designations of Importance to Terrestrial and Aquatic Surroundings of the Beaver Archipelago

1. Trout and Yellow Perch <http://geopubs.wr.usgs.gov/open-file/of03-120/>
2. Northern Lake Michigan Terrestrial Biodiversity Investment Area: [http://www.michigan.gov/documents/deq/deq-ess-clm-DraftCELCP-May07\\_211204\\_7.pdf](http://www.michigan.gov/documents/deq/deq-ess-clm-DraftCELCP-May07_211204_7.pdf)
3. Coastal Zone Management Area: [http://www.michigan.gov/documents/deq/lwm-czm-charlevoix-bi\\_266227\\_7.pdf](http://www.michigan.gov/documents/deq/lwm-czm-charlevoix-bi_266227_7.pdf)
4. Wildlife Research Area: MI Department of Natural Resources (1 of 4 in the state): <http://www.michigandnr.com/publications/pdfs/huntingwildlifehabitat/sga/beaver-swra.pdf>
5. Natural Area Nomination: High Island
6. Biodiversity Stewardship Area: [http://www.michigan.gov/documents/dnr/BSA\\_PubRev\\_SummaryTable\\_NLP\\_33845\\_2\\_7.pdf](http://www.michigan.gov/documents/dnr/BSA_PubRev_SummaryTable_NLP_33845_2_7.pdf)
7. Little Traverse Conservancy: Natural Area Preserves: <http://www.landtrust.org/PreserveGuide/Guide07Intro&Emmet.pdf>
8. Michigan Islands US Fish & Wildlife Service Preserve: [http://www.fws.gov/refuge/Michigan\\_Islands/about.html](http://www.fws.gov/refuge/Michigan_Islands/about.html)
9. The Nature Conservancy's Natural Areas: <http://www.midnr.com/Publications/pdfs/ForestsLandWater/RSFMP/NLP/NLPSection5.pdf>
10. Odawa Tribal Boundary: pg. 35 <http://www.lfbbodawansn.gov/Departments/ArchivesAndRecords/Our%20Land%20and%20Culture%20for%20web.pdf>
11. Grand Traverse Band of Ottawa and Chippewa: <http://www.gtbindians.org/tribal-council.html>
12. 2006 Priority Islands Conservation Areas-Bi-national Conservation of Great Lakes Islands report. <http://www.greatlakesislands.org/handout-tc.pdf>
13. IBA: [http://www.mapsportal.org/audubon\\_national\\_iba/](http://www.mapsportal.org/audubon_national_iba/)
14. Refer to Michigan Natural Features Inventory: 1998, 1999, and 2002 DEQ, CZM reports.

## **Appendix F: Threatened and Endangered Plant Species**

From Michigan Natural Features Inventory

Climbing Fumitory, Alleghany Vine

Pumpell's Brome

Narrow-Leaved Reedgrass

Calypso, Fairy-Slipper

American Chestnut

Dune Thistle, Pitcher's Thistle

Ram's Head Lady-Slipper

English Sundew

Seaside Crowfoot

Dwarf Lake Iris

American Shore-Grass

Michigan Monkey-Flower

Clustered Broom Rape

Butterwort

Houghton's Goldenrod

Lake Huron Tansy

Downy Oatgrass