Delaware Coastal Management Program
Section 309 Enhancement Program
2016-2020 Assessment and Strategy

Delaware Department of Natural Resources and Environmental Control
Office of the Secretary, Delaware Coastal Programs

CONTENTS

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INTRODUCTION

The National Coastal Zone Management Program, administered by the National Oceanic and Atmospheric Administration (NOAA), is a voluntary partnership between the federal government and U.S. coastal and Great Lakes states and territories authorized by the Coastal Zone Management Act (CZMA) of 1972 to address national coastal issues. The program works with coastal states and territories to address pressing coastal issues, including climate change, ocean planning, and planning for energy facilities and development.

The CZMA provides the basis for protecting, restoring, and responsibly developing our nation's diverse coastal communities and resources. To meet the goals of the CZMA, the national program takes a comprehensive approach to coastal resource management—balancing the often competing and occasionally conflicting demands of coastal resource use, economic development, and conservation. The program's key elements include protecting natural resources, managing development in high hazard areas, giving development priority to coastal-dependent uses, providing public access for recreation, prioritizing water-dependent uses, and coordinating state and federal actions.

The Coastal Zone Enhancement Program was established in 1990 under Section 309 of the CZMA and provides incentives to states to enhance their state programs within nine key areas: wetlands, coastal hazards, public access, marine debris, cumulative and secondary impacts, special area management planning, ocean and Great Lakes resources, energy and government facility siting, and aquaculture.

Under the Section 309, the Secretary of Commerce is authorized to make awards to states with approved coastal management programs to implement multi-year strategies that focus on one or more of the priority enhancement goals. To be eligible for the awards, every five years states assess their programs to identify priority needs and opportunities for improvement. This document is the Delaware Coastal Management Program's (DCMP) 309 Coastal Zone Enhancement Program Assessment and Strategy for 2016-2020.

This assessment was prepared based on information collected during a multi-phase programmatic strategic planning effort including an internet based survey of network partners, focus groups assessing community attitudes and needs, interviews with network partners in high priority areas, and comments received from the public.

The Delaware Coastal Programs, comprised of the DCMP and the Delaware National Estuarine Research Reserve (DNERR), has assessed and ranked the nine enhancement areas. The following priorities have been assigned based on the results of the assessments, and the information received from DCP staff, partners and collaborators.

Enhancement Area	Past Priority Rankings		Current Priority Rankings	
	2001	2005	2010	2015
Wetlands	High	Medium	High	High
Coastal Hazards	High	Medium	High	High
Public Access	Low	Medium	Low	Low
Marine Debris	Low	Low	Low	Medium
Cumulative & Secondary Impacts	High	High	Medium	Medium
Special Area Management Planning	High	High	High	Medium
Ocean Resources	Medium	High	High	Medium
Energy & Government Facility Siting	Medium	Medium	Medium	Medium
Aquaculture	Medium	Low	Low	Low

SUMMARY OF RECENT 309 ACHIEVEMENTS

In the 2011-2015 Coastal Zone Enhancement cycle, Delaware developed strategies to address coastal hazards and ocean resources.

Ocean Resources

Delaware's efforts to address ocean resource have been multi-faceted with research, policy development, and local and regional coordination components. The DCP completed a decade-long benthic and sub-bottom mapping effort for the Delaware's coastal waters including the Delaware Bay and Atlantic Ocean using RoxAnn acoustic and chirp seismic reflection profiling. The data has been made available through web and GIS-based systems to allow decisions-maker, stakeholders and the public an accessible means to review and utilize the data to better conserve the region's resources. The DCP has also conducted research on both commercially important and protected species whose management has been contentious due conflicts between stakeholder groups. The management of horseshoe in the Delaware Bay is important due to dynamic nature of its relationship with migrating shorebirds, some if which have declining world populations (e.g. Red Knot) and who are dependent on the horseshoe crabs during migration. The DCP has collaborated on or conducted nearly twenty years of research to support the management and protection of the globally important species generating long-term datasets on migrating shorebirds and spawning horseshoe crabs. Recently these efforts have been expanded to include the study of migration patterns of horseshoe crabs during non-spawning season. Collectively, resource agencies may use this information in efforts to create an effective balance between the competing stakeholder needs and concerns.

On a larger scale, the DCP initiated an effort to improve management of the state's near-ocean water resources and uses by developing a plan to address current and emerging issues and provide science-based data and information to stakeholders and decision-makers. Through a strategic stakeholder engagement process, data and information was collected detailing conflicts and compatibilities for over 20 categories of uses and resources in the region. This information was then used to develop a marine spatial data planning portal which will be used by project planners and permitting offices to aid in the development or review of project and in the management of ecological resources in the state. The application guides users through the process of determining appropriate and compatible activities that can be performed in a given location within Delaware coastal waters based on a user-defined project type and location and generates maps and reports illustrating how the intended activity relates to existing and potential future uses and resources including considerations for both spatial and temporal variations. These efforts have culminated in a user-friendly and publically accessible guidance tool that can be readily updated to foster discussion and coordination leading to sound, streamlined management decisions for Delaware's coastal resources and uses. Understanding these relationships and using that information to better accommodate users in these areas will reduce use and resource conflicts and improve the conservation and protection of the natural resource within the system.

The local research and planning efforts have broader reaching implications. DCP has supported two organizations addressing regional priorities on ocean governance challenges and opportunities. Since their inception, the DCP has assisted both the Mid-Atlantic Regional Council on the Ocean (MARCO) and the Mid-Atlantic Regional Planning Body (MidA RPB) with a variety of efforts from mapping activity use to meeting with stakeholders in groups or at public listening sessions and DCP has provided focused support on

priority issues. Coordination and stakeholder engagement have been a vital component of the planning process. MARCO recognized early the need to encourage Native American representation from tribes in Mid-Atlantic region as they have used and relied on ocean resources for countless generations. A two-way dialogue process has been established to ensure all state and federal-recognized tribes have a voice in the marine spatial planning process. Water quality, renewable energy, marine habitats and climate change adaptation are the shared regional priorities identified MARCO. As a leader in planning for the effects of climate change and coastal hazards, the DCP has worked directly on the climate change workgroup, assisting in the development of strategies for increasing resiliency in the five Mid-Atlantic states. MARCO received a $340,000 grant from the US Fish and Wildlife Service to implement a program to disseminate much needed tools and information. Due to the effects of Superstorm Sandy, this work will be done in tandem with the Northeast Regional Ocean Council. Another priority was strengthening protection of key habitats in the region. Submarine canyons which support unique, highly diverse and vulnerable habitats exist along the continental shelf. With support from the DCP, MARCO developed a course of action prioritizing certain canyons in order to gain clarity on exceptional ecological and significant economic importance of these ecosystems. These coordinated efforts are providing a more consistent framework for the marine spatial planning decision-making, both locally and throughout the Mid-Atlantic region, necessary to sustain the long-tern health of the Mid-Atlantic's ocean resources.

Through years of research, stakeholder engagement and conflict characterization and analysis, these efforts have culminated in development of new management implementation mechanisms, guidance and policy documents and tools in the forms of an a programmatic operations plan, a resource and use compatibilities guide, and an online webapp service for interactive planning to reduce use conflict and improve conservation efforts for use and adoption by the state or region and which will support the DCP in the development of new enforceable policies for incorporation into the federal consistency program.

Coastal Hazards

The development of the Department's Policy on Sea Level Rise and its associated planning scenarios was the impetus for a multi-year effort in the Delaware Coastal Programs to address coastal hazards in the state. In 2010, Delaware's Sea Level Rise Advisory Committee was created and tasked with assessing vulnerability of the state to sea level rise and recommending adaptation options. After a year and a half of study, coordination, collaboration and public engagement, "Preparing for Tomorrow's High Tide: Delaware's Sea Level Rise Vulnerability Assessment" was completed and made available for use by Delaware's Sea Level Rise Advisory Committee, decision-makers and landowners. The completion of this report is a key milestone in the development of Delaware's Sea Level Rise Adaptation Plan, a collaborative planning process led and funded by the DCMP, in collaboration DNERR. Delaware's Sea Level Rise Vulnerability Assessment was a first for the U.S. in both its statewide geographic scope and in-depth analysis. Using three future scenarios for sea level rise, it provided exposure data and maps for 79 resources statewide. It also assessed the potential social, economic and environmental impacts likely to result from exposure to sea level rise and prioritizes risk to the state. The specific nature of the information contained within the document has been central to increasing support for sea level rise planning and adaptation measures.

In 2013, after three years of assessment, education, public engagement, and policy analysis, the Sea Level Rise Advisory Committee formally approved a set of 55 recommendations for adapting to sea level rise in Delaware. The recommendations focus on actions to build the state's capacity to adapt to sea level rise and were developed with significant stakeholder and citizen input. These recommendations formed the framework for an implementation process led by the DCMP. Early implementation activities began almost immediately when Delaware's Governor Jack Markell fulfilled Recommendation 2.2 by signing Executive Order 41, "Preparing Delaware for Emerging Climate Impacts and Seizing Economic Opportunities from Reducing Emissions," mandating state agencies to include sea level rise in the design of state projects and to incorporate it into long-range plans. In addition, in support of recommendations aimed at increasing public awareness of the threats of sea level rise, Delaware's non-profit community collaborated to pass legislation designating a week in September as Sea Level Rise Awareness week in Delaware and commissioned a documentary about sea level rise impacts in Delaware.

In 2014, the DCMP completed the third part of the development phase for this effort with the publication of the Adaptation Implementation Workshop Proceedings. The document has been used by state agencies in preparing agency-specific recommendations for climate adaptation as called for by Executive Order 41: Preparing for Emerging Climate Impacts. DCMP has now fully moved into the implementation phase. To date, 15 of the recommendations are underway or have been completed either directly or with the assistance of the DCMP including participation on the involvement in the Delaware Climate Change Impact Assessment Steering Committee and supporting the Cabinet Committee on Climate and Resiliency.

Through its many efforts directly and with those in collaboration with networked partners, goals described in the 309 strategy for coastal hazards have been achieved resulting in policy and guidance documents and tools, including Executive Order 41, the "Preparing for Tomorrow's High Tide" series and the online, interactive sea level rise inundation viewer used to determine the potential impact of coastal hazards on projects under review by the DCMP and by the state to guide state agencies to better plan for future impacts, protect state resources and infrastructure and focus the priorities for projects receiving financial assistance.

ASSESSMENT

Phase I

WETLANDS

Resource Characterization

1. Using reports provided from NOAA's Land Cover Atlas, please indicate the extent, status, and trends of wetlands in the state's coastal counties.

Table 1

Coastal Wetlands Status and Trends*		
Total Wetland Acres (2011)	303295.5 (19.0% of state)	
Net Change Over Time (acres)	**1996-2011**	**2006-2011**
Total Wetlands	-7200.0	-165.2
Palustrine wetlands	-6389.4	-350.5
Estuarine wetlands	-669.2	218.4
Unconsolidated Shore	-141.4	-33.1

Table 2

How Wetlands Are Changing*		
Land Cover Type	**Area of Wetlands Transformed to Another Type of Land Cover between 1996-2011 (Acres)**	**Area of Wetlands Transformed to Another Type of Land Cover between 2006-2011 (Acres)**
Development	-1252.3	-191.0
Agriculture	-2848.9	4.4
Barren Land	-362.9	-53.2
Water	-297.8	105.6

*The wetlands acreage transformed from 1996 to 2011 totals -4762 acres (Table 2). The net change in total wetlands for that period was -7200 acres (Table 1). The difference in the values was most likely to be associated with actual losses with some changes possibly including changes of wetland to natural upland categories, or visa-versa. Many of these additional changes are associated with timber, or silviculture, activities which (depending on the management practices in your area) may result in additional losses (not noted in table 2 above). It should also be noted that some of the above changes may not reflect permanent wetland losses and that changes to water may reflect a loss of vegetative wetlands, but could also be associated with gains in unvegetated wetland types (such as unconsolidated bottom), which C-CAP does not map.

2. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of coastal wetlands since the last assessment to augment the national data sets.

Delaware Wetlands: Status and Changes from 1992 – 2007

In 2011, DNREC released the "Delaware Wetlands: Status and Changes from 1992 – 2007" report. A previous inventory and assessment of wetland changes for the state were completed for 1981-1992. The current mapping and analysis effort is largely an update of that study and was completed by the U.S. Fish and Wildlife Service's National Wetlands Inventory Program (NWI) and Delaware's DNREC. This report summarizes the 2007 status of wetlands across Delaware, details findings from the trends analysis of how and where wetlands were gained or lost between 1992 and 2007, and provides perspective on how those changes affect wetland functions and the future of Delaware wetlands.

Wetlands in this inventory were classified in two ways: by major ecological types and abiotic properties. Ecological types use biological, physical and chemical characteristics whereas abiotic properties address position on the landscape, landform, and direction of water flow. This mapping effort mapped 320,076 acres of wetlands across the state of Delaware. This total includes 62,291 acres of hydric soil map units that were naturally vegetated but did not exhibit a distinctive wet signature on the aerial imagery. These areas are likely to support seasonally saturated wetlands which are among the most difficult wetlands to identify. Delaware's wetlands are dominated by palustrine forests which make up 64 percent of the state's wetlands. Estuarine emergent wetlands comprise 23 percent of the wetlands statewide. Forty-seven percent of Delaware's wetlands are located in Sussex County, 38 percent in Kent and 15 percent in New Castle County. Forty-two percent of Delaware's wetlands fall within the Delaware Bay Basin, 42 percent in the Chesapeake Basin, 14 percent in the Inland Bays Basin, and two percent in the Piedmont Basin.

Wetland changes were determined by comparing aerial images from 1992 and 2007. This evaluation indicated that nearly 3,900 acres of vegetated wetlands were lost through conversion to another land use, while 768 acres of vegetated wetlands were created or restored. These changes resulted in a net loss of 3,126 acres of vegetated wetlands statewide. Palustrine vegetated wetlands were lost due to conversion to agriculture (33%), development (30%), extraction/transition (28%), pond and lake construction (4%) and highway and roads (2%). Most of the net palustrine loss was forested wetlands (2,931 acres). Estuarine vegetated wetlands had a net loss of 238 acres between 1992 and 2007. Causes for the estuarine vegetated wetlands loss were conversion to estuarine open water (83%), intertidal shores (10%), development (4%), beach overwash (2%), and pond construction (1%).

The state's annual vegetated wetland loss rate increased nine percent compared to a similar study for 1981/2-1992. State tidal wetland regulations have helped curb the loss of estuarine wetlands, yet freshwater vegetated wetlands experienced heavy losses from 1992 to 2007. Watershed wetland-health studies across the state have found that the majority of the remaining wetlands have been degraded to varying extents. Climate change, especially rising sea levels will produce increased threats to wetlands in the future. Without strengthened freshwater wetland regulations and improved permit tracking and enforcement, Delaware will likely continue to suffer the loss and degradation of its wetland resources and the valuable environmental services they provide.

Wetlands Rating and Assessment

The DNREC Wetlands Monitoring and Assessment Program (WMAP) has worked to develop and refine various wetlands rating and assessments methods, the application of each varying dependent upon the type of wetland and the level of assessment being sought. Systems currently employed include the 1) Mid-

Atlantic Tidal Rapid Assessment Methodology (MidTRAM), a rapid protocol for assessing the condition of estuarine emergent tidal wetlands in Delaware, Maryland, and Virginia validated with intensive biological data based on the bird community and biomass levels; 2) the Delaware Comprehensive Assessment Procedure (DECAP), a comprehensive assessment method for collecting data that can be used to determine the condition of a wetland site relative to reference condition (closest to natural and undisturbed) and is applicable to flat, riverine and depressional nontidal wetland subclasses in the Coastal Plain of Delaware and Maryland; and 3) the Delaware Rapid Assessment Procedure (DERAP), a rapid field method for determining the general condition of a wetland site which can be used in flat, riverine, and depressional wetlands in Delaware and Maryland. Guidance was updated in 2013 to also assess the values provided by nontidal wetlands and are designed to be completed remotely using Geographic Information Systems (GIS) and in the field during the DERAP assessment.

With these tools, the DNREC WMAP has been conducting assessments of the health of Delaware's wetlands on the watershed level. With over 60% of the state's watershed assessments complete, the program intends to complete all assessments by 2019 and begin the process again, with the added benefit of have comparable baseline data to assess change in addition to value and health.

Monitoring and Assessment of Representative Tidal Wetlands of the Delaware Estuary

In 2013 the Partnership for the Delaware Estuary (PDE) released a report on wetlands within the Delaware Estuary. The PDE following the lead of the Delaware DNREC, began to use the Mid-Atlantic Tidal Rapid Assessment Methodology (MidTRAM) in order to assess the health of the various watersheds throughout the Delaware Estuary to ground-truth emerging landscape data that suggested widespread declines in coastal wetland acreage and health. These rapid assessment form one component (Tier 2) of a multi-level program referred to as the Mid-Atlantic Coastal Wetland Assessment (MACWA). This study provided support for rapid assessments in three representative watersheds of the Delaware Estuary, but also includes additional Mid-TRAM data for other areas (seven watersheds overall) as well as preliminary cross-tier comparative analyses. In comparing seven representative watersheds assessed with MidTRAM, the overall composite scores revealed some differences in wetland health across the region, however more variability and detail about stressors can be found by examining geospatial variation with regard to individual metrics and combined attribute scores. The Delaware Estuary has always been a tidal wetland dominated ecosystem, naturally muddy and rich in sediments. Almost 150,000 acres remain, including perhaps 5% of pre-settlement acreage of nationally rare freshwater tidal marshes. The current loss rate of an acre per day is expected to increase with increasing rates of sea level rise and an expected increase in human population of 80% by 2100. Coastal wetland assessment and trends analysis is therefore a top priority for PDE and many of our partners. Despite growing use of MACWA data and broad support for its importance in the dynamic coastal landscape, the future of MACWA is uncertain because no federal or state funding programs are dedicated to support sustained wetland assessments.

NERRS Sentinel Sites

Each of the 28 reserves in the National Estuarine Research Reserve System (NERRS) implements standardized monitoring protocols to examine short term variability and long-term changes in estuarine ecosystems. The NERRS Sentinel Sites combine the monitoring, outreach and training capacity at each reserve into networks that address questions of impacts of climate change and anthropogenic stressors on estuarine ecosystems and coastal communities. The current focus of the NERR Sentinel Sites is to assess the impacts of sea level change and inundation on tidal wetlands, submerged aquatic vegetation (SAV), and

mangroves to inform coastal management by developing robust tools such as inundation maps, integrated ecosystem models, and vulnerability assessments to assist coastal managers in adapting to climate change. The NERR Sentinel Sites are a foundational element of the larger NOAA Sentinel Sites Program (NOAA SSP), which is a partnership between NOAA and other Federal, local and regional partners focused on leveraging networks of environmental observations to address coastal management issues of local and regional concern.

The Delaware NERR, in collaboration with the DCMP, is working to establish itself as a NERR sentinel site. Current research being conducted towards this effort includes: surface elevation tables to monitor changes in marsh elevation due to subsidence, biomass accretion and sedimentation; changes in groundwater and surface water quality and levels; and meteorological data collection. The effort will soon be expanded to include surface water monitors to measure the variability of marsh tidal flooding due to topographic variations. An assessment of Blue Carbon, or the storage and sequestration of carbon in estuarine ecosystems has recently begun both with the work of a University of Delaware collaborator and system-wide with an effort to determine sequestration variation through the quantification of marsh soil organic carbon content at eight National Estuarine Research Reserves across the United States, including the DNERR. The goal is to fill critical gaps in estimates of current carbon storage across a range of marsh types, as well as improve the methodology upon which existing estimates are made and thereby increase understanding of the ecosystem services that coastal habitats provide.

Management Characterization

1. Indicate if there have been any significant changes at the state or territory level (positive or negative) that could impact the future protection, restoration, enhancement, or creation of coastal wetlands since the last assessment.

Management Category	**Significant Changes Since Last Assessment** (Y or N)
Statutes, regulations, policies, or case law interpreting these	N
Wetlands programs (e.g., regulatory, mitigation, restoration, acquisition)	Y

Numerous activities have occurred during the previous five years have overall resulted in significant improvements to the State's tidal wetlands conservation and protection. However, there is still more work to be done, particularly in educating decision makers on the value of the services provided by both tidal and freshwater wetland systems to ensure greater protection, restoration, and migration opportunities are provided to them in the future.

In 2011, DNREC revised the Open Space Program (OSP) Priority Ranking Process. As established by the Delaware Land Protection Act, the OSP is to acquire interest in real property to carry out conservation programs of the State. Under the purpose of the law, the State is "to protect and conserve all forms of natural and cultural resources; to protect and conserve the biological diversity of plants and animals and their habitat; to protect existing or planned parks, forests, wildlife areas, nature preserves or other recreation, conservation or cultural sites by controlling the use of contiguous nearby lands; to preserve sites of special natural, cultural or geological interest; to connect existing open spaces into a cohesive

system of greenways and resource areas; to provide for public outdoor recreation; and to allow for water resource conservation." With consideration to the future impacts of climate change and other natural processes resulting in the loss of tidal wetlands, the OSP wanted revise the criteria to begin prioritizing the acquisition of those lands that would allow for tidal wetland inland migration. The assistance from the DCP, criteria relating perspective parcel proximity to lands predicted to be affected by climate change impacts and other natural processes were incorporated. The DCP will be seeking to have additional criteria added to the program to further the ability of the OSP to prioritize for wetland migration for acquisition through the valuation of tidal wetland ecosystem services.

In 2014, the final draft of the Delaware CELCP Plan was approved by the National Oceanic and Atmospheric Administration that addressed the CELCP plan requirements published in the Final Guidelines for the CELCP (68 Federal Register 35860-35869 (June 17, 2003)).The national Coastal and Estuarine Land Conservation Program (CELCP) was established by congress to provide matching funds to protect important coastal and estuarine areas and to further the goals of Coastal Zone Management Act. The goals of CELCP are to protect those lands that have significant conservation, ecological, recreation, historical, or aesthetic values through furthering the goals of the Coastal Zone Management Act (CZMA). The goals of the CZMA that CELCP addresses are: protecting coastal ecosystems, wetlands, corals, and natural shoreline; preserving natural features that provide storm protection, such as dunes and barrier islands; minimizing the loss of life and property by directing development out of high-risk areas; safeguard coastal water quality; preserve historic, cultural, and archaeological features; protect aesthetic coastal features and scenic vistas; and provide opportunities for public access to the coast. The Delaware CELCP Plan identifies specific habitats as priorities for protection that are threatened from sea level rise, direct and indirect impacts from development, coastal storms, and land use changes. To ensure all aspects of coastal land protection were identified in the Delaware CELCP Plan, a broad range of stakeholders and the public were asked to participate in the development of the Plan. Delaware's CELCP Plan is innovative in that it additionally addresses the need to protect lands that are most threatened from sea level rise since Delaware's sea level rise trends are almost twice the global average.

Delaware Coastal Programs assisted DNREC's Wetland Monitoring and Assessment Program (WMAP) with the development of additional metrics to aid in the condition-based assessment of nontidal wetlands for use in conjunction with Delaware Rapid Assessment Procedure. Condition scores provided with these tools estimate a wetland's efficacy in performing various functions and are independent of wetland values which are based on the opportunity of the wetland to provide a function and the local significance of that function. This tool will be beneficial to improving education, restoration, protection, and land use planning efforts. Additionally, WMAP is currently leading the periodic update of the Delaware Wetlands Conservation Strategy, a collaborative effort among the DNREC and other state partners to guide the efforts of state agencies to improve Delaware's wetland resources through increased agency coordination, data availability, education, monitoring and restoration efforts.

DCP served as one of two DNREC representatives on the Delaware Wetland Advisory Committee formed as a result of Senate Bill 78 which was signed into effect on July 31, 2013. The purpose of SB78 was to promote public health and safety through the conservation and restoration of non-tidal wetlands. The General Assembly requested the DNREC Secretary develop wetland protection priorities through consultation with a Wetland Advisory Committee and recommend for consideration a comprehensive approach for non-tidal wetland conservation, restoration and education. The Committee was directed to consider options that would reduce duplication, improve permitting efficiency and allow for cumulative

losses to be tracked. Also, SB78 amended Chapters 66 and 72 to give the DNREC Secretary authority to issue an after-the-fact permit, letter of authorization or waiver when activities have occurred before permission has been granted, and to impose civil penalties versus criminal penalties against violators. Topics brought before and by the committee for presentation and discussion included informing members about wetland ecology and detailing Delaware's wetland resources, understanding past wetland legislative efforts, reviewing current state and federal permitting procedures, accounting for gaps in wetland tracking, understanding perspectives from the permitted community, pursuing opportunities to reinvigorate existing programs, and considering various incentive-and regulatory-based programs for adoption. Eight recommendations were brought to a Committee vote, three characterized as regulatory and five incentive-based. While the incentive-based recommendations were accepted by the Committee, the regulatory recommendations were rejected. Upon review of the recommendations, the Governor requested DNREC organize a workgroup to assess the feasibility of moving forward with the development of freshwater wetlands legislation and a regulatory program. The DCP management is supporting this effort and is participating in the workgroup which convened in early 2015.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High	X
Medium	
Low	

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

The DCMP understands the need to expand protection, restoration and/or enhancement efforts for wetlands and will continue in its role to facilitate to collection and dissemination of data and information necessary to modify or aid existing conservation or acquisition programs within the state, identify conservation and protection priorities and continue its involvement in the evaluation for the development regulations to offer additional layers of protection to these important resources.

DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated wetlands are a priority enhancement issue and ranked highly as an area in need of most assistance. Additionally, this area was identified as a high priority by DCP staff though its strategic planning efforts.

COASTAL HAZARDS

Resource Characterization

1. **Flooding:** Using data from *NOAA's State of the Coast* "Population in the Floodplain" viewer and summarized by coastal county through NOAA's Coastal County Snapshots for Flood Exposure, indicate how many people were located within the state's coastal floodplain as of 2010 and how that has changed since 2000.

Population in the Coastal Floodplain			
	2000	**2010**	**Percent Change from 2000-2010**
No. of people in coastal floodplain	80,000	100,000	+25%
No. of people in coastal counties	783,600	897,934	+15%
Percentage of people in coastal counties in coastal floodplain	10%	11%	----

2. **Shoreline Erosion**: Using data from *NOAA's State of the Coast* "Coastal Vulnerability Index," indicate the vulnerability of the state's shoreline to erosion.

Vulnerability to Shoreline Erosion		
Vulnerability Ranking	**Miles of Shoreline Vulnerable**	**Percent of Coastline**
Very low (>2.0m/yr) accretion	35	18%
Low (1.0-2.0 m/yr) accretion)	-----	-----
Moderate (-1.0 to 1.0 m/yr) stable	52	27%
High (-1.1 to -2.0 m/yr) erosion	4	2%
Very high (<-2.0 m/yr) erosion	96	50%

3. **Sea Level Rise**: Using data from *NOAA's State of the Coast* "Coastal Vulnerability Index", indicate the vulnerability of the state's shoreline to sea level rise.

Coastal Vulnerability to Historic Sea Level Rise		
Vulnerability Ranking	**Miles of Shoreline Vulnerable**	**Percent of Coastline**
Moderate	190	100%

4. **Other Coastal Hazards:** In the table below, indicate the general level of risk in the coastal zone for each of the coastal hazards. The state's multi-hazard mitigation plan is a good additional resource to support these responses.

Type of Hazard	General Level of Risk (H, M, L)
Flooding (riverine, stormwater)	HIGH - #1 statewide
Coastal storms (including storm surge)	
Geological hazards (e.g., tsunamis, earthquakes)	MEDIUM - #4 NCC; #6 K & S
Shoreline erosion	HIGH – from CVI, not rated in State Plan
Sea level rise	MEDIUM - from CVI, not rated in State Plan
Great Lake level change	n/a
Land subsidence	Included in SLR
Saltwater intrusion	UNKN – research is underway

5. If available, briefly list and summarize the results of any additional data or reports on the level of risk and vulnerability to coastal hazards within your state since the last assessment. The state's multi-hazard mitigation plan or climate change risk assessment or plan may be a good resource to help respond to this question.

Results of the Sea Level Rise Vulnerability Assessment

Delaware's sea level rise vulnerability assessment demonstrates that inundation from sea level rise will occur in all three of Delaware's counties, affecting a range of resources. Although the direct impacts from sea level rise inundation will be felt primarily in areas near tidal waters, every Delawarean is likely to be affected by sea level rise whether through increased costs of maintaining public infrastructure, decreased tax base, loss of recreational opportunities and wildlife habitat, or loss of community character.

Statewide, between 8% and 11% of the state's land area (including wetlands) could be inundated by a sea level rise of 0.5 meters to 1.5 meters, respectively. Within those potentially inundated areas lie transportation and port infrastructure, historic fishing villages, resort towns, agricultural fields, wastewater treatment facilities and vast stretches of wetlands and wildlife habitat of hemispheric importance.

Recommendations for Preparing for Sea Level Rise

Delaware's Sea Level Rise Advisory Committee was charged with developing recommendations for adapting the state to the likely impacts of sea level rise. Because sea level rise adaptation will occur at many different geographic levels, from an individual home to regional transportation networks, the advisory committee focused its efforts on researching and developing recommendations that will build the state's capacity to adapt, rather than pinpointing adaptation measures that should be used in specific locations. Over 100 separate options and seven objectives were developed by the advisory committee. After further research and discussion, the list was narrowed and released to the public for review at a series of public engagement sessions in partnership with the DNERR Coastal Training Program.

After review of public comments and additional investigation and discussion, the Sea Level Rise Advisory Committee formally approved 55 recommendations for adapting to sea level rise to meet these objectives:

Objective 1: Improve Communication and Coordination among State, Federal, Local and Regional Partners to Streamline Sea Level Rise Adaptation Efforts.

Objective 2: Provide Increased Regulatory Flexibility for Adaptation and Improve Consistency among Regulatory Agency Decisions.

Objective 3: Provide Consistent and Predictable Policies for Future Growth, Investment, and Natural Resource Management.

Objective 4: Increase Public Awareness of Sea Level Rise through Education, Outreach and Marketing.

Objective 5: Improve the Availability & Robustness of Sea Level Rise Data Sets.

Objective 6: Provide Technical Assistance to Partners for Assessing Vulnerability and Choosing Adaptation Strategies.

Objective 7: Expand Funding Opportunities for Adaptation Planning and Implementation Projects.

Finalizing DFIRM Updates for Delaware

In 2007, the Federal Emergency Management Agency (FEMA) Region III began its most comprehensive effort ever to restudy the Region III coastal counties' current flood hazard areas. Using the most current data and the latest flood modeling and digital mapping technologies, new flood hazard maps, known officially as Digital Flood Insurance Rate Maps (DFIRMs) and associated flood risk products were created. As a result, updated flood hazard data will be available to help guide building, mitigation, and flood insurance decisions. With the release of these new coastal flood hazard maps, community officials, residents, and business owners in coastal and other tidally influenced areas will have up-to-date, reliable, internet-accessible data about the coastal flood risks they face.

The Delaware DNREC is conducting riverine flood studies in all three counties primarily consisting of Limited Detail flood studies, with model backed A –Zones and some streams which have been studied in detail in the past will be restudied or re-delineated with improved topography.

All three counties in Delaware now have new county-wide flood studies many coastal communities have or are in the process of updating their ordinances.

Management Characterization

1. Indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred that could impact the CMP's ability to prevent or significantly reduce coastal hazards risk since the last assessment.

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these that address:			
elimination of development/redevelopment in high-hazard areas[1]	Management Recommendations	Yes	Yes
management of development/redevelopment in other hazard areas	Management Recommendations	Yes	Yes
climate change impacts, including sea level rise or Great Lake level change	Executive Order	EO applies to state government agencies	Yes
Hazards planning programs or initiatives that address:			
hazard mitigation	Yes	Yes	Yes
climate change impacts, including sea level rise or Great Lake level change	Yes	Yes	Yes
Hazards mapping or modeling programs or initiatives for:			
sea level rise or Great Lake level change	Yes	Yes	Yes

[1] Use state's definition of high-hazard areas.

2. Briefly state how "high-hazard areas" are defined in your coastal zone.

Coastal High Hazard Area are defined as an area of special flood hazard extending from offshore to the inland limit of a primary frontal dune along an open coast and any other area subject to high velocity wave action from storms. Coastal high hazard areas also are referred to as "Zone V" or "V Zones" and are designated on FIRMs as flood insurance risk Zone VE.

3. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

See "Sea Level Rise Vulnerability Assessment and Adaptation Planning"

Recommendations for Preparing for Sea Level Rise

As described above, 55 recommendations to address the seven objectives identified by the State Sea Level Rise Advisory Committee were developed and published in 2013. Of those, the implementation of five recommendations is complete and eight additional are underway.

One of those recommendations was issuance of an Executive Order on climate change by the Governor. Executive Order 41 directs state agencies to "incorporate measures for adapting to increased flood heights and sea level rise in the siting and design of projects for construction of new structures and reconstruction of substantially damaged structures and infrastructure." It calls for avoidance of new structures in flood-prone areas and special design standards for structures where avoidance is not practicable.
Under the direction of Executive Order 41, a technical workgroup was established to develop flood avoidance guidance for state agencies. The Flood Avoidance Workgroup (FAW) is led jointly by the DNREC Division of Watershed Stewardship and the Delaware Coastal Programs Office.

The FAW met regularly between April and November 2014 to pursue the completion of five tasks:

1. Develop a new set of maps and tools for use by state agencies in implementing the guidance.
2. Develop guidance for use by state agencies for the siting and design of structures and infrastructures, with an emphasis on avoidance of current and future flood risk.
3. Identify the programs and processes that will help ensure compliance with guidelines. Work with them as needed to incorporate guidance into their policies/checklists.
4. Develop guidance for the use of natural systems and green infrastructure in state projects.
5. Coordinate development of tools and guidance with other EO 41 groups, including the points of contact and the Cabinet Committee on Climate and Resiliency.

The DCMP has supported this task under section 309. The Flood Avoidance Workgroup will complete the Flood Avoidance and Design Guidance document as a technical guide, and will assist state agencies with implementation in 2015. The Climate Framework includes 11 recommendations that can be used to institutionalize the Flood Avoidance and Design Guidance. Successful incorporation of the Flood Risk Adaptation Map and Flood Avoidance and Design Guidance into state agency procedures and processes will take additional coordination and technical assistance.

Education and Outreach

With the hazards facing the residents, business owners, and visitors of Delaware, increasing the awareness of the risks associated with and actions that can be taken to increase resiliency to these hazards and has been a focus of the DCMP. The Sea Level Rise Advisory Committee education and outreach workgroup developed the Sea Level Rise Outreach Strategy to communicate with and engage stakeholders in Delaware. Over the last two years the DCMP, in coordination with DNERR Coastal Training Program, has provided technical or financial assistance for numerous coastal hazard related education and training events for the general public, local, county and state officials.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High	X
Medium	
Low	

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

In Delaware, 100% of the state population resides in coastal counties. With an ever increasing awareness of how coastal hazards impact communities and how preparing for such impacts may reduce the risks associated with them, coastal hazard planning and adaptation will remain a focal point for the foreseeable future.

DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated coastal hazards are a priority enhancement issue and ranked it highly as an area in need of the most assistance. Additionally, this area was identified as a high priority by DCP staff though its strategic planning efforts.

PUBLIC ACCESS

Resource Characterization

1. Use the table below to provide data on public access availability within the coastal zone.

Public Access Status and Trends			
Type of Access	**Current number**	**Changes or Trends Since Last Assessment** (↑, ↓, –, unknown)	**Cite data source**
Beach access sites	Total sites 110 Sites per miles of shoreline 1.79	Unchanged. Delaware has 61.45 miles of regulated "beach".	DNREC - Shoreline and Waterway Management Section
Shoreline (other than beach) access sites	105	Unchanged.	DNREC - Shoreline and Waterway Management Section
Recreational boat (power or non-motorized) access sites	74	91 (2010 Del. Fishing Guide) Reduction is likely due to counting individual ramps in 2010 rather than "sites".	Outdoor Recreation Inventory (ORI) - 2013 SCORP
Number of designated scenic vistas or overlook points	1 – Scenic & Recreational River; 3 Scenic Byways (incl. 1 National)	Reduction of 1 Pending Scenic Byway that was not designated.	Delaware Greenways National Wild & Scenic River System
Number of fishing access points (i.e. piers, jetties)	161	Unknown. Wide variation among sources. ORI-SCORP is most comprehensive set to date.	Outdoor Recreation Inventory (ORI) - 2013 SCORP
Coastal trails/ boardwalks	No. of Trails/ boardwalks 325 Trails (incl. 15 BW) Miles of Trails/boardwalks 568	Near doubling of trails since last report. 1. ORI-SCORP is more comprehensive 2. Governor's "Trails and Pathways Initiative" beginning 2011.	GIS Data underlying the Outdoor Recreation Inventory (ORI) - 2013 SCORP
Number of acres parkland/open space	158,203 acres	Large increase from last reporting due to change in ORI-SCORP method. Now defined as "publicly accessible conservation and outdoor recreation lands".	GIS Data underlying the Outdoor Recreation Inventory (ORI) - 2013 SCORP

2. Briefly characterize the demand for coastal public access and the process for periodically assessing demand. Include a statement on the projected population increase for your coastal counties.[2]

The population within the state's coastal shoreline counties is projected to increase by 9 percent between 2010 and 2020, from 899,673 to a projected 979,216.

Statewide Comprehensive Outdoor Recreation Plan

Delaware's Statewide Comprehensive Outdoor Recreation Plan (SCORP), is a planning and policy document that identifies needs in outdoor recreation throughout the state of Delaware. Identification of these needs guides the investment of funding for outdoor recreation, specifically in the distribution of Land and Water Conservation Funds (LWCF) and Delaware Trust Funds, as well as other public and private funds. In order to remain eligible to receive LWCF grants, states are required by the Land and Water Conservation Fund Act, through administration by the Department of Interior, National Park Service, to develop a SCORP every five years.

During the development of the 2013 SCORP, citizens, local interest groups, municipal, county and state government agencies were asked to identify Delaware's outdoor recreation needs and concerns and provide recommendations to meet overall needs. A Technical Advisory Committee, made up of more than twenty-five local, regional, state, federal and non-governmental organizations, met quarterly to inform and guide plan development. The findings reported in the 2013 SCORP, indicted the changes in recreation and growth trends, community needs, and landscape preferences. Many discoveries were made in the process, such as: A majority of Delaware residents (93%) indicate outdoor recreation is important to their quality of life and 58% of residents participate in outdoor recreation for their physical fitness and to lead a healthier lifestyle. This effort includes the updating of the Outdoor Recreation Inventory (ORI) for the state. The ORI is an asset registry of open space, protected land, parks and recreational facilities managed by federal, state, county, and municipal governments, private conservation groups and school districts Focus of the SCORP is regional in nature, and not intended to indicate specific locations for community parks. However, further planning to secure park land and locate specific facilities at the local level is very important.

2011 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation (Survey) has been conducted since 1955 and is one of the oldest and most comprehensive continuing recreation surveys. The Survey collects information on the number of anglers, hunters, and wildlife watchers, how often they participate, and how much they spend on their activities in the United States. The 2011 survey showed no significant increase in fishing and hunting activities from 2006. There was a 45% increase in residents who participated in wildlife watching away from home and a 20% decrease in at-home observations.

[2] See NOAA's Coastal Population Report: 1970-2020 (Table 5, pg. 9): http://stateofthecoast.noaa.gov/coastal-population-report.pdf

3. If available, briefly list and summarize the results of any additional data or reports on the status or trends for coastal public access since the last assessment.

Delaware Bayshores Initiative

The Delaware Bayshores Initiative will collaboratively build on the region's reputation as a unique and beautiful natural resource, and help improve the shoreline economy by encouraging more Delawareans and visitors to enjoy it through activities such as recreational fishing, hunting, boating and ecotourism. This non-regulatory approach will continue the tradition of DNREC's commitment to preserving the state's coastal strip, which has been protected by Delaware's Coastal Zone Act for more than 40 years. Due in large part to the legacy of that landmark legislation, more than half of the Delaware Bayshore's acreage remains undeveloped, and is today protected as state or federal wildlife lands. By building on public-private partnerships and leveraging state, federal and private resources, the Bayshore Initiative targets three major areas for improvement: 1) Conservation and ecological restoration - connecting wildlife areas by acquisition or easement of unprotected lands, restoring native habitat, and protecting resources; 2) Recreation and connectivity - focusing strategic investments to connect wildlife areas to urban centers, maximizing enjoyment of the outdoors by providing safe, healthy recreational experiences, and enhancing access to wild areas; and 3) Engagement and marketing – engaging, educating and inspiring the next generation of environmental stewards, partnering with local communities and organizations to promote the area regionally, nationally and internationally, and promoting local volunteerism. In addition to economic benefits, the Delaware Bayshore Initiative stands to improve quality of life through enhanced outdoor recreational opportunities; to provide students with outdoor living classroom educational options; and to help prepare Delaware for future climate changes and impacts. It was recently recognized by the U.S. Department of the Interior as one of the country's most promising ways to reconnect Americans to the natural world.

*Children in Nature/No Child Left Insid*e

The "No Child Left Inside" Initiative taskforce charged with developing a statewide plan to increase opportunities for children to engage in nature, both in school, at home, and on public lands. In 2012, the taskforce released a report addressing the growing alarm among educators, parents and healthcare workers that a lack of time to learn and play outdoors is harming our children's health, hampering their academic success and leaving them ill prepared for the opportunities and challenges of the 21st century. Tackling increasing rates of childhood obesity, providing opportunities for children to experience nature up close and integrating meaningful hands-on, outdoor experiences into the school curriculum are essential to the solution. The taskforce addressed these issues with a comprehensive plan; a coalition of organizations and agencies to advocate for policies, programs and infrastructure to facilitate outdoor play and learning; and a comprehensive communications and outreach campaign to give Delaware residents greater access to our state's tremendous natural resources.

Management Characterization

1. Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) that could impact the future provision of public access to coastal areas of recreational, historical, aesthetic, ecological, or cultural value.

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Yes	No	No
Operation/maintenance of existing facilities	Yes	No	No
Acquisition/enhancement programs	Yes	No	No

2. For any management categories with significant changes briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

3. Indicate if your state or territory has a publically available public access guide. How current is the publication and how frequently it is updated?

Public Access Guide	Printed	Online	Mobile App
State or territory has? (Y or N)	Activity specific guides (fishing, hunting) are available	Activity specific guides/information (fishing, hunting, state parks) are available	No
Web address (if applicable)	Fishing Guide: http://www.dnrec.delaware.gov/fw/Fisheries/Documents/2014%20Fishing%20Guide.pdf Hunting and Trapping Guide: http://www.eregulations.com/wp-content/uploads/2014/06/14DEHD-FINAL-LR.pdf Delaware State Parks: http://www.destateparks.com/		Yes
Frequency of update	Guides - annually, Parks Webpage – as needed		

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High	_____
Medium	_____
Low	X

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

Public access to outdoor recreation is a driving force in this state's economy. As such, the state has numerous programs, both public and private, that provide for access to recreational opportunities of all types. Specifically, new initiative such as the Bayshores Initiative working to increase tourism and access to coastal communities and the No Child Left Inside Initiative by DNREC's Division of Parks and Recreation, Public Access ranked Low overall as a result of this process.

DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated public access was not a priority enhancement issue and ranked it moderate to low as an area in need of assistance. Additionally, this area was identified as a low priority by DCP staff though its strategic planning efforts.

MARINE DEBRIS

Resource Characterization

1. In the table below, characterize the existing status and trends of marine debris in the state's coastal zone based on the best available data.

Source of Marine Debris	Existing Status and Trends of Marine Debris in Coastal Zone		
	Significance of Source (H, M, L, unknown)	**Type of Impact** (aesthetic, resource damage, user conflicts, other)	**Change Since Last Assessment** ((↑, ↓, –, unknown)
Land-based			
Beach/shore litter	M	Aesthetic	↓
Dumping	M	Aesthetic, resource impact, user conflict	-
Storm drains and runoff	L	Aesthetic, other	unknown
Fishing (e.g., fishing line, gear)	unknown	Aesthetic, user conflict, resource damage	-
Other (please specify)			
Ocean or Great Lake-based			
Fishing (e.g., derelict fishing gear)	unknown	Aesthetic, user conflict, resource damage	unknown
Derelict vessels	L	Aesthetic, resource impact, user conflict	-
Vessel-based (e.g., cruise ship, cargo ship, general vessel)	L	Resource damage/water pollution*	unknown
Hurricane/Storm	M	Aesthetic, Resource Damage	unknown
Tsunami	L	No impact to Date	-
Other (please specify)			

*No/insufficient data to quantify this source of marine debris

2. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends or potential impacts from marine debris in the coastal zone since the last assessment.

The Delaware Department of Natural Resources and Environmental Control has continued to lead the Delaware Coastal Cleanup in conjunction with The Ocean Conservancy's International Coastal Cleanup, just completing its 28th year. Most recent efforts resulted in the collection of 3.5 tons of trash and recyclables, down significantly from 10.7 tons collected in 2011. Compared to the two previous assessment periods which saw little overall change, the amount of debris collection is down an average of 2 tons per year. With the implementation of a recycling component in 2011, the debris collected each year is separated to reduce the amount being directed to state landfill. This effort has resulted in from one-third to one-half of the waste collected each year being redirected to material recovery facilities for recycling. This program is essential in keeping our beaches clean, and providing the public with the knowledge of the detrimental impact litter has on the environment. The DCMP has been involved with this initiative by providing staff and funding to coordinate and conduct the cleanup activities.

DNREC continues to offer a grant program that would allow state schools, businesses and institutions to start or expand their recycling efforts. The Universal Recycling Grant and Low Interest Loan Program

were originally created under Delaware's Universal Recycling Law passed in 2010. The grant program, now in its fifth year, was first offered in 2011. Each cycle, the program aims to assist a certain audience considered in need at the time adding that the biggest goal is to divert as much recyclables out of landfills as possible. Cycles generally focus on three different components featured in the legislation — single families households, multi-family households and commercial businesses. The current cycle of the program gives priority to schools, food waste or construction waste projects and outreach/educational projects. It is believed that this universal recycling program and the related education programs has played a role in the overall reduction of land-based debris littering the state's coastal areas.

In 2014, the DCP was contacted NOAA's Marine Debris Office regarding the need for the identification and clean-up of Sandy related debris. As this would aid in providing baseline data for storm-related marine debris in the state, the DCMP agreed to assist with the effort and will perform an analysis of high resolution imagery to identify debris marine debris along the coast and in the tidal wetlands and coordinate its removal and disposal. The imagery was received in 2015 and analysis has been completed.

Management Characterization

1. Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) for how marine debris is managed in the coastal zone.

Management Category	**Employed by State/Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Marine debris statutes, regulations, policies, or case law interpreting these	Yes	No	No
Marine debris removal programs	Yes	No*	No

* Assistance is provided at the state level

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes and likely future outcomes of the changes.

Marine debris and its impact on Delaware has not previously been fully assessed or characterized. To better understand this emerging issue the DCP has begun formulating an effort to evaluate marine debris within the state and to support its regional partners. Below are state and regional efforts the DCP is supporting or leading in an effort to establish a baseline determination of how the issue of marine debris is affecting its resources and how future DCP projects and tasks may be developed.

- The DCP attended the NOAA Marine Debris Reduction Workshop in June 2015, a gathering of scientists and managers to discuss marine debris management in the region Mid-Atlantic region and initiate the development of a regional network of partners to exchange information and collaborate on marine debris projects.

- The DCP continues to support the regional efforts of MARCO's shared regional priorities, specifically focusing on water quality which highlights ocean acidification and marine debris initiatives. The DCP has prepared an initial assessment of marine debris in the five state MARCO region and a compilation of highlights from the NOAA Marine Debris Reduction Workshop including recommendations for MARCO that will be used to guide project plans for the NOAA Marine Debris Prevention, Education and Outreach Grant in the fall.
- Shortly after the devastating coastal impact of Super Storm Sandy aerial photography was flown of the Delaware coast. The DCP assessed the debris, focusing on identifying large hazardous debris that washed ashore during the storm, and is implementing debris removal plan with cooperation from its networked partners.
- As a first step on determining a baseline assessment of marine debris impacts in the state and identify potential project partners for future collaborative projects, the DCP hosted a meeting for DNREC programs involved with water quality and pollution prevention and discussed interest in marine debris initiatives. Participants expressed interest in continuing the discussions of their programs efforts could fit into a larger state-wide program. Future meetings will include practitioners and managers outside the department that may have an interest in the issues discussed.
- In support of a state-wide program, the DCP generated a white paper with initial baseline data trends in marine debris in Delaware, and the status of marine debris and anti-litter programs. It includes sections on data trends, funding opportunities, existing programs, Delaware pollution and recycling laws and regulations, and a project compendium, all of which are important when seeking grant funding to support future marine debris projects in the state.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal management program?

High	
Medium	X
Low	

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

While marine debris has not been characterized as a priority issue in the state, the impacts of marine debris on resources and uses occurring within the state and the current inefficiencies seen in marine debris control in the state are not satisfactory. Delaware has very successful programs to reduce solid waste, statewide recycling, tremendous public support for cleanups, and the low abundance of derelict vessels and marine debris. The DCP intends to lead an initiative to join these efforts to maximize the resources available to raise awareness to address this issue.

DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated marine debris was not priority enhancement issue and ranked it low, with the exception of the need to raise awareness. As such, this area was identified as a medium priority by DCP staff though its strategic planning efforts.

CUMULATIVE AND SECONDARY IMPACTS

Resource Characterization:

1. Using National Ocean Economics Program Data on population and housing, please indicate the change in population and housing units in the state's coastal counties between 2012 and 2007.

Trends in Coastal Population and Housing Units		
	2007	**2012**
Population	864,764	917,092
Housing Units	388,616	410,321
Change since 2002	6.05%	5.59%

2. Using provided reports from NOAA's Land Cover Atlas, please indicate the status and trends for various land uses in the state's coastal counties between 2006 and 2011.

Distribution of Land Cover Types in Coastal Counties		
Land Cover Type	**Land Area Coverage in 2011 (Acres)**	**Gain/Loss Since 2006 (Acres)**
Developed, High Intensity	45150.4	1746.2
Developed, Low Intensity	87168.1	1723.8
Developed, Open Space	60762.3	780.8
Grassland	9197.1	884.0
Scrub/Shrub	37773.3	4399.4
Barren Land	6332.9	275.8
Open Water	346836.6	242
Agriculture	549808.0	-5135.8
Forested	149099.8	-4784.2
Wetlands	302404.3	-165.2

3. Using provided reports from NOAA's Land Cover Atlas, please indicate the status and trends for developed areas in the state's coastal counties between 2006 and 2011 in the two tables below.

Development Status and Trends for Coastal Counties			
	2006	**2011**	**Percent Net Change**
Percent land area developed	188829.9 (11.8%)	193080.8 (12.1%)	4250.9 (2.3%)
Percent impervious surface area	59356.5 (3.7%)	61015.8 (3.8%)	1659.3 (2.8%)

** Note: Islands likely have data for another time period and may only have one time interval to report. If so, only report the change in development and impervious surface area for the time period for which high-resolution C-CAP data are available. Puerto Rico and CNMI do not need to report trend data.*

How Land Use Is Changing in Coastal Counties	
Land Cover Type	**Areas Lost to Development Between 2006-2011** (Acres)
Barren Land	90.7
Wetland	262.6
Open Water	13.1
Agriculture	4240.8
Scrub/Shrub	182.8
Grassland	88.5
Forested	548.6

4. Using data from NOAA's State of the Coast "Shoreline Type" viewer, indicate the percent of shoreline that falls into each shoreline type.

Shoreline Types	
Surveyed Shoreline Type	**Percent of Shoreline**
Armored	12%
Beaches	6%
Flats	0%
Rocky	10%
Vegetated	71%

5. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the cumulative and secondary impacts of coastal growth and development, such as water quality and habitat fragmentation, since the last assessment to augment the national data sets.

Delaware Bayshores Initiative

As previous described, the Delaware Bayshores Initiative is taking a collaborative approach further enhance the ecologically rich Delaware coast line from Delaware City to Lewes. The Bayshore is widely recognized as an area of global ecological significance. Its expansive coastal marshes, shoreline, agricultural lands and forests provide diverse habitat to more than 400 species of birds and wildlife. In 1992 the Delaware Bay Estuary was designated as a Wetland of International Significance by the Ramsar Convention on Wetlands, because it provides critical resting and feeding areas for migratory shore and wading birds. The Nature Conservancy and the Audubon Society both list the region as globally significant wildlife habitat. As such, one of its primary goals is to promote conservation and ecological restoration by connecting wildlife areas by acquisition or easement of unprotected lands, restoring native habitat, and protecting resources. Numerous land protection and enhance related projects have occurred as result of this initiative including the acquisition of 100s of acres of marsh habitat important to waterfowl, shorebirds and fisheries; support of the Delaware Bay oyster restoration project in an effort to revitalize the commercial oyster industry and improve water quality; and many other enhancement and restoration project on state and other protected lands to improve habitat quality.

Phase II Chesapeake Bay Watershed Implementation Plan

As the largest estuary in the United States, the Chesapeake Bay is essential for the well-being of many living things. Not only is it an irreplaceable home for various bay-dwelling organisms, it is also an important resource for thousands of people. The habitats and economical situations of many have been negatively impacted by pollutants entering the rivers and Bay. In particular, nutrient pollution has been a concern in Delaware's Chesapeake Bay Tributaries as decades of monitoring have identified high levels of nutrients and low levels of dissolved oxygen, resulting in these waterways being included on the State's 303(d) List of Impaired Waters. Prominent signs of such pollution have included algal blooms and decaying algae. The coordinated effort led by EPA to develop a TMDL for the entire Chesapeake Bay Watershed is the most recent attempt to correct these issues. The TMDL in Delaware will be achieved through the actions and programs outlined in Phase II Watershed Implementation Plan (WIP). Delaware's Final Phase I WIP was submitted to EPA in 2010 and met the nutrient and sediment allocations in the final TMDL. The actions specified in Delaware's Phase I WIP model input decks resulted in statewide loads that were 3%, 12%, and 33% under Delaware's nitrogen, phosphorus, and sediment allocations, respectively. Delaware agreed to apply the spare pounds back to the nonpoint source agriculture allocation and the implementation measures have been refined in this Phase II WIP. Since the TMDL establishment, EPA refined the Watershed Model, resulting in more accurate estimates of urban and suburban lands and more credit for nutrient management on agricultural lands. To create Delaware's Phase II WIP, the Phase I document was reviewed and revised to provide more details regarding how implementation is going to occur at the local level. This has resulted in parsing some implementation goals that were originally at a state scale down to a county level in the nonpoint input deck. In addition to several slight modifications to the 2025 goals identified in Phase I, the Phase II WIP input decks also establish implementation goals for 2017 that will achieve 60% of the necessary nitrogen, phosphorus, and sediment reductions.

Regulatory Updates

Several sets of regulations administered by the DNREC and affecting secondary and cumulative impacts have been update since the last assessment including regulations governing sediment and stormwater, surface water quality, and update of the state's 303(d) listing of impair waters.

Management Characterization

1. Indicate if the approach is employed by the state or territory and if there have been any significant state-level changes (positive or negative) in the development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources, since the last assessment.

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
Statutes, regulations, policies, or case law interpreting these	Yes	Yes	No
Guidance documents	No	No	No
Management plans (including SAMPs)	Yes	Yes	No

The DCMP has been able to provide support to efforts addressing cumulative and secondary impacts stemming from coastal growth and development and its effect on surrounding natural resources either by providing technical and financial assistance to local governments through the Coastal Resource Management Grant Program or through applied research with program partners. As the issues affecting local communities in the state vary so do the projects, however, much of this work has been driven due to heighten awareness of the impacts of coastal hazards and the need to address the combined effects of the increasing populations and resulting development before issues arise, to identify options to address ongoing issues, or assess the current state of an impact of a new threat to local resources. Below is selection of projects highlighting efforts that were completed or were recently initiated during this assessment period:

- The City of Delaware City conducted a drainage and vulnerability assessment, with financial support from the DCP, on a developed area within the municipal boundaries vulnerable to flooding due to drainage infrastructure issues compounded by coastal storm impacts. The assessment characterized the issues and identified adaptation options for the town to employ to reduce current flooding impacts as well as future impacts that may be worsened by changing sea levels.
- The Town of Bowers Beach was experiencing numerous problems associated with flooding impacts to development and commerce. The DCP led an effort to conduct a vulnerability assessment with the town, characterizing and prioritizing the town's vulnerabilities, and providing financial support for engineering solutions to address the highest priority issues.
- The City of New Castle received technical and financial assistance to address wetland loss along the riverfront that has been exacerbated by wakes from passing cargo ships and frequent coastal storms. A hybrid living shoreline was designed as a solution to restore wetland vegetation, create habitat for wetland organisms and reduce the wave energy as it approaches the shoreline.
- Recognizing the potential for saltwater intrusion to the town's sole source for drinking water, which sees ever increasing demands due to development pressures, the coastal town of Bethany Beach received financial assistance to expand it groundwater monitoring system to better understand the current vulnerability to the water supply and improve its ability to proactively address future issues.
- The DCP is providing technical and financial assistance in a collaborative effort to conduct a large-scale ecotoxicological study on current temporal and spatial trends of legacy pollutants and contemporary

compounds on ospreys, used as biological indicators of ecosystem health is crucial towards understanding conditions and change, in the Delaware Bay Estuary and River.

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High	
Medium	X
Low	

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated cumulative and secondary impacts are a moderate to high enhancement issue and ranked it highly as an area in need of most assistance. However, due to the efforts underway by other programs and the number of responses received to address other enhancement areas cumulative and secondary impacts was identified as an area of moderate priority by DCP staff though its strategic planning efforts.

SPECIAL AREA MANAGEMENT PLANNING

Resource Characterization

1. In the table below, identify geographic areas in the coastal zone subject to use conflicts that may be able to be addressed through a special area management plan (SAMP). This can include areas that are already covered by a SAMP but where new issues or conflicts have emerged that are not addressed through the current SAMP.

Geographic Area	Opportunities for New or Updated Special Area Management Plans Major conflicts/issues
Near-Shore Ocean	Emerging/potential use conflicts between proposed alternative energy development (wind and wave), dredging projects, fishing, swimming and benthic resources. Delaware lacks policies and plans for these intersecting and emerging issues. A SAMP could provide the foundation for such policies and plans.
Ocean Beaches	Recreational users (surfers) of ocean beaches are unhappy with recent beach replenishment projects in Delaware, believing that beach replenishment projects have contributed to a reduction in surf breaks. The state routinely replenishes beaches as part of its natural hazards mitigation strategy. As climate impacts increase, additional conflicts between user groups affected by beach replenishment may increase. A SAMP could serve to provide a neutral venue to develop mutually beneficial policies and practices.
Bayshores Region	The Delaware Bayshores Initiative is working to increase tourism in the Delaware Bayshores Region (from New Castle to Lewes); through this initiative, new relationships with Bayshores towns have been forged. Opportunities exist to work collaboratively within a Bayshores sub-region containing several jurisdictions to develop shared vision and policies for public access, recreation, resiliency and climate adaptation. A SAMP could be an ideal tool to achieve shared vision and policies.
Coastal Atlantic Region	The Coastal Atlantic Region, highly vulnerable to storms and sea level rise, contains five jurisdictions (Sussex County, Dewey, South Bethany, Bethany and Fenwick Island) that are individually planning coastal resiliency and climate adaptation projects. Because each of these jurisdictions is small, storm mitigation and climate adaptation projects within one jurisdiction may have negative impact to adjacent communities. A SAMP could provide a venue for collaborative science-based decision making about adaptation.

Deepwater Ports	The Port of Wilmington, Delaware's only port, is vulnerable to coastal storms and sea level rise and as it is land-locked, has limited capacity to expand and/or adapt to climate change. A proposal for a new port, just to the south of the existing port, has emerged but state law prohibits new port development. An explosive political situation has now been set; pitting unions, business interests and a county government against a pivotal state law, environmental interests and community interests. A SAMP could serve as a neutral venue to balance the competing interests.
Delaware's Coastal Zone	Delaware's Coastal Zone Act, arguably the most influential state environmental law, prohibits new industrial development (including ports) in a strip of land the length of the state. This prohibition directly and indirectly led to the preservation of hundreds of thousands of acres of farmland, forests and wetlands. With new gas exports planned for the Delaware River just north of the Delaware border, a new port proposal within the area protected by the Coastal Zone Act and the need to adapt to climate change, it is foreseeable that the Coastal Zone Act will be opened up for legislative amendments for the first time since its passage in 1971. A SAMP could help guide and inform any such amendments.
Pea Patch Island Heronry Region	It has been 15 years since the publication of the Pea Patch Island Heronry Region SAMP, and while the plan is still in use today, conditions in the region have changed significantly, with sea level rise and climate change emerging threats to the Heronry and its supporting habitat. An updated SAMP in this area would assess changing conditions, outline adaptation actions and chart the course for the next 15-20 years of management of this nationally important bird nesting area.
South Wilmington	The South Wilmington Neighborhood Plan, one of the five components of the south Wilmington SAMP, was published in 2006 and continues to be the guiding document for activities in this area. An update to the Plan would allow for incorporation of climate concerns and emerging economic conditions.

2. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of SAMPs since the last assessment.

The South Wilmington Planning Network, a champion and end-user of South Wilmington SAMP products, conducted an assessment of the implementation of the South Wilmington Neighborhood Plan (one of the five South Wilmington SAMP components) Of the 48 recommendations in the Neighborhood

Plan, 22 were fully implemented, and seven were partially implemented. The report is available online: http://www.wilmapco.org/Southbridge/files/SAMP_Prog_Report_Jan12.pdf.

No additional assessments have been conducted since the last 309 Assessment and Strategy.

Management Characterization:

1. Indicate if the approach is employed by the state or territory and if there have been any significant state- or territory-level management changes (positive or negative) that could help prepare and implement SAMPs in the coastal zone.

Management Category	**Employed by State or Territory** (Y or N)	**CMP Provides Assistance to Locals that Employ** (Y or N)	**Significant Changes Since Last Assessment** (Y or N)
SAMP policies, or case law interpreting these	Yes	No	No
SAMP plans	Yes	No	No

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal management program?

High _____
Medium __X__
Low _____

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

Unlike the other 309 enhancement areas in Delaware which are tangible issues, Special Area Management Plans are a tool or process that can be used to develop policies and management tools for the enhancement areas within specific geographic regions. While DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated SAMPS were low priority enhancement issues, the DCP staff racked this area as a medium priority level and will evaluate the utility of implementing a SAMP as a planning and policy development tool for any high priority enhancement area.

OCEAN RESOURCES

Resource Characterization

1. Understanding the ocean and Great Lakes economy can help improve management of the resources it depends on. Using Economics: National Ocean Watch (ENOW),[3] indicate the status of the ocean and Great Lakes economy as of 2011, as well as the change since 2005, in the tables below. Include graphs and figures, as appropriate, to help illustrate the information. Note ENOW data are not available for the territories. The territories can provide alternative data, if available, or a general narrative, to capture the value of their ocean economy.

Status of Ocean and Great Lakes Economy for Coastal Counties (2011)				
	Establishments (# of Establishments)	**Employment** (# of Jobs)	**Wages** (Millions of Dollars)	**GDP** (Millions of Dollars)
Living Resources	25	102	2.736	5.288
Marine Construction	17	112	5.622	8.982
Marine Transportation	46	877	40.493	70.245
Offshore Mineral Extraction	0	0	0	0
Tourism & Recreation	1033	17766	283.409	579.486
All Ocean Sectors	1163	20380	403.356	1173.878

Change in Ocean and Great Lakes Economy for Coastal Counties (2005-2010)				
	Establishments (% change)	**Employment** (% change)	**Wages** (% change)	**GDP** (% change)
Living Resources	-16.67	-29.66	-18.43	-13.97
Marine Construction	-48.48	-53.53	-47.90	-98.08
Marine Transportation	-2.13	-0.79	11.73	15.27
Offshore Mineral Extraction	-100	-100	-100	-100
Tourism & Recreation	-5.58	14.21	22.82	17.58
All Ocean Sectors	-5.68	12.28	23.65	6.52

NOTE: The values presented in the tables do not tabulate correctly due to data omission and suppression by the data source (ENOW). These figures were obtained and/or calculated using the county data for Delaware available from www.csc.noaa.gov/digitalcoast/tools/enow.

2. In the table below, characterize how the threats to and use conflicts over ocean and Great Lakes resources in the state's or territory's coastal zone have changed since the last assessment.

[3] www.csc.noaa.gov/enow/explorer/. If you select any coastal county for your state, you receive a table comparing county data to state coastal county, regional, and national information. Use the state column for your responses.

Significant Changes to Ocean and Great Lakes Resources and Uses	
Resource/Use	**Change in the Threat to the Resource or Use Conflict Since Last Assessment** (↑, ↓, –, unknown)
Resource	
Benthic habitat (including coral reefs)	Increase
Living marine resources (fish, shellfish, marine mammals, birds, etc.)	Increase
Sand/gravel	Increase
Cultural/historic	Unchanged
Use	
Transportation/navigation	Increase
Offshore development[4]	Unchanged
Energy production	Unchanged
Fishing (commercial and recreational)	Increase
Recreation/tourism	Increase
Sand/gravel extraction	Increase
Dredge disposal	Unknown
Aquaculture	Increase

3. For the ocean and Great Lakes resources and uses in Table 2 (above) that had an increase in threat to the resource or increased use conflict in the state's or territory's coastal zone since the last assessment, characterize the major contributors to that increase.

Major Contributors to an Increase in Threat or Use Conflict to Ocean and Great Lakes Resources												
Resource	**Major Reasons Contributing to Increased Resource Threat or Use Conflict** (Note All that Apply with "X")											
	Land-based development	Offshore development	Polluted runoff	Invasive species	Fishing (Comm & Rec)	Aquaculture	Recreation	Marine Transportation	Dredging	Sand/Mineral Extraction	Ocean Acidification	Other (Specify)
Benthic habitat (including coral reefs)		X						X	X	X		
Living marine resources (fish, shellfish, marine mammals, birds, etc.)		X		X	X	X	X	X	X	X		
Sand/gravel								X	X	X		
Transportation/navigation					X		X					
Fishing (commercial and recreational)					X		X	X	X	X		
Recreation/tourism	X									X		
Sand/gravel extraction							X					
Aquaculture					X							

[4] Offshore development includes underwater cables and pipelines, although any infrastructure specifically associated with the energy industry should be captured under the "energy production" category.

4. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends of ocean and Great Lakes resources or threats to those resources since the last assessment to augment the national data sets.

The DCMP is has completed a spatial planning document for the Delaware River, Bay and Atlantic waters, including the characterization of conflicting and compatible uses and resources. The DCMP's assessment was designed to consider all reasonable and foreseeable marine related uses in five categories including:

Uses

- Maritime Activities
  - o Dredging
  - o Ports
  - o Vessels
  - o Anchorages
  - o Vessel Routes & Aids to Navigation
  - o Security
- Fishing and Recreation
  - o Fishing & Gear (Pelagic and Bottom
  - o Aquaculture
  - o Swimming and Diving
  - o Surface Water Sports
  - o Boating
  - o Hunting
- Energy and Infrastructure
  - o Renewable Energy
  - o Pipelines and Cables
  - o Oil & LNG
  - o Outfalls

Resources

- Habitat and Organisms
  - o Air
  - o Water
  - o Bottom
- Other Resources
  - o Cultural and Historical
  - o Viewscape

Along with characterizations of the relationship among these uses, spatial and temporal considerations were identified for those conducting or reviewing activities as well as example siting standards and conditions. This document is available at http://maps.dnrec.delaware.gov/oceanplanning/

Management Characterization

1. Indicate if the approach is employed by the state or territory and if any significant state- or territory-level changes (positive or negative) in the management of ocean and Great Lakes resources have occurred since the last assessment?

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	No	N/A	No
Regional comprehensive ocean/Great Lakes management plans	Yes	No	Yes
State comprehensive ocean/Great Lakes management plans	Yes	No	Yes
Single-sector management plans	No	N/A	No

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

With increasing demands on ocean resources and the important economic and environmental services those resources provided, regional ocean management efforts have been prioritized by state and federal officials. In the Mid-Atlantic region in 2009, the Governors of New York, New Jersey, Delaware, Maryland, and Virginia signed the Mid-Atlantic Governors' Agreement on Ocean Conservation. The Agreement established the Mid-Atlantic Regional Council on the Ocean (MARCO) as a partnership to address shared regional priorities and provide a collective voice on ocean management challenges and opportunities. The priorities identified by the Governor's agreement are climate change adaptation, renewable energy, marine habitats, and water quality. MARCO is using regional ocean planning to improve the understanding of how ocean resources are being used, managed, and conserved, and to establish a common foundation to guide actions to address the shared regional priorities. Additionally, activities at the federal level affecting this region include the establishment in 2013 by Presidential Executive Order of the Mid-Atlantic Regional Planning Body (RPB) which includes federal, tribal, and Fishery Management Council as well as state representatives. The RPB works to address regional priorities as a way to implement the National Ocean Policy to guide the protection, maintenance, and restoration of America's oceans and coasts. Supported by MARCO, the RPB is leading a regional ocean planning initiative to facilitate sustainable, safe, productive, and appropriate economic development activities and to support the protection and restoration of the marine ecosystem so that it continues to provide the many goods and services that the people of the Mid-Atlantic want and need into the future.

To advance the implementation of its 309 strategy, the DCMP has supported the efforts of both MARCO and the RPB since their inception from assisting with mapping activity use to meeting with stakeholders in groups or at public listening sessions. Through the course of these interactions with stakeholders, and in hearing from program partners, it became clear to the DCMP that similar management efforts would not only be economically beneficial to the State of Delaware, but would be welcomed by many recreational and environmental stakeholder groups. Delaware developed a plan to identify and classify the uses and resources within it coastal waters, the Delaware River, Delaware Bay and its territorial water of the Atlantic Ocean. Key to this plan and management of these waters was identifying the conflicts and compatibilities of the current and potential future uses and resources including considerations for both spatial and temporal variations. Understanding these relationships and using that information to better accommodate users in these areas would thereby reduce use and resource conflicts and improving the conservation and protection of the natural resource within the system.

In an effort to complement the management plan and data mapping efforts of MARCO and the RBP, and to provide more comprehensive management of the ocean and coastal resources of the state, the DCMP developed a management plan examining existing and potential future uses and resources in order to allow for economic growth balanced with resource protection through the identification of spatial and temporal conflicts and compatibilities to make the most out of the limited areas available. Included in this effort is the development of an interactive mapping tool to assist project planners and decision makers. Delaware's data portal will allow users to propose an activity and define a project site or identify an area of concern to review uses and resources that exist within those areas. Data portal users are provided with information regarding how the proposed activity relates to the uses and resources within the proposed area. Providing use and resource compatibility information early in a planning can help streamline the process and aid in coordination with resource agencies.

3. Indicate if your state or territory has a comprehensive ocean or Great Lakes management plan.

Comprehensive Ocean/Great Lakes Management Plan	**State Plan**	**Regional Plan**
Completed plan (Y/N) (If yes, specify year completed)	Yes, 2015	No
Under development (Y/N)	No	Yes
Web address (if available)	http://maps.dnrec.delaware.gov/oceanplanning/	http://midatlanticocean.org/
Area covered by plan	State waters of Delaware including the Delaware River, Bay and Atlantic Ocean	Ocean and coastal water of the mid-Atlantic from New York to Virginia, (with some exceptions)

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High	
Medium	X
Low	

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

Creating a balance based on sustainable economic development and the protection and conservation of the states coastal ecosystem is vital to ensuring the current and future needs of the state's commercial and residential stakeholders are met. With the first steps of marine management complete, further work is needed to address conflicting activities and identifying how those activities may be integrated or modified to be consistent the goals of the effort.

While various groups or individuals have expressed the need for specific changes in practices they feel are incompatible with their recreational or resource protection interests, DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated ocean resource are a low priority enhancement. However, due to the many emerging issues that may be addressed through ocean planning, ocean resources was identified as an area of moderate priority by DCP staff though its strategic planning efforts.

ENERGY AND GOVERNMENT FACILITY SITING

Resource Characterization:

1. In the table below, characterize the status and trends of different types of energy facilities and activities in the state's coastal zone based on best available data. If available, identify the approximate number of facilities by type.

Status and Trends in Energy Facilities and Activities in the Coastal Zone				
Type of Energy Facility/Activity	**Exists in CZ**		**Proposed in CZ**	
	(# or Y/N)	Change Since Last Assessment (↑, ↓, –, unknown)	(# or Y/N)	Change Since Last Assessment (↑, ↓, –, unknown)
Energy Transport				
Pipelines	Yes	↑	Yes	
Electrical grid (transmission cables)	Yes	↑	Yes	
Ports	Yes	—		
Liquid natural gas (LNG)	No	—	No	
Other (please specify)				
Energy Facilities				
Oil and gas	Yes	—	No	
Coal	Yes	—	No	
Nuclear	No	—	No	Expansion of facility in NJ
Wind	Yes	One turbine at UD Campus	No	
Wave	No	—	No	—
Tidal	No	—	No	—
Current (ocean, lake, river)	No	—	No	—
Hydropower	No	—	No	—
Ocean thermal energy conversion	No	—	No	—
Solar	Yes	↑		↑
Biomass	Yes	unknown	No	Incineration ban in effect

2. If available, briefly list and summarize the results of any additional state- or territory-specific information, data, or reports on the status and trends for energy facilities and activities of greater than local significance in the coastal zone since the last assessment.

Delaware Climate Change Impact Assessment was released in 2014 by DNREC's Division of Energy and Climate. The document summarizes the potential impacts to Delaware's population and resources and aims to promote adaptation planning for current and future implications of climate change. A brief but comprehensive overview of the state's electricity infrastructure is included. The report highlights Delaware's reliance on imports as the state does not produce oil, coal or natural gas. Renewable sources include biomass, solar and wind facilities, however these represent a small percentage of overall uses.

Executive Order 18, titled "Leading by Example Towards a Clean Energy Economy & Sustainable Natural Environment" was enacted by Governor Jack Markell in February 2010. The order directs all state executive branch agencies to reduce energy consumption, seek sources of clean renewable sources for

electricity use in state facilities, cut petroleum consumption, vehicle emissions and vehicle miles traveled by agency personnel and develop a state agency procurement policy for environmentally preferable products and services.

3. Briefly characterize the existing status and trends for federal government facilities and activities of greater than local significance[5] in the state's coastal zone since the last assessment.

The Bureau of Ocean Energy Management is currently developing the 2017-2022 5-Year Program for the OCS Oil and Gas Leasing, Exploration, and Development Process. The DCMP has provided input consistently on the development of the 5-year plans, both from the program and on behalf of the Department. Comments have stated opposition to oil and gas leasing in the Mid-Atlantic, advocating instead for a focus on renewable energy potential in offshore waters. The Mid-Atlantic has not been targeted for oil and gas exploration in decades; partly because of a long standing congressional moratorium and lack of political interest in allowing lease sales off the East Coast, and partly due to the lack of data on resource potential and an established protocol for data collection. This situation has changed now that the BOEM has approved a program for collection of geological and geophysical data and now that there is no prohibition on exploration in the South and Mid-Atlantic. Multiple survey companies are seeking approvals to conduct seismic surveys to assess resource potential. The Draft Proposed Program for 2017-2022 includes areas offshore of Virginia and the Carolinas as eligible for potential lease sales towards the latter years of the 5 year plan. Subsequent plans may very well include areas offshore of Delaware and other Atlantic Coast states.

Management Characterization:

1. Indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) that could facilitate or impede energy and government facility siting and activities have occurred since the last assessment.

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Statutes, regulations, policies, or case law interpreting these	Yes	No	No
State comprehensive siting plans or procedures	Yes*	No	Yes

*Wind Energy Areas

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:

[5] The CMP should make its own assessment of what Government facilities may be considered "greater than local significance" in its coastal zone, but these facilities could include military installations or a significant federal government complex. An individual federal building may not rise to a level worthy of discussion here beyond a very cursory (if any at all) mention).

Since the last 309 assessment, the DCMP participated in a regional collaboration of state and federal agencies to address siting considerations for offshore wind energy and identify areas agreed to be compatible with such uses. The result was finalization of the NEPA document assessing environmental resources and potential impacts; and certification of these areas by coastal management programs through a regional consistency determination. The DCMP issued concurrence for wind farm leasing and development within the identified Mid-Atlantic Wind Energy Areas in September 2011 subject to a list of conditions to address select unresolved concerns. This approval process will provide a level of assurance to lessees and hopefully direct development to areas that are compatible with wind energy development.

Enhancement Area Prioritization:

1. What level of priority is the enhancement area for the coastal management program?

High	_____
Medium	X
Low	_____

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

The need to balance our natural resource protection efforts with the national interest of energy production is a precarious proposition. DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated ranked Energy and Government Facility Siting as a low priority enhancement area. However, new activities and uses in the region, and the potential cumulative and secondary impacts from new energy facilities (e.g., increased road transportation, impacts to threatened and endangered species), are creating yet unknown pressures to coastal resources and uses. The potential impacts these activities may have on the resources of the state and existing regulatory mechanisms need to review such activities should be evaluated to determine feasibility of these activities occurring in the state. As such, Energy and Government Facility Siting was identified as an area of moderate priority by DCP staff though its strategic planning efforts

AQUACULTURE

Resource Characterization:

1. In the table below, characterize the existing status and trends of aquaculture facilities in the state's coastal zone based on the best available data.

Type of Facility/Activity	Status and Trends of Aquaculture Facilities and Activities		
	# of Facilities	Approximate Economic Value	Change Since Last Assessment (↑, ↓, –, unknown)
Commercial: Finfish producer (Catfish, Crappie, Koi, Largemouth bass, minnows, Perch, Smallmouth bass, Striped bass, Sunfish)	1	Information withheld to avoid disclosing data for individual farms	—
Commercial: Live market, Tilapia	1	Information withheld to avoid disclosing data for individual farms	—
Research: oyster and hard clam production	1		—

Approximate Economic Value Source: USDA, National Agricultural Statistics Service: Census of Aquaculture (2013) Volume 3 AC-12-SS-2

2. If available, briefly list and summarize the results of any additional state- or territory-specific data or reports on the status and trends or potential impacts from aquaculture activities in the coastal zone since the last assessment.

Since the last assessment, the Delaware Center for the Inland Bays (CIB) completed an analysis assessing feasibility for shellfish aquaculture in the Inland Bays. Fifteen years of research supported the effort including most recently the completion of the Oyster Gardening Program (2003-2013), oyster habitat research (2005-2013), and the Inland Bays Hard Clam Survey (2010-2011). The cumulative results of applied shellfish research, demonstration, and field work and examples of related activities in neighboring states have increased public interest in the importance of Inland Bay shellfish resources for both restoration and potential commercial production. In 2012, the CIB convened a stakeholder workgroup to evaluate scientific and educational accomplishments, and policy changes needed to reinstate commercial shellfish aquaculture in Delaware's Inland Bays. The group included representation from the CIB, the Delaware Sea Grant Marine Advisory Service, DNREC, Delaware Department of Agriculture, Delaware Shellfish Advisory Council, commercial shellfish industry, recreational fishing, Sussex County Economic Development Office, and prospective shellfish farmers. The effort resulted in draft revisions to legislation to permit commercial aquaculture in the Inland Bays along with maps of potential shellfish aquaculture areas determined to be areas that could occur in balance with other bay users, and an outreach campaign to inform the public about the economic opportunities for coastal communities and ecological benefits related to commercial shellfish aquaculture. In August 2013, the Governor signed into law a bill opening the doors for aquaculture development in the Inland Bays. DRNEC promulgated shellfish aquaculture regulations one year later.

Management Characterization

1. Indicate if the approach is employed by the state or territory and if there have been any state- or territory-level changes (positive or negative) that could facilitate or impede the siting of public or private aquaculture facilities in the coastal zone.

Management Category	Employed by State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Aquaculture comprehensive siting plans or procedures	Yes	No	Yes
Other aquaculture statutes, regulations, policies, or case law interpreting these	Yes	No	Yes

2. For any management categories with significant changes, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information:
    a. Describe the significance of the changes;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

In 1990, the Delaware Aquaculture Act designated the Delaware Department of Natural Resource and Environmental Control as the lead for aquaculture development in Delaware, as well as the creation of the aquaculture advisory council. As described previously, the state legislature modified state code directing DNREC to control shellfish aquaculture in the Inland Bays and to set criteria for the approval of lease sites and applications for leasing. On August 11, 2014, the state aquaculture regulations for the establishment of shellfish aquaculture in Delaware's Inland Bays were enacted.

With the establishment of aquaculture laws and regulations, DNREC's Division of Fish and Wildlife developed a shellfish aquaculture program for eight specific shellfish aquaculture development areas (SADA) Rehoboth Bay, Indian River Bay and Little Assawoman Bay. A screening process to assess suitability of these locations was established and addressed issues including navigation, water quality, wetlands, submerged aquatic vegetation and existing shellfish resources. While 442 one-acre plots have been identified as SADAs for potential lease, additional site specific surveys must be conducted to ensure existing clam and oyster communities are not affected. As a result of this recent activity, the US Army Corps of Engineers Philadelphia District is updating is nationwide permit program with the development of regional conditions for existing shellfish aquaculture activities within SADA. Shellfish aquaculture is not restricted to the SADAs. While conducting aquaculture activities within these areas would require less administrative actions due to the previous reviews and approvals accompanying them, shellfish aquaculture could occur elsewhere but would require permits from various state and federal permitting offices.

These changes were not driven by 309; instead it was led by initiatives by the Center for the Inland Bays and the Delaware Department of Fish and Wildlife. The outcomes of these action is the establishment of a shellfish aquaculture industry that would be compatible with current uses in Delaware's Inland Bays with a structured process and conditions for leasing subaqueous bottom.

Enhancement Area Prioritization

1. What level of priority is the enhancement area for the coastal management program?

High	_____
Medium	_____
Low	X

2. Briefly explain the reason for this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.

DCP stakeholder engagement of state, county, and local government and non-governmental entities indicated aquaculture had varying degrees of priority ranked from a low to high enhancement area in need of assistance However, the advancements made in shellfish aquaculture over the past few years have been tremendous and are opening new doors to economic development balanced with resource management within the state aquaculture ranked as a low priority by DCP staff though its strategic planning efforts. The DCMP will continue to monitor aquaculture activities and if a need arises that can be addressed with DCP staff or resources; we will work with our partners to identify a means to do so.

Phase II

WETLANDS

In-Depth Resource Characterization:
Purpose: To determine key problems and opportunities to improve the CMP's ability to protect, restore, and enhance wetlands.

1. What are the three most significant existing or emerging physical stressors or threats to wetlands within the coastal zone? Indicate the geographic scope of the stressor, i.e., is it prevalent throughout the coastal zone or specific areas that are most threatened? Stressors can be development/fill; hydrological alteration/channelization; erosion; pollution; invasive species; freshwater input; sea level rise/Great Lake level change; or other (please specify). When selecting significant stressors, also consider how climate change may exacerbate each stressor.

	Stressor/Threat	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	Climate Change	Tidal and freshwater marshes statewide
Stressor 2	Development	Lands adjacent to tidal marshes, freshwater wetlands statewide
Stressor 3	Erosion/Subsidence	Tidal Marshes, to a greater extent those adjacent to the Delaware River and Bay

2. Briefly explain why these are currently the most significant stressors or threats to wetlands within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.

In relation to wetland ecosystems, climate change affects a wide variety of physical and ecological factors including changing sea levels, storm event frequency and intensity, water chemistry, temperature (air, water, and soil), carbon sequestration and precipitation frequency and intensity. Each of these variables influences the health and function of wetlands. Unfortunately, adapting to the impacts nearly simultaneous variations in the factors cannot occur with an understanding how climate change drives each process within the tidal and freshwater marsh ecosystems. Due to the relatively low elevations in Delaware significant losses of these critical resources due to inundation will occur if this understanding cannot be utilized to identify suitable lands for migration or to adapt restoration practices.

Further exacerbating the issue are erosion, subsidence and development. Erosive forces are acting upon the riverward extent of tidal marshes are primarily a result of tidal flow, coastal storms, and wakes from large vessels. The ever present and increasing pressures of development further are intensifying the problem. Development is affecting this resource indirectly and directly. A catch-22 is created with the implementation of sediment and storm water regulations. While the regulations are effective at reducing turbidity as a result of upstream development, much of the sediment that would naturally be conveyed downstream to accrete in wetlands and allow for a balance with subsidence and erosion is lost. This is then coupled with direct pressures from development, either occupying land essential for migration or by poor resource protection regulations.

3. Are there emerging issues of concern but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.

Emerging Issue	Information Needed
Climate change	Additional research and monitoring to understand the process, how it affects function and baseline conditions to measure change
Factors affecting migration	Additional research and mapping to determine the factors (environmental and physical that are hindering wetland migration

In-Depth Management Characterization:
Purpose: To determine the effectiveness of management efforts to address identified problems related to the wetlands enhancement objective.

1. For each additional wetland management category below that was not already discussed as part of the Phase I assessment, indicate if the approach is employed by the state or territory and if significant state- or territory-level changes (positive or negative) have occurred since the last assessment.

Management Category	Employed By State or Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Changes Since Last Assessment (Y or N)
Wetland assessment methodologies	Y	N	N
Wetland mapping and GIS	Y	N	N
Watershed or special area management plans addressing wetlands	N	N	N
Wetland technical assistance, education, and outreach	Y	Y	N

2. For management categories with significant changes since the last assessment, briefly provide the information below. If this information is provided under another enhancement area or section of the document, please provide a reference to the other section rather than duplicate the information.
    a. Describe significant changes since the last assessment;
    b. Specify if they were 309 or other CZM-driven changes; and
    c. Characterize the outcomes or likely future outcomes of the changes.

3. Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's or territory's management efforts in protecting, restoring, and enhancing coastal wetlands since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's or territory's management efforts?

Much of the efforts of the state to protect and restore wetlands have already been presented in the assessment. Additional efforts include:

- Update wetland inventory maps and improve access to wetland related data.
    - Development of a database or compendium for restoration project (underway)
    - Continue to monitor and report wetlands trends and status (ongoing)
    - Development of a centralized research repository (underway)
    - Development of monitoring and assessment information & protocol dissemination site (ongoing)
- Increase monitoring efficiency and effort to provide insight into wetland function and health
    - Development of standardized wetland-type specific sampling protocols (underway)
    - Development and implementation of training and workshops (ongoing)
    - Dissemination of monitoring and assessment data results online (ongoing – requires additional partner involvement)
- Integrate wetland restoration, creation, enhancement, and protection efforts to ensure efficient use of resources
    - Development of watershed-level restoration plans (partially complete)
    - Develop wetland project reference manual with standard procedures (planning)
- Coordinate information and resource sharing between wetland protection programs, professionals and agencies.
    - Integrate wetlands assessment data into Preliminary Land Use Service process (initiated but more progress necessary to be effective)
    - Conducting biennial conference to foster communication and collaboration among researchers (ongoing)
- Enhance Education and Outreach efforts to broaden wetland stewardship among all wetland stakeholders
    - Development of restoration guidebook (complete but requires updating)
    - Development and implementation of training and workshops and educational toolkit (ongoing)
- Assessing SLR Impacts on Wetlands
    - Development of landowner education program (planning)
    - Conduct migration and land conversion research (initiated)
    - Identify flood risk and capacity for coastal protection (planning)

Identification of Priorities

1. Considering changes in wetlands and wetland management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to more effectively respond to significant wetlands stressors. *(Approximately 1-3 sentences per management priority.)*

Management Priority 1: Wetlands Research and Monitoring

Description: The unpredictability of impacts resulting from climate change can affect all levels of function and process within the wetland ecosystem. Assessing the current condition of wetlands in Delaware and understanding how the ecological and hydrological systems are affected will have significant implications on how wetlands are managed and restored in coming years.

Management Priority 2: Wetlands Mapping

Description: To fully understand, manage and regulate the resource, it is essential to up-to-date and accurate maps of tidal and freshwater wetlands in Delaware, depicting not only location but all factors that could influence the wetland's ability to function or adapt to environmental or anthropogenic stressors including but not limited to wetland type, elevation, vegetation composition, adjacent land use, and groundwater recharge potential.

Management Priority 3: Wetland Regulation

Description: Delaware does not currently have a freshwater wetland regulatory program and depends on federal agencies to protect this resource. Recent efforts have been initiated to determine the level of support that exists for the development of program that would allow the state to have more control over the impacts to this important resource. Due to the significance of this resource and the variety of stakeholders that could be affected, it is important to support the efforts of the Department in this endeavor.

2. Identify and briefly explain priority needs and information gaps the CMP has to help it address the management priorities identified above. The needs and gaps identified here do not need to be limited to those items that will be addressed through a Section 309 strategy but should include any items that will be part of a strategy.

Priority Needs	**Need?** (Y or N)	**Brief Explanation of Need/Gap**
Research	Y	Additional research and monitoring to understand the process, how it affects function and baseline conditions to measure change (hydrology, carbon sequestration, vegetation assessments, etc)
Mapping/GIS	Y	Mapping and characterization of tidal wetlands and adjacent lands to support management and restoration; Update of tidal wetlands regulatory maps; Map unregulated freshwater wetlands
Data and information management	Y	Building network and collaboration among wetland scientist to enable data sharing to fill data gaps
Training/capacity building	Y	Build network to foster collaboration to share limited resources and data to build holistic view of current research
Decision-support tools	Y	Development of reports, outreach materials to disseminate data and information to decision makers.
Communication and outreach	Y	Education for stakeholders prior to regulatory, incentive or programmatic implementation.
Other (Specify)	Y	Update tidal regulations; Create freshwater wetland regulatory program

Enhancement Area Strategy Development:

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

Yes	X
No	

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

The DCP will develop a strategy for this enhancement area. The services provided by wetlands make them the most ecologically significant habitats in Delaware. From storm surge protection and water quality improvement to biological diversity and carbon storage, tidal and freshwater wetlands in Delaware are invaluable resources that due to both human and natural impacts are suffering losses annually. The impacts of climate change, erosion, subsidence, development, fragmentation and sediment deprivation and just a few of the threats to these systems resulting in direct loss or degradation of functionality. Residents of coastal communities and local organizations have expressed an understanding and need for the important services these habitats provide, offering support for restoration efforts such as the restoration of previously impounded systems to reduce flooding impacts, and wetland enhancement to increase biological diversity and recreational enjoyment.

COASTAL HAZARDS

In-Depth Resource Characterization:

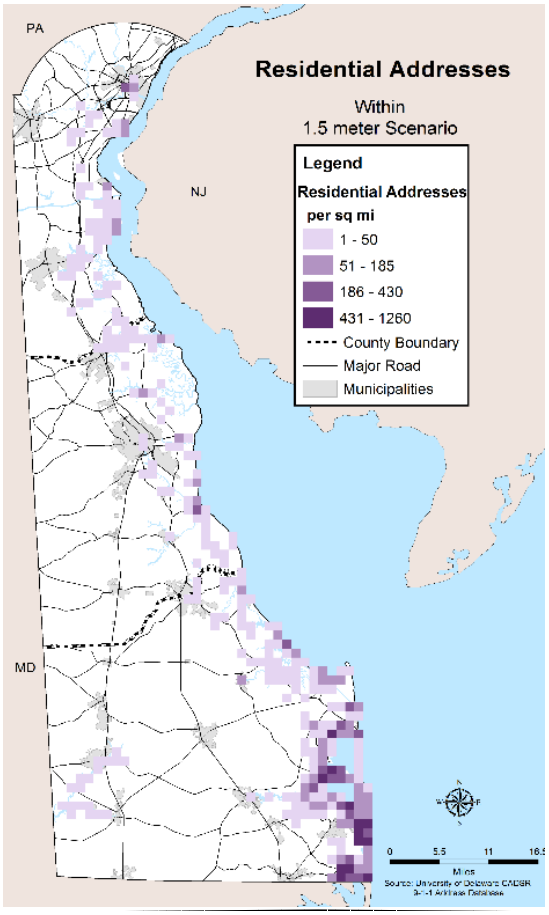
Purpose: To determine key problems and opportunities to improve the CMP's ability to prevent or significantly reduce coastal hazard risks by eliminating development and redevelopment in high-hazard areas and managing the effects of potential sea level rise and Great Lakes level change.

1a. **Flooding In-depth:** Using data from *NOAA's State of the Coast* "Population in the Floodplain" viewer and summarized by coastal county through NOAA's Coastal County Snapshots for Flood Exposure, indicate how many people at potentially elevated risk were located within the state's coastal floodplain as of 2010.

2010 Populations in Coastal Counties at Potentially Elevated Risk to Coastal Flooding				
	Under 5 and Over 65 years old		In Poverty	
	# of people	% Under 5/Over 65	# of people	% in Poverty
Inside Floodplain	19,762	11%	10,053	10%
Outside Floodplain	162,788	89%	86,752	90%

Residential Addresses Affected by Sea Level Rise			
	Total Addresses	# inundated at 1.5 m	% of Total inundated at 1.5m
All residences	346,574	17,095	5%
Mult-Unit Addresses	46,777	328	1%
Manufactured homes	18,526	3,318	18%

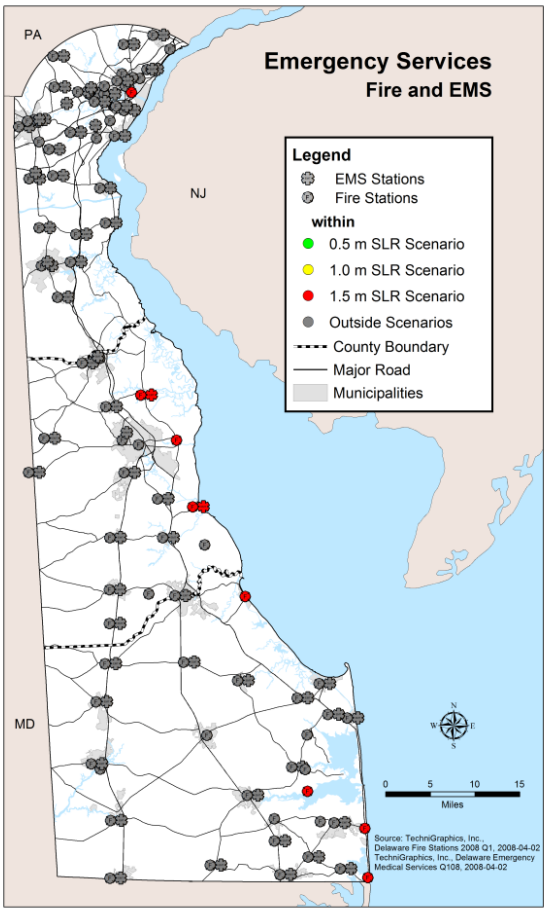
Source: Delaware Coastal Programs. Preparing for Tomorrow's High Tide – Sea Level Rise Vulnerability Assessment for the State of Delaware. 2012

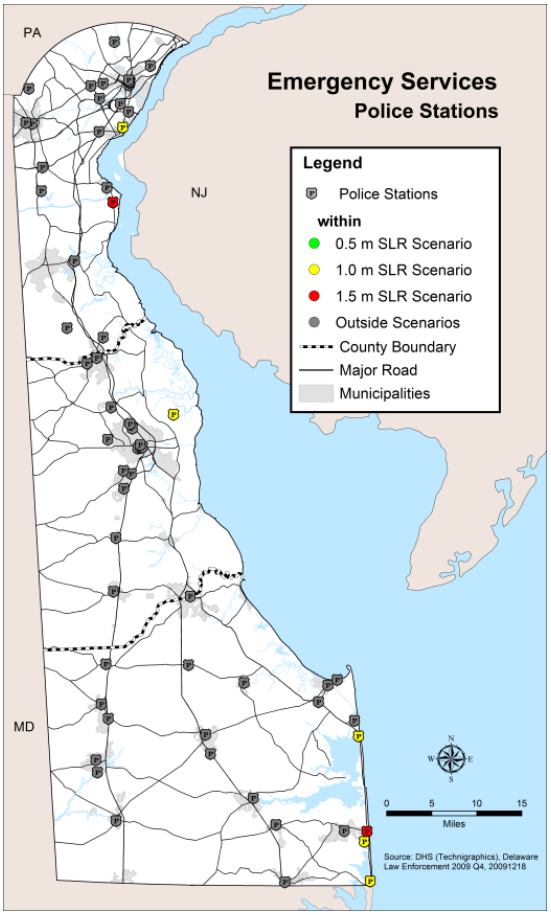


1b. **Flooding In-depth**: Using summary data provided for critical facilities, derived from FEMA's HAZUS and displayed by coastal county through NOAA's Coastal County Snapshots for Flood Exposure, indicate how many different establishments (businesses or employers) and critical facilities are located in the FEMA floodplain.

Critical Facilities in the FEMA Floodplain						
	Schools	**Police Stations**	**Fire Stations**	**Emergency Centers**	**Medical Facilities**	**Communication Towers**
FEMA HAZUS (2010)						
Inside Floodplain	30	9	21	0	3	6
Coastal Counties	357	36	57	2	11	34
Delaware Coastal Programs' Sea Level Rise Vulnerability Assessment (2012)						
1.5 m of SLR (# / total)*	1/401	5/63	8/88	1/7	--	--

*Number of facilities inundated by 1.5 meters of sea level rise / Total number of facilities Statewide.
Delaware Coastal Programs. Preparing for Tomorrow's High Tide – Sea Level Rise Vulnerability Assessment for the State of Delaware. 2012





2. Based on the characterization of coastal hazard risk, what are the three most significant coastal hazards in the coastal zone? Also indicate the geographic scope of the hazard, i.e., is it prevalent throughout the coastal zone or are specific areas most at risk?

	Type of Hazard	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Hazard 1	Coastal Storms	Throughout Coastal Zone
Hazard 2	Flooding	Throughout Coastal Zone
Hazard 3	Sea Level Rise	Throughout Coastal Zone

3. Briefly explain why these are currently the most significant coastal hazards within the coastal zone. Cite stakeholder input and/or existing reports or studies to support this assessment.

According to the U.S. Geological Survey, Delaware has the lowest mean elevation in the nation; and no part of Delaware is more than 10 miles from tidal water. Ten percent of Delaware's population lives within the coastal floodplain and development pressures have increased the number of people living in the floodplain 25% between 2000 and 2010. Municipal officials and citizens routinely report that they are experiencing an increased frequency of minor and moderate flood events. These empirical observations are backed up by recent reports; NOAA Technical Report NOS CO-OPS 073 (http://www.noaanews.noaa.gov/stories2014/20140728_nuisanceflooding.html) reported that the frequency of nuisance flooding in Lewes, Delaware had increased by 300% since 1950. NOAA attributes this increase in flood events to the high rates of local sea level rise in the Mid-Atlantic.

The impacts of accelerated sea level rise have also been well documented in Delaware; as reported in the state's sea level rise vulnerability assessment (http://de.gov/slrva) with an increase in sea levels of 1.5 meters, up to 11% of the state's land mass could be inundated by daily high tides. During the last five years, the Delaware Coastal Programs focused significant effort on understanding the impacts of sea level rise to state resources, educating citizens and decision-makers about the risk, developing policy options and implementing changes that increase Delaware's capacity to adapt and respond to sea level rise. As a result of this work, the DCP has become a critical source of information and technical assistance to municipal officials, state agencies, businesses and citizens wishing to adapt to climate change.

4. Are there emerging issues of concern, but which lack sufficient information to evaluate the level of the potential threat? If so, please list. Include additional lines if needed.

Emerging Issue	**Information Needed**
Cost-Benefit of Adaptation Options	Site specific building data including first floor elevations (does not exist statewide), models of reduction of flood risk from adaptation options, economic data on wetlands, intrinsic values, avoided costs.
Combined effect of sea level rise, coastal surge and heavy precipitation events	Watershed based flood models utilizing future climate scenarios

In-Depth Management Characterization:

Purpose: To determine the effectiveness of management efforts to address identified problems related to the coastal hazards enhancement objective.

1. For each coastal hazard management category below, indicate if the approach is employed by the state or territory and if there has been a significant change since the last assessment.

Management Category	Employed by State/Territory (Y or N)	CMP Provides Assistance to Locals that Employ (Y or N)	Significant Change Since the Last Assessment (Y or N)
Statutes, Regulations, and Policies:			
Shorefront setbacks/no build areas	Y	Y	N
Rolling easements	N	N	N
Repair/rebuilding restrictions	Y	Y	N
Hard shoreline protection structure restrictions	Y	Y	N
Promotion of alternative shoreline stabilization methodologies (i.e., living shorelines/green infrastructure)	Y	Y	Y
Repair/replacement of shore protection structure restrictions	Y	Y	N
Inlet management	Y	N	N
Protection of important natural resources for hazard mitigation benefits (e.g., dunes, wetlands, barrier islands, coral reefs) (other than setbacks/no build areas)	Y	Y	N
Repetitive flood loss policies (e.g., relocation, buyouts)	Y	N	N
Freeboard requirements*	Y	Y	Y
Real estate sales disclosure requirements	Y	N	N
Restrictions on publicly funded infrastructure	Y	Y	Y
Infrastructure protection (e.g., considering hazards in siting and design)	Y	Y	Y
Management Planning Programs or Initiatives:			
Hazard mitigation plans	Y	Y	N
Sea level rise/Great Lake level change or climate change adaptation plans	Y	Y	Y
Statewide requirement for local post-disaster recovery planning	N	N	N
Sediment management plans	Y	N	Y
Beach nourishment plans	Y	Y	Y
Special Area Management Plans (that address hazards issues)	N	N	N
Managed retreat plans	N	N	N
Research, Mapping, and Education Programs or Initiatives:			
General hazards mapping or modeling	Y	Y	Y
Sea level rise mapping or modeling	Y	Y	Y
Hazards monitoring (e.g., erosion rate, shoreline change, high-water marks)	Y	Y	Y
Hazards education and outreach	Y	Y	Y

*Employed by select municipalities

Identify and describe the conclusions of any studies that have been done that illustrate the effectiveness of the state's management efforts in addressing coastal hazards since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state's management efforts?

In 2009, the DCMP, through its consultant, Responsive Management, conducted a statewide telephone survey to understand the sea level rise and climate change attitudes and perceptions of Delaware residents. This survey was repeated in 2014 to determine how residents' opinions have shifted over a five year period. During this period there was a substantial increase in the percentage of residents who are completely convinced that sea levels are rising (from 29% - 39%). In addition, the number of residents who agree that they have personally experienced the impacts of sea level rise increased from 22% in 2009 to 30% in 2014 and those who said that sea level rise is having an impact "now" where they live also increased from 14% in 2009 to 20% in 2014. Most importantly for program purposes, the number of residents who "strongly agree" that immediate action should be taken to reduce the impacts of sea level rise increased from 35% in 2009 to 49% in 2014. This is a strong level of support for on-the-ground action, and is an indicator that the tools, training and outreach conducted by the DCP have had an impact. The report is available online: http://www.dnrec.delaware.gov/coastal/Pages/CCSLRSurvey.aspx.

No additional studies have been undertaken that illustrate the effectiveness of the state's management actions in addressing coastal hazards since the last assessment.

Identification of Priorities:

1. Considering changes in coastal hazard risk and coastal hazard management since the last assessment and stakeholder input, identify and briefly describe the top one to three management priorities where there is the greatest opportunity for the CMP to improve its ability to more effectively address the most significant hazard risks

Management Priority 1: Improving the ability of decision-makers to incorporate social and economic data into decision-making about coastal hazard adaptation and mitigation projects.

Description: One of the major impediments to on-the-ground action for coastal hazards at the state and local level is the ability for decision-makers to understand and apply the long-term economic and social costs and benefits of coastal projects to their decision-making. Little information about long-term costs and economic benefits exists, and the information that exists is either general or not geographically relevant, limiting its usefulness for practical applications. Improving the ability to understand the long-term costs of hazard mitigation projects can lead to increased support for long-term projects that may appear too costly, without additional consideration of the long term benefits that result from both avoided storm damage and improved function of natural systems.

Management Priority 2: Improving state and local policies and regulations to enable coastal hazard adaptation and mitigation projects that reduce vulnerability to flooding, coastal storms and sea level rise.

Description: Many state, county and local policies, procedures and regulations have failed to keep pace with the emerging science on sea level rise, coastal storms, climate change and shoreline erosion and with newly

established best management practices. Policies, procedures and regulations that are not updated to reflect the emerging science can hinder or prevent actions that improve coastal resiliency or can lead to mal-adaptation.

2. Identify and briefly explain priority needs and information gaps the CMP has for addressing the management priorities identified above.

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	Geographically specific cost-benefit studies are needed to influence decision-making. Many required data sets are lacking, including willingness to pay, secondary benefits, housing data and monetary costs etc.
Mapping/GIS/modeling	Y	There is currently no information available for decision-makers regarding the combined impacts of flooding, sea level rise and coastal surge. Statewide or county-wide building information is also not available; first floor elevations, replacement value etc. is a necessary component of any economic evaluation.
Data and information management	Y	Delaware lacks the site specific data and information management system that would improve the accuracy of the HAZUS for Flood system.
Training/Capacity building	Y	Staff need to become more familiar with economic models and social science literature; as will end-users. Specific training for HAZUS and other software may be necessary.
Decision-support tools	Y	Web-site or document outlining best practices for decision-making, including economic and social factors, does not exist but is essential to moving forward.
Communication and outreach	Y	A revised strategic communication strategy that incorporates emerging understanding of economic and social factors and best practices is needed.

Enhancement Area Strategy Development:

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

Yes Y
No _____

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

The DCMP will develop a strategy for this enhancement area. Coastal Hazards consistently is ranked by staff as a priority focus area and it is also a Federal priority. DCP's outreach has also clearly indicated that responding to coastal hazards is also a priority for stakeholders. Finally, DCP has positioned itself as a statewide leader in coastal hazards, has an existing network of partners and has developed staff capacity to successfully lead coastal hazards projects to improve the state's resilience to coastal storms, flooding and sea level rise.

STRATEGY

Determining the Economic Impacts of Coastal Resilience Actions to Support Policy Change

I. Issue Area(s)

The proposed strategy or implementation activities will support the following high-priority enhancement areas *(check all that apply)*:

- ☐ Aquaculture
- ☐ Energy & Government Facility Siting
- ☒ Coastal Hazards
- ☐ Ocean/Great Lakes Resources
- ☐ Special Area Management Planning
- ☐ Cumulative and Secondary Impacts
- ☒ Wetlands
- ☐ Marine Debris
- ☐ Public Access

II. Strategy Description

A. The proposed strategy will lead to, or implement, the following types of program changes *(check all that apply):*

- ☐ A change to coastal zone boundaries;
- ☐ New or revised authorities, including statutes, regulations, enforceable policies, administrative decisions, executive orders, and memoranda of agreement/understanding;
- ☒ New or revised local coastal programs and implementing ordinances;
- ☒ New or revised coastal land acquisition, management, and restoration programs;
- ☐ New or revised special area management plans (SAMP) or plans for areas of particular concern (APC) including enforceable policies and other necessary implementation mechanisms or criteria and procedures for designating and managing APCs; 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 government, and other agencies that will result in meaningful improvements in coastal resource management.

B. Strategy Goal: Improving community resilience from coastal storms and flooding by providing information on the cost to benefit impact of wetlands and infrastructure improvements, with enhanced local datasets that will be used in the HAZUS model, which will provide quantitative information to support local planning and ordinance development.

C. Strategy Description:

Describe the proposed strategy and how the strategy will lead to and/or implement the program changes selected above. If the strategy will only involve implementation activities, briefly describe the program change that has already been adopted, and how the proposed activities will further that program change. (Note that implementation strategies are not to exceed two years.)

In Delaware one of the greatest impacts from coastal storms is flooding. There are two potential sources of floodwater: 1) surge from the Atlantic Ocean or Delaware Bay across the beach and dune, or 2) flooding from the tributaries and surrounding tidal wetlands, combined with freshwater runoff - all exacerbated by sea level rise. The state has an existing beach replenishment program; the economic

benefits of which are well understood by community officials and resource management. However, sea level rise and storm models show that flood damage will increasingly occur in areas that do not receive protection from beach nourishment project and that might benefit from nature-based strategies for flood mitigation. The long term economic and social benefits of both nature-based and traditional infrastructure investments and other adaptation measures are not yet well understood. To support investment in infrastructure improvements and enhance the natural protection provided by wetlands, a defensible quantitative evaluation of these potential actions to alleviate flooding impacts is needed. If a positive cost to benefit ratio of infrastructure improvement and wetland protection can be shown it will be easier for local communities and counties to justify modifying their ordinances, comprehensive plans and capital plans to include these protection and zoning measures.

To provide this quantitative information to the local governments, the DCP will support the collection of localized data on infrastructure and the protection value of wetlands (based on transferable criteria). The infrastructure data, including first floor elevations, roadways, drainage, topography etc., will be input into the FEMA HAZUS model to determine the economic impact of a coastal flooding event. HAZUS is a risk assessment methodology for analyzing potential losses from floods, hurricane and earthquakes. In HAZUS, current scientific and engineering knowledge is coupled with the latest geographic information systems (GIS) technology to produce estimates of hazard-related damage before or after a disaster occurs. HAZUS is used for mitigation and recovery, as well as preparedness and response. Government planners, GIS specialists and emergency managers use HAZUS to determine losses and the most beneficial mitigation approaches to take to minimize them. HAZUS can be used in the assessment step in the mitigation planning process, which is the foundation for a community's long-term strategy to reduce disaster losses and break the cycle of disaster damage, reconstruction and repeated damage. Using HAZUS as a planning tool has not been broadly applied in Delaware.

To provide accurate flood elevation datasets for the HAZUS model, the flood mitigation properties of wetlands will have to be researched along with the long-term prognosis of the wetland's sustainability. This research will identify a series of coefficients for wetland parameters that can be selected for each community based on local hydrology, marsh elevation, vegetation, acreage, etc. These coefficients will be used to determine the new flood water levels and durations to be used in the HAZUS model for each community. The HAZUS model will first be run under current conditions to develop a baseline. The model will then be rerun with multiple scenarios allowing for variations in potential infrastructure improvements, adaptation measures and wetland changes including improved and deteriorating wetland conditions and/or acreages. The economic impact from the flooding events will be compared to the expected cost of infrastructure improvements, adaptation or wetland protection to determine the cost to benefit ratio of the actions. It is anticipated that for many actions and protection measures there will be a positive cost to benefit ratio that will encourage local communities and counties to modify their comprehensive plans and local ordinances to include these changes or protection measures. The DCP will actively work with the communities and local governments to implement changes in years 4 and 5 of the Strategy. DCP will use site specific model results to validate the benefit of proposed activities and assist the communities and local governments in adapting these activities into their regulations, ordinances and comprehensive plans. The results may also be used to change state policies on land purchase, restoration, acquisition, and to support funding for these activities.

III. Needs and Gaps Addressed:

Identify what priority needs and gaps the strategy addresses and explain why the proposed program change or implementation activities are the most appropriate means to address the priority needs and gaps. This discussion should reference the key findings of the assessment and explain how the strategy addresses those findings.

Wetlands:

Research: To enable the inclusion of site specific tidal wetland properties, additional research to estimate long-term changes and determine protection services of tidal wetlands is required. This research will include long-term monitoring of: 1) wetland elevations to examine accretion/subsidence rates; 2) surface water level to determine changes in sea level and the attenuation of flooding from storm events; 3) vegetation to determine how various species affect changes in flood attenuation and respond to climate change; 4) hydrological modeling to determine the impacts of wetlands topography on extent of flood attenuation and water levels; and 5) erosion rates to predict long-term geographic area extent values. To estimate the cost of wetland preservation an economic analysis will need to be performed to develop costs for acquisition and management of tidal wetlands.

Mapping/GIS: To accurately determine the extent of tidal wetlands and erosion and migration rates, a change analysis of recent GIS mapping efforts in relation to historic datasets will need to be performed. New GIS coverages will need to be developed based on the economic benefit categories of wetlands determined in the research depicting the type and extent of wetlands surrounding communities for input into the HAZUS model.

Data and Information Management: In order to provide accurate Delaware specific data for incorporation into the model, all reliable existing datasets should be included. Presently, several sections in DNREC, University of Delaware, USFWS and some NGO's collect information on multiple wetland parameters. Part of this strategy will build on state efforts to improve communication and coordination of wetland scientists to facilitate the exchange of data and information including the possible development of a centralized statewide repository of projects and research.

Training and Capacity Building: This strategy will support improved collaboration among wetland scientists in Delaware, while providing for a more robust dataset on wetlands information. One example of how this would be beneficial is research currently underway utilizing Sediment Elevations Tables (SETs). Five entities, including the DNERR, two National Estuary Programs (Partnership of the Delaware Estuary and the Center for the Inland Bays, two US Fish and Wildlife Service Refuges (Bombay Hook and Prime Hook) and The Nature Conservancy, all maintain SETs in the state. Consolidating the data collected would result in the creation a holistic network of wetland data and leverage the limited resources of individual researchers. Additional data integration would provide scientists with a means to build their capacity in order to obtain a better understanding Delaware's wetlands. This strategy will provide logistic and financial support to accomplish this task.

Decision Support Tools: Annual reports detailing wetland monitoring efforts will be produced. While these reports may initially be of use only to a limited audience, this will support the effort to increase collaboration in the scientific community and through the efforts of the DCMP and the DNERR Coastal Training Program the information will be translated for use by a wider audience including local government and decisions-makers. The results of the HAZUS model as they refer to wetland management will be incorporated into the outreach reports/presentations/etc. in years 4 and 5 of the strategy.

Communication and Outreach: The strategy has a strong communication and outreach component as it related to wetlands in the later years of the strategy. The DNERR Coastal Training Program will work closely with researchers and the DCMP to effectively demonstrate the value of tidal wetland and the economic benefit they provide for coastal resilience. In years 4 and 5, the outreach component will be directed towards the local government officials and other stakeholders to promote stronger plans and regulations for wetland preservation. The outreach will be developed and implemented based on the data and information collected through the preliminary research and HAZUS modeling.

Coastal Hazards:

Research: An analysis of the cost of implementation of coastal resilience projects will need to be performed to determine if the potential cost savings provides a positive cost to benefit ratio based on the results of the HAZUS modeling. It is anticipated that census data will provide a substantial amount of the inputs to the model datasets although additional research may be required to fine tune the information at the local community level.

Mapping/GIS: This strategy will improve the GIS coverages used for coastal hazard mitigation and adaptation purposes. These additional coverages will include improved information on wetland extent and conditions as they apply to coastal resilience, an expanded dataset on first-floor elevations of coastal communities. Finally, all geospatial economic based data obtained through this strategy will be incorporated into GIS coverages that are publicly available and can be used by local communities in their own economic analysis with or without the support of the DCMP.

Data and Information Management: In order to provide accurate Delaware specific data for incorporation into the model, all reliable existing datasets should be included. The DCP will initially examine US Census datasets and augment the data as necessary to provide information at the community level. Information will also be gathered on the cost of adaptation strategies for accurate cost to benefit determination. All relative information will also be compiled in tables or other appropriate formats to provide end-users a concise and easily understood means of assessing the information for other projects and assessments. It is anticipated that additional first floor elevation data and other county assessment data will have to be collected. This information will be incorporated into a HAZUS dataset for other agencies to use, which would be significant co-benefit of this project because of the current limited local data available to improve the accuracy of HAZUS.

Training and Capacity Building: This strategy will provide training in HAZUS to staff and other interested parties (community leaders, agency representatives, etc.). In addition some basic capacity building will likely be necessary in using census and other socio-economic datasets. It will also encourage the coordination with other HAZUS users to develop a long-term database management structure and agreements in the state.

Decision Support Tools: The 309 strategy will result in decision support tools providing defensible information about the costs and benefits of flood adaptation measures for use by municipal officials and resource managers in making long term plans for adaptation. The results of the HAZUS modeling will be provided to the local decision-makers along with documentation outlining the relative costs of actions and potential savings from protection during flooding events. A guidance document will be created including all relative information outlining the procedures used for the HAZUS model, relative cost of coastal resilience adaptation measures, the protection value they provide and suggestions for the amendment of ordinances, regulations and guidelines.

Communication and Outreach: The strategy has a strong communication and outreach component in the later years of the strategy. The DNERR Coastal Training Program will work closely with the DCMP to host workshops at the local level to provide information on the HAZUS results and outreach support to communities to find funding options to begin implementation of identified adaptation measures. Then, more importantly, work with interested communities to amend ordinances and guidelines to support implementation of coastal resilience measures.

IV. Benefits to Coastal Management :

Discuss the anticipated effect of the strategy, including the scope and value of the strategy, in advancing improvements in the CMP and coastal management, in general.

Successful completion of this strategy will provide several benefits to coastal management by improving coastal resilience in the state and in turn protecting and preserving valuable wetland habitat. The anticipated results of the HAZUS effort will provide the critical data necessary to justify investments to provide protection from flooding events. These investments could not only reduce insurance costs and limit losses, but also protect lives. In the current economy it is often difficult to support investments in infrastructure improvements, however having the ability to show a significantly greater cost savings from future flooding events will facilitate difficult decisions. If the true economic benefit of wetlands in providing protection from flooding events can be shown, it could boost funding for and better target wetland areas for acquisition. By providing coastal resilience as the driver behind the wetland component, the state would additionally benefit from all of the other numerous benefits provided by tidal wetlands with the successful completion of this strategy. A subsequent benefit for Delaware's emergency management community because the HAZUS dataset available for use for FEMA mitigation projects and disaster declarations will have local data, and thus provide more accurate storm damage information.

V. Likelihood of Success:

Discuss the likelihood of attaining the strategy goal and program change (if not part of the strategy goal) during the five-year assessment cycle or at a later date. Address the nature and degree of support for pursuing the strategy and the proposed program change and the specific actions the state or territory will undertake to maintain or build future support for achieving and implementing the program change, including education and outreach activities.

This 309 Strategy has a high likelihood of success. Its ultimate goal is to facilitate and stimulate coastal resilience projects and changes to state and local policies that encourage adaptation through nature-based and traditional infrastructure improvements and other adaptation measures. Providing defensible scientific and economic data on the benefits of infrastructure upgrades and wetland protection to the local governments is the key to the success of the strategy. The need for this type of information, especially as it relates to flooding issues was an overwhelming concern expressed by community leaders. DCP has a long history of successfully working with communities through the DCMP's coastal resource grant program and with state-wide initiatives like the Sea Level Rise Vulnerability/Assessment and Adaptation process , which demonstrate that DCP possesses the requisite abilities to work at all levels of government in the State that will be necessary for this strategy. While it is not expected that every community will participate in this strategy, it is expected that the most vulnerable coastal communities would welcome the support from DCP and the results of the project to assist in their long-term planning efforts. As the DCP has an ongoing commitment to local community support, if the information provided by this strategy is deemed valuable as anticipated, it will become engrained into the community support activities for the foreseeable future.

VI. Strategy Work Plan

Using the template below, provide a general work plan that includes the major steps that will lead toward or achieve a program change or implement a previously achieved program change. If the state intends to fund implementation activities for the proposed program change, describe those in the plan as well. The plan should identify a schedule for completing the strategy and include major projected milestones (key products, deliverables, activities, and decisions) and budget estimates. If an activity will span two or more years, it can be combined into one entry (i.e., Years 2-3 rather than Year 2 and then Year 3). While the annual milestones are a useful guide to ensure the strategy remains on track, OCRM recognizes that they may change somewhat over the course of the five-year strategy unforeseen circumstances. The same holds true for the annual budget estimates. Further detailing and adjustment of annual activities, milestones, and budgets will be determined through the annual cooperative agreement negotiation process.

Strategy Goal: Improving community resilience from coastal storms and flooding by providing information on the cost to benefit impact of wetlands and infrastructure improvements, with enhanced local datasets for use in the HAZUS model to provide quantitative information to support local planning and ordinance development.

Total Years: 5 years
Total Budget: $440,000

Year(s): 1-5
Description of activities: Develop and Implement Comprehensive DNERR Wetland Monitoring Plan to provide ecological inputs for HAZUS model.
Major Milestone(s): Final Monitoring Plan (Y1), Purchase and installation of monitoring equipment (Y1); continued long term monitoring with annual reports and work towards database development with state partners (Y2-5)
Budget: Y1: $55,000, Y2-5: $10,000 per year

Year(s): 1-2
Description of activities: HAZUS training and dataset development
Major Milestone(s): Training for 2 additional staff in HAZUS; Refinement of base datasets for local conditions including incorporating county assessment datasets and other local socio-economic data.
Budget: Y1: $33,000, Y2:28,000

Year(s): 2
Description of activities: Examination of historic datasets to determine flood attenuation and water level responses to various wetland characteristics
Major Milestone(s): Report on wetland characteristic vs. flood protection properties
Budget: $25,000

Year(s): 2
Description of activities: HAZUS sensitivity analysis
Major Milestone(s): Report on the relative economic impact of various infrastructure improvements and surrounding wetland characteristics as determined by modeling various individual scenarios in HAZUS
Budget: $25,000

Year(s): 3
Description of activities: Modeling of wetland hydrology and habitat to determine flood protection parameters of a typical community adjacent wetland
Major Milestone(s): Technical report on the characteristics of various tidal wetlands found in Delaware and the impacts that these characteristics have on water level and surge attenuation
Budget: $50,000

Year(s): 3
Description of activities: Run HAZUS scenarios for 2-3 coastal communities
Major Milestone(s): Report on economic analysis of common infrastructure improvements and wetland configurations for 2-3 coastal communities.
Budget: $28,000

Year(s): 4-5
Description of activities: Formation of Coastal Resilience workgroup for the determination and dissemination of types and relative cost of improvements.

Major Milestone(s): Report on recommendations to communities on positive cost to benefit improvements for infrastructure and wetlands preservation. Training document for coastal communities and counties on incorporating local information into HAZUS model and interpreting results
Budget: Y4: $38,000, Y5: $20,000

Year(s): 4-5
Description of activities: Expand monitoring of critical wetland parameters to target areas surrounding coastal communities
Major Milestone(s): Increase monitoring of critical parameters to wetlands adjacent to 5 additional communities, to support future HAZUS modeling at additional locations with site specific data.
Budget: Y4: $40,000, Y5: $10,000

Year(s): 5
Description of activities: Outreach to communities and counties on the findings of the project and assist in development of revised comprehensive plans and ordinances.
Major Milestone(s): Outreach documents/presentations. Workshops and on-going meetings with at least five coastal communities in support of revising comprehensive plans and ordinances.
Budget: $48,000

VII. Fiscal and Technical Needs

A. Fiscal Needs:

If 309 funding is not sufficient to carry out the proposed strategy, identify additional funding needs. Provide a brief description of what efforts the CMP has made, if any, to secure additional state funds from the legislature and/or from other sources to support this strategy.

This strategy builds upon several existing DCMP and DNERR tasks, especially in monitoring and assessment of wetlands. Section 306 funds and DNERR Section 315 will be used to augment the monitoring and assessment for information of crucial importance to the HAZUS datasets. These existing initiatives are the ongoing NERRS System Wide Monitoring Program (SWMP) data collection, NERRS Sentinel Site and associated ecological monitoring programs and sediment elevation tables (SETs). The DNREC Division of Fish and Wildlife has performed extensive land cover mapping and the DNREC Division of Watershed Stewards has collected valuable information on wetlands condition. It is anticipated that all of these programs will continue to support their efforts which will contribute valuable datasets for this strategy. As stated in Section VIII. Projects of Special Merit will be applied for to improve data sets to increase the accuracy of any model results and identify areas for funding coastal resilience projects. The DCP anticipates that it can meet all the deliverables outlined with the budgeted 309 funding, however, many datasets and other activities could possibly be enhanced if additional funding is available and DCP will, whenever appropriate, attempt to secure additional funds.

B. Technical Needs:

If the state does not possess the technical knowledge, skills, or equipment to carry out all or part of the proposed strategy, identify these needs. Provide a brief description of what efforts the CMP has made, if any, to obtain the trained personnel or equipment needed (for example, through agreements with other state agencies).

The DCP has the technical ability to perform analysis with the HAZUS model and 2 staff members have had multi-day training on HAZUS, provided by FEMA. DCP will work closely with the local FEMA and DEMA representatives most familiar with the model to quickly address any technical issues in running the model and interpreting the results. DCP will also work closely with the State of Delaware FEMA Floodplain Manger on using local data on infrastructure and collecting additional data where necessary. Most coastal communities in Delaware have at least a partial set of first floor LiDAR elevation data to be used in HAZUS that was previously collected by DNREC's Flood Mitigation Program. The DCP has experience in processing point cloud (LAS) LiDAR data and will need to maintain licensing agreements for the software used for the data analysis. The other major technical data need is for improved data on the protective properties of wetlands. The DCMP partner program, the DNERR will serve as the technical resource for this information. Through existing research activities with sentinel sites and SWMP, in conjunction with proposed research activities by DNERR and other partner agencies, the technical information needed to evaluate the current and future economic protection value of wetlands can be determined.

VIII. Projects of Special Merit (Optional)

If desired, briefly state what projects of special merit the CMP may wish to pursue to augment this strategy. Any activities that are necessary to achieve the program change or that the state intends to support with baseline funding should be included in the strategy above. The information in this section will not be used to evaluate or rank projects of special merit and is simply meant to give CMPs the option to provide additional information if they choose. Project descriptions should be kept very brief (e.g., undertake benthic mapping to provide additional data for ocean management planning). Do not provide detailed project descriptions that would be needed for the funding competition.

While this project could be completed under the proposed timeline and budget, Project(s) of Special Merit could enhance the results by improving and refining the datasets available for the HAZUS model. These could include a project to provide closer examination of the energy level loss (attenuation) and flooding level reductions provided by various types and configurations of wetlands adjacent to communities.

Another project to assist the local governments could be identifying strategies for long-term financing of adaptation in Delaware. This project would result in recommendations to augment existing and/or create new laws and policies to create revenue sources and provide long-term financing for adaptation actions that are identified as credible options through the HAZUS models and subsequent meetings and workshops.

5-Year Budget Summary by Strategy

Activity Title	Year 1 Funding	Year 2 Funding	Year 3 Funding	Year 4 Funding	Year 5 Funding	Total Funding
Wetland Monitoring Plan	$ 55,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	**$ 95,000**
HAZUS Training and Dataset Development	$ 33,000	$ 28,000				**$ 61,000**
Wetland Flood Protection Review		$ 25,000				**$ 25,000**
HAZUS Sensitivity Analysis		$ 25,000				**$ 25,000**
Wetland Hydrology Modeling			$ 50,000			**$ 50,000**
Initial HAZUS Model Runs			$ 28,000			**$ 28,000**
Workgroup Formation and Outreach Material Development				$ 38,000	$ 20,000	**$ 58,000**
Targeted Wetland Monitoring				$ 40,000	$ 10,000	**$ 50,000**
Outreach and Assistance with Policy Updates					$ 48,000	**$ 48,000**
Total	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 88,000**	**$ 440,000**

SUMMARY OF STAKEHOLDER AND PUBLIC COMMENTS

Stakeholder group engagement took place in four phases: 1) Internet-based Stakeholder Survey, 2) Community Attitudes and Needs Focus Groups, 3) Key Partner Interviews, and 4) Public Comment.

Internet-based Stakeholder Survey

The survey was distributed primarily to state government agencies, with whom we frequently work. Fifty-eight responses were received. Those identifying themselves are listed below. The remaining responses were submitted anonymously.

Survey Respondents
DNREC Division of Watershed Stewardship
DNREC Division of Fish and Wildlife
DNREC Office of the Secretary
DNREC Division of Parks and Recreation
DNREC Division of Water
DNREC Division of Waste and Hazardous Substances
DNREC Division of Air Quality
Delaware Emergency Management Agency
Delaware Department of State Division of Cultural & Historic Affairs
Delaware Department of Transportation
Delaware Office of State Planning
US Fish and Wildlife Service
US Army Corps of Engineers
Bureau of Ocean Energy Management
Partnership for the Delaware Estuary
Center for the Inland Bays
The Nature Conservancy
Delaware Nature Society
Delaware State University
University of Delaware
Coastal & Estuarine Research, Inc

Affiliation Selection

State Government	35
Federal Government	5
Non-Profit Organization	9
University/College	8
Commercial/Industry	1

Survey Questions

Training/Education	Stakeholder Engagement	Policy Development
Technical Assistance	Research	Stewardship

Considering the categories above:

1) Regarding Wetlands, to what extent do you or your group need assistance?
2) Regarding Coastal Hazards, to what extent do you or your group need assistance?
3) Regarding Public Access, to what extent do you or your group need assistance?
4) Regarding Marine Debris, to what extent do you or your group need assistance?
5) Regarding Cumulative Impacts of Development, to what extent do you or your group need assistance?
6) Regarding Special Area Management Plans, to what extent do you or your group need assistance?
7) Regarding Ocean Planning, to what extent do you or your group need assistance?
8) Regarding Energy and Government Facilities, to what extent do you or your group need assistance?
9) Regarding Aquaculture, to what extent do you or your group need assistance?

Enhancement Area Prioritization

Based on the responses to the survey questions, the need for assistance in each enhancement areas were prioritized as follows:

Wetlands	1st
Cumulative and Secondary Impacts	2nd
Aquaculture	3rd
Coastal Hazards	4th
Public Access	5th
Special Area Management Planning	6th
Ocean Resources	7th
Energy and Government Facility Siting	8th
Marine Debris	9th

Community Attitudes and Needs Focus Groups

A series of focus groups were conducted for municipal and county officials for the purpose of understanding Delaware decision-makers' knowledge, concerns and needs related to coastal management issues and determine how the DCP can best meet these needs. Six sessions, two in each county, were held and attended by local municipal, county, and private sector representatives. While place-based affiliation was generally reported, participants were guaranteed anonymity as a condition of participation.

Community Affiliation

Town of Dewey Beach
City of Dover
Town of Fenwick Island
City of Georgetown
Town of Harrington
City of Lewes
Town of Milton
Town of Camden
Kent County
Town of Bethany Beach
Town of Middletown
City of Newark
City of Milford
Town of Frederica
City of Rehoboth Beach
Town of Bowers Beach
City of Seaford
City of Wilmington
Town of Ocean View
City of Dover
Town of Viola
City of Delaware City
City of New Castle
Middlesex Beach (unincorporated)

Twenty-two municipalities and one county were represented in the focus group sessions comprising just over 40% of the state's local governments. Each group was comprised of community decision-makers

including local municipal, county, and private sector representatives speaking on behalf of the local governments.

Focus Group Questions

1) What are topics or challenges in your community that need to be addressed? What are some of the challenges in addressing them?
2) Are there emerging issues in your community that you anticipate you will need to address in the next 5 years?
3) How are you handling your existing issues?
4) Do you need assistance on existing issues – do you anticipate needing assistance on emerging issues?
5) What kind of assistance are you looking for? (Financial, Training, Technical, Planning)

Coastal Management Issue Concerns

The major coastal management concerns among decision-makers include flooding, drainage, beach nourishment, storm water system maintenance and storm water runoff quality, wastewater treatment plant discharge, channel dredging, dike repair/construction, coastal surge, road access and evacuation routes, wetland protection, wetland conservation, and flood hazard mapping needs.

As a result of the responses given, Coastal Hazards, Wetlands, and Cumulative and Secondary Impacts were identified as the enhancement areas of most concern for local government officials.

Key Partner Interviews

Following up on the state agency internet survey responses, the DCMP spoke directly with representatives from key network partner program representing the high priority enhancement areas. Key partners were asked what the greatest opportunities were for the state's coastal management program to assist in more effectively addressing issues within the enhancement areas from their perspectives.

Network Partner Program Contacts

Coastal Hazards:
DNREC Division of Watershed Stewardship (Flood Management)
DNREC Division of Watershed Stewardship (Shoreline and Waterway Management)

Wetlands:
DNREC Division of Watershed Stewardship (Wetlands Monitoring and Assessment)
DNREC Division of Water (Wetlands and Subaqueous Lands)

Responses received generally spoke to increase coordination between programs to better utilize existing and leverage additional resources. Specifically, including blue carbon into wetland planning was strongly recommended due to role it may play in the future studies and assessments.

Public Comments

Delaware's draft 309 Section 309 Enhancement Program 2016-2020 Assessment and Strategy was made available for public review for 30 days. Notice of the opportunity to review and provide comments on this document was made through a newspaper with statewide circulation and through the DNREC electronic public notice system. The document was available electronically on the DCP website or a hard copy version could be viewed at the DCP Dover office. No comments were received.