

**Michigan Coastal Management Program
Office of the Great Lakes
Department of Environmental Quality**

**Section 309 Assessment and Five-Year Strategy for
Coastal Zone Management Program Enhancement
Fiscal Years 2012-2016**

March 2011

Organizational Note

¹Executive Order 2011-11, will recreate the Departments of Natural Resources and Environmental Quality from the current Department of Natural Resources effective March 13, 2011. The Office of the Great Lakes, and with it the Coastal Management Program, will become part of the Department of Environmental Quality (DEQ) on that date. Other programs currently within the DNRE (e.g., Wildlife Division), will become part of the Department of Natural Resources (DNR). For ease of future reference, organizational designations applicable after March 13, 2011 will be used throughout this document.

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I. Introduction

Section 309 of the federal Coastal Zone Management Act (CZMA; Public Law 92-583, as amended) establishes a voluntary enhancement grants program for states with federally approved Coastal Management Programs (CMPs). Under the provisions of Section 309, every five years state CMPs may assess and prioritize challenges and needs regarding the management of nine “enhancement areas” within their coastal zones, specifically: Wetlands; Coastal Hazards; Public Access; Marine Debris; Cumulative and Secondary Impacts; Special Area Management Planning; Ocean/Great Lakes Resources; Energy and Government Facility Siting; and Aquaculture. Guided by the assessments, states may develop and implement changes to their CMPs that improve management of high- and medium-priority enhancement areas over a five-year timeframe, subject to federal approval. States implement the approved changes with annual funding provided under Section 309.

The Michigan Coastal Management Program (MCMP), DEQ developed this *Section 309 Assessment and Five-Year Strategy for Coastal Zone Management Program Enhancement: Fiscal Years 2012-2016*, pursuant to final guidance issued by the Office of Ocean and Coastal Resource Management (OCRM) National Oceanic and Atmospheric Administration (NOAA) in July, 2009. This document contains the Assessments for each of the nine enhancement areas, including the predicted priority of the management challenge to the MCMP over the State’s Fiscal Year 2012-2016 timeframe, corresponding to federal Fiscal Years 2011-2015. A number of factors influence the prioritization of the enhancement areas, including the immediacy, scope, and magnitude of the management challenge in Michigan’s coastal zone, availability of other sources of funding to apply to the management challenge, and the extent to which the MCMP’s enforceable policies encompass the enhancement area.

The MCMP identifies the Wetlands, Cumulative and Secondary Impacts, Great Lakes Resources, and Energy and Government Facility Siting enhancement areas as high priorities over the Fiscal Year 2012-2016 timeframe. The Coastal Hazards, Public Access, and Special Area Management Planning enhancement areas are medium priorities, while the Marine Debris and Aquaculture enhancement areas are low priorities. It is important to note that a low priority rating indicates only that specific issues related to an enhancement area are low priorities within the context of the Section 309 Assessment, given the limited uses of Section 309 funding. The priority rating is not a broader indication of the importance of the enhancement area to the MCMP.

This document also contains four Strategies; each Strategy addresses one or more high- or medium-priority enhancement areas. The Strategies are presented in a separate section following the Assessments. The development and approval of a Strategy does not guarantee funding for the projects therein; however, only projects contained in an approved Section 309 Assessment and Strategy document are eligible for Section 309 funding annually appropriated and allocated to state CMPs.

MCMP staff prepared a draft of this document in consultation with staff from various DEQ and DNR divisions, other state agencies, and partner organizations, as needed. The MCMP submitted the draft to the NOAA OCRM for review and comment in November, 2010, and announced the availability of the draft for a 30-day public review and comment period in the December 6, 2010 issue of the *Environmental Calendar*, the Department’s biweekly electronic publication presenting opportunities for public input on proposed agency decisions, documents, and other issues. NOAA OCRM provided several comments on the draft. No comments were received from the public.

The final document incorporates additional information and other substantial revisions in response to the NOAA OCRM comments. Importantly, the number of proposed Strategies decreased from seven in the draft to four in the final document. The proposed projects in the deleted Strategies will either be pursued with other funding sources, or have been consolidated into the remaining final Strategies.

II. Summary of Completed Section 309 Projects Included in the Previous Section 309 Assessment and Strategy

The MCMP's previous Section 309 Assessment and Strategy covers Fiscal Years 2007-2011, corresponding to federal Fiscal Years 2006-2010. This period is still ongoing, as Michigan's Fiscal Year 2011 ends September 30, 2011. Consequently, the following summary of projects is necessarily incomplete. Section 309 funds supported projects in two high-priority enhancement areas, specifically, Coastal Hazards, and Cumulative and Secondary Impacts. Selected major accomplishments are summarized in the table below:

Enhancement Area	Major Accomplishments Supported with Section 309 Funds 2007-2010
Coastal Hazards	<ul style="list-style-type: none"> • DEQ staff worked with researchers at Michigan State University (MSU) to develop and test a more accurate methodology for measuring shoreline recession rates used to designate High Risk Erosion Areas under Part 323, Shorelands Protection and Management, of the Natural Resources and Environmental Protection Act (NREPA; Public Act 451 of 1994, as amended). This research will form the basis for Administrative Rule amendments. • MSU researchers developed a GIS-based Critical Dune Area decision support tool for regulatory staff to use in administering Part 353, Sand Dune Protection and Management, of the NREPA in Lower Peninsula counties. MSU researchers also conducted an assessment of the effectiveness of the current Part 353 regulatory program.
Cumulative and Secondary Impacts	<ul style="list-style-type: none"> • Twenty-three coastal communities developed or updated land use plans or zoning ordinances, including four joint planning projects that involved multiple jurisdictions. • The DNR has developed and adopted management plans for seven coastal State Parks that collectively contain more than 16,000 acres of recreational lands, sensitive habitats, and almost 30 miles of Great Lakes shoreline. • The Institute for Fisheries Research developed a GIS-based lakebed alteration decision support tool (DST) that proved indispensable in the deliberations of the Great Lakes Wind (GLOW) Council. The GLOW Council was tasked by the Governor Jennifer Granholm in 2009 with identifying areas of the Great Lakes most suitable for offshore wind energy development, as well as areas that should be off limits to wind farms due to potential impacts. • Additional projects focused on minimizing resource impacts from wind energy development include surveys of waterfowl use of coastal and offshore waters of Saginaw Bay, bat migration over northern Lake Michigan, and impacts of wind farm operation on nesting songbirds. • Huron Pines worked with a variety of stakeholders to develop a conservation plan for sensitive coastal habitats in the northeast Lower Peninsula. The project area contains almost 500 miles of Lake Huron shoreline. The conservation plan laid the groundwork for a highly successful effort now underway to identify, map, and control <i>Phragmites</i> infestations along the shore. • Two regional planning commissions developed new coordinated greenway and blueway plans for Cheboygan, Presque Isle, Alpena, Alcona, Iosco, and Muskegon Counties.

Wetlands

Section 309 Enhancement Objective

Protection, restoration, or enhancement of the existing coastal wetlands base, or creation of new coastal wetlands

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective

1. Please indicate the extent, status, and trends of wetlands in the coastal zone using the following table:

Wetlands type	Estimated historic extent (acres)	Current extent (acres)	Trends in acres lost since 2006 (Net acres gained & lost)	Acres gained through voluntary mechanisms since 2006	Acres gained through mitigation since 2006	Year and source(s) of Data
Tidal (Great Lakes) vegetated	See table below	See table below	See table below	See responses to questions #2 and #7	133.32 acres	CIWPIS (Coastal and Inland Waters Permitting Information System)
Tidal (Great Lakes) non-vegetated	N/A	N/A	N/A	N/A	N/A	N/A
Non-tidal/freshwater	See table below	See table below	See table below	See responses to questions #2 and #7	N/A	See table below

Wetlands Type	Estimated Historic extent (acres)	1998 state-wide (estimated acres)	Trend historic – 1998 (estimated acres gained/lost)	1998 Lower Peninsula only (estimated acres)	2005 Lower Peninsula only (estimated acres)	Trend 1998 – 2005 (estimated acres gained/lost)	Most recent acreage estimates of area (1998 Upper peninsula + 2005 Lower peninsula)	Trend historic – most recent estimated 1998/2005 (acres gained lost)	Year and source(s) of Data
Tidal (Great Lakes) vegetated	158,365	71,396	86,969 acres <i>lost</i>	28,496	48,911	20,415 acres <i>gained</i>	91,083	67,282 acres <i>lost</i>	National Wetlands Inventory 2005 and Hydric soils data
Tidal (Great Lakes) non-vegetated	** not applicable for Michigan's Great Lakes coastal wetlands **								
Non-tidal/freshwater	236,099	182,855	53,244 acres <i>lost</i>	82,819	95,584	12,765 acres <i>gained</i>	194,708	41,391 acres <i>lost</i>	National Wetlands Inventory 2005 and Hydric soils data

Revised Resource Characterization Table for Section 309 Assessment and Strategy

Tidal (Great Lakes) vegetated – this includes vegetated wetlands within the Coastal Zone Management (CZM) boundary, which intersect the ordinary high watermark (OHWM) of the Great Lakes and are directly affected by water levels of the lakes.

Non-tidal/freshwater – this includes vegetated wetlands within the CZM boundary, which do not intersect the OHWM of the Great Lakes, and are therefore indirectly affected by water levels of the lakes.

There are no figures listed for **Tidal (Great Lakes) non-vegetated** because there are no significant acres of coastal wetlands along the coast of Michigan which fit this description. It was determined that this category does not apply in Michigan.

The most recent GIS data available for acreage of coastal wetlands in Michigan is a 2005 National Wetlands Inventory (NWI) update, but only for the Lower Peninsula. The 1998 NWI update is a statewide data set, and is the next most recent available GIS data. This table shows the various acreages based on these available data sets. Historic extent was calculated using hydric soils data.

Please note: This table shows a significant increase in coastal wetland acres in the Lower Peninsula between 1998 and 2005. Based on the mapped areas of significant increase, this appears to be accurate. 1998 was marked by high Great Lakes water levels, while 2005 was marked by low water levels. The significant increase in wetland acreage appears to have occurred mainly in very shallow coastal areas with extensive areas of bottomlands exposed by the low water levels. Emergent wetland vegetation rapidly colonized the exposed bottomlands.

Overall, the trends indicated in this table show a substantial loss in coastal wetlands from historic estimates, but also indicate significant variability due to water level fluctuations. Historic trends in Great Lakes water levels have resulted in varying exposure of coastal wetland vegetation through the years. The water levels have begun to rise since the 2005 mapping; therefore, the data in a future mapping effort of this mechanism may show significantly less coastal wetlands, however; these acres have not been altered by human impacts. The MCMP and Wetlands Program staff will be better able to track wetland impacts and gains in future years once the database updates currently underway are completed.

2. If information is not available to fill in the above table, provide a qualitative description of information requested including wetlands status and trends, based on the best available information.

CIWPIS, the database the DEQ uses to manage permitting information for several land and water regulatory programs including the Wetlands Program, does not provide the capability to track impacts and mitigation by type of wetland. The Department is in the process of updating or replacing the database and these and other data management capabilities will be incorporated into the new database.

3. Provide a brief explanation for trends.

Refer to footnotes to the above table.

4. Identify ongoing or planned efforts to develop monitoring programs or quantitative measures for this enhancement area.

The Michigan Wetlands Program is about to participate in a five-year, basin-wide wetland assessment and monitoring effort funded by federal Great Lakes Restoration Initiative (GLRI) grants and administered by a multi-partner team headed by researchers at Central Michigan University. An unprecedented effort to collect comprehensive, consistent sampling data from coastal wetlands throughout the Great Lakes system is set to launch in the spring of 2011, with Great Lakes Restoration Initiative funding provided by the U.S. Environmental Protection Agency (EPA). Several years in the making, the monitoring program is the current phase of a long-running endeavor to classify and map Great Lakes coastal wetlands, and assess and track their health. The \$10 million program will take five years to complete and involve scores of researchers and resource management agency staff from the U.S. and Canada, working at several hundred sites. Central Michigan University is coordinating the program, and the DEQ is one of many program partners.

The coastal wetland monitoring program implements an EPA-funded monitoring plan finalized by the Great Lakes Coastal Wetlands Consortium in 2008, following almost seven years of research and development. The building blocks of the monitoring plan are five sets of indicators addressing major components of coastal wetland condition, specifically, water chemistry, vegetation, invertebrates, fish, and amphibian and bird communities. The plan prescribes a suite of standard measurements and data collection protocols for assessing each set of indicators. Over the next five years, researchers will collect sampling data for these indicators from every Great Lakes coastal wetland at least 10 acres in area. A subset of the sites sampled one year will be resampled the following year to determine trends in wetland health. The project team will hold training sessions in the last year of the project for agencies and organizations interested in continuing the monitoring program locally. The EPA's Great Lakes National Program Office will then take over monitoring effort coordination. DEQ staff involved in this effort is partly supported by Section 306 CZM funding.

5. Use the following table to characterize direct and indirect threats to coastal wetlands, both natural and man-made. If necessary, additional narrative can be provided below to describe threats:

Type of threat	Severity of impacts (H,M,L)	Geographic scope of impacts (extensive or limited)	Irreversibility (H,M,L)
Development/Fill	High	Extensive	Low
Alteration of hydrology	Medium	Limited	Medium
Erosion	Low	Limited	Low

Type of threat	Severity of impacts (H,M,L)	Geographic scope of impacts (extensive or limited)	Irreversibility (H,M,L)
Pollution	Medium	Limited	Low
Channelization	Medium	Limited	Medium
Nuisance or exotic species	High	Extensive	Medium
Freshwater input	N/A	N/A	N/A
Sea level rise/Great Lake level change	High	Extensive	Low

6. (CM) Indicate whether the Coastal Management Program (CMP) has a mapped inventory of the following habitat types in the coastal zone and the approximate time since it was developed or significantly updated:

Habitat type	CMP has mapped inventory (Y or N)	Date completed or substantially updated
Tidal (Great Lakes) Wetlands	Yes	1998 statewide, 2005 Lower Peninsula
Beach and Dune	Yes	1989
Nearshore	No	N/A

7. (CM) Use the table below to report information related to coastal habitat restoration and protection. The purpose of this contextual measure is to describe trends in the restoration and protection of coastal habitat conducted by the State using non-CZM funds or non-Coastal and Estuarine Land Conservation Program (CELCP) funds. If data is not available to report for this contextual measure, please describe below actions the CMP is taking to develop a mechanism to collect the requested data:

Contextual measure	Cumulative acres for 2004-2010
Number of acres of coastal habitat restored using non-CZM or non-Coastal and Estuarine Land Conservation Program (CELCP) funds	See below
Number of acres of coastal habitat protected through acquisition or easement using non-CZM or non-CELCP funds	See below

The MCMP does not currently track the acres of coastal habitat restored using non-CZM or non-CELCP funds. Information is currently available from DEQ Wildlife Division for approximate wetland acres restored statewide for 2006-2009. The approximate acreage is 3,382 acres. Data specific to projects within the Coastal Zone Boundary are not currently available. The MCMP is coordinating with other state and federal agencies as well as non-profit partners to create a mechanism to accurately reflect the number of acres of coastal habitat restored within the Boundary. The MCMP is planning to continue to work with partners and explore other sources of data to resolve this tracking issue.

The MCMP does not currently track the acres of coastal habitat protected through acquisition or easement using non-CZM or non-CELCP funds. Information is currently available from DNR Wildlife Division for approximate wetland acres acquired statewide for 2006-2009. The approximate acreage is 12,047 acres. Data specific to projects within the Coastal Zone Boundary are not currently available. The MCMP is coordinating with other state and federal agencies as well as non-profit partners to create a mechanism to accurately reflect the number of acres of coastal habitat protected through acquisition or easement within the Boundary. The MCMP is planning to continue to work with partners and explore other sources of data to resolve this tracking issue.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the wetland management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Wetland regulatory program implementation, policies, and standards	Yes	Yes
Wetland protection policies and standards	Yes	No
Wetland assessment methodologies (health, function, extent)	Yes	Yes
Wetland restoration or enhancement programs	Yes	No
Wetland policies related to public infrastructure funding	Yes	No
Wetland mitigation programs and policies	Yes	No
Wetland creation programs and policies	Yes	No
Wetland acquisition programs	Yes	No
Wetland mapping, GIS, and tracking systems	Yes	Yes
Special Area Management Plans	No	No
Wetland research and monitoring	Yes	Yes
Wetland education and outreach	Yes	No

2. For management categories with significant changes since the last assessment provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information.

- a) Characterize significant changes since the last assessment;**
- b) Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and**
- c) Characterize the outcomes and effectiveness of the changes.**

Wetland Regulatory Program Implementation, Policies, and Standards

Public Act 120 of 2009 amended Part 303, Wetlands Protection, and related Parts of Michigan’s Natural Resources and Environmental Protection Act, affecting several aspects of the State’s wetland regulatory program. Broadly speaking, the multiple, varied provisions of Act 120 provide for additional general permitting options and minor project categories, and facilitate the permitting process for cranberry growing operations. A number of these changes are temporary and will be revisited in coming years. Other changes require significant program development including creation and reissuance of general permit and minor project categories under Parts 301, 303, and 325, development of local government pilot and wetland mitigation banking pilot programs, and development of a Programmatic General Permit with the U.S. Army Corps of Engineers. A Wetland Advisory Council established under the amendments is responsible for studying implementation of the changes and developing recommendations on the State’s long-term approach to protecting and managing wetland resources. The Council must submit its final set of recommendations to the Governor, DEQ, and certain legislative committees by August 15, 2012. The Wetland Program staff implementing the changes is partly supported by Section 306 CZM funding.

Wetland Assessment Methodologies, Mapping, GIS, and Tracking Systems, and Research and Monitoring

An unprecedented effort to collect comprehensive, consistent sampling data from coastal wetlands throughout the Great Lakes system is set to launch in the spring of 2011, with Great Lakes Restoration Initiative funding provided by the U.S. Environmental Protection Agency (EPA). Several years in the making, the monitoring program is the current phase of a long-running endeavor to classify and map Great Lakes coastal wetlands, and assess and track their health. The \$10 million program will take five years to complete and involve scores of researchers and resource management agency staff from the U.S. and Canada, working at several hundred sites. Central Michigan University is coordinating the program, and the DEQ is one of many program partners.

The coastal wetland monitoring program implements an EPA-funded monitoring plan finalized by the Great Lakes Coastal Wetlands Consortium in 2008, following almost seven years of research and development. The building blocks of the monitoring plan are five sets of indicators addressing major components of coastal wetland condition, specifically, water chemistry, vegetation, invertebrates, fish, and amphibian and bird communities. The plan prescribes a suite of standard measurements and data collection protocols for assessing each set of indicators. Over the next five years, researchers will collect sampling data for these indicators from every Great Lakes coastal wetland at least 10 acres in area. A subset of the sites sampled one year will be resampled the following year to determine trends in wetland health. The project team will hold training sessions in the last year of the project for agencies and organizations interested in continuing the monitoring program locally. The EPA's Great Lakes National Program Office will then take over monitoring effort coordination. DEQ staff involved in this effort is partly supported by Section 306 CZM funding.

3. (CM) Indicate whether the CMP has a habitat restoration plan for the following coastal habitats and the approximate time since the plan was developed or significantly updated:

Habitat type	CMP has a restoration plan (Y or N)	Date completed or substantially updated
Tidal (Great Lakes) Wetlands	No	N/A
Beach and Dune	No	N/A
Nearshore	No	N/A

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the Coastal Management Program and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Select type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H,M,L)
Statewide Coastal Habitat Restoration Plan based on current research and monitoring data.	Policy, data, communication and outreach	High
Integrating coastal wetland monitoring data into regulatory decisions	Policy, data	High

Gap or need description	Select type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H,M,L)
Technical assistance, education and outreach to local governments, land conservancies, and conservation organizations on current and emerging climate change research to help inform policy decisions.	Data, communication and outreach	High
Database of acquisition and restoration projects statewide and within the CZM boundary.	Data	High

The ongoing project to update or replace the CIWPIS database with a more powerful and sophisticated database with GIS capabilities, and the new, five-year effort to collect comprehensive monitoring data on coastal wetland status and trends present an unprecedented opportunity to collect coastal wetland data and manage it in new ways. This will increase the Department's capacity to develop new wetland programs, policies, and guidance that respond to the latest information on coastal wetland condition and trends, including climate trends. Many of these projects can be accomplished with Section 306 funding or other sources of funding.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

High

Briefly explain the level of priority given for this enhancement area.

Public Act 120 of 2009 initiated a period of review for Michigan's wetland regulatory program, coordinated by the new Wetland Advisory Council. Consequently, it is a high priority for the MCMP to identify options for the effective science-based, data-driven management and stewardship of coastal wetlands during this review period.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes

Briefly explain why a strategy will or will not be developed for this enhancement area.

The MCMP will develop a Strategy for identifying research-based climate change adaptation actions for Great Lakes coastal wetlands, and incorporating these actions into State and local resource management plans. This enhancement area task is best suited to Section 309 funding support.

Coastal Hazards

Section 309 Enhancement Objective

Prevent or significantly reduce threats to life and property by eliminating development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea level rise and Great Lakes level change.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Characterize the level of risk in the coastal zone from the following coastal hazards:

(Risk is defined as: “the estimated impact that a hazard would have on people, services, facilities and structures in a community; the likelihood of a hazard event resulting in an adverse condition that causes injury or damage.” Understanding Your Risks: Identifying Hazards and Estimating Losses. FEMA 386-2. August 2001)

Type of hazard	General level of risk (H, M, L)	Geographic Scope of Risk (Coast-wide, Sub-region)
Flooding	High	Multiple sub-regions
Coastal storms, including associated storm surge	Low	Coast-wide
Geological hazards (e.g., tsunamis, earthquakes)	Low	Coast-wide
Shoreline erosion (including bluff and dune erosion)	High	Coast-wide
Sea level rise and other climate change impacts	N/A	Coast-wide
Great Lake level change and other climate change impacts	High	Coast-wide
Land subsidence	Low	Coast-wide
Other (please specify) Rip Current Hazards	High	Coast-wide, with higher risk on Lake Michigan/Superior

2. For hazards identified as a high level of risk, please explain why it is considered a high level risk. For example, has a risk assessment been conducted, either through the State or Territory Hazard Mitigation Plan or elsewhere?

Flooding

Under the Flood Risk Area provisions of Part 323, Shorelands Protection and Management, of the NREPA, new structures in the 100-year floodplain of the Great Lakes must be elevated to prevent property damage. All of Michigan’s 41 coastal counties have designated flood risk areas mapped and regulations in effect, which is the same number of counties identified in the 2006 Assessment. The Flood Risk Area Program continues to be operated mostly at the county level, and DEQ staff provides periodic technical assistance and monitoring. All 41 counties participate in the National Flood Insurance Program and have local zoning requirements which meet or exceed Flood Risk Area Program standards.

Relatively low water levels have limited recent flooding events; however, the flooding threat continues to be characterized as high due to the combination of historical flooding problems with the possibility of water levels rising within the 2012-2016 timeframe. If the current prolonged period of below-average water levels continues, it may result in a general lowering of the threat for coastal

flooding. Nevertheless, regional flooding events could still be expected in areas that are extremely low-lying, or in areas that experience seiche events. Lake St. Clair and Lake Erie trend nearer to their respective average water levels than Lake Superior and Lake Michigan-Huron. Consequently, communities on these lakes may be more likely to experience flooding events.

Shoreline Erosion

Approximately 268 miles of Michigan's Great Lakes Coast are designated as High Risk Erosion Areas (HREA) under Part 323 of the NREPA. DEQ recession rate studies have shown these areas are receding at an average annual rate of one foot or more per year. The Department continues to reassess recession rates on a county-by-county basis to account for changing physical conditions, and to incorporate up-to-date technology in the recession rate studies. Recent county-wide studies show significant decreases in the number of regulated properties and in the length of designated shoreline. These decreases are attributed to the prolonged period of relatively low water levels on Michigan's Great Lakes. Generally, beaches accrete or build in profile during low lake levels, which tends to promote lakeward establishment of vegetation on beaches and foredunes. The current HREA administrative rules emphasize the change in location of this vegetation line over time in the calculation of shoreline recession rates. Conducting the recession rate studies during periods in the lake level cycle when the vegetation line is temporarily advancing lakeward often leads to lower recession rates than those calculated in previous studies for the same stretch of shoreline. Recession rates that decrease to less than one foot per year prompt the Department to de-designate the HREAs in question, which correspondingly decreases the number of regulated properties.

The hazard threat due to erosion remains significant in many locations and would increase in the event of a return to normal or above-normal water levels. Great Lakes water levels appear to be cyclic in nature and prolonged low water periods similar to current conditions occurred in the 1930s and 1960s. Historically, low water periods are followed by prolonged periods of relatively high water, and this historic record suggests that higher-than-average water levels will return in the future. The challenge is to determine whether a change in the system has occurred that might cause a deviation from historic cycles.

Current climate models that encompass the Great Lakes provide some indication that lake levels may continue to trend downward over the long term; however, the models apply at very coarse geographic scales and do not provide sufficient detail to model the Great Lakes Basin at a regional level. To address that gap, the DNRE Wildlife Division obtained Great Lakes Restoration Initiative funding in 2010 for three inter-related, multi-year projects that will, respectively:

- Develop statistical downscaling of climate variables for Michigan using output from global climate models from the Fourth Assessment Report of the Intergovernmental Panel on Climate Change;
- Assess changes in mean climate and weather extremes, including lake-effect snow and the hydrology budget of the Great Lakes Basin for the mid- and late 21st century; and
- Examine the relationship between large-scale atmospheric circulation patterns and Great Lakes water levels.

Another recent development with the potential to influence lake levels and shoreline erosion is the interest in the placement of engineered structures downstream of Lake Huron which would increase levels of the lakes upstream of the structures. This idea is under discussion in the context of the ongoing International Upper Great Lakes Study (IUGLS) sponsored by the International Joint Commission (IJC). Shoreline erosion could potentially be affected by this type of engineered manipulation of the system, as well as from natural factors.

Great Lakes Level Changes

Great Lakes water level changes are identified as having a high level of risk, as was the case in the 2006 Assessment. Low water levels have persisted for the past decade, particularly on Lakes Superior, Michigan, and Huron. Multiple impacts and damages can be attributed to Great Lakes level variations and several of these will be addressed in other enhancement area assessments. However, the threat specifically related to coastal hazards are the continued attempts by property owners to construct buildings and infrastructure further lakeward due to the perception of a lower level of threat from both coastal erosion and flooding. One example of this trend is a recent proposal reviewed by DEQ regulatory staff for a new single-family home on the southeast shore of Lake Michigan, to be sited on the open beach. Historic orthophotographs from the high water period of the mid-1980's show water partly covering the area of the proposed footprint of the house.

The current prolonged period of low water levels, especially in embayment regions such as Saginaw Bay and Georgian Bay, is the subject of the two-phase IUGLS sponsored by the IJC. Phase I is the examination of a theory that historic dredging may have widened the St. Clair River, leading to a drop in the level of lakes that lie above it in the hydrologic regime. Phase II addresses the overall need for improved regulation of outflows at the Sault Locks.

Rip Currents

Rip currents have been identified as a significant coastal hazard by scientists and the public alike for some time. Since a 2004 Great Lakes Rip Current Conference, Michigan Sea Grant and the National Weather Service have increased their focus on rip current outreach and education. Yet, even with this increased effort the hazard associated with rip currents in Michigan waters remains, as evinced by the number of rip current-related deaths in 2010. Prior to Labor Day, rip currents contributed to 11 deaths along Michigan's Lake Michigan coast and 25 deaths throughout the Great Lakes. Rip current-related deaths are a regular occurrence in Michigan with the State ranking fourth in the number of fatalities for all coastal states in the contiguous U.S. during the 1994-2007 time period.

3. If the level of risk or state of knowledge of risk for any of these hazards has changed since the last assessment, please explain.

Flooding

The Federal Emergency Management Agency's (FEMA) ongoing Map Modernization Program is increasing the body of research on Michigan's Flood Risk Areas. Under the program, the FEMA is producing county-wide flood maps for much of the Great Lakes coast. The agency is using the U.S. Army Corps of Engineers (USACE) 1988 Phase I and Phase II Revised Reports on Great Lakes Open-Coast Flood Levels to delineate the floodplain along the shoreline. In addition, USACE reports for Saginaw Bay (1989), Green Bay (1990), Grand Traverse Bay (1990), and Lake St. Clair/Anchor Bay (2007) will be used to delineate the floodplain. In most cases these flood elevations remain appropriate for use as reference elevations in the update process, though minor revisions have been made to the Lake St. Clair elevations. It should be noted that the main focus for the updates is not to revise the flood reference levels, but rather to update the topographic elevation models upon which these levels are applied to determine updated flood zones.

The following is a summary of the county-wide mapping projects currently underway or completed along Michigan's Great Lakes coastal counties:

- Maps have been completed for Berrien, Huron, Macomb, St. Clair, and Van Buren counties.
- Preliminary maps are now available for Bay, Cheboygan, Monroe, Ottawa, Sanilac, Tuscola, and Wayne counties.

- Preliminary maps for Alpena, Charlevoix, Chippewa, Grand Traverse, Iosco, Muskegon, and Saginaw counties are underway and expected to be available by early 2011.
- Mapping activities are underway for Alcona, Allegan, Arenac, Gogebic, Leelanau, Marquette, Mason, Menominee, and Oceana counties, and preliminary maps are expected to be available by late 2011.
- In 2010/2011, the floodplain boundaries in Macomb County along Lake St. Clair will be updated to reflect the revised floodplain elevations for Lake St. Clair developed by the USACE in 2007/2008. This report was prepared to reflect the effect of adding 19 years of gage record to the 1988 report.
- Updated mapping activities are not planned by FEMA for Alger, Antrim, Baraga, Benzie, Delta, Emmet, Houghton, Keweenaw, Luce, Mackinac, Manistee, Ontonagon, Presque Isle, or Schoolcraft Counties.

The FEMA is in the process of working with the USACE and mapping contractors to review and update the methodology for determining the 1% annual chance flood elevations (including wave run-up and velocity zones) on the Great Lakes. A pilot study is underway on Lake Michigan to test the methodology along the Allegan County shoreline and within Green Bay in Wisconsin. Once the methodology is refined, the FEMA intends to consider mapping velocity zones (V-zones) on the Great Lakes. V-zones are the shoreline areas subject to significant wave action during a 1% annual chance flood event. While there may be areas where a V-zone designation is appropriate, the DEQ has concerns about implementation of a V-zone methodology on the Great Lakes in all locations. The Department recommends that the methodology reflect historic events and should only be applied in areas where there is significant V-zone risk. These areas do not include the bluff conditions that characterize much of the Lake Michigan and Lake Superior shoreline.

Great Lakes Level Changes and Shoreline Erosion

Prolonged low water levels have reduced the immediacy of the threat of coastal erosion to existing development along many stretches of Michigan's Great Lakes coast. All of the Great Lakes remain at relatively low levels (particularly Lakes Superior, Michigan and Huron) compared to historic averages, and these relatively low water levels have been sustained for almost a decade.

Updated shoreline recession rate studies were completed for five counties since the 2006 Assessment; specifically, Alcona, Alpena, Arenac, Berrien, and Presque Isle Counties. In each case, the total length of designated HREA shoreline was reduced and in four of the counties the HREA designations were removed entirely. A recession rate update study in Cheboygan County was recently completed with results showing a reduction in total designated HREA shoreline length. DEQ staff is in the process of notifying affected property owners and addressing input received regarding areas proposed for designation under the HREA program.

During the current low water period many stretches of shore - especially sand-dominated shorelines and beaches - have recovered significantly from past erosion events, and in some cases beach widths have increased by hundreds of feet. There is a readily observable relationship between beach composition/morphology and the ability of a beach to "recover" during low water periods. Coasts characterized by sand dunes or lower sandy shores have generally undergone a period of subaerial beach growth. This beach growth has provided a temporary buffer for coastal buildings/infrastructure from episodic erosion events. Cohesive bluff shorelines generally show a minimal amount of subaerial beach growth lakeward of the bluff slopes. Notably, some stretches of sediment-starved beach (such as Baldwin Township, Iosco County) that have been armored with seawalls or revetments have not recovered during this extended period of low water. In fact, along some stretches of coast, wave action has continued to impact the seawalls during this low water period.

The natural beach-building that has occurred over the past several years has generally decreased the overall risk from episodic erosion events. However, this reduction in risk will be short-lived if water levels return to normal or above-normal levels. The 2006 Assessment contained separate assessments for episodic erosion vs. chronic erosion. If this were still the case, chronic erosion would maintain a status of high risk while episodic erosion would be lowered to medium risk. Since these items are now combined, the overall erosion risk is maintained at the high level because of the potential for higher lake levels in the 2012-2016 timeframe.

Rip Currents

The assessment of rip current threats has changed due to the significant increase in rip current-related deaths over the past year. Rip currents have always been a threat along Michigan's Great Lakes coast; however, there is some indication that regional climate changes may be contributing to an increase in the threat level, specifically: 1) Increased air and water temperatures have increased the overall number of swimmers visiting public beaches; and 2) changes in temperatures and perhaps changes in temperature gradients between the air and water may be driving increased wind, wave, and current activity.

4. Identify any ongoing or planned efforts to develop quantitative measures of risk for these hazards.

DEQ continues to conduct shoreline recession rate update studies on a county-by-county basis pursuant to Part 323 of the NREPA. The objective is to quantify coastal recession rates and apply these to the calculation of appropriate construction setbacks for coastal development. A statewide HREA shoreline layer has been created and will be updated as needed to monitor changes in the mileage of designated HREAs.

The previously described DNR Wildlife Division projects to refine global climate change models to the scale of the Great Lakes will generate important information relevant to anticipated lake level impacts over the next few years.

5. (CM) Use the table below to identify the number of communities in the coastal zone that have a mapped inventory of areas affected by the following coastal hazards. If data is not available to report for this contextual measure, please describe below actions the CMP is taking to develop a mechanism to collect the requested data:

Type of hazard	Number of communities that have a mapped inventory	Date completed or substantially updated
Flooding	All 41 coastal counties	Varies by county
Storm surge	N/A	N/A
Geological hazards (including earthquakes, tsunamis)	None	N/A
Shoreline erosion (including bluff and dune erosion)	183	Varies by community
Sea level rise	N/A	N/A
Great Lake level fluctuation	None	N/A
Land subsidence	None	N/A

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

- 1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:**

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Building setbacks/restrictions	Yes	No
Methodologies for determining setbacks	Yes	Yes
Repair/Rebuilding restrictions	Yes	No
Restriction of hard shoreline protection structures	Yes	No
Promotion of alternative shoreline stabilization methodologies	No	No
Renovation of shoreline protection structures	No	No
Beach/dune protection (other than setbacks)	Yes	Yes
Permit compliance	Yes	No
Sediment management plans	No	No
Repetitive flood loss policies, (e.g., relocation, buyouts)	No	No
Local hazards mitigation planning	Yes	No
Local post-disaster redevelopment plans	No	No
Real estate sales disclosure requirements	No	No
Restrictions on publicly funded infrastructure	Yes	No
Climate change planning and adaption strategies	No	No
Special Area Management Plans	No	No
Hazards research and monitoring	Yes	No
Hazards education and outreach	Yes	No

- 2. For management categories with significant changes since the last assessment, provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information.**

- a) Characterize significant changes since the last assessment;**
- b) Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and**
- c) Characterize the outcomes and effectiveness of the changes.**

Methodologies for Determining Setbacks

Significant changes have occurred since the last assessment regarding the methodology for determining coastal construction setbacks under the High Risk Erosion Area program. Section 309 funding was used to collect field data and assess the feasibility of using a modern erosion reference feature (ERF) collected with a differential GPS unit, rather than the former process of orthorectifying modern aerial images and digitizing the ERF on the imagery within a geographic information system. The new approach still requires orthorectified historic aerial imagery for acquisition of the historic ERF. Early results show that the new approach has advantages including increased accuracy in the identification/delineation of this feature, as well as providing

staff the opportunity to collect on-site photographs, field notes, and other information at the time of data collection. However, this method is time-intensive and not well-suited to assessing long stretches of shoreline, such as an entire county. DEQ staff is currently using this approach to examine and update recession rates within existing stretches of designated HREA shoreline.

Recent recession rate studies have also included collection of the top of bluff/bank feature to assess whether it is appropriate to use this as the erosion reference feature in place of the currently used landward extent of the zone of active erosion, typically expressed as a vegetation line. Further assessment of the bluff top approach for calculating required setback distances is ongoing with Section 309 funding support. This year's effort will focus on the applicability of these methods to different shore types, including high bluff environments.

Beach Protection

Beach protection efforts have been directly affected by a Michigan Supreme Court ruling which resulted in a clarification of the landward boundary for public trust protection. The case, Glass v. Goeckel (473 Mich. 667) clarified that the jurisdiction line in Part 325, Great Lakes Submerged Lands, of the NREPA is a feature-based delineation referencing the Natural Ordinary High Water Mark (NOHWM) rather than a specific elevation. This was a major paradigm shift for regulatory staff and required additional research and guidance. Section 309 funds supported a two-phase research project in which a University of Michigan research team analyzed the physical representation of the NOHWM as it exists on dynamic beaches of the Great Lakes, as well as the legal aspects of this change. To date, the change in procedure has been addressed through development of a new internal guidance document; however, it is expected that modifications will be required in Part 325 or administrative rules.

3. **(CM) Use the appropriate table below to report the number of communities in the coastal zone that use setbacks, buffers, or land use policies to direct development away from areas vulnerable to coastal hazards. If data is not available to report for this contextual measure, please describe below actions the CMP is taking to develop a mechanism to collect the requested data.**

For CMPs that use numerically based setbacks or buffers to direct development away from hazardous areas report the following:

Contextual measure	Number of communities
Number of communities in the coastal zone required by state law or policy to implement setbacks, buffers, or other land use policies to direct development away from hazardous areas.	130 townships, villages, and cities contain designated high risk erosion areas, covering portions of 33 coastal counties.
Number of communities in the coastal zone that have setback, buffer, or other land use policies to direct develop away from hazardous areas that are more stringent than state mandated standards or that have policies where no state standards exist.	Accurate data not available ¹

For CMPs that do not use state-established numerical setbacks or buffers to direct development away from hazardous areas, report the following:

¹ A survey was conducted in 2008 of coastal communities and a very poor response rate (~11%) was obtained; 32 responses out of a total of 301 coastal counties, townships, cities and villages. Six communities indicated they employed setbacks, buffers, or other land use policies more stringent than state standards. Sixteen respondents indicated the use of such policies in locations where no state standards existed. The MCMP will continue to look for opportunities to include data collection of this sort into a future initiative such as development of a Michigan Coastal Atlas.

Contextual measure	Number of communities
Number of communities in the coastal zone that are required to develop and implement land use policies to direct development away from hazardous areas that are approved by the state through local comprehensive management plans.	N/A
Number of communities that have approved state comprehensive management plans that contain land use policies to direct development away from hazardous areas.	N/A

Priority Needs and information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the MCMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
Acquisition of low-altitude oblique aerial imagery for Lower Peninsula Great Lakes shoreline	Data	Medium
Revisions to administrative rules for high risk erosion areas under Part 323, shorelands protection and management of the NREPA	Regulatory	High
Revisions to administrative rules for Part 325, great lakes submerged lands, of the NREPA	Regulatory	Medium
Online coastal atlas or other readily accessible portal for DEQ staff and public, providing information on erosion hazard areas, critical dune areas, and other coastal hazards	Communication and outreach	Medium
Lack of "in-house" capacity in DEQ to conduct GIS-Based HREA recession rate update studies	Capacity	Medium
Research to improve rip current forecasting and guidance for public beach managers on assessing rip current conditions	Data, training, communication and outreach	High

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Medium

Briefly explain the level of priority given for this enhancement area.

Relatively low Great Lakes water levels over the past several years have moderated the threat of coastal flooding, erosion, and associated property damage. Nevertheless, the potential remains for lake levels to rise again over the course of the 2012-2016 timeframe.

The number of fatalities due to rip currents at Michigan's beaches suggests the need for research-based enhancements in the way that rip current conditions are forecast and communicated to public beachgoers.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes

Briefly explain why a strategy will or will not be developed for this enhancement area.

The enhancement objective is, in part, to prevent or significantly reduce threats to life posed by coastal hazards. Rip current research and improved forecasting and guidance for public beach managers would substantially advance this objective.

The new methodology for determining construction setbacks in designated High Risk Erosion Areas will be ready for formal adoption through administrative rule revisions in the 2012-2016 timeframe, and the DEQ is interested in adopting the new methodology.

Public Access

Definition: pathways, boardwalks, trails, parks, scenic overlooks, beaches, fishing piers, boat launches, lighthouses, docks/marinas

Section 309 Enhancement Objective

Attain increased opportunities for public access, taking into account current and future public access needs, to coastal areas of recreational, historical, aesthetic, ecological, or cultural value.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. Characterize threats and conflicts to creating and maintaining public access in the coastal zone:

Type of threat or conflict causing loss of access	Degree of threat (H,M,L)	Describe trends or provide other statistics to characterize the threat and impact on access	Type(s) of access affected
Private residential development (including conversion of public facilities to private)	Low	From 2007 through 2009, Michigan's 42 coastal counties saw a total net increase of only 2,352 housing units, or 0.10%, with some coastal counties actually losing housing units during that timeframe. The slow residential growth is attributed to declining employment, economic uncertainty, and shrinking population statewide.	Coastal lands above the ordinary high watermark – all types listed in definition of public access
Non-water dependent commercial/industrial uses of the waterfront (existing or conversion)	Low	There is anecdotal evidence that some water-dependent uses in community waterfronts, including public access sites, have been converted to non-water dependent private uses, but this conversion rate hasn't been studied or quantified. Starting in Fall 2011, a NOAA fellow will develop a peer-reviewed methodology for measuring waterfront land use conversion rates, and apply the methodology to determine the overall rate of waterfront conversion for the State of Michigan.	Coastal lands above the ordinary high watermark – all types listed in definition of public access
Erosion	Low	Impacts to public access due to erosion have been lower than normal due to the relatively low water levels sustained for the past decade.	Coastal lands above the ordinary high water mark – all types listed in definition of public access

Type of threat or conflict causing loss of access	Degree of threat (H,M,L)	Describe trends or provide other statistics to characterize the threat and impact on access	Type(s) of access affected
Great Lake level change	Medium	During the past several years, low water levels in Lakes Michigan and Huron exposed substantial expanses of bottomlands, allowing emergent native and invasive species of wetland vegetation to take hold. The low water and dense vegetation changed the character of the shoreline and limited use of public access sites dependent on deep water.	Fishing piers, boat launches, beaches, marinas, docks, trails, boardwalks, overlooks, pathways
Natural disasters	Low	No known qualitative data on the effect of flooding, thunderstorms, tornadoes, wildfires, winter storms and drought on coastal public access	Coastal lands above the ordinary high watermark – all types listed in definition of public access
National security	Low	No known anecdotal or qualitative data on national security impacts on coastal public access at Michigan's ten international border crossings or other facilities	Coastal lands above the ordinary high watermark – all types listed in definition of public access
Encroachment on public land	Low	Unknown at this time	Coastal lands above the ordinary high watermark – all types listed in definition of public access

2. Are there new issues emerging in your state that are starting to affect public access or seem to have the potential to do so in the future?

2005 Michigan Supreme Court - Glass v. Goeckel (473 Mich. 667)

On July 29, 2005, the Michigan Supreme Court ruled that the general public has the right to walk along the Great Lakes shore on land below the ordinary high watermark. The Court based its decision on the public trust doctrine and found that walking along the lakeshore is a traditionally protected public right. The decision included a determination of the ordinary high watermark based on the presence of persistent upland vegetation, instead of a numeric elevation. MCMP staff continues to answer general inquiries from the public regarding the ordinary high water mark.

Invasive Species

Since 1996, Michigan has had an approved statewide Aquatic Nuisance Species (ANS) State Management Plan that has guided Michigan's actions and decision-making to prevent the introduction and spread of AIS within and throughout Michigan waters and the Great Lakes. The DEQ is using U.S. Fish and Wildlife Service Great Lakes Restoration Initiative (GLRI) Fiscal Year 2010 funding to increase capacity for a coordinated state-wide approach to AIS prevention and control in Michigan. Over the five-year period of the GLRI, the DEQ will create and implement a comprehensive AIS program in the state. The primary goal of Michigan's program is to identify and block pathways used by non-native species to enter the state or spread within the state. A concurrent goal is to prevent establishment of new species if prevention plans fail. The goals will be accomplished through regulations, education, research, coordination, early detection, rapid response, and assessment as implemented under Michigan's ANS State Management Plan. Michigan's ANS State Management Plan is available at www.michigan.gov/deqaquaticinvasives.

Common Reed (*Phragmites australis*):

During the past several years, low water levels in Lakes Michigan and Huron exposed substantial expanses of bottomlands. Wetland vegetation quickly established on the exposed soil, and in some areas along the coast bands of vegetation dozens to hundreds of feet wide now lie between the ordinary high water mark and the water's edge. Much of this vegetation is the invasive, non-native form of the common reed, *Phragmites australis*, which forms extensive stands 8 to 12 feet tall. The dense stands of *Phragmites* have poor wildlife habitat value, and block physical and visual access to the water. DEQ Water Resources Division field staff members in several coastal districts routinely address inquiries from the public and issue permits to riparian landowners for eradicating *Phragmites*. These staff members are supported in part with Section 306 funding.

The spread and establishment of *Phragmites* has been notably rapid and problematic along the Saginaw Bay coast due to the sheer extent of the bottomlands exposed by the low lake levels. To better communicate effective treatment methods and regulatory requirements to Saginaw Bay communities and property owners, the DEQ joined with a number of partners in 2006 to design and implement a *Phragmites* control demonstration project at a coastal site in Bay County. The site is open to the public and enhanced by interpretive signage. The intent of the project is to compare and exhibit the effectiveness of several *Phragmites* control methods involving different combinations of chemical and mechanical treatments. The treatment combinations chosen are based on recommendations provided in *A Landowner's Guide to Phragmites Control*, an informational brochure produced for Great Lakes shoreline property owners and supported with Section 306 funds. The U.S. Environmental Protection Agency - Great Lakes National Program Office provided major funding for the demonstration project, and partners include the National Fish and Wildlife Foundation, BASF Corporation, Cygnet Enterprises, Ducks Unlimited, and Hampton Township. Final results of the original project will be available in summer, 2011. Future uses for the site now under consideration include launching a new research demonstration project focused on habitat management techniques for land managers, such as prescribed burning.

To the north of Saginaw Bay, Huron Pines has launched a volunteer-based campaign to identify and control new infestations of *Phragmites* along the coast of the northeast Lower Peninsula, and publicize the problems caused by this and other invasive species. The organization is also reaching out to coastal landowners to offer assistance in treating infestations. *Phragmites* infestations in the project area are relatively new and limited in extent, and Huron Pines is stressing the importance of early detection and treatment in its public outreach efforts. This initiative is supported with Section 306 funds.

Several other grass-roots initiatives are taking shape in coastal communities. For example, residents and local government officials in Clay Township, St. Clair County, recently developed the Clay Township *Phragmites* Management Plan and Program. The community-driven effort involves surveying the status of *Phragmites* in the township, identifying priority treatment areas, educating property owners about permit requirements and treatment techniques, coordinating volunteers to assist with *Phragmites* control, and identifying sources of funding. Other coastal communities have developed *Phragmites* control ordinances under the authority of Michigan's Noxious Weed Law, Public Act 359 of 1941, as amended. Banks Township (Antrim County); Leelanau Township (Leelanau County), and Peninsula Township (Grand Traverse County) have adopted such ordinances. These efforts were not supported with CZM funding.

Communities, agencies, and organizations around the coast will have the opportunity to network, coordinate, and plan collaborative actions for managing *Phragmites* at *Phragmites Invasions in Michigan: A Symposium to Build Capacity for Management*, scheduled for March 28-30, 2011. The Great Lakes Commission is organizing the symposium with Section 306 funding support. It is part

of a broader initiative to develop a strategic framework for comprehensive *Phragmites* management and control in Michigan. Additional information is available at the Symposium website: <http://glc.org/ans/phragmites/symposium2011.html>.

Shoreline Armoring

Seawalls, revetments, breakwaters, groins, jetties, and other structures meant to stabilize shorelines, protect property from flooding and erosion, or to accommodate commercial navigation or industry line the coast in many developed areas of Michigan's Great Lakes, Lake St. Clair, and connecting channels. Historically, these structures were made of wood or metal pilings, rock, or reinforced concrete. A growing body of research shows that such "hard" engineered structures commonly exacerbate erosion in their vicinity, and are associated with other negative effects, including public access impacts. For example, hard-surfaced seawalls resist impact from wave action, but the surfaces also deflect wave energy in ways that cause the adjacent beach to erode and narrow. Groins and jetties designed to protect the shore from erosion or to keep sediment from building up in channels also trap sand on the updrift side and leave beaches on the downdrift side of littoral systems starved and prone to narrowing and erosion. In addition, hard engineered steep walls may prevent or discourage people's movement between the beach and upland areas, and have negligible habitat value for fish and wildlife compared to natural shorelines.

While hard-engineered shoreline armoring continues to be installed or maintained around the Great Lakes, rising awareness of their damaging effects is leading to a greater interest in "soft" engineering, also referred to as bioengineering, to protect the shore. Soft engineering is the use of ecological principles and practices to reduce erosion and achieve the stabilization and safety of shorelines, while enhancing habitat, improving aesthetics, and saving money. Soft engineering is achieved by using vegetation and other materials to soften the land-water interface. It has significant potential to improve public access along the Great Lakes shore. The MCMP supports shoreline bioengineering projects with Section 306 pass-through grants to local governments.

In January 2009, Michigan Sea Grant began a research project titled *Detroit River Softshore Engineering Technical Support*, to evaluate the many shoreline bioengineering projects installed in the Detroit River area over the past several years. The research involves a literature review, compilation of site-specific information on shoreline miles and acres of habitat restored, costs, project goals, and post-project monitoring. The report is slated for release in April, 2011 and will include recommendations informed by the evaluation of these projects. This effort is non-MCMP driven, though Section 306 funding is supporting MCMP staff coordination and collaboration with the project leads.

The DEQ established the Michigan Natural Shoreline Partnership (MNSP) in 2008, a collaboration of the Department with lake associations, conservation districts, watershed councils, contractors, The Nature Conservancy, and Michigan Sea Grant. The focus is on bioengineering for inland lake shorelines; however, it is conceivable that the products developed could be applied to very low energy Great Lake shorelines. These products include a list of native plant materials and a library of reference materials available to users at www.mishorelinepartnership.org. The MNSP is completing the Natural Shoreline Landscape Workshop Tool Kit for resource professionals and nonprofit organizations interested in holding shoreline bioengineering workshops for the public. The Partnership also developed a Certified Natural Shoreline Professional Training and Certification Program for professional landscape and marine contractors, consisting of three days of classroom instruction and a one-day field course on designing, installing, and maintaining natural shorelines on inland lakes. Finally, the first annual MNSP technical conference, *Shoreline and Shallows*, is scheduled for March, 2011. Although this effort is non-MCMP driven, Section 306 funding is supporting MCMP staff coordination and collaboration with the MNSP.

Conflicting Objectives

Conflicts with coastal resource management objectives also complicate efforts to provide adequate and appropriate access. Public demand may exceed the limits or capacity of some resources to sustain impact. For example, some coastal upland, wetland, and aquatic habitats are very sensitive to even modest levels of disturbance. Consequently, the DNR Recreation Division has adopted a new approach to developing state park management plans. The approach is based on a National Park Service model that involves dividing the park into management zones appropriate for certain levels and types of recreational use, corresponding to the sensitivity of habitats or resources within the zones. To date, Section 306 funding has supported development of these management plans at ten coastal state parks.

A perennial issue is adjacent landowner opposition to the establishment of public boat launches and other access, because of real or perceived concerns over traffic congestion, noise, litter, and vandalism. Many shoreline property owners also have a strong and often exclusive sense of ownership toward the beaches and waters lakeward of their property lines, and may view legally-sanctioned beach walking as trespass. In recognition of this issue, the MCMP reviews local government applications for public access pass-through CZM funding to ensure proposed projects have strong local support.

Great Lakes Water Levels

Fluctuating Great Lakes levels may affect the quality of access provided at public sites in various ways. As mentioned previously, the low water levels prevalent for the past several years throughout the Great Lakes have exposed bottomlands, most prominently where the lands below the ordinary high watermark have very gradual slopes, such as Saginaw Bay. The native, emergent wetland vegetation that now covers portions of the exposed bottomlands expands habitat for some forms of wildlife, which may improve hunting opportunities. On the other hand, low water and dense, invasive, non-native vegetation make it difficult or impractical to maintain many boating access sites, and some public boat launches have been idled until higher water levels return. Additional, detailed information on Great Lakes water levels is presented in the Coastal Hazards Assessment.

Muck and Algal Blooms

Excessive algal growth, detritus, or “muck” frequently washes up and accumulates on the shoreline in parts of Michigan’s Great Lakes, such as Saginaw Bay and areas near the Sleeping Bear Dunes National Lakeshore, with a perceived increase in duration and spatial distribution compared to past years. The subsequent degradation of the aesthetic value of the beaches often concerns the public, especially adjacent property owners. These algal mats also have the potential to retain and/or promote the growth of pathogens. While nutrients in Saginaw Bay waters are contributing to the algal growth; the impacts of zebra and quagga mussels are also contributing to this dynamic problem that is occurring in various areas along the Great Lakes shoreline. In Saginaw Bay, the state is currently meeting the phosphorus goal and is working with NOAA regarding studies on nutrient cycling in the bay, especially changes due to invasive species like the zebra and quagga mussels.

A number of efforts are currently underway to directly or indirectly address nutrient issues, while there currently no available options to address zebra and quagga mussels. For example, at the State level restrictions on the use of lawn fertilizers containing phosphorus were signed into law in 2010, and will take effect January 1, 2012. In addition, through organized efforts such as the Saginaw Bay Coastal Initiative (SBCI), the DEQ and other state agencies are working with citizens, local government officials, and multiple regional and federal agencies to develop and implement a comprehensive approach to promoting environmentally sound economic development and resource restoration in the Saginaw Bay coastal area. As a result of these efforts, numerous

guidance documents have been developed to inform the public and decision-makers about muck management, phosphorus, algae, best management practices, invasive species, and public health issues. The SBCI developed a report identifying recommendations to reduce phosphorus sources to the Saginaw Bay in June 2009. These recommendations are in the process of being implemented through several grants, and are being used to develop proposals for the Great Lakes Restoration Initiative (GLRI) and other funding sources. In addition, the DEQ has acquired GLRI funding to support local health department efforts to monitor beach water quality along Saginaw Bay. Additional information regarding Michigan's SBCI and the state's initiatives are available at the SBCI website at http://www.michigan.gov/deq/0,1607,7-135-7251_30353_42900---,00.html.

At the local level, Bay County has initiated a revolving loan fund to repair and replace failing septic systems believed to contribute to water quality problems. The fund is supported with grants from the Saginaw Bay Watershed Initiative Network and the Bay Area Community Foundation. The County is also investigating options for mechanical clean-up of the muck from public beaches. The Bay County Environmental Affairs and Community Development Department is coordinating these efforts. In addition, the Bay County Health Department is implementing an electronic database to track its septic system information and using the County's GIS department to identify parcels with suspected septic system problems within the Kawkawlin River Watershed as part of a 319 planning grant.

Universal Access

The DNR received a \$3 million grant from the W.K. Kellogg Foundation for a universal access initiative titled "Access to Recreation". It focuses on providing universal access to public park and recreation opportunities across Michigan. Funds are allocated through the DNR Grants Management program to both state and local public entities. This funding initiative is intended to increase use at public access sites by people of all abilities. The MCMP will continue to participate in the initiative and will consider using Section 306 funds to develop a program policy and procedure for compliance with the Americans with Disability Act.

3. **(CM) Use the table below to report the percent of the public that feels they have adequate access to the coast for recreation purposes, including the following. If data is not available to report for this contextual measure, please describe below actions the CMP is taking to develop a mechanism to collect the requested data:**

Contextual measure	Survey data
Number of people that responded to a survey on recreational access	N/A
Number of people surveyed that responded that public access to the coast for recreation is adequate or better	N/A
What type of survey was conducted (i.e. phone, mail, personal interview, etc.)?	N/A
What was the geographic coverage of the survey?	N/A
In what year was the survey conducted?	N/A

The MCMP has no formal process to assess demand for public access along the Great Lakes shoreline. A survey mechanism for measuring regional levels of public access and corresponding public demand is under consideration for development in 2012 with Section 306 funding support.

4. **Briefly characterize the demand for coastal public access within the coastal zone, and the process for periodically assessing public demand.**

To assist in preparing the State Comprehensive Outdoor Recreation Plan (SCORP) for the 2008-2012 timeframe, the DNR conducted a mail survey of 2,001 randomly selected registered Michigan

voters in 2007 to obtain information on their outdoor recreation activities and preferences. More than half (51%) of the respondents cited outdoor recreation as very important to their households, while 35% reported it moderately important and the remaining 14% reported it as slightly important or unimportant. More than half the responding households reported that one or more members walked outdoors, relaxed outdoors, picnicked, bicycled, took sightseeing trips, drove for pleasure, swam outdoors, or fished in the past year. The survey also showed strong support for conservation of natural resources. In particular, the survey results demonstrated that Michigan citizens want continued public acquisition of lands for outdoor recreation with an emphasis on conservation, water access and trails.

5. Please use the table below to provide data on public access availability. If information is not available, provide a qualitative description based on the best available information. If data is not available to report on the contextual measures, please also describe actions the CMP is taking to develop a mechanism to collect the requested data:

Types of public access	Current number(s)	Changes since last assessment (+/-)	Cite data source
(CM) Number of acres in the coastal zone that are available for public (report both the total number of acres in the coastal zone and acres available for public access)	1,291,615 total acres in coastal zone 499,167 acres (38.65%) available for public access	Not reported in last Assessment	Website Organization: Ducks Unlimited Conservation and Recreation Lands (CARL) GIS database - http://www.ducks.org/conservation/glaro/carl-gis-layer
(CM) Miles of shoreline available for public access (report both the total miles of shoreline and miles available for public access)	Approximately 3,288 total miles of shoreline. Technically, most of the exposed bottomlands along the shoreline are available for public use, due to the Supreme Court ruling cited.	Not reported in last Assessment	Michigan Supreme Court in Glass v Goeckel (473 Mich. 667)
Number of State/County/Local parks and number of acres	Approximately 47 coastal state parks, approx. 120 county parks, numerous local parks	- One additional state park - Increase in county parks	Website Organization: Michigan Department of Natural Resources and Environment http://www.michigandnr.com/parksandtrails/parkmap.aspx for State Parks County parks data obtained from "Mapbook of Michigan Counties"
Number of public beach/shoreline access sites	600 public beach/shoreline access sites totaling 542 public beach miles	Reported as unknown in last Assessment	Website Organization: Natural Resources Defense Council http://www.nrdc.org/water/oceans/ttw/titinx.asp
Number of recreational boat (power or non-power) access sites	90 State Harbors and Marinas; 96 State Boat Access Sites; At least 58 canoe/kayak access sites	Decrease - data source used in previous Assessment included the entire coastal county rather than just the	Website Organization: Michigan Department of Natural Resources and Environment http://www.mcgi.state.mi.us/MRBIS/harborearch.asp for Harbors and Marinas; For Boat Access Sites; http://www.mcgi.state.mi.us/MRBIS/

Types of public access	Current number(s)	Changes since last assessment (+/-)	Cite data source
		coastal boundary	Website Organization: Pure Michigan – Official Travel and Tourism Site For canoeing and kayaking http://www.michigan.org/Things-to-Do/Paddle-Sports/Canoeing/Default.aspx?city=G42&sort=asc&ln=100
Number of designated scenic vistas or overlook points	See paragraph at end of table		
Number of Underwater Preserves and/or Marine Sanctuary	12 Underwater Preserves encompassing approximately 2,700 square miles of Great Lakes bottomland; 1 National Marine Sanctuary	One additional State Underwater Preserve	Website Organization: Michigan Department of Natural Resources and Environment Michigan Underwater Preserve System - http://www.michigan.gov/deq/0,1607,7-135-3313_3677_3701-14531--,00.html
Number of State or locally designated perpendicular rights-of-way (i.e. street ends, easements)	See paragraph at end of table	Unknown	
Number of fishing access points (i.e. piers, jetties)	Approximately 130 sites	Increase	Website Organization: Great Lakes Fisheries Trust http://www.glft.org/grants/funded/index.cfm http://www.glft.org/angleraccessguide/locations.cfm DNR Fisheries Division staff
Number and miles of coastal trails/boardwalks	See paragraph at end of table	Unknown	Website Organization: Michigan Department of Natural Resources and Environment http://www.michigandnr.com/parksandtrails/Default.aspx?SearchType=trails (partial data)
Number of dune walkovers	See paragraph at end of table	Unknown	
Percent of access sites that are ADA compliant	19% of coastal state parks, unknown for sites under other ownership	Data for last Assessment was obtained from a now-obsolete publication; no known single source of data exists for coastal ADA access sites	DNR Recreation Division staff
Percent and total miles of public beaches with water quality monitoring and public closure notice programs	2006 – 35% 2007 – 35% 2008 – 35% 2009 – 37% - Total miles unknown at this time.	- Increase in overall number of coastal public beaches monitored - Total miles was not required	DEQ Beach Monitoring Annual Reports - 2006-2009

Types of public access	Current number(s)	Changes since last assessment (+/-)	Cite data source
	- No data available at this time for 2010.	previously	
Average number of beach mile days closed due to water quality concerns	2006–52 closures, 148 days 2007–46 closures, 443 days 2008–52 closures, 327 days 2009–62 closures, 661 days - No data available at this time for 2010.	Increase in beach days closed due to an increase in beaches being monitored since the last assessment	DEQ Beach Monitoring Annual Reports - 2006-2009

There is no existing, comprehensive source of data on the number of boardwalks, dune walkovers, or rights-of-way that are legal access sites, local parks, scenic vistas and overlooks, or other public access sites available on lands owned or controlled by the local governments within Michigan's coastal boundary. Several organizations have expressed interest in partnering with the MCMP in developing a coastal public access guide.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

- 1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:**

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Statutory, regulatory, or legal system changes that affect public access	Yes	Yes
Acquisition programs or policies	Yes	Yes
Comprehensive access management planning (including GIS data or database)	Yes	Yes
Operation and maintenance programs	Yes	No
Alternative funding sources or techniques	Yes	Yes
Beach water quality monitoring and pollution source identification and remediation	Yes	No
Public access within waterfront redevelopment programs	Yes	No
Public access education and outreach	Yes	No

2. **For management categories with significant changes since the last assessment provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information:**
- a) **Characterize significant changes since the last assessment;**
 - b) **Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and**
 - c) **Characterize the outcomes and effectiveness of the changes.**

Statutory, Regulatory, or Legal System Changes that Affect Public Access

A summary of the Michigan Supreme Court case – Glass v. Goeckel (473 Mich. 667) is provided under question #2. This was not supported by CZM funding.

In 2009, the DEQ and stakeholders in the lighthouse restoration community agreed on language for a use agreement to authorize the continuing occupation of Great Lakes public trust bottomlands by historic, offshore lighthouses. The agreement is required to receive a deed to the lighthouse from the National Park Service through the disposal process provided for in the National Historic Lighthouse Preservation Act of 2000. The grant of the subject use agreement finalizes issuance of the deed. The National Park Service deed and associated covenant include requirements for continued lighthouse preservation and maintenance. The use agreement is expected to facilitate the transfer of responsibility for lighthouses on Michigan's Great Lakes bottomlands to interested coastal communities and nonprofit organizations. These efforts were not supported with Section 309 funds; however, the DEQ staff involved in this process was partially supported with Section 306 funding.

Acquisition Programs or Policies

The Coastal and Estuarine Land Conservation Program (CELCP) is a relatively new federal program for acquisition of coastal lands. In Michigan, CELCP funds are used to acquire and protect in perpetuity coastal habitats with exceptional ecological values. Low impact public recreation such as hunting, hiking, and nature observation is allowed on lands acquired with CELCP funds. In the near future the MCMP will consult with the staff of other land acquisition and habitat management programs in the Department, and with NOAA CELCP staff to develop guidelines on the types and intensities of public access appropriate for Michigan CELCP projects. The MCMP will make this information available to prospective CELCP grant sub-applicants. Development of Michigan's draft CELCP Plan was supported by Section 306 CZM funding.

Comprehensive Access Management Planning (Including GIS Data or Database)

Since the last Assessment, Ducks Unlimited in partnership with The Nature Conservancy developed a GIS database of Michigan's Conservation and Recreation Lands (CARL), including lands open to the public. This database has current and future value as a resource for local, regional, and state conservation, recreation, and land use planning efforts. The MCMP will make this database available on the Program website and use it in the development of a future coastal public access guide. Section 309 CZM funding supported development of the coastal portion of the CARL database

Alternative Funding Sources or Techniques

The Recreation Passport is a new initiative which grew out of a proposal developed by the Citizens Committee for Michigan State Parks. It replaces the traditional state park and boating Motor Vehicle Permit system currently in place at state parks, recreation areas, and boat launches. Starting October 1, 2010, Michigan residents renewing license plates through the Secretary of State can purchase a Recreation Passport tag for an additional \$10.00. The passport will be required for entry to state parks, recreation areas, and boating access sites, and must be renewed annually. The Recreation Passport will help fund Michigan's state parks, state recreation areas,

boating facilities, state forest campgrounds, non-motorized trails and pathways, cultural and historic resources in state parks, and provide park and recreation development grants for local units of government.

A portion of the revenue collected through the Recreation Passport will go toward a new Local Public Recreation Facilities Fund (LPRFF), and the DNR is soliciting public comment on a draft of the LPRFF grant program. These grants will fund local government projects to develop and improve public recreation facilities. Adoption of the official program is expected in late February, 2011 and the DNR anticipates accepting applications from local governments in May. Development of the Recreation Passport was not supported with CZM funds. The MCMP plans to use Section 306 funding to coordinate with the LPRFF grant program staff to support coastal public access projects.

3. Indicate if your state or territory has a printed public access guide or website. How current is the publication and/or how frequently is the website updated? Please list any regional or statewide public access guides or websites.

Michigan has numerous guides and websites for public access statewide, developed by a variety of state and local agencies and organizations; however, there are no known, comprehensive guides or websites that focus specifically on coastal public access. A few examples of Michigan public access websites are listed below:

- <http://www.michigan.org/> - Michigan's Official Travel and Tourism Site;
- <http://www.michigan.gov/dnre> - Michigan Department of Natural Resources and Environment;
- <http://greatsandbayproductions.com/migreatbay/index.html> - Website currently being developed for Iosco, Arenac, Bay, Saginaw, Tuscola, Huron counties;
- http://www.wm-alliance.org/parks_recreation.php?initiative_id=2 - West Michigan Parks and Recreation Inventory

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
Inventory of coastal public access and assessment of public demand	Data, communication and outreach	High
Comprehensive coastal public access guide and/or website	Communication and outreach	High
Public access prioritization and planning for adapting to fluctuating water levels and changing coastal environments	Data, policy, communication and outreach	Medium

The development of a comprehensive coastal access inventory and guide, and a process to periodically assess public demand specifically for coastal access would improve MCMP efforts to identify gaps in public access and inform decisions on allocating CZM funding to support local or regional public access project proposals. The inventory would be GIS-based to facilitate decision-making, given that Michigan has 3,288 miles of coastline and more than 1.2 million acres of land in the coastal zone. Public survey data and other data on the types of shoreline changes triggered by fluctuating water levels, and their impacts on public access by region, would help identify the types

of public access projects most resilient to these fluctuations and changes. This data would inform MCMP strategic decisions on allocating limited CZM funding to ensure that the public access projects funded would have substantial, long-term use with minimal maintenance needs.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Medium

Briefly explain the level of priority given for this enhancement area.

Public access projects represent a substantial proportion of the applications received in response to the annual request for proposals for CZM Section 306/306A-funded pass-through grant projects. This indicates that public access is a high priority for Michigan's coastal communities. The MCMP is interested in strategically using limited CZM public access funding to maximize its impact.

2. Will the CMP develop one or more strategies for this enhancement area?

No

Briefly explain why a strategy will or will not be developed for this enhancement area.

The tasks that the MCMP will implement in future years under this enhancement area do not qualify as program changes and are best accomplished with Section 306 funding.

Marine Debris

Section 309 Enhancement Objective

Reducing marine debris entering the Nation's coastal and ocean environment by managing uses and activities that contribute to the entry of such debris.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

1. In the table below, characterize the significance of marine debris and its impact on the coastal zone:

Source of marine debris	Extent of source (H, M, L)	Type of impact (aesthetic, resource damage, user conflicts, other)	Significant changes since last assessment (Y or N)
Land based – beach/shore litter	High	Aesthetic, user conflict, danger to wildlife (ingestion of and entanglement in debris items), public health hazard (dangerous debris items, such as broken glass)	No
Land based – dumping	Low	Aesthetic, user conflict, danger to wildlife	No
Land based – storm drains and runoff	High	Aesthetic, user conflict, danger to wildlife (ingestion of and entanglement in debris items), public health hazard (dangerous debris items, such as used syringes), water quality impacts	No
Land based – fishing related (e.g. fishing line, gear)	Low	Aesthetic, danger to wildlife (ingestion of and entanglement in debris items)	No
Great Lakes based – fishing (derelict fishing gear)	Low	Aesthetic, danger to wildlife (potential entanglement in fishing line, nets, etc.)	No
Great lakes based – derelict vessels	Low	Danger to navigation	No
Great lakes based – vessel based (cruise ship, cargo ship, general vessel)	Low	Aesthetic, danger to wildlife, aquatic habitat impacts, water quality impacts	Yes
Hurricane/storm	Low	Unknown	No
Other (please specify) trash wash-up in west Michigan 2008 & 2010. U.S. Coast Guard is investigating source.	High	Aesthetic, user conflict, danger to wildlife, public health hazard (dangerous debris items, such as syringes, medical waste, etc.)	Yes

2. If information is not available to fill in the above table, provide a qualitative description of information requested, based on the best available information.

In most cases, it is not possible to conclusively determine whether the debris on Michigan's beaches is from people using the beach, debris discharged from storm drains or in stormwater runoff, or from recreational or commercial vessels. In 2009, 48% of all debris removed from shorelines and cataloged during the Michigan Coastal Clean-up was from smoking-related activities, 43% was food-related, 1% was medical/hygiene items, 2% balloons, and 6% from other sources.

Top ten items found during the 2009 Michigan Coastal Clean-up:

Cigarette filters	70,784
Food wrappers & containers	24,422
Caps and lids	16,108
Straws and stirrers	8,228
Cigar tips	7,066
Plastic bags	6,400
Cups, plates, eating utensils	5,108
Balloons	4,159
Plastic bottles	3,219
Paper bags	2,033

3. Provide a brief description of any significant changes in the above sources or emerging issues.

In 2008, the United States Coast Guard (USCG) proposed a new final rule under the federal Act to Prevent Pollution from Ships (33 U.S.C. Sections 1901-1912), which would authorize commercial bulk freighters in the Great Lakes to dispose of dry cargo residue overboard. Dry cargo residue is waste that accumulates on the decks of bulk freighters during the loading and unloading of bulk dry cargoes such as coal, cement, iron ore, salt, and limestone. The final rule would have replaced an interim rule currently in effect that limits the areas where ship crews may sweep dry cargo residue overboard. An estimated 250 tons per year of dry cargo residue is discharged into the Great Lakes under the interim rule. The proposed final rule was determined to be inconsistent with Part 95, Watercraft Pollution Control, of the NREPA, a Michigan Coastal Management Program enforceable policy. Due to a number of concerns raised by Great Lakes states, the USCG did not proceed with final rulemaking at that time. However, in the summer of 2010 the agency indicated its renewed interest in developing a final rule.

A potential emerging issue in Michigan relates to the trash wash-ups that occurred in 2008 and 2010 along the eastern Lake Michigan shoreline which included medical waste. However, it has been noted that the trash that washed up both years was preceded by heavy rains and flooding in Milwaukee and Chicago that resulted in large sewage overflows. The USCG is still investigating the source of the trash.

4. Do you use beach clean-up data? If so, how do you use this information?

The MCMP provides small grants to the primary participating environmental organizations that coordinate and implement the annual September Adopt-a-Beach™ Event, which is typically scheduled to coincide with the International Coastal Clean-up. The organizations, Alliance for the Great Lakes and Clean Water Action, submit a summary of the beach clean-up data to the MCMP and provide the full suite of data to The Ocean Conservancy, which uses the information to develop national and international strategies for reducing marine debris. In Michigan, beach clean-up data is used to educate people about the problems caused by marine debris. Section 306 funding has been key to the overall effectiveness and success of the beach cleanups and the Adopt-a-Beach™ program in Michigan.

Data has also been shared with the USCG for their investigation into the beach trash wash-ups in 2008 and 2010. In 2009, a volunteer with the Alliance for the Great Lakes found a commercial ice machine on the beach in Sleeping Bear Dunes. A serial number was found and turned into the Coast Guard who located the ship that lost the ice machine. There is also interest in the clean-up data from researchers examining links between marine debris and beach health issues, for example, the possible link between food waste on public beaches and substantial concentrations of gulls and other scavengers. Gulls are suspected to contribute to bacterial contamination problems that trigger beach closings.

Management characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	Employed by state/territory (Y or N)	Employed by local governments (Y, N, Uncertain)	Significant changes since last assessment (Y or N)
Recycling requirements	No	Yes	No
Littering reduction programs	Yes	Uncertain	No
Wasteful packaging reduction programs	No	No	No
Fishing gear management programs	No	Uncertain	No
Marine debris concerns in harbor, port, marine, and waste management plans	No	No	No
Post-storm related debris programs or policies	No	No	No
Derelict vessel removal programs or policies	No	No	No
Research and monitoring	Yes	Yes	Yes
Marine debris education and outreach	Yes	Yes	Yes
Other (boat shrink-wrap recycling)	No	Yes	Yes

2. For management categories with significant changes since the last assessment provide the information below.

- a. Characterize significant changes since the last assessment;
- b. Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and
- c. Characterize the outcomes and effectiveness of the changes.

Research and Monitoring

The Adopt-a-Beach™ Program organized by the Alliance for the Great Lakes (AGL) in several Great Lakes states was described in the last assessment. The MCMP supports the program in Michigan with annual Section 306 funding. Since its inception, the program has included litter removal and related data collection by volunteers. Recently, the AGL broadened the focus to include the collection of a more holistic suite of beach health assessment data, aligned with a U.S. EPA beach sanitary survey form. The expanded data collection effort will allow AGL to coordinate with public health agencies and researchers to address local beach health issues indicated by the data. For example, in some Great Lakes locations volunteers remove and record an unusually high number of tampons, which may indicate sanitary sewer overflow discharges. In other locations food waste items are of interest as they draw high numbers of birds to the beaches, which can contribute to bacterial contamination problems.

The volunteer beach clean-ups coordinated by the AGL typically address litter and other debris washed up on beaches and shorelines. However, in 2009, the AGL partnered with Friends of the Rouge River in southeast Michigan to remove submerged junk from the river during the September Adopt-a-Beach™ Event. A NOAA marine debris grant provided the major funding for this project.

Education and Outreach

In 2010, the AGL was awarded funding through the Great Lakes Restoration Initiative to advance the Adopt-a-Beach™ Program. In part, the organization plans to use the EPA grant to extend the program to many coastal communities not presently served, including several southeast Michigan locations along the St. Clair and Detroit Rivers. A primary target are coastal communities fringing the Saginaw Bay Area of Concern due to long-standing, significant beach health issues involving algal blooms and substantial accumulations of organic “muck” described in the Public Access Assessment.

Another, broader change related to education and outreach is the increasing profile of Great Lakes debris issues at the national and international level. Indications of this emerging interest include the designation of a Great Lakes regional coordinator for the NOAA Marine Debris Program in 2010. The AGL will be working closely with the regional coordinator and with other stakeholder groups and agencies to help evaluate marine debris issues and develop responses appropriate for the Great Lakes. Another indication is The Ocean Conservancy’s invitation to the AGL to present on the Adopt-a-Beach™ Program at the International Marine Debris Conference scheduled for March, 2011, in Hawaii. The AGL will also contribute a Great Lakes perspective on a draft marine debris monitoring protocol under development by NOAA during a workshop at the conference. The Ocean Conservancy is providing funding support for AGL participation in the 2011 conference. In past years, Section 306 funding supported AGL participation in the conferences.

Other – Boat Shrink-wrap Recycling Program

Many recreational boat owners have their craft stored outdoors during the winter months protected by a layer of shrink-wrap made of low-density polyethylene, or LDPE. After the shrink-wrap is removed in spring, the used plastic is discarded and often ends up in landfills. In 2007 Michigan Sea Grant, through its Clean Marina Program, partnered with an Ohio company that manufactures recycled plastic products on a boat shrink-wrap recycling pilot project in southeast Michigan. The pilot proved successful and the voluntary recycling program is now available statewide. The company, Mondo Polymer Technologies, Inc., arranges for the collection of the used shrink-wrap from interested marinas, yacht clubs, dry marinas, and boat storage yards, including facilities that are not participating in the Clean Marina Program. Michigan Sea Grant developed technical assistance materials on proper handling, bundling, and storage of the used plastic prior to collection. Since 2007, approximately 500,800 pounds of boat shrink-wrap have been diverted from Michigan landfills and made into recycled plastic products such as guardrail blocks, wheel

chairs, lawn edging, plastic banners, decking, and benches. This program operates without CZM funding.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
Research on hypothetical link between food waste on beaches, gull populations, and water quality impacts	Data	Low

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Low

Briefly explain the level of priority given for this enhancement area.

With uncommon exceptions that are typically related to violation of existing laws, marine debris impacts on Michigan’s coast are minimal.

2. Will the CMP develop one or more strategies for this enhancement area?

No

Briefly explain why a strategy will or will not be developed for this enhancement area.

Many needs under the Marine Debris enhancement area are adequately addressed through existing funding, laws, educational services, and voluntary recycling/pollution reduction programs; therefore, Marine Debris is a low priority for Michigan’s Section 309 Enhancement Grants Program.

Cumulative and Secondary Impacts

Section 309 Enhancement Objective

Development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect of various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

- 1. Identify areas in the coastal zone where rapid growth or changes in land use require improved management of cumulative and secondary impacts (CSI) since the last assessment. Provide the following information for each area:**

Geographic area	Type of growth or change in land use	Rate of growth or change in land use (% change, average acres converted, H, M, L)	Types of CSI
Mainland areas of coastal counties	Wind energy development	Anticipated rate of growth through 2016 - High	Habitat fragmentation; direct mortality to bats and birds
Offshore waters of the Great Lakes	Wind energy development	Anticipated rate of growth through 2016 - Low	Direct mortality to bats and birds
Great Lakes islands	Wind energy development	Anticipated rate of growth through 2016 - Medium	Fragmentation of important migration stop-over habitat for bats and birds; direct mortality to bats and birds

Population growth, demographic shifts, and attendant residential development were forecast as important agents of cumulative and secondary impacts on coastal habitats and other resources in the 2006 Assessment. However, decreased availability of mortgages, declining employment, economic uncertainty, and shrinking population have instead contributed to the current trend of slow or negative coastal residential growth in Michigan. The state-wide rate of growth in the number of housing units began to deflate in 2004, a year before the housing unit growth rate began to decline nationally. From 2007 through 2009, Michigan's 42 coastal counties saw a combined net increase of 2,352 housing units, or 0.10%. The highest rate of growth over the three-year period was 1.8% (304 units gained) in Charlevoix County. The highest rate of decrease was -0.63% (102 units lost) in Oceana County. The greatest numerical gain was 1,209 units (1.2%) in Ottawa County. The greatest numerical loss was 2,881 units (-0.34%) in Wayne County.

In 2010, growth of the wind energy industry is anticipated to emerge as the prominent driver of coastal land use change in the next five years. Department of Energy, Labor and Economic Growth (DELEG) data indicate that 144 megawatts (MW) of wind power had been installed in Michigan as of December, 2009. At the time of the 2006 Assessment, less than 2.8 MW of wind power had been installed in the state. The DELEG Energy Systems Bureau forecasts that Michigan will have between 2,000 MW and 2,500 MW of installed wind power by 2015, supplied by an estimated 1,200 wind turbines. Since the recommended spacing between wind turbines is approximately 1,500 feet, commercial wind farms occupy several hundred to thousands of acres. Coastal counties are expected to host a substantial portion of these facilities because of their relatively abundant and reliable wind resources.

Interest in a Great Lakes offshore wind energy industry is strong in Michigan, though offshore wind turbines have yet to be installed. On September 1, 2009, an advisory council appointed by

Governor Jennifer Granholm released its report outlining recommendations for siting and regulating offshore wind farms in Michigan's 38,000 square miles of Great Lakes waters. Preliminary scoping indicates that more than 40% of this area may eventually prove suitable for wind energy facility development. However, there is a need for new state laws and administrative rules to allow construction and operation of wind farms on state-owned bottomlands.

2. Identify sensitive resources in the coastal zone (e.g., wetlands, waterbodies, fish and wildlife habitats, critical habitat for threatened and endangered species) that require a greater degree of protection from the cumulative or secondary impacts of growth and development. If necessary, additional narrative can be provided below to describe threats:

Sensitive resources	CSI threats description	Level of threat (H, M, L)
Birds and bats	Direct mortality by wind turbine blade strikes	High
Onshore wildlife habitat	Fragmentation and reduction in area through wind farm development	High
Offshore waterbird and waterfowl habitat	Loss of foraging habitat necessary for migration and overwintering	Medium

Research conducted at wind farms in the United States has shown that resident and migrating raptors and other birds are killed when they strike or are struck by wind turbine blades. Mortality may be relatively high where prominent landscape features, such as high ridges, direct migrating birds through wind farms. Many birds that typically migrate at night are attracted to artificial lights, including lights affixed to wind turbine towers for aviation safety. This suggests that wind turbines may present a particular hazard to certain bird species such as Neotropical migrant passerines, which are nocturnal migrants. Other research has shown that bats are killed by rotating wind turbine blades. A lethal mechanism other than direct strikes may cause at least some bat mortality; specifically, experiencing the sudden drop in air pressure within the sweep of the rotating blades may fatally damage the bat's lungs and vascular system. This damage has been termed "barotrauma."

All birds and bat species breeding in or migrating through Michigan's coastal zone, including Great Lakes offshore waters and islands, may be susceptible to direct mortality through wind turbine impacts. The potential for bird impacts would be influenced by the proximity of operating wind turbines to breeding locations, migration routes, and stop-over habitat. The potential for bat impacts would be influenced by the proximity of operating wind turbines to occupied foraging habitat and migration corridors.

Potential bird and bat impacts include direct mortality of threatened and endangered species. Twenty-four bird species are listed pursuant to the provisions of Part 365, Endangered Species Protection, of the NREPA. Of this number, nine species are designated as endangered, 14 as threatened, and one as extirpated from Michigan. Most of the 23 extant species are migratory. Two of these migratory state-listed species, the piping plover and Kirtland's warbler, are listed as endangered under the federal Endangered Species Act (P.L. 93-205). Two bat species are listed pursuant to Part 365 of the NREPA, with one species each designated as endangered and threatened. The state-listed endangered Indiana bat is also federally endangered.

Construction and operation of wind farms and supporting infrastructure such as roads and transmission lines has the potential to destroy, degrade, and fragment wildlife habitat, including habitat in the coastal zone important for birds and bats. Habitat on the mainland and Great Lakes

islands is used by migrating and breeding birds, while certain areas in the offshore waters of the Great Lakes and connecting channels are important rafting locations for migrating and wintering waterbirds and waterfowl. The U.S. Fish and Wildlife Service (USFWS) has designated critical habitat for two federally-endangered species, the piping plover and Hine's emerald dragonfly, in the coastal zone of 15 Michigan counties.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management Categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Regulations	No	No – however additional background is provided below
Policies	No	No
Guidance	Yes	Yes
Management plans	No	No – however additional background is provided below
Research, assessment, monitoring	Yes	Yes
Mapping	Yes	Yes
Education and Outreach	No	No – however additional background is provided below

Regulations and Policies

Siting of onshore, commercial wind energy facilities on private lands in Michigan is subject to local zoning; it is not subject to state or federal control. Yet, assessment of potential wildlife impacts requires a sophisticated level of analysis beyond the capacity and resources of most local government units. Michigan's Great Lakes bottomlands are owned by the State and future offshore wind energy projects would be subject to State review, approval, and control. However, there is consensus that the current State statutes and rules addressing developments on bottomlands are insufficient to manage offshore wind energy development.

Guidance

Wildlife mortality caused by wind energy facilities may be subject to the provisions of Part 365 of the NREPA and federal statutes including the Migratory Bird Treaty Act (16 U.S.C. 703-712), Endangered Species Act, and Bald and Golden Eagle Protection Act (16 U.S.C. 668a-d). Since 2006, the DNR Wildlife Division has encouraged wind energy developers to participate in informal, non-binding consultations that involve staff from the Lansing Office, local field biologists, and staff from the USFWS - East Lansing Field Office with the objective of addressing potential wildlife impacts early in the wind energy facility development process. The consultations provide developers the opportunity to learn of protected species issues specific to the area of the proposed development, and discuss agency recommendations relevant to project siting and design. For example, Wildlife Division staff recommends that developers obtain a free Environmental Review of the proposed project site to identify known occurrences of threatened and endangered species in the vicinity. Environmental Reviews are based on protected species location information in the Biotics database, maintained by the Michigan Natural Features Inventory (MNFI). A generic recommendation from USFWS Region III, which includes Michigan, is to avoid siting wind farms within three miles of the Great Lakes shoreline, and within five miles of bald eagle nests.

Management Plans

No state-level management plans for onshore or offshore wind energy development have been developed. Two county-level wind energy land use plans have been developed with Section 306 CZM funding, for Manistee and Alpena Counties.

Research, Assessment, and Mapping

The Environmental Protection Agency, Great Lakes National Program Office funded the 2010 report, *Islands of Life: A Biodiversity and Conservation Atlas of the Great Lakes Islands*, prepared by the Ontario Ministry of Natural Resources, Nature Conservancy of Canada, and The Nature Conservancy, Great Lakes Program. The report is based on a comprehensive assessment and ecologically-based analysis of the biodiversity values, threats, and conservation needs of Great Lakes islands in U.S. and Canadian waters. Notably, the report identifies islands that harbor nesting colonies of terns, herons, and other waterbirds.

The MCMP has used Section 309 CZM funding for two migratory bird and bat research projects relevant to wind farm siting and operation for certain areas of the coastal zone, specifically, Saginaw Bay and northern Lake Michigan. The results of the individual studies, when completed, will apply to limited geographic areas and inform wind project siting decisions at the local level, for example, through the coordinated Wildlife Division and USFWS project consultation process, and through the conservation information products the MNFI develops and provides to local land use planners (information on MNFI conservation planning services is available at the following URL: <http://web4.msue.msu.edu/mnfi/services/consplan.cfm>).

The MCMP has also provided Section 309 funding to the Institute for Fisheries Research, a collaboration between the University of Michigan and DNR Fisheries Division, to develop a GIS-based decision support tool (DST) for informing decisions on the siting of offshore wind farms and other developments on Michigan’s Great Lakes bottomlands at multiple scales, including the lake-wide or regional level. The intent behind the development of the DST is to serve future guidance on offshore wind farm siting to state regulators and the wind energy industry. However, GIS data on migratory bird and bat use of coastal and offshore areas are largely lacking, and is recognized as a critical need to improve the utility and effectiveness of the DST as a source of guidance. In this respect, the two migratory bird and bat research projects mentioned in the above paragraph may be counted among Michigan’s early steps toward amassing the body of research needed to comprehensively characterize offshore migration and habitat use at the lake-wide or regional spatial scales.

Education and Outreach

The State has not developed a program or materials to educate the public about potential Michigan-specific wildlife impacts of onshore or offshore wind energy development.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of Priority (H, M, L)
State statutes and administrative rules addressing offshore wind energy developments	Regulatory, policy	High

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of Priority (H, M, L)
Comprehensive research and GIS mapping of coastal and offshore bird and bat migration routes and stop-over habitat	Data	High
Updated occurrence information on threatened and endangered species within the coastal zone, to inform the Environmental Review process	Data	Medium
County-level guidance for local governments and wind energy developers on siting onshore wind farms to avoid or minimize wildlife impacts	Training, communication and outreach	High
Monitoring of offshore wind farm wildlife impacts	Data	Low
Public outreach and education on Michigan-specific wildlife issues relevant to coastal and offshore wind farm siting and operation	Communication and outreach	Medium

In the next few years Michigan will begin a comprehensive effort to manage the cumulative and secondary impacts of coastal and offshore wind energy development. Some components of this effort can be addressed with Section 309 funding support, including development of a State regulatory program for offshore wind energy, guidance for state regulators and the wind energy industry on siting offshore wind farms to avoid or minimize wildlife impacts, and collection of wildlife research and survey data specific to coastal and offshore areas to serve as the foundation for the guidance. Other components can be addressed with Section 306 funding or State funding, including technical assistance for local governments and the wind energy industry on avoiding wildlife impacts associated with coastal onshore wind farms, and public education on Michigan-specific wildlife issues related to wind farm development and operation.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

High

Briefly explain the level of priority given for this enhancement area.

The rapid growth of the onshore wind energy industry and intense interest in offshore wind energy development in Michigan has put State and local government in the position of promoting wind energy for its economic and environmental benefits while assuming responsibility for protecting coastal resources, including public trust resources, from associated impacts. Presently, the information base on coastal and offshore resources is insufficiently developed to allow regulatory agencies to make fully informed decisions on balancing promotion of the industry with protection of certain resources, particularly migratory birds, bats, and other protected species of Michigan's Coastal Zone. This information would also assist wind energy developers in early project planning.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes

Briefly explain why a strategy will or will not be developed for this enhancement area.

A strategy will be developed to build the needed information base and State agency capacity for managing offshore wind energy development to provide for coastal resource protection. The major elements of this strategy are collection of research-based GIS data on migratory bird, bat, and protected species use of coastal and offshore areas for incorporation into the lakebed alterations DST, and development of a DEQ-administered regulatory program for managing the leasing of bottomlands for offshore wind development projects and the construction, operation, and decommissioning of these projects.

Special Area Management Planning

Section 309 Enhancement Objective

Preparing and implementing special area management plans for important coastal areas

The Coastal Zone Management Act (CZMA) defines a Special Area Management Plan (SAMP) as “a comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies; standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone. In addition, SAMPs provide for increased specificity in protecting natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous areas, including those areas likely to be affected by land subsidence, sea level rise, or fluctuating water levels of the Great Lakes, and improved predictability in governmental decision making.”

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

Identify geographic areas in the coastal zone subject to use conflicts that can be addressed through special area management plans (SAMP). Also include areas where SAMPs have already been developed, but new issues or conflicts have developed that are not addressed through the current plan. If necessary, additional narrative can be provided below:

Geographic Area	Major conflicts	Is this an emerging or a long-standing conflict?
St. Clair River Delta	Historic private development on publicly-owned Great Lakes bottomlands	Long-standing
Offshore waters of the Great Lakes suitable for wind energy development	Natural resource, navigation, recreation, and other impacts from offshore wind farms	Emerging

St. Clair River Delta

The St. Clair Flats is a geographically discrete area in the St. Clair River Delta, in Lake St. Clair. It is subject to state management guidelines; however, the area is not subject to a formal SAMP. Most or all of the Flats is Great Lakes bottomlands and below the 100-year flood elevation. The Delta is a productive and regionally important wetland habitat for fish and wildlife, and has a centuries-long history of use by hunters, anglers, and trappers.

At the end of the 19th century the Michigan Legislature formalized the occupation of a portion of the Delta bottomlands near Harsen’s Island by platting almost 2,000 lots. The Legislature provided for the leasing of these lots under the St. Clair Flats Act (Public Act 326 of 1913, as amended; now Part 339, Control of Certain State Lands, of the NREPA). Since then, some of these lots have reverted to State ownership, some have been deeded to private ownership, and the remaining lots are leased for a term of 99 years. The remaining leases will begin to expire in 2013; Part 339 does not provide for new leases or extensions to existing leases. Development on lots deeded to private owners is subject to the permitting and other requirements established under various Parts of the NREPA and administrative rules, including Part 325, Great Lakes Submerged Lands. The DEQ staff that administers the Part 339 and Part 325 Programs is supported by Section 306 CZM funds.

The options available to the DEQ for disposition of individual leased lots include converting leases for developed lots to deeds pursuant to the provisions of Part 339, or allowing the lease to expire to

regain State ownership. The St. Clair Flats Management Recommendations, developed in 1979, help guide the Department in determining the disposition of the remaining leases. One aspect of the Department’s general management approach is consolidating State ownership by acquiring the private interests in tracts of leased land that are not developable, and restoring habitat on these lands. The other aspect is concentrating private development in areas that can be served by public utilities. Prior to the State’s completion of a deed conversion to private ownership, the waste disposal system for that leased lot must be approved by the county health department. The private development must also be protected from damage and destruction as a result of wave action, high water levels, and storms on Lake St. Clair.

Offshore Regions Suitable for Wind Energy Development

As described in the Great Lakes Resources Assessment and Cumulative and Secondary Impacts Assessment, the construction and operation of offshore wind energy facilities in Michigan’s Great Lakes is increasingly likely, and will constitute an unprecedented level of development and occupation of State-owned, offshore bottomlands. At present, five “Wind Resource Areas” totaling 13,339 square miles of Great Lakes bottomlands are classified as “most favorable” for offshore wind energy development by the Michigan Great Lakes Wind Council (the October, 2010 report is posted at: http://www.michiganlowcouncil.org/GLOWreportOct2010_with%20appendices.pdf). However, it is expected that additional offshore areas will be targeted for wind energy projects in coming years as the technology for constructing and operating wind turbines in deep waters advances.

Offshore wind energy facilities will represent an additional use of waters and public trust bottomlands that are already used for commercial and recreational navigation, commercial and recreational fisheries, military purposes, fish and wildlife populations and habitat, public and industrial water supply, and other uses. The bottomlands also support shipwrecks, other submerged cultural artifacts, *in situ* remnants of prehistoric, Ice Age forests valuable in climate research, and other archaeological and paleontological resources. As witnessed by the recent, negative and vigorous public reaction to proposed wind farms within sight of the Lake Michigan shoreline, coastal waters are also prized for their aesthetic qualities.

At present, individual uses are addressed under a variety of limited-focus laws, treaties, and policies; no comprehensive statute or policy addresses balancing and managing the competition among offshore uses and values, much less in a way that protects natural resources, including public trust resources.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

- 1. Identify below any special management areas in the coastal zone for which a SAMP is under development or a SAMP has been completed or revised since the last Assessment:**

SAMP Title	Status (new, revised, or in progress)	Date approved or revised
No formal SAMP exists or is under development for an area in Michigan’s Coastal Zone	N/A	N/A

Michigan has not developed or adopted a SAMP, and there is no interest in SAMP development at this time.

2. For management categories with significant changes since the last assessment, provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information.
- a) Characterize significant changes since the last assessment (area covered, issues addressed and major partners);
 - b) Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and
 - c) Characterize the outcomes and effectiveness of the changes.

Not applicable.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy).

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
Spatial information on uses and resources of all of Michigan's Great Lakes bottomlands and waters	Data	High
Comprehensive, inclusive approach to balancing competing uses and values of all of Michigan's Great Lakes bottomlands and waters	Regulatory, policy, capacity, communication and outreach	Medium

No priority needs or information gaps have been identified specifically for the St. Clair River Delta at this time.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Medium

Briefly explain the level of priority given for this enhancement area.

The Obama Administration's July 19, 2010 Executive Order establishing a National Policy for the Stewardship of the Ocean, Our Coasts, and the Great Lakes calls for comprehensive, integrated, ecosystem-based, coastal and marine spatial planning and management for the nation's coastal waters, including Great Lakes waters. The Executive Order creates the expectation that Michigan will participate in the development and implementation of such a plan for the Great Lakes.

2. Will the CMP develop one or more strategies for this enhancement area?

No

Briefly explain why a strategy will or will not be developed for this enhancement area.

The Executive Order directs the newly-established National Ocean Council to develop a strategic action plan for implementing coastal and marine spatial planning over the next several months. The MCMP believes that it is prudent to wait until the Council finalizes the action plan in consultation with the Great Lakes states to decide how to prepare for the development of a State and regional coastal and offshore spatial plan.

Great Lakes Resources

Section 309 Enhancement Objective

Planning for the use of ocean/Great Lakes resources.

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

- 1. In the table below, characterize Great Lakes resources and uses of state concern, and specify existing and future threats or use conflicts:**

Resource or use	Threat or use conflict	Degree of threat (H, M, L)	Anticipated threat or use conflict
Fisheries	Aquatic nuisance species	High	High
Lighthouses	Property issues/maintenance	Low	Low
Recreation	Access	Low	Low
Water quality	Contamination	Low	Low
Underwater archaeological resources	Preservation	Low	Low
Drilling for oil and gas	Pollution/contamination	Low	Low
Shipping	Navigability due to low water levels	Low	Low
Fresh water	Water diversion	Low	Low
Offshore wind energy	Recreation, navigation, environmental	High	High

- 2. Describe any changes in the resources or relative threat to the resources since the last assessment.**

Fisheries and Aquatic Nuisance Species

The 2006 Assessment identified threats from new Aquatic Nuisance Species (ANS) that included the potential invasion of the Asian carp into the Great Lakes through the Chicago Sanitary and Ship Canal. The threat of the Asian carp entering the Great Lakes has increased substantially since then as occurrences have been documented in 2009 less than 10 miles from Lake Michigan. Asian carp present a severe threat to the Great Lakes ecosystem due to their high degree of mobility, rapid rate of reproduction, and a voracious appetite. More than 180 non-native aquatic species have become established in the Great Lakes to date, representing an estimated economic loss of \$5.7 billion annually. An Asian carp invasion would be expected to have more serious environmental and economic consequences than any of the preceding invaders.

Multiple efforts to address threats posed by the Asian carp are ongoing at the federal, state and regional level, including initiation of a study by the Great Lakes Commission and the Great Lakes and St. Lawrence Cities Initiative to develop and evaluate scenarios for separating the Mississippi River and Great Lakes watersheds, focusing on the Chicago area waterway system. The U.S. Army Corps of Engineers is also initiating a multi-year study to separate the Mississippi River Basin from the Great Lakes Basin, called the Great Lakes Mississippi River Interbasin Study. The DNR and DEQ are also taking steps to identify effective actions. For example, the DNR recently released the "Proposed Plan for the Prevention, Detection, Assessment, and Management of Asian Carps in Michigan Waters." The Proposed Plan contains strategies for prevention, communication, detection, assessment, and management. The principal focus is on preventing the establishment of Asian carp in Michigan waters to avoid negative ecological, recreational, and economic effects.

The DNR Fisheries Division, Law Enforcement Division, and the Michigan Department of Agriculture and Rural Development are coordinating to implement prevention strategies with partner agencies and the public.

Other ANS such as the zebra mussel, quagga mussel, and round goby continue to require attention and management due to their ability to threaten the diversity and abundance of native species and the ecological stability of the lakes. Additionally new species of invaders continue to be identified, such as the bloody red shrimp. Since 1996, Michigan has had an approved statewide Aquatic Nuisance Species (ANS) State Management Plan that has guided Michigan's actions and decision-making to prevent the introduction and spread of AIS within and throughout Michigan waters and the Great Lakes. The DEQ is using U.S. Fish and Wildlife Service Great Lakes Restoration Initiative (GLRI) Fiscal Year 2010 funding to increase capacity for a coordinated state-wide approach to AIS prevention and control in Michigan. Over the five-year period of the GLRI, the DEQ will create and implement a comprehensive AIS program in the state. The primary goal of Michigan's program is to identify and block pathways used by non-native species to enter the state or spread within the state. A concurrent goal is to prevent establishment of new species if prevention plans fail. The goals will be accomplished through regulations, education, research, coordination, early detection, rapid response, and assessment as implemented under Michigan's ANS State Management Plan. Michigan's ANS State Management Plan is available at www.michigan.gov/deqaquaticinvasives.

Oil and Gas Drilling

The 2010 BP Deepwater Horizon incident in the Gulf of Mexico and the Enbridge oil spill in Marshall, Michigan, which caused approximately 800,000 gallons to reach the Kalamazoo River, raised public concern over the potential for oil spill impacts in the Great Lakes. The Enbridge spill was captured far upstream from Lake Michigan. However, the event triggered introduction of a package of legislative bills that would have put to vote a constitutional ban on drilling in Michigan's Great Lakes waters. The bills were not passed. It is not clear what impact a constitutional ban would have, since Michigan's Great Lakes currently are off limits to new drilling (both platform and directional) under State and federal law, as described in the 2006 Assessment.

Diversion of Great Lakes Waters

Through the Council of Great Lakes Governors, the governors of Michigan, Illinois, Indiana, Minnesota, New York, Ohio, Pennsylvania and Wisconsin, and the premiers of Ontario and Québec have taken the lead in protecting the Great Lakes and St. Lawrence River Basin. On December 13, 2005, the Great Lakes governors and premiers signed the Great Lakes-St. Lawrence River Basin Sustainable Water Resources Agreement. At the same time, the governors endorsed the companion Great Lakes-St. Lawrence River Basin Water Resources Compact. These documents detail how the states and provinces will cooperatively manage and protect the waters in the Basin, and provide a framework for each state and province to enact measures for its protection. The documents include the following points:

- There will be a ban on new diversions of water from the Great Lakes Basin. Limited exceptions could be allowed if specific conditions are met, such as for public water supply purposes in communities near the Basin when the diverted water less consumptive use is returned to the Great Lakes Basin.
- The states and provinces will use a consistent standard to review proposed uses of Basin water.
- The collection of technical data will be strengthened, and the states and provinces will share the information to improve decision-making by the governments.

- Regional goals and objectives for water conservation and efficiency will be developed, and reviewed every five years. Each state and province will develop and implement a water conservation and efficiency program.
- Economic development will be fostered through the sustainable use and responsible management of Basin waters.
- The waters of the Basin are recognized as a shared public treasure and there is a strong commitment to continued public involvement in the implementation of the agreements.

In February, 2006 Governor Jennifer M. Granholm signed landmark legislation that allows the State to manage large quantity water withdrawals of over 100,000 gallons per day, and prohibits withdrawals that would have an adverse impact on the water resource. The legislation requires all bottled water operators with withdrawals of over 250,000 gallons per day to meet certain requirements; including avoiding impacts to common law riparian water rights.

In 2008, the Governor signed legislation that further defined the “adverse resource impact standard” in numeric terms and called for development of an online water withdrawal assessment tool. The assessment tool became available online on July 9, 2009 through a joint effort of the DNR, DEQ, Michigan State University, and the United States Geological Survey. It provides the ability for DEQ regulatory staff and prospective water users to determine in real time whether a proposed withdrawal would cause an adverse resource impact. The 2008 legislation also adopts and implements in Michigan the Great Lakes Compact.

Offshore Wind Energy

The siting of offshore wind energy facilities became a priority issue for Michigan during the assessment period and is expected to be a high priority during the 2012-2016 timeframe. The U.S. Department of Energy has predicted significant growth in both onshore and offshore wind energy production in its report “20% Wind Energy by 2030: Increasing Wind Energy’s Contribution to U.S. Electricity Supply.” The National Renewable Energy Laboratory has reported that “Offshore wind generated electricity in the United States has the potential to become a major contributor to the domestic energy supply . . . because it can compete in highly populated coastal energy markets where onshore wind energy is generally not available” (Musial, 2004).

Michigan is well positioned to capitalize on its offshore wind energy potential, given its location in the heart of the Great Lakes population center, abundant offshore wind resources, and a wealth of Great Lakes bottomland areas. Of the more than 38,000 square miles of Great Lakes bottomlands within Michigan’s boundaries, 7,874 square miles have a depth of 30 meters or less, which is currently the practical limiting depth for offshore wind development. A study released by Michigan State University’s Land Policy Institute (Adelaja, 2008) indicated that Michigan’s portion of the Great Lakes could produce nearly 322,000 megawatts of power from wind – an amount equal to roughly one-third of all electricity generated nationwide. Realizing this large potential would require placing a large number of turbines in the Lakes.

Several management challenges and potential use conflicts have emerged through recent investigations surrounding offshore wind energy production. A number of these challenges relate to two key issues: 1) The State of Michigan is the owner of, and provides for Public Trust protection over Great Lakes bottomlands from the ordinary high watermark lakeward to the respective state/international boundary lines; and 2) the primary law - Part 325, Great Lakes Submerged Lands, of the NREPA - regulating bottomland alterations was enacted prior to interest in a Great Lakes offshore wind energy industry and does not provide for the siting of offshore wind facilities. New legislation addressing offshore wind energy development is needed to address shortfalls in existing state statutes, and a DEQ staff partly supported with Section 306 funding has been assisting a legislative work group focused on developing such legislation.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Comprehensive great lakes management plan or system of marine protected areas	Yes	Yes
Regional comprehensive great lakes management program	Yes	No
Regional sediment or dredge material management plan	No	No
Intra-governmental coordination mechanisms for great lakes resources	Yes	No
Single-purpose statutes related to great lakes resources	Yes	No
Comprehensive great lakes management statute	Yes	No
Great lakes resource mapping or information system	Yes	Yes
Great lakes habitat research, assessment, or monitoring programs	Yes	Yes – refer to the wetlands assessment for a description of the new GLRI-funded great lakes coastal wetland monitoring program
Public education and outreach efforts	No	No

2. For management categories with significant changes since the last assessment, provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information.

- a) Characterize significant changes since the last assessment;
- b) Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and
- c) Characterize the outcomes and effectiveness of the changes.

Great Lakes Marine Protected Areas

The Grand Traverse Bay State Bottomland Preserve was established in 2008 through amendment to the administrative rules for Part 761, Aboriginal Records and Antiquities, of the NREPA. The new bottomland preserve encompasses approximately 295 square miles of Lake Michigan bottomlands and surface waters and includes the East and West Arms of Grand Traverse Bay. Several known shipwreck sites are located in the preserve, and many more ships are documented as lost in Grand Traverse Bay. This effort was not driven with Section 309 CZM funds, however, the DEQ staff involved in this process was partially supported with 306 funding.

Regional Comprehensive Great Lakes Management Program

The 2006 Assessment outlined the development of the Great Lakes Regional Collaboration (GLRC), Strategy to Restore and Protect the Great Lakes (released December 12, 2005), and the GLRC Implementation Framework. The GLRC is a cooperative effort to design and implement a

strategy for the restoration, protection and sustainable use of the Great Lakes. In response to the GLRC Strategy, the DEQ Office of the Great Lakes developed the Michigan Great Lakes Protection and Restoration Initiative and the MI-Great Lakes Plan (http://www.michigan.gov/documents/deq/MI-GLPlan_262388_7.pdf), intended to foster the protection, restoration, and sustainability of Michigan's Great Lakes for current and future generations.

Development of the MI-Great Lakes Plan was not funded with Section 309 or 306 funding. However, a number of the strategies proposed in this document will advance priorities listed in the Plan. For example, the MI-Great Lakes Plan presents a path forward towards a "Blue Water Economy" and identifies the great potential in economic growth around new specialized industries such as offshore wind energy production. The 309 strategy to build a regulatory program and implement administrative rules for the prudent development of offshore wind energy facilities would foster this much-needed economic growth in a way that protects coastal resources from associated impacts. The Section 309 strategy to revise the High Risk Erosion Area regulations would promote the resource protection called for in the MI-Great Lakes Plan regarding Habitat and Species Protection. Specifically, this strategy will help to address some of the key threats identified in the plan which include the loss of habitats in the highly productive nearshore and coastal zone as a result of development and shoreline hardening. The Section 309 strategies related to wetlands will also support concepts identified in the MI-Great Lakes Plan focused on the need for improved protection and restoration of coastal wetlands.

Great Lakes Resource Mapping or Information System

Increased interest in offshore wind energy development is addressed earlier in this Assessment and in the Cumulative and Secondary Impacts Assessment. A significant advance is the GIS-based Lakebed Alterations Decision Support System developed through various phases of CZM Section 309 grant-funded projects with the Institute for Fisheries Research – a collaboration between the University of Michigan and DNR Fisheries Division. The focus of the project is a GIS-based decision support tool (DST) to inform decisions on the siting of offshore wind farms and other developments on Michigan's Great Lakes bottomlands.

An early version of the lakebed alterations DST was made available to the Governor's Great Lakes Offshore Wind (GLOW) Council and ultimately was the tool of choice in the Council's determination of Michigan's five offshore Wind Resource Areas (WRAs). The Council issued two successive reports, on September 1, 2009, and October 1, 2010. The first report identified areas in Michigan's Great Lakes considered most favorable for development of offshore wind energy facilities, and included recommendations for legislative and rule changes to guide the development of offshore wind energy. The second report included refined mapping efforts following incorporation of additional and updated data sets into the analysis, which resulted in modifications to the previously identified WRAs. The second report also included a proposed legislative framework for permitting and bottomland leasing, and discussion on an appropriate public engagement process to be incorporated into any future permitting program.

The lakebed alterations DST has already proved influential in planning for offshore wind energy and will become increasingly important over the next five years. Plans for the 2012-2016 timeframe include enhancing the DST to serve as both a decision support system for regulators reviewing lease nominations and permit applications under expected new offshore wind energy siting laws, as well as a tracking system for associated offshore bottomland leases, facility installations, and other required parameters. High quality, updated data layers are a key component of a well-functioning DST that properly informs the user, as was shown through the revised mapping conducted between publications of the two GLOW Council reports. The mapping in the 2010 report reflected at least partly updated data on shipping lanes, threatened and endangered

species, and fish spawning areas, and a new method of accounting for commercial fishing within the mapped environment. These data improvements led to shifts in the location of the WRAs identified in the 2010 report versus the 2009 report. Significantly, the WRA in Saginaw Bay was relocated outside of the Bay into the main body of Lake Huron.

Future improvements in GIS data coverage and currency are expected to revise the identification of areas suitable for offshore wind energy development in a similar way. Specifically, resource management agencies and the wind energy industry recognize that the information base on coastal and offshore resources is insufficiently developed to allow regulatory agencies to make fully informed decisions on balancing promotion of the industry with protection of certain resources. In particular, research-based data on near-shore fisheries habitat and use of coastal and offshore areas by migratory birds, bats, and other protected species of Michigan's Coastal Zone are largely lacking. These missing data are seen as critical gaps in the information needed for regulators and wind energy developers to make decisions on offshore wind project siting and design.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the MCMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
State statutes and administrative rules addressing offshore wind energy developments	Regulatory, policy	High
Research and GIS mapping of coastal and offshore bird and bat migration routes and stop-over habitat	Data	High
Research and GIS mapping of near-shore fisheries habitat and updated fish spawning data	Data	High
Monitoring of offshore wind farm wildlife impacts	Data	Low

Enhancement Area Prioritization

- 1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?**

High

Briefly explain the level of priority given for this enhancement area.

Development of offshore wind farms in the Great Lakes will represent construction on and occupation of the Public Trust submerged lands to an unprecedented degree. To ensure that future offshore wind energy development minimizes impacts to coastal resources and the Public Trust, it is an MCMP priority that appropriate laws governing these developments are in place, and regulatory reviews and decisions incorporate complete, up-to-date, and relevant data.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes

Briefly explain why a strategy will or will not be developed for this enhancement area.

A strategy will be developed to build the needed information base and State agency capacity for managing offshore wind energy development to provide for coastal resource protection. This strategy includes collection of research-based GIS data on migratory bird, bat, and protected species, use of coastal and offshore areas, and near-shore fisheries habitat for incorporation into the lakebed alterations DST that will be used to serve regulatory guidance. It also supports development of a DEQ-administered regulatory program for managing the leasing of bottomlands for offshore wind development projects and the construction, operation, and decommissioning of these projects.

Energy and Government Facility Siting

Section 309 Enhancement Objectives

Adoption of procedures and enforceable policies to help facilitate the siting of energy facilities and Government facilities and energy-related activities and Government activities which may be of greater than local significance

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

- In the table below, characterize the types of energy facilities in your coastal zone (e.g., oil and gas, liquefied Natural Gas (LNG), wind, wave, Ocean Thermal Energy Conversion (OTEC), etc.) based on best available data. If available, identify the approximate number of facilities by type:**

Type of Energy Facility	Exists in CZ (# or Y/N)	Proposed in CZ (# or Y/N)	Interest in CZ (# or Y/N)	Significant changes since last assessment (Y or N)
Oil and gas facilities	950 active oil and gas wells in coastal counties, all in the Lower Peninsula	Yes	Yes	Yes
Pipelines	Yes – natural gas and/or petroleum product pipelines run through 36 of the 41 coastal counties	No	Unknown	No
Electric transmission cables	Yes – 69 kilovolt or higher transmission lines run through most coastal counties	Yes	Yes	Yes
LNG	No	No	No	No
Wind	Approximately 322 megawatts installed or planned for installation in coastal counties through the end of 2010	Yes – refer to discussion under Question #2	Yes	Yes
Wave	No	No	Unknown	No
Tidal	No	No	No	No
Current (ocean, lake, river)	1	1	Yes	No – pilot-scale projects exist or are proposed
OTEC	No	No	Unknown	No

Type of Energy Facility	Exists in CZ (# or Y/N)	Proposed in CZ (# or Y/N)	Interest in CZ (# or Y/N)	Significant changes since last assessment (Y or N)
Solar	Approximately 0.48 megawatts installed or planned for installation in coastal counties through the end of 2010	Yes	Yes	No – not a significant source of energy at present; facilities do not depend on or benefit from a coastal location
Other – coal-fired power plants	27 in coastal counties	Yes	Yes	Yes
Other – hydroelectric pumped storage facilities	1	No	No	No
Other – hydroelectric dams	47 in coastal counties	No	Unknown	No
Other – nuclear power plants	3 in operation, all in coastal counties	No	No	No

2. Please describe any significant changes in the types or number of energy facilities sited, or proposed to be sited, in the coastal zone since the previous assessment.

Gas Facilities

Oil and gas production has been ongoing in many areas of Michigan’s Lower Peninsula for several decades, including many coastal counties. Oil and gas exploration and production in Michigan are subject to statutes, rules, and orders administered by the Department of Natural Resources and Environment. Part 615, Supervisor of Wells, of the NREPA provides for regulatory oversight including promulgation of administrative rules.

DEQ records of oil and gas permits issued every year since 1927 provide a basic measure of oil and gas industry activity in the state. Annual permit totals indicate a period of comparatively intense exploration and production lasting from the early 1980’s through the mid-1990s and peaking in 1992 when the State issued 2,024 permits. Industry activity has continued at lower levels in recent years with an average of 646 new permits issued annually from 2006 through 2009.

A potentially significant change since the 2006 Assessment relates to recent, sudden interest in natural gas in formations called the Collingwood and Utica Shales. The gas in these formations lies at depths ranging from 9,000 to 10,000 feet below the surface, far beneath the gas in the 1,500 to 2,000 foot-deep Antrim Shale formation that fueled the exploration and production activity in the 1980s and 1990s. The interest in the deep formations was sparked by a recent exploratory well drilled in Missaukee County that initially produced 2.5 million cubic feet per day. Subsequently, the May 4, 2010 oil and gas lease auction held by the DNR netted \$178 million from oil and gas companies bidding for the right to explore for and produce natural gas and oil on leased, state-owned lands. Given that cumulative sales from all previous State oil and gas lease auctions since 1929 totaled \$190 million, it appears that gas companies may be preparing to launch a boom in

exploration and possibly production focused on these deep formations. Pipeline construction often follows trends in oil and gas production, and increased gas production may prompt demand for new pipeline projects.

If exploration shows that the gas resources are economically profitable, production from the deep formations will require horizontal drilling and an extraction process called hydraulic fracturing that involves high-pressure injection of a mix of sand, water, and chemicals into the shale to widen naturally occurring fissures in the rock. The water mixture is then pumped back to the surface and the natural gas flows through the widened fissures, into the pipe and up to the wellhead. Hydraulic fracturing in these deep formations often uses millions of gallons of fresh water per project, and produces comparable volumes of flowback waste water. Proper management of flowback water is essential in protecting public health and the environment. In Michigan, all flowback water (as well as water produced along with oil and gas during subsequent production operations) is considered an oil and gas waste and must be managed and disposed of according to strict rules specifically applying to those fluids. The fluids must be contained in steel tanks and transported to disposal wells where they are injected into deep rock layers that are isolated from fresh water supplies. The disposal wells are licensed by both the DEQ and the U.S. Environmental Protection Agency, and must be tested periodically to assure well integrity.

Wind Energy and Electric Transmission Cables

Department of Energy, Labor and Economic Growth (DELEG) data indicate that 144 megawatts (MW) of wind power had been installed in Michigan as of December, 2009. At the time of the 2006 Assessment, less than 2.8 MW of wind power had been installed in the state. The DELEG Energy Systems Bureau forecasts that Michigan will have between 2,000 MW and 2,500 MW of installed wind power by 2015, supplied by an estimated 1,200 wind turbines. Coastal counties are expected to host a substantial portion of these facilities because of their relatively abundant and reliable wind resources. Demand for new electric transmission lines will accompany increased wind power generation.

At least 122 MW of wind power have been installed in Huron County, which borders Lake Huron and Saginaw Bay. The Michigan Public Service Commission (PSC) is reviewing a request from a power transmission company to install a 120-mile extension of a 345 kilovolt (kV) electric transmission line into Huron County. The new line would increase the wind energy transmission capacity in the area by 5,000 MW. The PSC must complete its review and decision on the request by the end of February, 2011.

Interest in a Great Lakes offshore wind energy industry is strong in Michigan, though offshore wind turbines have yet to be installed. On September 1, 2009, an advisory council appointed by Governor Jennifer Granholm released its first report outlining recommendations for siting and regulating offshore wind farms in Michigan's 38,000 square miles of Great Lakes waters. Preliminary scoping indicates that more than 40% of this area may eventually prove suitable for wind energy facility development.

Coal-Fired Power Plants

Under Part 55, Air Pollution Control, of the NREPA the DEQ has the authority to issue permits for emissions from new coal-fired power plants and other sources of air pollution. The DEQ has the authority to administer the federal Clean Air Act (CAA) within Michigan. Part 55 permits are issued to satisfy the requirements of the CAA.

Michigan Air Pollution Control Rules and Section 165(a)(2) of the CAA, allow for the consideration of alternatives to a given proposal, including a new coal-fired power plant. An alternatives analysis may evaluate, among other things, construction of new, non-coal burning, electric power

generation facilities; new coal-burning technologies that reduce or sequester emissions; electricity demand reduction through energy efficiency programs or load management; and generation or purchase of electricity from existing power generation facilities. The DEQ analysis of alternatives under Section 165(a)(2) of the CAA and Rule 1817(2) can include consideration of need for the proposed facility. Under a Memorandum of Understanding entered between the DEQ and the PSC on April 1, 2009, the PSC provides technical assistance to the DEQ in making determinations on alternatives to and need for new coal-fired power generation.

Since the 2006 Assessment the DEQ Air Quality Division has received four applications for new coal-fired power facilities in coastal counties. Two applications have been denied, one approved, and one issued then voided so that issues identified during the course of an appeal could be addressed.

3. Does the state have estimates of existing in-state capacity and demand for natural gas and electric generation? Does the state have projections of future capacity? Please discuss.

Pursuant to Executive Directive 2006-02, the PSC prepared and submitted to Governor Granholm in January, 2007 *Michigan's 21st Century Electric Energy Plan*. When the Plan was completed, annual electric power generation in the State totaled approximately 105 million mega-watt hours, and peak electric demand was forecasted to increase by 1.2% per year for the next 20 years. At that rate, the authors of the Plan estimated that additional baseload power generation – that is, power generated by plants intended to run constantly at near-capacity levels – would be necessary by 2015 at the latest. However, assumptions that supported this prediction have since been tempered by a state population decline and state and national economic troubles. Specifically, between July, 2006 and July, 2009, Michigan's population decreased by an estimated 112,711 people or approximately 1.1%. The loss of residents and contraction in the State's automotive and other manufacturing industries has meant that Michigan's electric power needs lag behind the projected demands forecasted a few years ago.

4. Does the state have any specific programs for alternative energy development? If yes, please describe including any numerical objectives for the development of alternative energy sources. Please also specify any offshore or coastal components of these programs.

Mandatory Renewable Energy Standard for Electricity Providers

On October 6, 2008, Public Act 295 of 2008, the "Clean, Renewable, and Efficient Energy Act," was enacted and took immediate effect. The Act establishes a renewable energy standard requiring all electric power providers to provide a minimum of 10% of their electricity from renewable sources by 2015. The first phase of the requirement starts in 2012, when electricity providers must provide at least 2% of their electricity from renewable sources. The percentage increases to 3.3% in 2013, 5% in 2014, and the full 10% the following year. Electricity providers failing to meet the required standard may be subject to financial penalties. Under the Act, renewable energy resources include biomass, solar, wind, hydroelectric, geothermal, municipal solid waste, and landfill gas. The definition of hydroelectric energy in the law does not include dams constructed after October, 2008 or pumped storage facilities. Petroleum, coal, natural gas, and nuclear power are explicitly excluded from the definition of renewable energy resources.

Onshore Wind Energy Resource Zones

Act 295 also contains provisions directing the PSC to create a Wind Energy Resource Zone Board charged with developing a "list of regions in the state with the highest level of wind energy harvest potential" and conducting relevant studies. Board membership includes representation from local government, electric utilities, independent power transmission companies, environmental organizations, renewable energy industry, PSC, Office of the Attorney General, and the public. The

Board convened to begin its assessment late in 2008. The high-level wind energy resource assessment involved applying a series of criteria to Michigan's 37 million acres. First, the Board used several exclusion criteria to determine lands to be removed from consideration, due to constraints related to environmental and natural resource protection, topography, public safety, and other factors. In the next step, a grid with 450 meter by 450 meter spacing laid over the remaining 19 million acres indicated the maximum number of wind turbines that could be theoretically placed on those lands, since turbines in commercial wind farms are spaced at least 450 meters apart. Finally, a wind resource map overlay from the National Renewable Energy Laboratory, U.S. Department of Energy, showed which areas had consistent wind speeds in the range thought to be high enough for commercial wind farms.

The Board identified four priority regions through the assessment process and with public input, as described in its October, 2009 Final Report (available at http://www.dleg.state.mi.us/mpsc/renewables/windboard/werzb_final_report.pdf). Three regions are on Lake Michigan and the other is Huron County and adjacent parts of the "Thumb" area on Lake Huron and Saginaw Bay. The regions have abundant and reliable wind resources, open space suitable for commercial wind projects, and are substantially free from other known development constraints. The Thumb area has the highest wind energy production potential of the four regions. Electric utilities and transmission companies operating in the regions advised the PSC on transmission infrastructure expansions and upgrades needed to deliver each region's expected wind-generated power to urban markets. The PSC subsequently designated two of the four regions - the Thumb area and western Allegan County - as wind energy resource zones to guide state decisions and industry investments in planning, siting, and constructing electric transmission lines. Nevertheless, wind energy facility siting decisions on private lands are subject to local zoning; state law does not specifically address onshore wind farm siting. It is expected that market forces, local government decisions, potential environmental impacts, and other factors will also prove influential in determining where wind developers locate their projects in the Coastal Zone. Consequently, future wind energy projects could be located outside of the wind energy resource zones identified by the Board.

Offshore Wind Resource Areas

A separate process initiated through the executive order 2009-1 addressed Great Lakes offshore areas suitable for wind energy projects. On September 1, 2009 the Great Lakes Offshore Wind (GLOW) Council appointed by Governor Jennifer Granholm earlier that year released its report outlining recommendations for siting and regulating offshore wind farms in Michigan's 38,000 square miles of Great Lakes waters. Preliminary scoping indicated that more than 40% of this area may eventually prove suitable for wind energy facility development. In its subsequent October 1, 2010 report, the GLOW Council refined the focus to five "wind resource areas" totaling 13,339 square miles of Great Lakes bottomlands classified as "most favorable" for offshore wind energy development (the October, 2010 report is posted at: http://www.michiganglowcouncil.org/GLOWreportOct2010_with%20appendices.pdf).

The refinements largely resulted from review and analysis of additional data incorporated into the CZM-funded, GIS-based lakebed alterations DST that the Council relied on for its deliberations, as described in the Great Lakes Resources Assessment. It is important to note that future wind project development will not be limited to these wind resource areas, and it is expected that other offshore areas will be considered for wind energy projects as the technology for constructing and operating wind turbines in deep waters advances. The Council also determined that there is a need for new state laws and administrative rules to allow construction and operation of wind farms on state-owned bottomlands.

The lakebed alterations DST is being developed to guide future state agency decisions on leasing Great Lakes bottomlands and permitting offshore wind energy projects. The version of the DST

available to state regulatory staff will serve all datasets including sensitive data on threatened and endangered species locations. Another version of the DST with sensitive datasets masked will be available to the public on the Internet in early 2011. This public version is intended to help direct industry efforts in offshore wind project data collection, planning, and site selection. Once Michigan has an offshore wind regulatory program in place, it will also assist citizens in assessing and preparing comments on lease and permit applications. The utility and reliability of the DST directly depends on the coverage, completeness, and currency of the GIS datasets it serves, and the associated metadata. Presently, a number of datasets critical to informing regulatory decisions on offshore wind project siting are largely or entirely lacking, including data on migratory bird and bat use of coastal and offshore areas, and data on near-shore fisheries habitat. The MCMP has taken initial steps to address these data gaps by funding two such bird and bat studies, as described in the Cumulative and Secondary Impacts Assessment. However, a great deal of additional research remains to be done. Developing these data and incorporating them into the DST within the next three to five years is a Department priority, and is supported by the wind energy industry. Department staff anticipate receiving the first permit applications for offshore wind projects within that timeframe.

5. If there have been any significant changes in the types or number of government facilities sited in the coastal zone since the previous assessment, please describe.

No significant changes have occurred in the types or number of government-owned or operated facilities in the coastal zone since 2006.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

1. Does the state have enforceable policies specifically related to energy facilities? If yes, please provide a brief summary, including a summary of any energy policies that are applicable to only a certain type of energy facility.

The DEQ regulates oil and gas drilling facilities under Part 615, Supervisor of Wells, of the NREPA. Permittees must meet conformance bond, wellhead blowout control, soil erosion and sedimentation control, and other requirements. Drilling project activities must comply with permit requirements under other Parts of the NREPA if the project impacts wetlands, inland lakes and streams, or other protected resources.

The PSC has review and approval authority on the routing of intrastate natural gas pipelines under Public Act 9 of 1929, as amended, intrastate oil and petroleum pipelines under Public Act 16 of 1929, as amended and electric transmission lines under Public Act 30 of 1995, as amended.

No state statutes or rules specifically address the siting of wind, nuclear, fossil-fuel, or other power plants.

2. Please indicate if the following management categories are employed by the State or Territory and if there have been significant changes since the last assessment:

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Statutes or regulations	Yes - Part 615 of NREPA (oil and gas wells); Act 30 of 1995 (electric transmission cables); Act 9 of 1929 (intrastate gas pipelines); Act 16 of 1929	Yes

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
	(intrastate oil and petroleum pipelines); offshore wind energy statute (Part 324 of NREPA) pending	
Policies	Yes – state and federal moratoria on oil and gas drilling beneath the Great Lakes, including horizontal drilling; Executive Directive 2003-22 on the siting of State offices and buildings in urban areas	No
Program guidance	Yes – siting onshore wind turbines to avoid wildlife impacts (refer to Cumulative and Secondary Impacts Assessment)	Yes (refer to Cumulative and Secondary Impacts Assessment)
Comprehensive siting plan (including SAMPs)	No	No
Mapping or GIS	Yes	Yes
Research, assessment or monitoring	Yes	Yes
Education and outreach	Yes	Yes

3. For management categories with significant changes since the last assessment provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information.
- a) Characterize significant changes since the last assessment;
 - b) Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and
 - c) Characterize the outcomes and effectiveness of the changes.

Statutes and Regulations

Legislation to establish an offshore wind energy regulatory program will soon be before the Michigan Legislature. It was developed by a legislative workgroup with substantial input and assistance from DEQ staff, and the DEQ will be the state agency administering the new program. The legislation provides for the siting, construction, operation, and decommissioning of wind energy facilities in the Great Lakes; outlines the requirements to nominate Great Lakes bottomland parcels for lease; describes an auction process to acquire bottomland parcels; specifies information and studies required when submitting permit applications for site assessment, construction, operation, and decommissioning activities; and establishes criteria for reviewing these applications. The legislation also provides for public comment periods and public hearing opportunities for the general public to review and provide input on proposed bottomland parcel nominations and permit applications for site assessment, construction, operation, and decommissioning work. The need for such legislation is widely recognized, for example, in the October 1, 2010, *Report of the Michigan Great Lakes Wind Council* (available at: http://www.michiganlowcouncil.org/GLOWreportOct2010_with%20appendices.pdf).

The Department anticipates the authority to develop and administer the offshore wind energy regulatory program in 2011. At that time, establishment of an operational program will be a Department priority. The DEQ staff assisting the legislators in their deliberations is supported by Section 306 CZM funds.

Mapping and GIS

A description of the GIS-based lakebed alteration DST and its role in identifying offshore wind resource areas is provided in the Great Lakes Resources Assessment. Development of the DST has been supported with Section 309 CZM funds.

Research, Assessment, or Monitoring

The MCMP has funded limited migratory bird and bat research relevant to wind farm siting and operation for certain areas of the coastal zone, specifically, Saginaw Bay and northern Lake Michigan. The resulting data will be incorporated into the lakebed alterations DST when the studies are completed, and will also be available to inform coastal land-based wind project siting decisions through the coordinated DNR-Wildlife Division and USFWS project consultation process, described in the Cumulative and Secondary Impacts Assessment. These research projects are supported with Section 309 CZM funds.

Education and Outreach

Onshore wind energy facility siting decisions on private lands are subject to local zoning; state law does not specifically address onshore wind farm siting. The DELEG Energy Office has developed sample zoning language for small-scale and utility grid wind energy systems, to assist local governments in developing wind turbine siting requirements in zoning ordinances. DELEG staff are also collaborating with DNR Wildlife Division, Michigan Natural Features Inventory - Michigan State University Extension, university researchers, and other organizations to develop guidelines on site-specific pre-construction and post-construction wildlife studies that should be required for onshore wind energy projects. These guidelines will inform local governments in developing or revising wind energy ordinances, for example. Michigan State University has developed and offered basic training on wind energy siting and policy issues through its Michigan Citizen Planner program. Michigan Citizen Planner courses are popular among local government officials, including planning and zoning officials. These efforts were not supported with CZM funding.

The GLOW Council process used to identify offshore wind resource areas provided for public involvement. The Council hosted five public meetings in different areas of the state in 2010 that were attended by more than 500 people. The Council used the meetings, in part, to educate attendees about offshore wind energy and policy issues. The GLOW Council's public involvement process was supported with Section 306 CZM funds.

In 2010, Michigan State University Extension developed an outreach and education program on oil and gas drilling for landowners. The program addresses oil and gas geology and production, hydraulic fracturing, leases, contracts, legal information, tax information, and other topics of interest to landowners who may be approached by oil and gas companies to lease their mineral rights. This program is not supported with CZM funding.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
State statutes and administrative rules addressing offshore wind energy developments	Regulatory, policy	High
Research and GIS mapping of coastal and offshore bird and bat migration routes and stop-over habitat	Data	High
Updated occurrence information on threatened and endangered species within the coastal zone, to inform the Environmental Review process	Data	Medium
County-level guidance for local governments and wind energy developers on siting onshore wind farms to avoid or minimize wildlife impacts	Training, communication and outreach	High
Public outreach and education on offshore wind energy regulations, and Michigan-specific wildlife issues relevant to coastal and offshore wind farm siting and operation	Communication and outreach	Medium

In the next few years Michigan will begin a comprehensive effort to manage the impacts of coastal and offshore wind energy development. Some components of this effort can be addressed with Section 309 funding support, including development of a State regulatory program for offshore wind energy, guidance for state regulators and the wind energy industry on siting offshore wind farms to avoid or minimize wildlife impacts, and collection of near-shore fisheries and wildlife research and survey data specific to coastal and offshore areas to serve as the foundation for the guidance. Other components can be addressed with Section 306 funding or State funding, including technical assistance for local governments and the wind energy industry on avoiding wildlife impacts associated with coastal onshore wind farms, and public education on Michigan-specific wildlife issues related to wind farm development and operation. Wildlife research and survey data will provide a critical part of the foundation for siting and regulatory decisions. The importance of the wildlife data are explained in the Cumulative and Secondary Impacts Assessment.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

High

Briefly explain the level of priority given for this enhancement area.

The rapid growth of the onshore wind energy industry and intense interest in offshore wind energy development in Michigan has put State and local government in the position of promoting wind energy for its economic and environmental benefits while assuming responsibility for protecting coastal resources, including Public Trust resources, from associated impacts. Presently, the information base on coastal and offshore resources is insufficiently developed to allow regulatory agencies to make fully informed decisions on balancing promotion of the industry with protection of certain resources, particularly near-shore fisheries habitat, migratory birds, bats, and other protected species of Michigan’s Coastal Zone. This information would also assist wind energy developers in early project planning.

2. Will the CMP develop one or more strategies for this enhancement area?

Yes

Briefly explain why a strategy will or will not be developed for this enhancement area.

A strategy will be developed to build the needed information base and State agency capacity for managing offshore wind energy development to provide for coastal resource protection. The major elements of this strategy are collection of research-based GIS data on near-shore fisheries habitat, migratory bird, bat, and protected species use of coastal and offshore areas for incorporation into the lakebed alterations DST, and development of a DEQ-administered regulatory program for managing the leasing of bottomlands for offshore wind development projects and the construction, operation, and decommissioning of these projects.

Aquaculture

Section 309 Enhancement Objective

Adoption of procedures and policies to evaluate and facilitate the siting of public and private aquaculture facilities in the coastal zone, which will enable States to formulate, administer, and implement strategic plans for marine aquaculture

Resource Characterization

Purpose: To determine the extent to which problems and opportunities exist with regard to the enhancement objective.

Generally characterize the private and public aquaculture facilities currently operating in your state or territory:

Type of existing aquaculture facility	Describe recent trends	Describe associated impacts or use conflicts
Private – 26 aquaculture facilities in coastal counties currently licensed with the Michigan Department of Agriculture and Rural Development	Not a growth industry at this time. Tribes have received federal funding to support aquaculture production of walleye. No new facilities in the Coastal Zone.	Potential risk of pathogen and aquatic nuisance species introductions to the Great Lakes ecosystem, particularly those facilities dependent on surface water supplies. However, most of the larger private hatcheries in Michigan stock public waters and are inspected for key pathogens, or use closed circulation systems. Potential for nutrient pollution from facilities with concentrated fish populations.
Public- six state fish hatcheries, two hatcheries managed by the USFWS	No new hatcheries have been established since the previous Assessment. Generally, no funds are available for the construction and operation of new public hatcheries.	Low risk of pathogen and aquatic nuisance species introductions to the Great Lakes ecosystem. As a result of the adoption of the Model Program of the Great Lakes Fishery Commission's Great Lakes Fish Health Committee, all public hatchery facilities have strict fish health inspection and detailed biosecurity measures in place. Potential for nutrient pollution from facilities with concentrated fish populations. A new effluent treatment system was installed at the Platte River State Fish Hatchery in 2003 to address effluent quality concerns.

All aquaculture facilities in Michigan are land based; current Michigan law does not directly address caged aquaculture facilities in the Great Lakes. A variety of warm- and cool-water fish and other aquaculture species are raised in these facilities. Aquaculture facilities licensed with the Michigan Department of Agriculture are subject to the provisions of the Michigan Aquaculture Development Act (Public Act 199 of 1996, as amended), including provisions restricting the species raised to those on the State's approved list. Any private facility that stocks fish in Michigan public waters is subject to State permit requirements.

Management Characterization

Purpose: To determine the effectiveness of management efforts to address those problems described in the above section for the enhancement objective.

- 1. For each of the management categories below, indicate if the approach is employed by the state or territory and if significant changes have occurred since the last assessment:**

Management categories	Employed by state/territory (Y or N)	Significant changes since last assessment (Y or N)
Aquaculture regulations	Yes	Yes
Aquaculture policies	Yes	No
Aquaculture program guidance	No	No
Research, assessment, monitoring	Yes	No
Mapping	Yes	No
Aquaculture education and outreach	Yes	Yes

2. For management categories with significant changes since the last assessment provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference rather than duplicate the information.

- a) Characterize significant changes since the last assessment;
- b) Specify if it was a 309 or other CZM-driven change (specify funding source) or if it was driven by non-CZM efforts; and
- c) Characterize the outcomes and effectiveness of the changes.

Aquaculture Regulations

Any private facility that stocks fish in Michigan public waters is subject to permitting and other requirements under State law, including inspection requirements. According to DNR Fisheries Division staff, fish health inspection requirements have strengthened substantially since 1999, and continue to do so. For example, in December, 2008 the DNR issued Fish Disease Control Order FO-245.09 to contain and slow the spread of Viral Hemorrhagic Septicemia Virus (VHSv), a lethal fish pathogen recently detected in parts of the Great Lakes, from impacted waters. In 2010, the State Veterinarian issued an importation requirement under the authority of the Animal Industry Act (Public Act 466 of 1988, as amended) requiring a pre-importation permit for aquaculture species imported into the state. Importers must provide proof that the aquatic livestock is free of VHSv. The U.S. Department of Agriculture – Animal and Plant Health Inspection Service (USDA-APHIS) has also strengthened regulations on interstate fish importation to address VHSv. Michigan’s Fish Disease Control Order and importation requirement are not supported by CZM funds.

Aquaculture Education and Outreach

The MDARD, Michigan Sea Grant, USDA-APHIS, and other agencies and organizations have launched education and outreach efforts targeting the aquaculture industry, anglers, and others to prevent the introduction of VHSv to new waters. Nevertheless, it is possible that the pathogen will eventually spread through the Great Lakes, aided by the movement of wild fish. The education and outreach efforts are not supported by CZM funds.

Priority Needs and Information Gaps

Using the table below, identify major gaps or needs (regulatory, policy, data, training, capacity, communication and outreach) in addressing each of the enhancement area objectives that could be addressed through the CMP and partners (not limited to those items to be addressed through the Section 309 Strategy). If necessary, additional narrative can be provided below to describe major gaps or needs.

Gap or need description	Type of gap or need (regulatory, policy, data, training, capacity, communication & outreach)	Level of priority (H, M, L)
Research to inform future policy development addressing caged aquaculture facilities	Regulatory, policy, data	Low

There is a possibility that caged aquaculture facilities may be proposed in the future, for example, as secondary developments to offshore wind farms. This is because offshore wind energy facilities would provide key amenities for open water aquaculture in the Great Lakes that are currently

lacking, such as firm, safe attachment locations for the pens, unlimited water supply, no-cost waste disposal, and power. According to Michigan Department of Agriculture staff, the Michigan Aquaculture Development Act does not provide for the establishment of caged aquaculture facilities in the Great Lakes. Yet, DNR Fisheries Division staff notes that the Act does not specifically address open water aquaculture in the Great Lakes. From a practical perspective, the potential for actual construction of offshore wind energy facilities is several years distant, and this enhancement area may be a higher priority in a subsequent Section 309 Assessment.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal zone (including, but not limited to, CZMA funding)?

Low

At present, there are no existing or proposed caged aquaculture facilities in Michigan's portion of the Great Lakes or tributaries.

2. Will the CMP develop one or more strategies for this enhancement area?

No

Briefly explain why a strategy will or will not be developed for this enhancement area.

The Michigan Department of Agriculture and DNR have the regulatory authority to manage aquaculture industry activities under the Michigan Aquaculture Development Act, Animal Industry Act, and Part 459, Propagation of Game Fish in Private Waters, of the NREPA, and other regulations. The DEQ has regulatory authority over uses of Great Lakes bottomlands. State law does not directly address the legality of the establishment of caged aquaculture facilities in the Great Lakes. At present, the enhancement area is a low priority for the MCMP due to the current limited growth phase of the aquaculture industry, adequacy of the federal and state regulatory framework, and ongoing outreach and education efforts targeting the industry.

Strategy: Climate Change Adaptation in Coastal Wetland Management

Issue Area:

Wetlands

Program Change Description:

- New or revised coastal land acquisition, management, and restoration programs; and
- New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local governments and other agencies that will result in meaningful improvements in coastal resource management

This strategy will support the identification of research-based adaptation actions and strategies for Great lakes coastal wetlands, and incorporation of coastal wetland climate change adaptation into State and local resource management plans. Specifically, Section 309 funding will be used to:

- Identify specific climate change impacts to Great Lakes coastal wetlands through review of the published literature and contacts with the coastal wetland research and management community. Identify adaptation measures and strategies for addressing these impacts that are appropriate for Michigan's coastal wetlands, and suited to Michigan's state and local wetland protection and management framework. Train staff on how to incorporate climate change measures into wetland regulatory processes including permitting, enforcement, and mitigation. Adaptation actions that will maintain or expand overall biodiversity, increase connectivity of coastal wetland areas, and improve water management to address multiple natural resource goals are priorities;
- Incorporate preservation, restoration, and similar climate change adaptation measures for coastal wetlands into the state's Climate Change Action Plan, Wetlands Action Plan, Wildlife Action Plan, and CELCP plan;
- Work with the Michigan Association of Regions, Michigan State University Extension - Michigan Natural Features Inventory (MNFI), and other agencies and organizations that provide land use planning assistance to local governments to develop technical assistance on incorporating climate change adaptation measures for coastal wetlands in local green infrastructure plans, land use plans, and zoning ordinances.

Needs and Gaps Addressed:

Many State agencies are involved in climate change mitigation and adaptation activities, but none have determined the predicted impacts on coastal wetlands and identified and implemented prudent adaptations. There are no known efforts at the local level to identify climate change adaptation measures for coastal wetlands, and incorporate these measures into local plans and ordinances.

Michigan's Wetland Program lacks a comprehensive mechanism for tracking the current climate science, and using the information effectively to promote science-based protection and management of coastal wetlands. These systems are dynamic and management of these areas should promote adaptation and practical action. Some loss in coastal wetland acreage is anticipated due to climate change, but there is also potential for the formation of new wetland areas due to increased flooding, exposed bottomlands, and changes in wetland type and function, for example. The current regulatory processes do not incorporate a review that could integrate climate change adaptations into the permitting, enforcement and mitigation decision making processes.

This strategy represents the first major step toward developing the Wetland Program's capacity to identify climate change impacts on coastal wetlands and appropriate adaptation measures. It will enable the Program to incorporate research-based adaptation measures and strategies into state resource management plans by

the end of the strategy timeframe. It will also result in development and distribution of technical assistance for local governments on addressing climate change impacts on coastal wetlands through master plans and local zoning ordinances. Such Michigan-specific technical assistance does not currently exist.

Benefits to Coastal Management:

Michigan's Climate Action Plan, Wetlands Action Plan, Wildlife Action Plan, and CELCP Plan guide State agencies in program and policy decisions. Incorporating the most recent climate change information and adaptation strategies into these plans will improve coastal wetland management at the State level. This information will also aid in the incorporation of climate change adaptation information into the wetland permitting, enforcement and mitigation review processes.

Michigan's local governments have a substantial role in wetland protection through their local planning and zoning authorities. For example, wetland protection efforts at the local government level may substantially augment state regulations through mandating the protection of upland buffers around wetlands and other surface waters, which is not provided for in Part 303, Wetlands Protection, of the NREPA. Consequently, enhancing local government capacity to address climate change impacts on coastal wetlands through local planning and zoning will allow for the development and implementation of wetland protections that are beyond the scope of state law.

Likelihood of Success:

This proposal has significant support within DEQ, which is the lead agency in the development of the Wetlands Action Plan and CELCP Plan, and a partner agency in the development of the Climate Action Plan.

Michigan's planning regions, MNFI, and other agencies and organizations are experienced in providing land use and conservation planning information and services to local governments throughout Michigan. Examples of conservation information products and services the MNFI develops and provides to local land use planners are available at the following URL: <http://web4.msue.msu.edu/mnfi/services/consplan.cfm>. These are the appropriate partners to engage in developing and disseminating technical assistance to local governments.

Importantly, the newly-formed Michigan Wetlands Association and DEQ are partnering to host a symposium in the summer of 2011 which will focus on current trends and goals of wetlands protection in Michigan, with a keynote address and workshop focus on climate change in coastal wetlands. This symposium will initiate a statewide collaboration to expand the knowledge base and preparation for climate change, and will provide an opportunity to launch this strategy in partnership with other agencies and organizations that have a role in the protection and management of Michigan's coastal wetlands.

Strategy Work Plan:

Total Years: 5

Total Budget: Estimated at \$338,000

Final Outcomes and Products:

Increased knowledge of climate change trends and predictions within the Great Lakes basin, and improved understanding of the anticipated impacts on Michigan's coastal wetlands. Identification of research-based adaptation measures and strategies for addressing these impacts. Incorporation of these adaptation measures and strategies into the Michigan Climate Action Plan, Wetlands Action Plan, Wildlife Action Plan, and CELCP Plan. Production of technical assistance for local governments on incorporating climate change adaptation measures for coastal wetlands into land use plans and zoning ordinances.

Year 1:

Description of activities

Research published climate change studies relevant to coastal wetlands, and contact existing regional climate change workgroups or research groups such as the Climate Change Action Council. Participate in meetings with these groups to foster information exchange on climate change adaptation efforts with a focus on coastal wetland predictions and management approaches.

Outcomes

Review of existing research related to climate change in Great Lakes coastal wetlands, with an emphasis on predicted impacts and appropriate management responses.

Budget: Estimated at \$58,000

- \$7,500 for review of published and unpublished climate change studies relevant to Great Lakes coastal wetlands and additional research to fill identified gaps;
- \$7,500 for meetings and coordination with workgroups and agencies
- \$43,000 for contracts or pass through grants for projects that conduct assessments of current studies, research and data, or potential impacts to Great Lake coastal wetlands due to climate change.

Year 2:

Description of activities

Continue to identify climate change studies, workgroups, and research programs. Continue to participate in and coordinate coastal wetland adaptation planning efforts to address climate change trends and predictions. Begin work with other agencies to incorporate climate change and coastal wetlands into the Climate Change Action Plan, Wetlands Action Plan, Wildlife Action Plan, and CELCP Plan. Begin work on adaptation measures for coastal wetlands regulatory programs. Continue to improve overall knowledge and management goals to link the current science to agency policy and procedures.

Outcomes

Updated review of climate change studies relevant to coastal wetlands; Identification of needs and gaps for development of climate change adaptation measures for coastal wetlands regulatory programs.

Budget: Estimated at \$45,000

- \$5,000 for updating review of climate change research and additional research to fill identified gaps;
- \$10,000 for meetings and coordination with workgroups and agencies;
- \$10,000 for drafting coastal wetland climate change adaptation measures for incorporation into State plans;
- \$20,000 for contracts or pass through grants for projects that conduct assessments of current studies, research and data, or potential impacts to Great Lake coastal wetlands due to climate change.

Year 3:

Description of activities

Continue to participate in and coordinate coastal wetland adaptation planning efforts. Contract to address needs and gaps for development of climate change adaptation measures for coastal wetlands regulatory programs.

Outcomes

- Draft coastal wetland climate change adaptation measures for incorporation into State resource management and action plans;

Budget: Estimated at \$55,000

- \$10,000 for meetings and coordination with workgroups and agencies;
- \$45,000 for addressing gaps for development of climate change adaptation measures for coastal wetlands regulatory programs.

Year 4:

Description of activities

Continue to participate in and coordinate coastal wetland adaptation planning efforts. Finalize coastal wetland climate change adaptation measures for incorporation into State resource management and action plans. Incorporate climate change measures into coastal wetland regulatory processes including permitting, enforcement, and mitigation. Contract for developing technical assistance on incorporating climate change adaptation measures for coastal wetlands into local land use planning and zoning.

Outcomes

Finalization of coastal wetland climate change adaptation measures; Incorporation of climate change adaptation measures into wetland regulatory processes.

Budget: Estimated at \$90,000

- \$10,000 for meetings and coordination with workgroups and agencies;
- \$10,000 for finalization of coastal wetland climate change adaptation measures;
- \$10,000 for program development and incorporation into regulatory processes;
- \$60,000 for technical assistance for local governments.

Year 5:

Description of activities

Continue to participate in and coordinate coastal wetland adaptation planning efforts. Contract for developing and finalizing technical assistance on incorporating climate change adaptation measures for coastal wetlands into local land use planning and zoning. Provide workshops on climate change adaptation measures for local governments and others.

Outcomes

Completed technical assistance on coastal wetlands and climate adaptation for local governments. Workshops on climate change adaptation measures for local governments and others.

Budget: \$90,000

- \$10,000 for meetings and coordination with workgroups and agencies
- \$40,000 for workshops and printing.
- \$40,000 for technical assistance for local governments.

Fiscal and Technical Needs:

Fiscal needs:

Due to the lack of other applicable sources of funding currently available, the Wetland Program will be unable to implement the proposed activities if funding is not obtained through Section 309.

Technical needs:

The outcomes specified within this strategy can be achieved by DEQ Wetland Program staff, MCMP staff, and contracts and pass through grants.

Strategy: High Risk Erosion Area Rule Revisions

Issue Area:

Coastal Hazards

Program Change Description:

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding that will improve a State's ability to achieve one or more of the enhancement objectives;
- New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local governments and other agencies that will result in meaningful improvements in coastal resource management

Section 309 funds will be used to extensively revise and promulgate new administrative rules for the High Risk Erosion Area Program (HREA) to provide better property protection from coastal erosion hazards in a more efficient manner. The administrative rules for designated HREAs promulgated under Part 323, Shorelands Protection and Management, of the NREPA have not been substantially updated since 1992. Changes to the existing rules are warranted given recent advances in the technology used in the update research for identifying erosional areas, as well as evidence of problems regarding the application of the current erosion reference feature used in the research and in measuring setbacks on-site. The DEQ Water Resources Division proposes to research necessary rule changes, build consensus through a formal stakeholder process, draft rule changes, and move these rule change proposals through the administrative process for full adoption. MCMP staff will provide technical assistance on an as-needed basis.

During low water levels in the Great Lakes, vegetation advances lakeward onto foredunes and other ephemeral beach formations. Consequently, the erosion hazard line (EHL; the landward edge of the zone of active erosion) also migrates lakeward. The Part 323 administrative rules currently use the EHL as the erosion reference feature that is tracked in the long-term shoreline recession rate studies. HREA Program staff calculates projected recession distances and consequent setbacks based on the study results. The EHL also serves as the measuring point from which setbacks are measured during on-site permit application reviews. Yet, because the foredunes and other ephemeral beach formations may vanish when the lake levels rise again, during an intense storm for example, using the EHL as the measuring point often underestimates the erosion risk for shoreline houses and other structures.

HREA Program staff experience in conducting recession rate update studies during low lake levels indicates that the top of the bluff is a more consistent, long term measuring point or reference feature for both the projected recession distances (calculated as part of on-going long term recession rate studies), and the resulting setback distances applied to construction activities. This prospective change in the erosion reference feature is an example of a candidate change that might be considered in the rule revision process. Other candidate changes are likely to come to light during the early benchmarking phase of the strategy, when WRD staff review the coastal erosion regulations used in other states.

The following objectives will be pursued through the rule revisions:

- Identify best practices learned through benchmarking the coastal erosion programs in other coastal states (especially Great Lakes states) and through HREA Program staff experience in conducting county-wide erosion rate update studies. Incorporate these practices into the processes of establishing setback regulations and conducting erosion rate update studies.
- Ensure setback regulations coincide with the measuring point used in recession rate studies.

- Provide for flexibility in recession rate research methodology to incorporate new technologies, data sets, and approaches as they become available.
- Revise the regulations so the permit application review criteria correspond to the best practices identified through benchmarking and the erosion rate update studies.
- Change definitions to correspond with revised recession rate study methodology and regulatory amendments.
- Clarify and simplify as appropriate standards and definitions.
- Remove unnecessary regulations while maintaining protection of the coastal resources.

This strategy builds upon the previous coastal hazards strategy and will incorporate much of the knowledge that has been gained. The previous strategy for coastal erosion hazards focused on identifying and implementing techniques to improve the accuracy of the recession rate studies and to investigate whether the current erosion reference feature is appropriate. Section 309 funding provided support for an investigation of key concepts and caused a significant change in the methods used for current studies.

One such issue explored is options for reducing the time frame between acquisition of the modern erosion reference feature and the implementation of new setback requirements. Historically, the modern erosion reference feature has been obtained by acquiring low-altitude vertical aerial photographs, ortho-rectifying the photos within a GIS environment based on field collected ground control points (GCP), and digitizing the modern erosion reference feature within the GIS environment. Time delays were often substantial, and caused by the need to conduct QA/QC on the aerial photos, collection of field-based GCPs, and the time required to orthorectify dozens of aerial photographs for a single county. One of the recently-conducted studies replaced the aforementioned process with field-based collection of the erosion reference feature, using a submeter, differential global positioning system (GPS) by essentially walking along the line. While this approach significantly reduced the time period to complete the study, this advantage was tempered by the field-intensive nature of the data collection which significantly limited the study area that could be covered.

While further work is needed to determine the most time-efficient approach to allow the State to reassess erosion hazards along its 3,288 miles of shoreline, the field based approach also provided data that will inform the currently proposed strategy with respect to potentially redefining the erosion reference feature. Section 309 funding has been used to concurrently collect GPS data delineating the currently defined EHL as well as the top of bluff feature that may be considered for use as an alternative erosion reference feature. Michigan State University's Center for Remote Sensing and GIS has collected this data through a pass-through grant and will analyze the two approaches to identify advantages and disadvantages associated with each. This information is expected to play a key role in the rule revision strategy proposed here.

Needs and Gaps Addressed:

Administrative rule updates are needed to ensure that the program requirements are truly reflective of actual long-term erosion rates and maintain protections against erosion hazards, the program can be administered in an efficient manner, and the regulations are readily understood by the public.

Benefits to Coastal Management:

Effective coastal construction setback standards are needed to ensure protection of public and private property along the coast, and more importantly provide for protection of beach resources while minimizing the need for shore protection structures, which have significant impacts on beaches.

Communicating the value of coastal construction setbacks to the regulated community in the Great Lakes involves distinct challenges. While water levels along the ocean coasts are generally unidirectional and rising, Great Lakes coastal managers must deal with the cyclic nature of water levels and consequences this has on coastal erosion. This can lead to conflict when coastal managers must impose building setback restrictions on stretches of shore that "appear" to be stable and even accretionary. However, it also provides a significant opportunity to educate the public about the cyclic nature of water levels and the fact that the shorelines of the

Great Lakes will continue their long-term trend of chronic erosion. This strategy will involve public hearings, discussions with state legislators and staff, meetings with local government officials, and mailings to property owners as part of the administrative rule amendment and implementation process. These activities present opportunities for education.

Likelihood of Success:

The proposed rule revisions are supported by DEQ Water Resources Division and have a high likelihood of success. The WRD staff implementing this strategy has long-standing experience in administering HREA rules, and experience in the development of administrative rules.

Strategy Work Plan:

Total Years: 5

Total Budget: \$330,000

Final Outcomes and Products: Document on benchmarked best practices in the coastal erosion programs of a sample of other states. Revised administrative rules for the HREA Program. Staff training on revised rule implementation. Outreach to local governments and the regulated community on the rule revisions.

Year 1:

Description of activities

Contract benchmarking best practices in the erosion programs of other coastal states; review the best practices of these other programs to further evaluate possible changes in Michigan's HREA Administrative Rules; identify performance issues with Michigan's current HREA program; identify potential changes to the HREA Administrative Rules based on the benchmarking study and previous observations made in implementing the current rules.

Outcomes

Document on benchmarked best practices in the coastal erosion programs of a sample of other states. Potential rule revision concepts and supporting material in preparation for the administrative rule amendment process.

Budget: \$80,000

- \$70,000 for benchmarking studies, and additional research directed towards informing the rule making process.
- \$10,000 for development of rule revision concepts

Year 2:

Description of activities

Establish and convene stakeholders committee to work with DEQ staff in developing rule amendments.

Outcomes

Rule amendment document developed for use as process continues.

Budget: \$50,000

- \$30,000 for establishing stakeholders committee and holding meetings
- \$20,000 for draft rule amendment document

Year 3:

Description of activities

Use information developed through stakeholder committee deliberations to commence the administrative rule promulgation process pursuant to State law. This process involves several steps, including but not limited to publication of notices, holding state-wide public hearings, possible changes to the proposed administrative rules, and review by the legislative committee responsible for rule amendment promulgation.

Outcome

Draft of new administrative rules incorporating public and legislative input.

Budget: \$60,000

- \$10,000 for public notices and hearings
- \$50,000 for drafting rule revisions and responding to public input

Year 4:

Description of activities

Complete administrative rule promulgation process pursuant to State law. This process involves several steps, including but not limited to publication of notices, holding state-wide public hearings, possible changes to the proposed administrative rules, and review by the legislative committee responsible for rule amendment promulgation.

Outcome

New administrative rules.

Budget: \$50,000

- \$15,000 for public notices and hearings
- \$35,000 for preparation of final draft of administrative rules

Year 5:

Description of activities

Implement amended administrative rules, including staff training, program web-site modification and development, and outreach efforts to local units of government and property owners.

Outcome

Fully implement the new administrative rules, and associated outreach to local government partners and the regulated community. A significant amount of the budget allocated for Year 5 activities will be dedicated towards various outreach efforts, which may include a pass-through grant or contract, to create and disseminate information about the new regulations.

Budget: \$90,000

- \$60,000 for program staff training and guidance document development
- \$20,000 for local government and public outreach
- \$10,000 for property owner mailings

Fiscal and Technical Needs:

Section 306 funding with state matching funding, or other funding avenues will be needed in the event that Section 309 funding is unavailable and/or insufficient to achieve the program change.

Technical support will be sought from the NOAA, Coastal States Organization, universities, and other agencies to aid in Michigan's development of strategies for stakeholder and public participation in the rule promulgation process and in developing an effective outreach strategy.

Strategy: Improved Rip Current Forecasting and Hazard Messaging

Issue Areas: Coastal Hazards

Program Change Description:

- New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable Coastal Zone Management (CZM) program policies to applicants, local governments and other agencies that will result in meaningful improvements in coastal resource management.

The Great Lakes possess both the breadth and power to develop the dynamics necessary for the production of rip currents, which pose a significant and demonstrated threat to the recreational community. In 2010 alone, there were approximately 25 rip current-related deaths in Michigan and many of these occurred at public beaches. The objective of this strategy is to reduce the potential for rip current-related deaths by improving rip current forecasting and hazard messaging through research, and incorporating the findings into formal state policy and guidance applicable to public beaches at Michigan State Parks and Recreation Areas. Forty-five of the parks and recreation areas managed by the DNR Recreation Division are on the Great Lakes or connecting channels, and include some of the most highly visited parks in the State system. The majority of these coastal parks designate public swimming beaches in the summer months.

Designation and use of public bathing beaches are subject to the provisions of Part 801, Marine Safety, of the NREPA. By law, the owner or person in charge of a public bathing beach must outline a safe bathing or swimming area with buoys. Placement of the buoys is subject to permitting requirements administered by the DNR Law Enforcement Division. Members of the public may not bathe or swim more than 100 feet beyond the buoyed area. Management of bathing and swimming beaches in Michigan State Parks and Recreation Areas is also subject to DNR Parks and Recreation Policy #3.6, Designated Beach Policy, last revised in June, 2004. The Policy establishes a reasonable standard of care for the designated beaches that park supervisors and staff must follow. It includes special provisions for Great Lakes designated beaches in recognition of the unique hydrological conditions present in the lakes, and outlines a signal system of prominently displayed colored flags to indicate the potential for adverse water conditions, including rip current conditions.

The success of State Park and Recreation Area staff efforts to safeguard visitors from rip currents and other dangerous lake conditions depends, in part, on the staff's ability to predict and recognize adverse conditions and implement the hazard signal system accordingly. Because staff lacks the statutory authority to *require* visitors to exit the water under dangerous lake conditions, the success of these efforts also hinges on the visitors' understanding of the hazard signal system, associated signage, and staff's ability to communicate to visitors information about the nature of the hazard and the prudent response.

Section 309 funds will be used to support the development and implementation of a rip current research and hazard communication strategy, applying a multifaceted approach to increase, translate, and disseminate scientific information about Great Lakes rip currents to State Park staff and visitors, so they may take appropriate actions. This work will result in a revised Designated Beach Policy for DNR Recreation Division, and guidance and training for Recreation Division staff on implementing the policy. The revised Policy will incorporate a summarized analysis of the rip current hazards along Michigan's coast as well as a process that beach managers may employ on a daily basis to properly assess and communicate the potential hazard that exists on any given day. Additionally, the project includes development and delivery of rip current hazard assessment and messaging technical assistance to coastal park managers at the local unit of government level for incorporation into their existing public beach policies. The MCMP will partner on this project with the DNR Recreation Division, state park "Friends" groups, the University of Michigan (U-M) College of Engineering - Department of Naval Architecture and Marine Engineering Hydrodynamics Laboratories, NOAA – National Weather Service (NOAA-NWS) Great Lakes Forecast Offices, Michigan Sea Grant, and Michigan State University Extension (MSUE).

This project has two phases, specifically: 1) Technical science on the forcing factors of Great Lakes rip currents, and the development of a spatial analysis tool; and 2) enhancement and expansion of knowledge transfer and messaging approaches regarding rip currents, including addressing social issues that inform development of beach safety messages to specific user groups.

Phase 1: Technical Science

Forcing factors of Great Lakes rip currents differ in several important and poorly understood ways from classic open ocean rips. The U-M Marine Hydrodynamics Laboratories, (MHL) will deploy recently acquired shore-based radar units specifically designed to map rip currents in real time. These units will support the acquisition of time-sensitive “perishable” data before, during, and after a rip event to determine how morphodynamic influences of near-shore features play a role in rip current generation. Subsequently, the U-M MHL will apply findings obtained in the first year to identify potential “hotspots” for rip occurrence based on the morphology, fetch, wave climate and other characteristics of specific stretches of the lakeshore. This spatial analysis will focus on areas that are open to the public for swimming - including those within the State Park system - which are particularly susceptible to rip current formation. The scientific assessment will incorporate recent LiDAR bathymetric data available for a large expanse of the Lake Michigan shoreline, high resolution aerial photographs and pictometry, and CZM-funded bathymetric survey data previously collected by the University of Michigan, as deemed appropriate.

The U-M Hydrodynamics Laboratory will leverage its collaborative relationship with the NOAA-NWS Great Lakes Forecast Offices to apply the research findings towards development of updated recommendations for revising and refining forecasting methods for rip current hazards. Specifically, for each field data collection, close coordination will occur with the local forecast office to compare forecasted and observed beach and near-shore conditions. The results of the comparisons will indicate what appropriate improvements are warranted to NOAA-NWS current forecasting methods. To date, U-M researchers have coordinated such efforts with the Marquette, Grayling, and Grand Rapids Forecast Offices.

The final year of the research phase of this project will focus on developing revisions to the DNR Recreation Division Designated Beach Policy, coordinating Division-wide review, obtaining input on the proposed revisions from State Park user groups, and approval by Division Management. The revised Policy will incorporate a summarized analysis of the rip current hazards along Michigan’s coast as well as a process that beach managers may employ on a daily basis to properly assess and communicate the potential hazard that exists on any given day. The revision development process will address the potential for incorporating review of National Weather Service surfcast information as a criterion for determining whether to fly the green, yellow, or red flag as part of the beach hazard warning system. Safety training will be provided to staff at State Parks that experience rip currents. Appropriate guidance will be developed to assist field staff in managing their water recreation programs including beach areas.

Phase 2: Knowledge Transfer and Messaging

Information obtained through the technical science phase of the project will guide development of a knowledge transfer strategy, building on existing efforts of the Michigan Sea Grant and NOAA-NWS. Sea Grant staff will conduct social and behavioral research on park users and other target audiences, with an emphasis on at-risk groups such as young adult males, and use the findings to guide development of effective rip current hazard messaging approaches. Sea Grant will then work with the MCMP on training for DNR Recreation Division staff and technical assistance materials on updated messaging and outreach approaches for use at State Park beaches. These messaging and outreach approaches will be incorporated into the Designated Beach Policy where appropriate. Additionally, the MCMP will partner with Sea Grant to package the rip current hazard assessment and messaging information into a technical assistance format to be made available to coastal park managers at the local unit of government level for incorporation into their existing policies and guidance. Michigan Sea Grant will lead an outreach team to inform local park managers and staff of the overall level of rip current-related risks at coastal public beaches, and deliver the technical assistance.

While the Section 309 knowledge transfer and messaging components will be restricted to items incorporated into the State's Designated Beach Policy and similar policies and guidance at the local level, it is expected and desired that project partners will also seek to broadcast findings of the updated rip current research using the improved messaging approaches to the general public, for example, through social media. Section 306 funds will be used for conducting updated rip current outreach directly to the public.

Needs and Gaps Addressed:

In light of continued rip current-related incidents in the Great Lakes, there remains a critical need to apply new technology, improve data, and better inform coastal resource managers, communities and the public about rip currents. A significant amount of scientific research and public outreach has been conducted regarding rip current hazards on the ocean coasts. However, Michigan and the Great Lakes have not benefited from a comparable research and outreach effort on this issue. Therefore, this strategy will target the hydrodynamic conditions in the Great Lakes that are distinctly different from the oceans, and public outreach that is appropriately tailored for Great Lakes audiences.

Benefits to Coastal Management:

Increasing knowledge about the formation and forecasting of rip currents will increase the ability to aid hazard mitigation planning efforts at the state level. Improved rip current risk forecasting and hazard communication is expected to reduce the number of fatalities due to rip currents along Michigan's Great Lakes shoreline, particularly at public beaches.

Likelihood of Success:

This strategy has DNR Recreation Division support and a high likelihood of success. This project effort will build on previous successful efforts related to rip current hazards. Michigan Sea Grant, the U-M Marine Hydrodynamics Laboratories, and National Weather Service have collaborated on rip current research and outreach and education efforts since the mid-1990s. Michigan Sea Grant, the U-M Hydrodynamics Laboratories, and DNR Recreation Division are ready to leverage an existing network of university scientists, resource managers, the NOAA-NWS, public safety officials, community leaders, and others to accomplish this strategy.

Strategy Work Plan:

Total Years: 3

Total Budget: \$229,000

Final Outcomes and Products:

Research, data, scientific reports and publications on Great Lakes rip current forcing factors and improved rip current forecasting methods. Spatial analysis of rip current "hot spots" along the Michigan coast. Research on social factors that influence the effectiveness of rip current hazard messaging and development of effective messaging on Great Lakes rip current hazards. Revised Designated Beach Policy for DNR Recreation Division and associated training for coastal State Park staff. Technical assistance and workshops for local public beach managers on incorporating rip current hazard assessment and messaging into local park policies.

Year 1:

Description of activities

U-M Marine Hydrodynamics Laboratories researchers will begin real-time mapping of rip currents with shore-based radar units, and identify weather and site characteristics that potentially contribute to rip current formation. Sea Grant will work with university researchers and graduate students to conduct social science research on public beach users.

Outcomes

Research data on rip current dynamics and forcing factors; research data on social factors that influence effectiveness of hazard messaging.

Budget: Estimated at \$76,000

- \$50,000 for deployment of shore-based radar units and data collection
- \$10,000 for administration and coordination
- \$15,000 for social science research, including convening focus groups
- \$1,000 for travel

Year 2:

Description of activities

U-M Marine Hydrodynamics Laboratories researchers will analyze Year 1 data and develop a spatial analysis of rip current risk along stretches of coastline with significant recreational use, and work with NOAA-NWS Forecast Offices to improve rip current forecasting methods. Sea Grant will work with university researchers and graduate students to complete data collection and analyze social science research data.

Outcomes

Documentation and identification of rip current occurrence and forcing factors; identification of rip current “hot spots;” improved rip current forecasting methods; completion of social science research on factors that influence effectiveness of hazard messaging.

Budget: Estimated at \$80,000

- \$50,000 for spatial analysis of rip current risk, and forecasting method improvements
- \$10,000 for administration and coordination
- \$20,000 for collection and final analysis of social science research data

Year 3:

Description of activities

U-M Marine Hydrodynamics Laboratory researchers will work with MCMP staff and DNR Recreation Division staff to revise the Designated Beach Policy based on research results, with input from user groups. Sea Grant will develop guidance on effective rip current hazard messaging for Great Lakes beach users. MCMP will work with DNR Recreation Division and Sea Grant staff to develop and deliver training to coastal State Park staff on implementing the revised Policy. Sea Grant will work with MCMP to develop and deliver technical assistance on assessment of rip current hazards and hazard messaging to local public beach managers and staff.

Outcomes

Revised Designated Beach Policy; coastal State Park staff training on implementing policy revisions; analysis of social factors that influence effectiveness of hazard messaging; guidance on effective rip current hazard messaging; technical assistance and workshops for local public beach managers on rip current hazard assessment and messaging.

Budget: Estimated at \$73,000

- \$48,000 for revised Designated Beach Policy development and approval
- \$10,000 for coastal State Park staff training
- \$15,000 for development and delivery of technical assistance for local public beach managers

Fiscal and Technical Needs:

The Section 309 funding identified in the budget is sufficient to accomplish this strategy.

The partnership of collaborators on this strategy has the technical expertise, capacity, and equipment to accomplish this strategy.

Strategy: Offshore Wind Energy Regulatory Program Development

Issue Areas

Cumulative and Secondary Impacts; Great Lakes Resources; Energy and Government Facility Siting

Program Change Description

- New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding that will improve a State's ability to achieve one or more of the enhancement objectives;
- New or revised coastal land acquisition, management, and restoration programs; and
- New or revised guidelines, procedures, and policy documents which are formally adopted by a state or territory and provide specific interpretations of enforceable CZM program policies to applicants, local governments and other agencies that will result in meaningful improvements in coastal resource management.

Legislation will soon be before the Michigan Legislature to authorize the DEQ to regulate the leasing of Great Lakes public trust bottomlands for offshore wind energy development, and the assessment, construction, operation, and decommissioning of offshore wind energy facilities on these parcels. Once the legislation is passed and signed into law, it is expected that the DEQ will nominate bottomland parcels for leasing in areas identified as favorable for offshore wind energy development. Local governments and other eligible entities named in the legislation will also be able to nominate bottomland parcels in conditional areas to be identified by the Department. Conditional areas have one or more competing uses or sensitive resources such as recreational and commercial fishing, high biological activity, and shipwreck sites, and would require studies to determine their suitability for offshore wind energy development. In addition, the DEQ will be required to identify categorical exclusion areas where no offshore parcels can be nominated due to the presence of shipping channels, military operation areas, utility line corridors, and other incompatible uses.

The Department's determinations of favorable, conditional, and categorical exclusion areas for offshore wind energy development will be guided primarily by the data and associated criteria served by the GIS-based lakebed alteration decision support tool (DST) described in the Great Lakes Resources and Energy and Government Facility Siting Assessments. The DST will be used to serve the guidance to regulatory staff, the regulated community, and the public engaged in reviewing and providing comments on the Department's proposed regulatory decisions.

Section 309 funds will be used to develop and implement specific components of the new offshore wind energy regulatory program which will be established under Part 324 of the NREPA. The Part 324 program staff will manage the leasing of bottomland parcels and permitting of offshore wind energy projects in the Great Lakes to avoid, minimize, and mitigate harm to coastal wildlife, fisheries, and other resources and uses that may be impacted by the construction, operation, and decommissioning of these projects. Section 309 funds will support the following program components:

- Development of formal program procedures, processes, and criteria related to application reviews, auctions, nominations, and accounting;
- Promulgation and implementation of administrative rules for the purposes of bottomlands protection and management, aquatic habitat protection and enhancement, shipwreck site management, and other mitigation measures associated with and necessary for the development of offshore wind energy facilities; and
- Development and publishing of formal GIS-based program guidance for classifying favorable, conditional, and categorically excluded offshore areas. This includes the research, data collection, and analysis required to develop the information base on near-shore fisheries habitat and wildlife use of coastal and offshore areas for the guidance. GIS-based program guidance and supporting technical assistance documents will be served through the lakebed

alterations DST and will be needed for agency staff administering the program, the regulated community, and the public.

Though not part of this strategy, it should be noted that additional program tasks will be initially supported with State start-up funding, including development of a database to track bottomland parcel lease nominations and permit applications, and development and maintenance of a Part 324 website. State funds will also initially support personnel costs for program staff including three new dedicated positions (secretary, GIS specialist, and a program position), supervisory oversight, and administrative costs. The Department will be seeking sources of funding for another program need, the integration of the leasing and permitting application database with the lakebed alterations DST.

The MCMP will seek formal approval of Part 324 as a coastal enforceable policy once the Part 324 program is initiated, in consultation and coordination with NOAA OCRM staff.

Needs and Gaps Addressed

When the Part 324 becomes law as expected, the DEQ will be required to develop the capacity to begin nominating bottomland parcels for lease within the first year of program establishment, and to begin accepting and processing permit applications within approximately three to five years. Though State program start-up funding will be available for basic program staffing and development of the leasing and permitting database, no state funds are anticipated for development of program procedures, administrative rules, and guidance on classifying offshore areas. Section 309 funding will allow the Department to meet these critical program needs.

Guidance on classifying offshore areas as favorable, conditional, and categorically excluded is a major need for the new program in the 2012-2016 timeframe. The utility and reliability of the GIS-based guidance will directly depend on the coverage, completeness, and currency of the GIS datasets at its foundation. Consequently, the collection and analysis of research-based GIS data on near-shore fisheries habitat, and use of coastal and offshore areas by bats, migratory birds, and other protected species including threatened and endangered species is a priority. The current lack or incomplete spatial coverage of these data is considered a prominent gap by resource managers, policy makers, and wind energy stakeholders, and challenges the prudent development of Michigan's offshore wind energy industry. Section 309 funding will meet this substantial need by supporting the development of these data and their incorporation into the GIS-based lakebed alterations DST.

Benefits to Coastal Management

Once Part 324 is made law and the Part 324 Program has become fully operational with the assistance of Section 309 funding, the State will have the authority and capacity to require wind energy developers to avoid, minimize, and mitigate the impacts of offshore wind energy developments on coastal resources and uses.

Likelihood of Success

The legislation to establish Part 324 of the NREPA that will be introduced was developed by a legislative workgroup with substantial input and assistance from DEQ staff. The legislation provides for the siting, construction, operation, and decommissioning of wind energy facilities in the Great Lakes; outlines the requirements to nominate Great Lakes bottomland parcels for lease; describes an auction process to acquire bottomland parcels; specifies information and studies required when submitting permit applications for site assessment, construction, operation, and decommissioning activities; and establishes criteria for reviewing these applications. The legislation also provides for public comment periods and public hearing opportunities for the general public to review and provide input on proposed bottomland parcel nominations and permit applications for site assessment, construction, operation, and decommissioning work. The need for such legislation is widely recognized, for example, in the October 1, 2010, *Report of the Michigan Great Lakes Wind Council* (available at: http://www.michiganlowcouncil.org/GLOWreportOct2010_with%20appendices.pdf).

The Department anticipates the authority to develop and administer the Part 324 regulatory program in 2011. At that time, establishment of an operational program will be a Department priority.

All components of this strategy have DEQ support, and a high likelihood of success. The agency staff that will be assisting in the development of the Part 324 Program also provided assistance to the legislative workgroup that developed the Part 324 legislation. The staff is experienced in the development of program procedures and administrative rules. It is expected that staff will be successful in managing the execution of these tasks for the Part 324 Program with Section 309 funding. The staff also provided input to the GLOW Council on use of the lakebed alterations DST to identify preliminary offshore areas favorable for wind energy development. It is also expected that staff will be successful in working with the Institute for Fisheries Research to integrate the DST into GIS-based program guidance with Section 309 funding.

The MCMP will partner with the agencies, organizations, and academic institutions that have the proven ability and trained personnel needed to collect and analyze the research-based GIS data on near-shore fisheries habitat, and use of coastal and offshore areas by bats, migratory birds, and other protected species including threatened and endangered species. Current MCMP partners who would assist in this strategy include, but are not limited to DNR Wildlife Division, DNR Fisheries Division, Michigan Natural Features Inventory – Michigan State University Extension, Institute for Fisheries Research, University of Michigan, Central Michigan University, Michigan Technological University, and The Nature Conservancy. It is expected that the Section 309-funded research and GIS data development undertaken by these partners will be successful, and will successfully build the required Part 324 Program guidance served through the lakebed alterations DST. Additionally, the MCMP will convene a technical advisory group of DEQ regulatory staff, agency and academic researchers, and wind energy industry representatives to advise on research and survey priorities, geographic area priorities, and experimental design. The intention is for the advisory group to identify and shape necessary research and GIS data development in coordination with industry interest in offshore wind project development, so that program guidance is available in time to influence agency and industry decision-making.

Strategy Work Plan

Total Years: 5

Total Budget: \$1,587,000

Final Outcomes and Products:

Part 324 program procedures; Part 324 administrative rules; guidance materials for lease and permit applicants, and members of the public interested in reviewing and commenting on proposed regulatory decisions; GIS-based guidance on classification of offshore areas for agency staff, the regulated community, and the public; and research-based GIS data on near-shore fisheries habitat, and use of coastal and offshore areas by bats, migratory birds, and other protected species including threatened and endangered species.

Year 1:

Description of activities

Water Resources Division staff will begin work on procedures to guide Part 324 program development and administration. Program staff will develop guidance materials for lease and permit applicants, and members of the public interested in reviewing and commenting on proposed regulatory decisions. MCMP will convene a technical advisory group to identify priorities for near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species research. Priority research and GIS data development will be funded through contracts or competitive pass-through grants. DEQ staff will work with the Institute for Fisheries Research and others as necessary to incorporate new and updated data layers within the lakebed alterations DST, and produce associated program guidance.

Outcomes

Development and adoption of Part 324 program procedures; guidance for applicants and the public; technical advisory group establishment; new research and GIS data on near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species; incorporation of new and updated GIS data within lakebed alterations DST; guidance resulting from the new and updated data.

Budget: Estimated at \$326,000

- \$5,000 for program procedures development
- \$5,000 for applicant and public guidance material development
- \$1,000 for technical advisory group establishment and meetings
- \$120,000 for coastal and offshore bird and bat migration and habitat use studies
- \$100,000 for near-shore fisheries habitat assessments
- \$60,000 for threatened and endangered species surveys in the Coastal Zone
- \$35,000 for contract with Institute for Fisheries Research for integration of new data into lakebed alteration DST and production of resulting guidance

Year 2:

Description of activities

Continue work on program procedures. Continue work on guidance materials for applicants and the public. Begin administrative rule-making process to provide for authority to distribute pass-through funding from bottomlands lease revenue for the purposes of bottomlands protection and management, aquatic habitat enhancement, shipwreck site management, and other mitigation measures. A stakeholder group will be formed to provide input on the draft rules. MCMP will meet with the technical advisory committee to identify priorities for near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species research. Priority research and GIS data development will be funded through contracts or competitive pass-through grants. DEQ staff will work with the Institute for Fisheries Research and others as necessary to incorporate new and updated data layers within the lakebed alterations DST, and produce associated program guidance.

Outcomes

Development and adoption of additional Part 324 program procedures; guidance for applicants and the public; establishment of administrative rules stakeholder group; preliminary drafts of administrative rules under Part 324; new research and GIS data on near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species; incorporation of new and updated GIS data within lakebed alterations DST; guidance resulting from the new and updated data.

Budget: Estimated at \$311,000

- \$5,000 for program procedures development
- \$5,000 for applicant and public guidance material development
- \$2,000 for establishment and meetings of Part 324 administrative rules stakeholders group
- \$3,000 for development of preliminary draft administrative rules
- \$1,000 for technical advisory group meetings
- \$118,000 for coastal and offshore bird and bat migration and habitat use studies
- \$97,000 for near-shore fisheries habitat assessments
- \$50,000 for threatened and endangered species surveys in the Coastal Zone
- \$30,000 for contract with Institute for Fisheries Research for integration of new data into lakebed alteration DST and production of resulting guidance

Year 3:

Description of activities

Continue work on program procedures. Continue work on guidance materials for applicants and the public, as necessary. Complete administrative rule development and promulgation. MCMP will meet with the technical advisory committee to identify priorities for near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species research. Priority research and GIS data development will be funded through contracts or competitive pass-through grants. DEQ staff will work with the Institute for Fisheries Research and others as necessary to incorporate new and updated data layers within the lakebed alterations DST, and produce associated program guidance.

Outcomes

Development and adoption of additional Part 324 program procedures; guidance for applicants and the public; promulgation of administrative rules under Part 324; new research and GIS data on near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species; incorporation of new and updated GIS data within lakebed alterations DST; guidance resulting from the new and updated data.

Budget Estimated at \$298,000

- \$3,000 for program procedures development
- \$3,000 for applicant and public guidance material development
- \$3,000 for meetings of Part 324 administrative rules stakeholders group
- \$3,000 for completion and promulgation of Part 324 administrative rules
- \$1,000 for technical advisory group meetings
- \$115,000 for coastal and offshore bird and bat migration and habitat use studies
- \$95,000 for near-shore fisheries habitat assessments
- \$45,000 for threatened and endangered species surveys in the Coastal Zone
- \$30,000 for contract with Institute for Fisheries Research for integration of new data into lakebed alteration DST and production of resulting guidance

Year 4:

Description of activities

Continue work on program procedures. Implement Part 324 administrative rules. MCMP will meet with the technical advisory committee to identify priorities for near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species research. Priority research and GIS data development will be funded through contracts or competitive pass-through grants. DEQ staff will work with the Institute for Fisheries Research and others as necessary to incorporate new and updated data layers within the lakebed alterations DST, and produce associated program guidance

Significant updates to the lakebed alterations DST will likely be necessary at this time to accommodate anticipated and customary software upgrades in the GIS platform. The current version of the decision support tool is programmed in the most up-to-date programming language compatible with the standard for GIS - ESRI's ArcView v. 9.3 and 10. The expectation for significant updates in Year 4 is based on the fact that such technology changes rapidly. Experience with other GIS projects has shown that significant upgrades in platform tend to change every few years and that upgrading GIS projects to incorporate platform changes is required to ensure the program continues to function for the broadest range of user.

Outcomes

Development and adoption of additional Part 324 program procedures; implementation of new administrative rules; new research and GIS data on near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species; incorporation of new and updated GIS data within lakebed alterations DST; guidance resulting from the new and updated data; update of DST GIS platform.

Budget: Estimated at \$346,000

- \$3,000 for program procedures development
- \$10,000 for implementation of Part 324 administrative rules
- \$1,000 for technical advisory group meetings
- \$116,000 for coastal and offshore bird and bat migration and habitat use studies
- \$96,000 for near-shore fisheries habitat assessments
- \$50,000 for threatened and endangered species surveys in the Coastal Zone
- \$30,000 for contract with Institute for Fisheries Research for integration of new data into lakebed alteration DST and production of resulting guidance
- \$40,000 for DST GIS platform update

Year 5:

Description of activities

Continue work on program procedures. Implement Part 324 administrative rules. MCMP will meet with the technical advisory committee to identify priorities for near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species research. Priority research and GIS data development will be funded through contracts or competitive pass-through grants. DEQ staff will work with the Institute for Fisheries Research and others as necessary to incorporate new and updated data layers within the lakebed alterations DST, and produce associated program guidance

Outcomes

Development and adoption of additional Part 324 program procedures; implementation of new administrative rules; new research and GIS data on near-shore fisheries habitat, coastal and offshore bird and bat migration, and protected species; incorporation of new and updated GIS data within lakebed alterations DST; guidance resulting from the new and updated data; update of DST GIS platform.

Budget: Estimated at \$306,000

- \$3,000 for program procedures development
- \$10,000 for implementation of Part 324 administrative rules
- \$1,000 for technical advisory group meetings
- \$116,000 for coastal and offshore bird and bat migration and habitat use studies
- \$96,000 for near-shore fisheries habitat assessments
- \$50,000 for threatened and endangered species surveys in the Coastal Zone
- \$30,000 for contract with Institute for Fisheries Research for integration of new data into lakebed alteration DST and production of resulting guidance

Fiscal and Technical Needs:

Fiscal needs

Once the Part 324 Program is established with State start-up funding and Section 309 funding and the Department has obtained NOAA approval of Part 324 as an enforceable policy for the MCMP, program administration will be partly supported by Section 306 funding. Additional long-term funding sources for the Part 324 Program are expected to include the State General Fund, annual rental fees from bottomland leases, and permit application fees. Once the offshore wind energy facilities begin generating electricity the Department is also expected to receive royalty payments. These or other sources of funding may be used to support the integration of the leasing and permitting application database with the lakebed alterations DST.

Technical needs

The Department intends for two full time positions (professional specialist and a GIS specialist) to staff this program. Collectively these staff will have the technical expertise to manage the development of the GIS-

based guidance on the classification of offshore areas, in cooperation with staff of the Institute for Fisheries Research.

The Institute for Fisheries Research will continue as a partner throughout the 5-year strategy period to provide their wealth of knowledge and technical expertise regarding the assessment and management of offshore resources using geospatial tools. The partnership between the MCMP and IFR is currently entering its fourth year and the IFR continues to exceed all expectations in terms of resource management knowledge and geospatial technical abilities that have been applied towards the creation of the DST. The Institute's success in building the existing version of the lakebed alterations DST is underscored by the Great Lakes Offshore Wind Council's reliance on the DST in its effort to identify potential Wind Resource Areas.

As described previously, a technical advisory group will advise on research and survey priorities, geographic area priorities, and experimental design for the development of research-based GIS data on near-shore fisheries habitat, and use of coastal and offshore areas by bats, migratory birds, and other protected species including threatened and endangered species. The MCMP will partner with the agencies, organizations, and academic institutions that have the technical ability and trained personnel needed to collect, analyze, and prepare this data for incorporation into the lakebed alterations DST.

Five Year Budget Table

Enhancement Area(s)	Strategy Project	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Wetlands	Climate Change Adaptation in Coastal Wetland Management	\$58,000	\$45,000	\$55,000	\$90,000	\$90,000	\$338,000
Coastal Hazards	High Risk Erosion Area Rule Revisions	\$80,000	\$50,000	\$60,000	\$50,000	\$90,000	\$330,000
	Improved Rip Current Forecasting and Hazard Messaging	\$76,000	\$80,000	\$73,000			\$229,000
Cumulative and Secondary Impacts/Great Lakes Resources/Energy and Government Facility Siting	Offshore Wind Energy Regulatory Program Development	\$326,000	\$311,000	\$298,000	\$346,000	\$306,000	\$1,587,000
Total Funding		\$540,000	\$486,000	\$486,000	\$486,000	\$486,000	\$2,484,000

Section 309 Five-Year Budget Table. This table summarizes the projects and funding needs by enhancement area.