Section 309 Assessment and Strategy of Pennsylvania's Coastal Resources Management Program

Performed Under the
Coastal Zone Enhancement Grants Program
Section 309
Coastal Zone Management Act

Prepared by
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Compacts and Commissions Office
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Pennsylvania Coastal Resources Management Program Section 309 Assessment and Strategy

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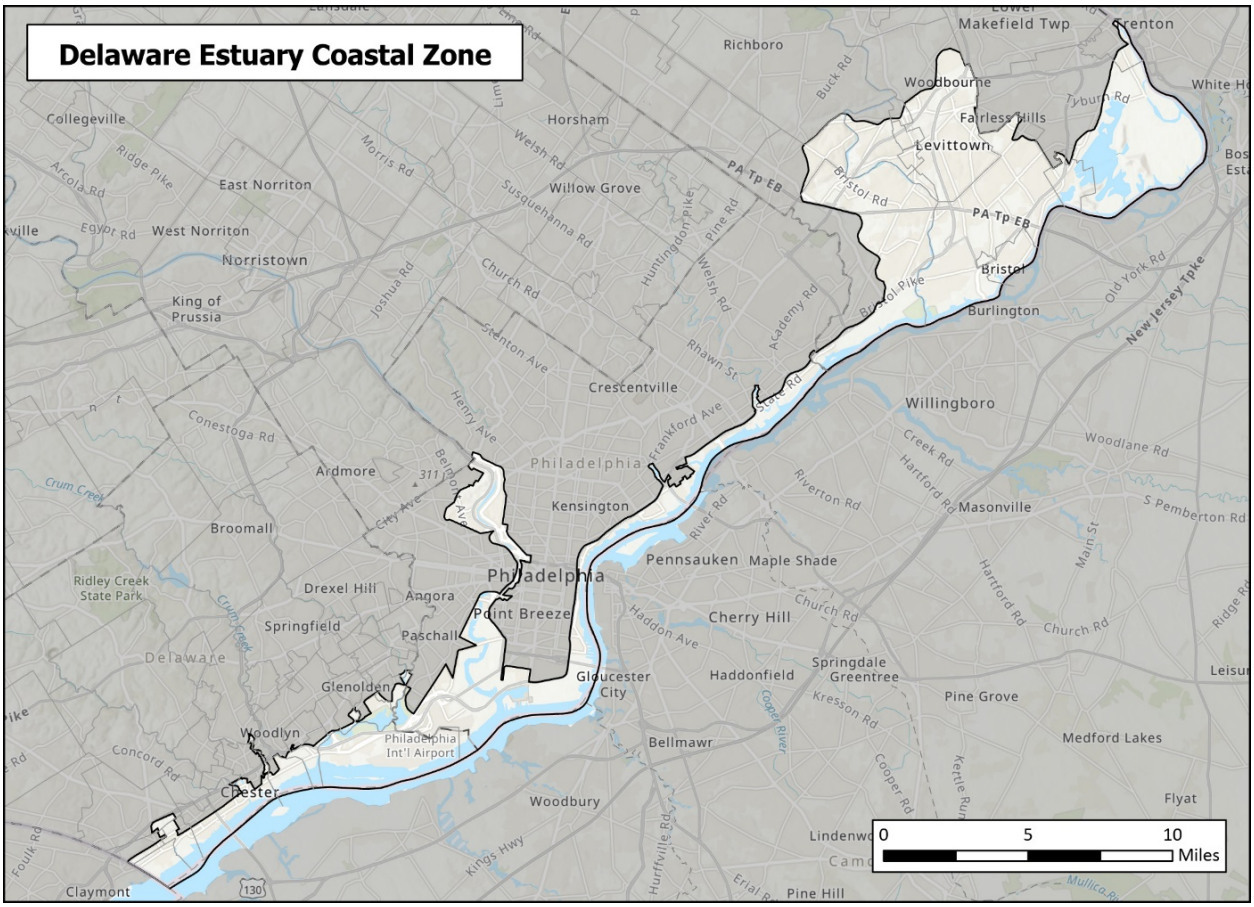
Acronyms

USACE	United States Army Corps of Engineers
BMPs	Best Management Practices
CAFO	Concentrated Animal Feeding Operation
C-CAP	Coastal Change Analysis Program
CCMP	Comprehensive Conservation and Management Plan
CMP	Coastal Management Program (NOAA)
CRMP	Coastal Resources Management Program
CSO	Combined Sewer Overflow
CZAC	Coastal Zone Advisory Committee
CZMA	Coastal Zone Management Act
DCED	Department of Community and Economic Development
DCNR	Department of Conservation and Natural Resources
DECZ	Delaware Estuary Coastal Zone
DEP	Department of Environmental Protection
DRBC	Delaware River Basin Commission
DVRPC	Delaware Valley Regional Planning Commission
ECG	East Coast Greenway
EPA	Environmental Protection Agency
ESI	Environmental Sensitivity Index
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
GIS	Geographic Information System
GLWQA	Great Lakes Water Quality Agreement
GSA	General Services Administration
HABs	Harmful Algal Blooms
ICC	International Coastal Cleanup
LAMP	Lakewide Action and Management Plan
LECZ	Lake Erie Coastal Zone
MS4	Municipal Separate Storm Sewer Systems
NFIP	National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
OCM	Office of Coastal Management (NOAA)
PASDA	Pennsylvania Spatial Data Access
PASG	Pennsylvania Sea Grant
PDA	Pennsylvania Department of Agriculture
PDE	Partnership for the Delaware Estuary
PEMA	Pennsylvania Emergency Management Agency
PENNVEST	Pennsylvania Infrastructure Investment Authority
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
PWD	Philadelphia Water Department
RSC	Regional Science Consortium
SAMP	Special Area Management Plan
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SFTF	Small Flow Treatment Facility

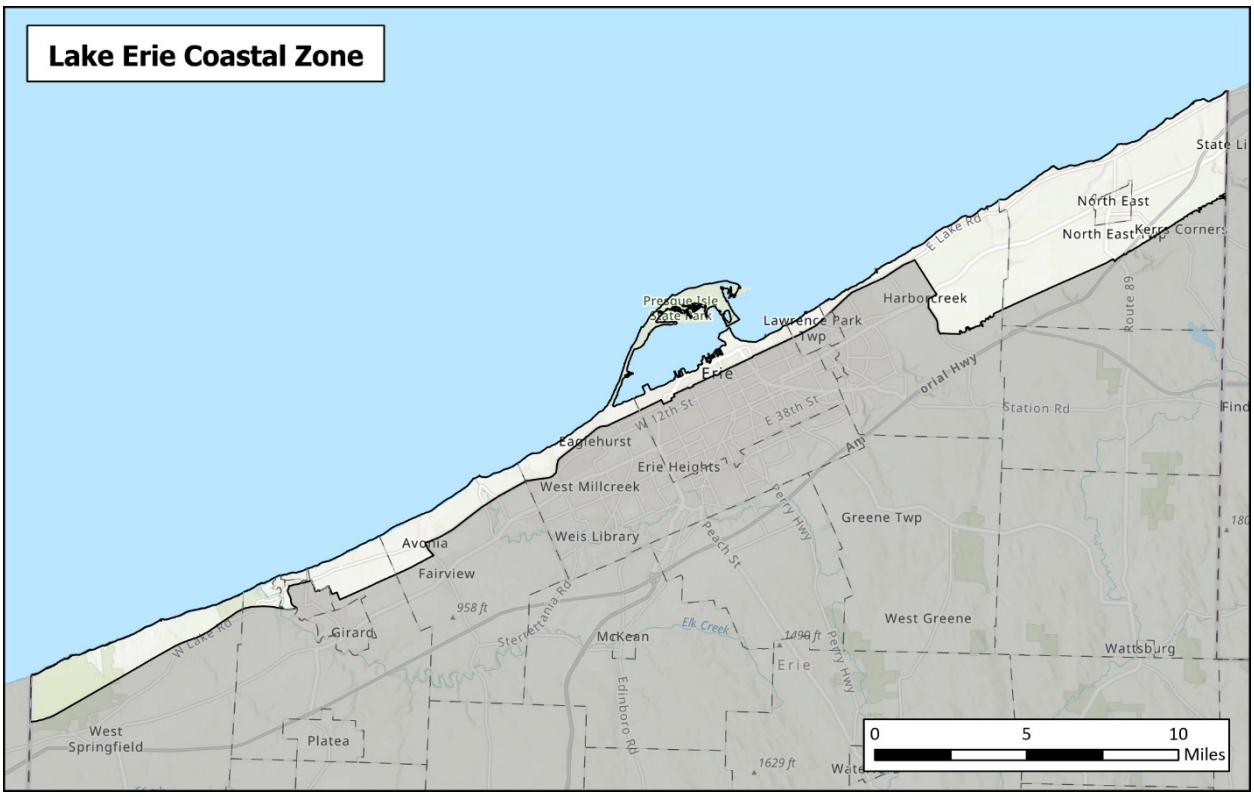
A. Introduction

1. Overview

The National Coastal Zone Management Program (CZMP) is administered by the National Oceanic and Atmospheric Administration (NOAA). Originally authorized by the Coastal Zone Management Act (CZMA) of 1972, 16 U.S.C. §§ 1451 *et seq*., the program is a voluntary partnership between the federal government and United States coastal and Great Lakes states and territories. Pennsylvania's Coastal Resources Management Program (CRMP) was federally approved in 1980 and is administered by the Department of Environmental Protection (DEP). Coastal zones are areas where land meets the coast and include both coastal waters and adjacent shorelands. The CRMP works in two distinct coastal areas; the 112-mile shoreline of the tidal Delaware Estuary in Bucks, Delaware, and Philadelphia Counties shown on Map 1.1, Delaware Estuary Coastal Zone, and the 77-mile shoreline along Lake Erie in Erie County shown on Map 1.2, Lake Erie Coastal Zone.



Map 1.1: Delaware Estuary Coastal Zone - This map shows the extent of the coastal zone along the tidal Delaware River in Pennsylvania. More detailed maps are available on CRMP's website at https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/Coastal-Zone-Boundary-Files.aspx.



Map 1.2: Lake Erie Coastal Zone - This map shows the extent of the coastal zone along Pennsylvania's shoreline of Lake Erie. More detailed maps are available on CRMP's website at https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/Coastal-Zone-Boundary-Files.aspx.

This assessment of CRMP's program is based on the Final Section 309 Guidance published by NOAA (June 2019). Section 309 of the CZMA (16 U.S.C. § 1456b), as amended in 1990 and 1996 (PL 104-540) [revised by PL 96-464; PL 101-508], encourages states to revise their previous Section 309 assessments and develop new strategies to achieve program changes in one or more of the coastal zone enhancement areas:

- Coastal wetlands
- Coastal hazards
- Public access
- Marine debris
- Cumulative and secondary impacts
- Special area management planning
- Ocean/Great Lakes resources
- Energy and government facility siting
- Aquaculture

Under the Section 309 grant program, states that improve their programs to meet the goals in one or more of the enhancement areas are eligible for additional federal funding.

As required by the program, CRMP conducted a reassessment of the nine enhancement areas in both the Lake Erie Coastal Zone (LECZ) and the Delaware Estuary Coastal Zone (DECZ). This provided CRMP with an opportunity to reevaluate its management direction and past efforts in the nine priority enhancement areas.

Following the guidance and template set forth by NOAA, this report is a combined Assessment and Strategy. The Assessment provides an overview of the Section 309 efforts since 2016, followed by an evaluation and update of the enhancement areas in accordance with the questions provided in the guidance. The Assessment must also include information on changing statutes, regulations, policies, or case law interpreting these, which includes items under the purview of other agencies and not directly under DEP's jurisdiction so that NOAA is aware of any changes in the last five years (DEP or other) that would affect this program in these enhancement areas. The Strategy outlines a potential plan to address the enhancement areas CRMP identified during the Assessment as "high priority". A copy of the 2015 Assessment and Strategy (FY2016 – FY2020) is available, for reference, at the DEP website, http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=5204&DocName=FINAL%20SECTION%20309%20ASESSMENT%20AND%20STRATEGY%20OF%20PA%26%2339%3bS%20COSTAL%20RESOURCES%20MANAGEMENT%20PROGRAM.PDF%20. A copy of the final FY2021 – FY2025 Assessment and Strategy will also be made available on the CRMP website.

Prior to drafting our current Assessment and Strategy, CRMP reached out to local stakeholders in both coastal zones to receive feedback on priorities and potential program changes. More details, including the list of local stakeholders engaged and a brief summary of feedback, is provided at the end of the document in section F, entitled Summary of Stakeholder Engagement and Public Comment. Notification of the draft FY2021 – FY2025 Assessment and Strategy and ability to provide public comment on the document was advertised in the *Pennsylvania Bulletin* on April 10, 2021, and on CRMP's website at https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/default.aspx. CRMP provided a minimum 30-day public comment period on the draft document. No public comments were received during the public comment period.

B. Summary of Recent Section 309 Achievements

CRMP received NOAA approval of the 2016 – 2020 Assessment and Strategy on September 25, 2015. CRMP developed two strategies for the 2016 – 2020 period: 1) DECZ Boundary Expansion and 2) Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency.

1. **Delaware Estuary Coastal Zone Boundary Expansion**
   The DECZ Boundary Expansion strategy was developed after receiving supporting stakeholder feedback primarily from Delaware County officials and local partners. This feedback was initiated during the stakeholder engagement portion of the CRMP's Section 309 assessment process in 2015. CRMP analyzed all three DECZ counties for potential boundary expansion areas but focused a more in-depth analysis on Delaware County. The Delaware County Planning Department, working with input from some municipal officials, developed and presented CRMP with a draft map indicating their preferred expanded boundary. CRMP's analysis included public access, trail connectivity, historic resources, habitat connectivity, impervious surfaces, open space, and stormwater systems. While preliminary boundary expansion efforts continue to develop, CRMP also continued to monitor the progress of the new guidance being developed by NOAA's Office of Coastal Management (OCM) with regards to the use of Section 306A funds outside of the Section 306A boundary, recognizing that many potential projects from just outside the existing coastal zone boundary would have direct impacts to the coastal zone. This new guidance has the potential to accomplish many of the goals of a boundary expansion, specifically in regards to providing grant funding to meaningful projects for the coastal areas. NOAA released the revised Coastal Zone Management Act Section 306A Guidance in November 2019 (https://coast.noaa.gov/data/czm/media/guide306a.pdf). The guidance includes the following narrative with regards to geographical areas where Section 306A funds may be used:

   2.7 Geography

   Under very limited circumstances, OCM may consider approval of Section 306A projects that fall outside of the approved coastal zone boundary of a coastal management program. Approval of such projects should be viewed as the exception. State coastal management programs are not encouraged to seek projects outside of their designated state coastal zone boundaries. However, if proposed, the primary purpose of such "inland" projects must further the preservation, conservation, management, or use of the state's coastal zone and address § 306A objectives for the coastal zone.

   Historically, construction and acquisition projects were required to be located within the boundaries of the coastal zone. While this new guidance provides the opportunity to potentially fund projects with direct linkages to the coastal zone, such as stormwater and public access, an expanded boundary would be a stronger alternative for supporting these linkages. The new guidance criteria requires projects to be within the coastal zone boundary with few exceptions. CRMP is currently re-considering potential boundary expansion options in the DECZ that focus on sea level rise and flooding concerns, along with other variables.

2. **Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency**
   CRMP developed this 3-part strategy to increase internal program capacity as well as increase capacity at the local community level.

   Part 1 of the 2016 – 2020 Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency strategy focused on building community resiliency within the DECZ. The effort began by meeting with individual municipalities to ascertain interests, information gaps, and challenges that they face when considering resiliency planning associated with a changing

climate. The Delaware Valley Regional Planning Commission (DVRPC), an on-going recipient of Section 309 funding, has led CRMP community outreach efforts in the DECZ. DVRPC has developed and presented outreach at the local level with regards to forecasting risks and potential steps to mitigate those risks. A critical resource that has been developed by DVRPC is an interactive storymap called Coastal Effects of Climate Change in Southeastern PA. This "map" serves as a comprehensive clearing house for information related to risks and resiliency that is specific to Pennsylvania's coastal communities in the DECZ. The storymap is available on DVRPC's website under a broader Pennsylvania Coastal Resiliency page (https://www.dvrpc.org/Resiliency/Coastal). The Pennsylvania Coastal Resiliency webpage contains additional information and tools, tailored to local DECZ municipalities, to help address current risks and plan for long-term risks associated with a changing climate. The storymap and coastal specific resiliency webpage provide a strong foundation for moving forward. CRMP plans to work with DVRPC to continue to build upon this information in order to provide additional resources for local municipalities and waterfront property owners. Information added will include model agreements and ordinances, as well as success stories to encourage changes at the local level. Lessons learned from this strategy are also informing CRMP activities in the LECZ.

Part 2 of the 2016 – 2020 Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency strategy was developed to focus on CRMP's 11 policy areas and make specific program changes to better manage and support climate resiliency planning and implementation projects. In December 2020, CRMP submitted regulatory update program change documents to NOAA to support federal consistency. Once these program changes are approved, CRMP plans to address the narrative program changes to the approved program Plan. This will include a specific focus on climate resiliency and adaptation.

Part 3 of the 2016 – 2020 Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency strategy involved making updates and additions to our Coastal Zone Advisory Committee (CZAC). The CZAC was established with Governor Thornburgh's original Executive Order that created CRMP on September 22, 1980. CRMP is examining the appropriateness of adding additional agencies such as the Pennsylvania Emergency Management Agency (PEMA), to better address coastal hazards, including climate resiliency. An additional update to the Executive Order includes agency name changes that have occurred since 1980. CRMP continues to work towards developing an updated Governor's Executive Order.

C. Current Enhancement Area Analysis Summary

CRMP analyzed each of the nine enhancement areas to determine their priority as coastal issues and their potential for program changes that could result in a more effective program. Prior to drafting this Section 309 Assessment and Strategy document, CRMP engaged key stakeholders to solicit input on what the priorities should be and where specific CRMP program changes could be implemented to enhance management of the resources. These discussions provide a base for the next Section 309 5-year strategy and also encourage broader dialogue about the CRMP and on-going priorities.

CRMP identified two "high priority" enhancement areas; coastal hazards and cumulative and secondary impacts. These two enhancement areas continue to be a high priority for CRMP. Additionally, coastal hazards are designated as an enhancement area of national importance by NOAA. As a result of identifying these two "high priority" enhancement areas, more in-depth Phase II assessments were conducted on each of the high priority enhancement areas to further evaluate potential problems, opportunities for improvement and specific needs. CRMP has developed two strategies relating to these enhancement areas, which are further explained later in this document (see Strategy section E).

1. **Wetlands**
   Wetlands were considered a medium priority during the last assessment and are considered a medium priority during this assessment. Significant changes in Pennsylvania's wetland mitigation policies are still in progress and are expected to be finalized during the next assessment period, in which CRMP is involved with representing the unique wetland resources in coastal areas. Wetlands are considered a high priority for the CRMP but can be addressed with existing regulations, policies, and other activities put in place by DEP. Wetlands are an important piece of climate mitigation and will also be impacted by climate change. In addition to protection and restoration, monitoring of changes to condition and function is also important to both coastal and inland wetlands.

2. **Coastal Hazards**
   Coastal hazards were considered a high priority during the prior assessment and are considered a high priority during this assessment. Fellow state agencies and local stakeholders also consider coastal hazards to be a high priority. CRMP is proposing coastal hazard strategies in both coastal zones as part of this Assessment and Strategy.

3. **Public Access**
   Public access was considered a high priority during the prior assessment and is being considered as a medium priority during this assessment. Public access remains a high priority for CRMP and for our local stakeholders. CRMP has consistently supported public access partnerships and accomplishments and will continue to do so through existing CRMP policies.

4. **Marine Debris**
   Marine debris was considered a medium priority during the last assessment and is being considered as a medium priority during this assessment. Marine debris cleanups are conducted in both coastal zones and research into microplastics continues to be further developed in both coastal zones. CRMP will continue to support marine debris projects with our existing policies and programs.

5. **Cumulative and Secondary Impacts**
   Cumulative and secondary impacts were considered a high priority enhancement area during the last assessment and are being considered as a high priority for this assessment. Cumulative and secondary impacts remain a high priority for the program more generally, and "polluted

runoff", associated with cumulative and secondary impacts, is an approved Section 312 evaluation metric for CRMP. CRMP's proposed strategies address coastal hazards that are related to cumulative and secondary impacts by making changes to better address flooding in the DECZ and coastal bluff erosion caused by increased stormwater in the LECZ.

6. **Special Area Management Planning**
   Special Area Management Planning was considered a low priority during the last assessment period and is being considered a low priority during this assessment. CRMP priorities can be addressed by enhancing existing CRMP policies, including those related to Coastal Hazards.

7. **Ocean/Great Lakes Resources**
   Ocean/Great Lakes resources were considered a medium priority during the last assessment and are being considered a medium priority during this assessment. CRMP remains active in supporting aquatic nuisance species (invasive species) management activities and can continue to support these activities without making specific program changes. CRMP also remains active in researching and promoting the underwater historic resources in both coastal zones.

8. **Energy and Government Facility Siting**
   Energy and government facility siting were considered a medium priority in the last assessment and are being considered a medium priority during this assessment. CRMP continues to monitor wind development possibilities in Lake Erie and the changes to energy facilities along the tidal Delaware River. CRMP currently participates in siting activities through the federal consistency process.

9. **Aquaculture**
   Aquaculture was considered a low priority during the last assessment and is being considered a low priority during this assessment. Commercial aquaculture has not yet been developed in either coastal zone. The critically important recreational fisheries in the LECZ are supplemented by aquaculture, both public and private hatcheries. CRMP recognizes the importance of these operations but does not feel a program change is necessary. CRMP can continue to support local partners under existing programs and policies.

D. Assessment

1. Wetlands

Section 309 Enhancement Objective: Protection, restoration, or enhancement of the existing coastal wetlands base, or creation of new coastal wetlands. §309(a)(1)

Note: For the purposes of the Wetlands Assessment, wetlands are "those areas that are inundated or saturated at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." [33 CFR 328.3(b)]. See also p. 174 of the CZMA Performance Measurement Guidance for a more in-depth discussion of what should be considered a wetland.

a. Phase I (High-Level) Assessment:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP [Coastal Management Program] *that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.*

i. Resource Characterization:

1. *Using provided reports from NOAA's Land Cover Atlas, please indicate the extent, status, and trends of wetlands in the state's coastal counties. You can provide additional or alternative information or use graphs or other visuals to help illustrate or replace the table entirely if better data are available.*

   The NOAA Land Cover Atlas provides data developed through the Coastal Change Analysis Program (C-CAP). The C-CAP provides nationally standardized, raster-based inventories of land cover for the coastal areas of the United States. Two file types are available: individual dates that supply a wall-to-wall map, and change files that compare one date to another. The most recent C-CAP Land Cover Atlas data available is 2016. (https://coast.noaa.gov/digitalcoast/data/ccapregional.html). The current state of wetlands in 2016 presented below and the information provided in Tables 1.1 thru 1.4, are based on C-CAP Land Atlas data. The C-CAP status and trends data indicates that overall wetland acreage has had minimal changes between 2010 and 2016 in both the DECZ and LECZ.

   Current state of wetlands in 2016 (acres): DECZ: 5,813 acres
   LECZ: 5,600 acres

Table 1.1: Coastal Wetlands Status and Trends in the DECZ

Change in Wetlands	from 1996-2016	from 2010-2016
Percent net change in total wetlands (% gained or lost)	2.57% loss	0.02% loss
Percent net change in freshwater (palustrine) wetlands (% gained or lost)	3.13% loss	0.14% gain
Percent net change in tidal (estuarine) wetlands (% gained or lost)	3.11% gain	1.51% loss

Table 1.2: How Wetlands Are Changing in the DECZ

Land Cover Type	Area of Wetlands Transformed to Another Type of Land Cover between 1996-2016 (acres)	Area of Wetlands Transformed to Another Type of Land Cover between 2011-2016 (acres)
Development (high/medium/low developed, developed open space)	101.9	20.9
Agriculture (cultivated land, pasture/hay)	4.7	1.1
Barren Land (AKA bare land)	4.4	0
Water (open water)	76.7	27.1
Additional cover types not included above:		
Grassland	6.2	2.9
Deciduous forest	5.3	1.1
Scrub/Shrub	6.7	1.6
Unconsolidated shore	11.8	14.9

Table 1.3: Coastal Wetlands Status and Trends in the LECZ

Change in Wetlands	from 1996-2016	from 2010-2016
Percent net change in total/freshwater (palustrine) wetlands (% gained or lost)	1.36% loss	0.03% gain

Table 1.4: How Wetlands Are Changing in the LECZ

Land Cover Type	Area of Wetlands Transformed to Another Type of Land Cover between 1996-2016 (acres)	Area of Wetlands Transformed to Another Type of Land Cover between 2011-2016 (acres)
Development (high/medium/low developed, developed open space)	37.6	0
Agriculture (cultivated land, pasture/hay)	2.9	0
Barren Land (AKA bare land)	3.6	0
Water (open water)	23.8	0
Additional cover types not included above:		
Grassland	0.4	-
Deciduous forest	5.3	-
Scrub/Shrub	15.6	-
Unconsolidated shore	1.8	0.9

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.*

Pennsylvania Wetland Mapping Project

Originally produced in 2017 for the counties in the Chesapeake Bay watershed, Pennsylvania expanded the effort to include consistent datasets for the entire Commonwealth. This data became available on Pennsylvania Spatial Data Access (PASDA) in 2019. The project produced two individual final products to support land-cover mapping and modeling initiatives in Pennsylvania; one product focuses on overall primary wetland identification and the other focuses on identifying restorable wetlands (see Table 1.5).
http://www.pasda.psu.edu/uci/SearchResults.aspx?Keyword=Modeled+Wetlands

Table 1.5: Pennsylvania Modeled Probability of Occurrence Wetland Mapping Totals

Water Body Type	Total Number of Mapped Units	Acreage
Emergent	239,281	223,764.43
Forested	548,124	1,247,890.58
Scrub/shrub	212,742	119,357.10
	Total of all wetlands	**1,591,012.11**

(derived from Modeled Primary Wetlands, Commonwealth of Pennsylvania, Statewide, 2013, University of Vermont Spatial Analysis Laboratory)

National Wetland Inventory (NWI) Updates

Updates to the NWI mapping for Pennsylvania's Lake Erie watershed and DECZ were completed in 2014 and 2015, respectively. CRMP participated in developing these updates. These projects were described in detail in CRMP's prior assessment. The information is included here to continue to communicate the availability of these more current and accurate mapping resources. Future planners of coastal wetland mapping and monitoring projects are encouraged to go directly to the US Fish and Wildlife NWI site to retrieve the most recent and accurate NWI products. https://www.fws.gov/wetlands/Data/Mapper.html

ii. 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.*

   Table 1.6 indicates if significant changes have occurred. Further discussion is provided under question two below the table.

Table 1.6: Significant Changes in Wetland Management

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

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* [Coastal Zone Management]*-driven changes; and*
   c. *Characterize the outcomes or likely future outcomes of the changes.*

Statutes, regulations, policies, or caselaw interpreting these

Pennsylvania State Programmatic General Permit

In order to reduce redundancy, DEP administers the Dam Safety and Encroachments Act (32 P.S. §§ 693.1 *et seq*.) through 25 Pa. Code Chapter 105, Dam Safety and

Water Management (Chapter 105) , Water Obstruction and Encroachment Program and the federal Section 404 Clean Water Act (33 U.S.C. § 1344) /Section 10 Rivers and Harbors Act of 1899 (33 U.S.C. § 403) United States Army Corps of Engineers (USACE) permitting activities through a State Programmatic General Permit (PASPGP). PASPGP-5 became effective on July 1, 2016 and was revised in July 2018. PASPGP-5 is scheduled to expire on June 30, 2021. PASPGP-6 is scheduled to take effect on July 1, 2021 for a five year term. DEP will continue to work with the USACE to provide efficiency for permit applicants and reviewers while maintaining necessary protections. Note that according to the conditions specified in PASPGP-5 the USACE will conduct independent federal permit reviews in the tidal waters of the Delaware estuary and within Lake Erie.
https://www.nap.usace.army.mil/Missions/Regulatory/Permits/SPGP/

Proposed Regulatory Changes to Chapter 105 Water Obstruction and Encroachment Permitting

During 2020 DEP began the process of revising Chapter 105. The proposed changes are considered to be the first substantive updates to Chapter 105 regulations since 1991. A major factor in developing the proposed changes is to provide clarity to existing regulations and current practices. Sections of the regulations that are being revised will address application requirements for the impacts analysis, alternatives analysis, cumulative impacts, environmentally beneficial aquatic resource restoration, and aquatic resource assessment and replacement criteria (related to the technical guidance documents mentioned below). CRMP had the opportunity to review and provide input during the process of developing the proposed changes and the revised final regulations will be used to implement coastal zone consistency determinations.

Wetlands programs (e.g., regulatory, mitigation, restoration, acquisition)

Wetland Mitigation Banking

Pennsylvania continues to move forward with increased use and support of watershed-based wetland mitigation banking. Due to the larger scale, wetland mitigation banking offers advantages of increased success of resource replacement as well as increased efficiencies for permittees. Three private entrepreneurial mitigation bankers, as well as the Pennsylvania Department of Transportation, have received authority to provide aquatic compensation in the form of mitigation banking. The three private mitigation banking companies have combined to successfully provide 213,540 linear feet of stream credits and 191.65 acres of wetland credits. The mitigation banking program has operated without compliance issues and is considered to have made significant contributions to restoring aquatic resources. Wetland mitigation banking has not yet occurred within the coastal zones. It is anticipated that the use of wetland mitigation banking in Pennsylvania will continue to grow during the next assessment period. If wetland mitigation banking is proposed within either coastal zone, CRMP will coordinate the planning with DEP's Bureau of Waterways, Engineering and Wetlands.

In Lieu Fee Mitigation

DEP is currently in the process of developing a new watershed based in lieu fee mitigation program. The in-lieu fee program offers benefits similar to mitigation banking in that replacement of resources at a larger scale offers benefits of increased success for resource replacement and increased efficiencies for

permittees. DEP anticipates the new program will receive final approval and become operational during 2021.

Technical Guidance Documents for Assessing Resource Conditions
In 2017, DEP completed new Technical Guidance Documents for wetland, riverine, and lacustrine aquatic resources assessments for use in the Chapter 105 permitting process. The wetland assessment methodologies are provided in the Pennsylvania Wetland Condition Level 2 Rapid Assessment Protocol. The guidance focuses on rapid assessment methodologies and generates a numeric score for defined condition categories. This change furthers efforts to consider functions and values in addition to wetland acreage when considering impacts and mitigation.
http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=4683

Pennsylvania Aquatic Resource Protection and Management Action Plan
DEP is currently working to draft a new Pennsylvania Aquatic Resource Protection and Management Action Plan. The Plan is in the beginning stages but is expected to be completed during the next assessment period.

ePermitting
In October 2018, DEP initiated ePermitting for Chapter 105 general permits. DEP is continuing efforts to move to online electronic permit applications for all Chapter 105 authorizations. The ePermitting process allows for additional efficiency for both project applicants and reviewers.
https://www.dep.pa.gov/Business/Water/Waterways/Pages/ePermitting.aspx

Pennsylvania Department of Conservation and Natural Resources (DCNR) Climate Change Adaptation and Mitigation Plan, June 2018
This Plan is described in more detail in the Coastal Hazards and Cumulative and Secondary Impacts Assessment sections (D.2 and D.5). Wetlands play a vital role in mitigating the impacts from climate change. The health and ecological and environmental functions wetlands provide are directly impacted by climate change. This Plan offers the following recommendations specific to wetlands:

- Protect and restore floodplain and riparian wetlands to maximize floodwater storage and groundwater recharge.
- Use green stormwater management (e.g., wetlands) and green design ideas from the Bureau of Facility Design and Construction.
- Restore on-site hydrology and connectivity to forested wetlands and lowlands, and increase water retention and storage for groundwater recharge.
- Restore surface water connectivity to groundwater through floodplain and riparian wetlands restoration.
- Restore floodplain and riparian wetlands to maximize floodwater storage and groundwater recharge.
- Adding wetlands and swales in floodplains adjacent to creeks and rivers.
- Protect and restore floodplain and riparian wetlands to maximize floodwater storage and groundwater recharge.

http://elibrary.dcnr.pa.gov/GetDocument?docId=1743769&DocName=Climate_Change_Adaptation_Plan_Final_Aug2018.pdf

iii. 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.*

   CRMP considers wetlands to be a priority that can be addressed through existing CRMP policies. CRMP understands that the significant ecological role and critical habitat value that wetlands provide will only continue to become more important under climate change conditions and should be considered a high priority in climate resiliency planning. Monitoring and assessment of wetlands (tidal, Great Lakes, and inland) will be critical in evaluating any functional changes over time. CRMP can support new or on-going efforts to monitor wetlands through existing programs.

   In the DECZ four out of six stakeholders selected wetlands as a high priority. In the LECZ none of the seven stakeholders selected wetlands as a high priority. This is a similar result to the stakeholder engagement received 5 years ago during the prior assessment. The difference in wetland priority may relate to the highly urbanized nature of the DECZ that has historically lost significant wetland acreage. There were no stakeholders that considered wetlands to be a low priority.

2. Coastal Hazards

Section 309 Enhancement Objective: Prevent or significantly reduce threats to life and property by eliminating development and redevelopment in high-hazard areas, managing development in other hazard areas, and anticipating and managing the effects of potential sea level rise and Great Lakes level change. §309(a)(2)

Note: For purposes of the Hazards Assessment, coastal hazards include the following traditional hazards and those identified in the CZMA: flooding; coastal storms (including associated storm surge); geological hazards (e.g., tsunamis, earthquakes); shoreline erosion (including bluff and dune erosion); sea level rise; Great Lake level change; land subsidence; and saltwater intrusion.

a. Phase I (High-Level) Assessment:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. Resource Characterization:

1. *In the table below, indicate the general level of risk in the coastal zone for each of the coastal hazards. (H=High, M=Moderate, L=Low)*

Table 2.1: General Level of Hazard Risk in the DECZ

Type of Hazard	General Level of Risk (H, M, L)
Flooding (riverine, stormwater)	**H**
Coastal storms (including storm surge)	**M**
Geological hazards (e.g., tsunamis, earthquakes)	**L**
Shoreline erosion	**L**
Sea level rise	**H**
Great Lakes level change	**N/A**
Land subsidence	**L**
Saltwater intrusion	**H**
Other (invasive species)	**M**

Table 2.2: General Level of Hazard Risk in the LECZ

Type of Hazard	General Level of Risk (H, M, L)
Flooding (riverine, stormwater)	**H**
Coastal storms (including storm surge)	**M**
Geological hazards (e.g., tsunamis, earthquakes)	**L**
Shoreline erosion	**H**
Sea level rise	**N/A**
Great Lakes level change	**H**
Land subsidence	**L**
Saltwater intrusion	**H**
Other (invasive species)	**H**

2. *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.*

Commonwealth of Pennsylvania 2018 State Hazard Mitigation Plan
The Commonwealth of Pennsylvania 2018 State Hazard Mitigation Plan was approved by the Federal Emergency Management Agency (FEMA) on October 10, 2018. CRMP had the opportunity to participate in the planning process meetings and provided input and comments on the document. Coastal erosion, flooding, hurricanes/tropical storms/nor'easters, and invasive species are coastal hazards that are profiled in the Plan. The Plan also includes mitigation strategies to increase awareness about the impacts of climate change and assessing future risk associated with climate change in applicable hazard profiles.
https://pahmp.com/

County Hazard Mitigation Plans
Each of Pennsylvania's coastal counties participates in hazard mitigation planning consistent with the Federal Disaster Mitigation Act of 2000. Brief summaries are provided below:

Bucks County 2016 Hazard Mitigation Plan Update
This Plan recognizes flooding, hurricanes, tropical storms, and nor'easters among their list of high ranked hazards. Storm surge and tidal flooding are discussed, however, sea level rise is not mentioned. The Plan is expected to be updated in 2021.
http://www.buckscounty.org/docs/default-source/pc/2016bchmpupdate.pdf?sfvrsn=0

Delaware County 2016 Hazard Mitigation Plan
This Plan recognizes flooding, hurricanes, tropical storms, and nor'easters as hazards. The report also recognizes the long-range potential for flooding along the Delaware River and its tributaries resulting from sea level rise associated with effects from climate change. While the plan recognizes sea level rise, it does not directly address the risk due to the broad and long-range consequences. The plan is expected to be updated in 2021.
https://www.delcopa.gov/planning/pubs/DelawareCounty-HMP-2016.pdf

City of Philadelphia 2017 All Hazard Mitigation Plan
The City of Philadelphia All Hazard Mitigation Plan includes sea level rise in the analysis of flooding risk and mentions some specific mitigative actions. Hurricanes and tropical storms are also addressed. The plan is expected to be updated in 2022.
https://www.phila.gov/media/20170517145926/Hazard-Mitigation-Plan-2017-FINAL.pdf

Erie County 2018 Hazard Mitigation Plan
The Erie County 2018 Hazard Mitigation Plan includes coastal erosion, harmful algal blooms (HABs), high lake levels, and seiche waves as "Lake Hazards." The "Flood Hazards" include river floods, coastal floods, storm surges, and stormwater backups. It is noteworthy that "Invasive Species" are listed as a specific hazard and are considered a "moderate" risk in the plan. A discussion of the potential risks associated with climate change can be found in the

Community Profile section. The plan is expected to be updated in 2023. https://eriecountypa.gov/wp-content/uploads/2019/06/2018-Erie-HMP-Corrected-Submission-Reduced.pdf

Pennsylvania Climate Action Plan 2018, Strategies and Actions to Reduce and Adapt to Climate Change

The Pennsylvania Climate Change Act (Act 70 of 2008) requires DEP to prepare and update the Climate Change Action Plan every three years. Pennsylvania's original Climate Change Action Plan was completed in December 2009. The act also requires DEP to administer a Climate Change Advisory Committee that provides input and feedback during the preparation of the plan. This current plan builds on prior efforts to inventory greenhouse gas emissions and develop efficient strategies to reduce them. Prior versions of this plan focused more on greenhouse gas emissions and cost-effective strategies for reducing or offsetting them. The 2018 version of the plan more comprehensively addresses impacts and adaption measures than prior versions and briefly discusses potential impacts to forests, wetlands, and coastal systems. A 2021 update of the plan is anticipated and will help guide CRMP's efforts to mitigate and adapt to climate related coastal hazards during this Section 309 strategy period.
https://www.dep.pa.gov/Citizens/climate/Pages/PA-Climate-Action-Plan.aspx

2020 Pennsylvania Climate Change Impacts Assessment Update

DEP released this document on April 20, 2020. The document was produced for DEP by the Pennsylvania State University Environmental and Natural Resources Institute. The assessment focuses on the effects of climate change on livestock, water quality, and infrastructure. Using federal and state data, the report indicates that precipitation in general and the frequency of extreme precipitation events have increased over the last century and are expected to continue to increase. The management of extreme precipitation events may require different approaches than simply planning for increased annual precipitation. These events cause increased flooding that threatens infrastructure and impacts water quality. This document will inform the 2021 update of the Pennsylvania Climate Change Action Plan and serve as a guide for adapting CRMP policies.
http://files.dep.state.pa.us/Energy/Office%20of%20Energy%20and%20Technology/OETDPortalFiles/ClimateChange/2020ClimateChangeImpactsAssessmentUpdate.pdf

Pennsylvania DCNR Climate Change Adaptation and Mitigation Plan, June 2018

Pennsylvania DCNR has taken the lead role in determining Pennsylvania's ecological and natural resource related climate change vulnerabilities and identifying strategies to address them. In addition to the 2.2 million acres of state forests and 121 state parks, DCNR serves as a leader and advisor for citizens and private property owners across the Commonwealth. This plan recognizes potential climate impacts such as higher temperatures, more extreme weather events, continued range shifts for wildlife and plant species, changing timing of natural cycles, and an increase in invasive species. The plan also recognizes the mitigation potential of natural resources such as forests and wetlands and examines climate related changes to recreational resources. The plan identifies specific climate vulnerabilities and specific adaptation actions. CRMP will utilize this plan as a resource for guiding CRMP priorities and making potential changes to the 11 policy areas in the approved program plan.

http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033655.pdf

FEMA Countywide Flood Insurance Studies

These studies are used to inform and update the Flood Insurance Rate Maps (FIRMs). Maps and flood studies are available for viewing or download at the FEMA Flood Map Service Center: https://msc.fema.gov. The map services are routinely improving their functionality and available information. The studies and many of the associated FIRMs in each of Pennsylvania's four coastal counties have been updated since writing the previous Section 309 assessment (see Table 2.3).

Table 2.3: Effective dates of Countywide Flood Insurance Study Updates in Pennsylvania Coastal Counties

Countywide Flood Insurance Study Update	Date Effective	
Bucks County	March 21, 2017	Changes to numerous FIRMs became effective at time of update.
Delaware County	November 3, 2017	
Philadelphia	November 18, 2015	
Erie County	June 7, 2017	

DVRPC – Pennsylvania Coastal Resiliency Project

The Pennsylvania Coastal Resiliency Project is a direct result of CRMP's 2016 – 2020 Section 309 strategy Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency. CRMP partnered with DVRPC to help build capacity at the municipal level in the DECZ and assist them in planning for and responding to increased flooding events. In 2017 DVRPC surveyed DECZ municipalities in Bucks and Delaware Counties to learn about historic flooding problems and concerns, and to inquire about climate change planning at the local level. The survey was followed by face-to-face meetings with interested municipalities to further the discussion. The survey and meetings are the foundation for the coastal information that is provided on the Pennsylvania Coastal Resiliency Project webpage at https://www.dvrpc.org/Resiliency/Coastal/. A major component of the project has been the development of the Coastal Effects of Climate Change in Southeastern PA storymap tool. Current tabs on the map include flooding scenarios, chronic inundation, infrastructure risk, property value risk, and the Community Rating System. The storymap has served as a critical DVRPC outreach tool for climate adaptation capacity building. CRMP and DVRPC would like to continue the momentum generated by the project, storymap, and outreach through engaging in future partnerships.

DVRPC White Paper: An Assessment of Planning Tools for Climate Change Resiliency in the Delaware Valley.

This document was produced in May 2020 for DVRPC partners that are located in a 9-county region in two states: Bucks, Chester, Delaware, Montgomery, and Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer in New Jersey. The goal of the white paper is to organize the overwhelming number of tools available in planning for the impacts of climate change so that municipalities can better focus on the most relevant tools for their specific needs. Tools evaluated included: web resources, academic articles, government publications, and private-sector reports.
https://www.dvrpc.org/Reports/19030.pdf

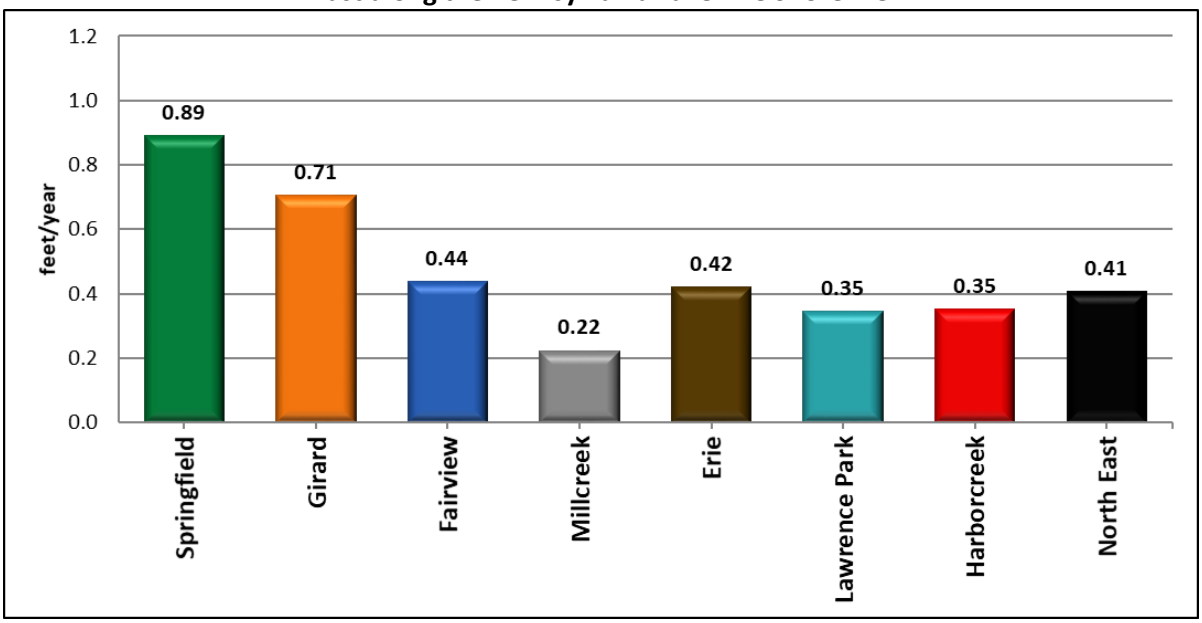
The Lake Erie Bluff Coast of Pennsylvania: A State of Knowledge Report on Coastal Change Patterns, Processes, and Management

Funded in part by a Growing Greener grant provided by DEP, this report was produced by Penn State Erie – The Behrend College. The report is a comprehensive summary that includes a thorough literature review that addresses bluff behavior and change mechanisms, the forces that cause bluff instability and change, and a synopsis of methods and practices related to bluff monitoring, analysis, prediction, and hazard management. The report includes methods that other states, including other Great Lakes states, can use to determine setback distances. https://pawalter.psu.edu/sites/default/files/resources/SOK%20Complete%20Report%20Final%20%282018%29.pdf

Pennsylvania Coastal Resources Management Control Point Monitoring

CRMP currently maintains 134 control points along the Lake Erie bluff shoreline to measure and calculate bluff recession. Measurements from these fixed monuments to the bluff crest at specific bearings are taken approximately every four years. The data shown in Figure 2.1 is based on 131 control point locations most recently measured in 2018 and 2019. The data represents approximately 40 years of monitoring. Note the substantially higher erosion rates in the western municipalities. CRMP is in the preliminary stages of working towards the development of a public-facing, interactive storymap to portray bluff recession. https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Lake-Erie-Bluff-Recession-Control-Point-Monitoring/Pages/default.aspx

Figure 2.1: Graphical Representation of Bluff Recession Rates by Municipality Moving from West to East along the Pennsylvania Lake Erie Shoreline



Erie County Average = 0.51 feet per year

ii. Management Characterization:

1. *In the tables below, 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.*

Table 2.4: Significant Changes in Hazards Statutes, Regulations, Policies, or Case Law

Topic Addressed	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)
Elimination of development/redevelopment in high-hazard areas	Y	Y	N
Management of development/redevelopment in other hazard areas	Y	Y	N
Climate change impacts, including sea level rise or Great Lakes level change	Y	Y	N

CRMP did not identify any significant changes in hazards statutes, regulations, policies, or case law.

Table 2.5: Significant Changes in Hazards Planning Programs or Initiatives

Topic Addressed	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)
Hazard mitigation	Y	Y	Y
Climate change impacts, including sea level rise or Great Lakes level change	Y	Y	Y

These changes are identified under question number three below (D.2.a.ii).

Table 2.6: Significant Changes in Hazards Mapping or Modeling Programs or Initiatives

Topic Addressed	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)
Sea level rise or Great Lakes level change	Y	Y	Y
Other hazards (Bluff Recession)	Y	Y	Y

These changes are identified under question number three below (D.2.a.ii).

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

Bluff Recession Hazard Areas

In the LECZ Bluff Recession Hazard Areas are considered "high-hazard areas." The regulatory definition of Bluff Recession Hazard Area is given at 25 Pa. Code Chapter 85, Bluff Recession and Setback Act (Act 48 of 1980), and Act 72 of 2011, which amended the definition. Bluff Recession Hazard Area is defined as "[a]n area or zone where the rate of progressive bluff recession creates a substantial threat to the safety or stability of nearby existing or future structures or utility facilities. The

term shall not include any area where the horizontal distance, measured perpendicular to the shoreline, between the shoreline and the bluff toe is in excess of 250 feet and such area shall not be subject to any Environmental Quality Board regulations or municipal setback ordinance or regulation established under this act." CRMP is responsible for studies that support Bluff Recession Hazard Area designations and supports local implementation of the Bluff Recession Setback Act (BRSA).

Special Flood Hazard Areas
Special Flood Hazard Areas are defined by FEMA and generally include the land area covered by the floodwaters of a base flood. This is the area where the National Flood Insurance Program's (NFIP's) floodplain management regulations are enforced and where mandatory flood insurance may apply. The base flood is the 100-year flood event (1% annual chance). This is also sometimes referred to as the 100-year floodplain.

Floodplain or Flood Hazard Area
Pursuant to the Pennsylvania Floodplain Management Act (32P.S. §§ 679.101-679.601), Floodplain or Flood Hazard Area is defined as "The 100-year floodway and that maximum area of land that is likely to be flooded by a 100-year flood as shown on the floodplain maps approved or promulgated by FEMA."

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.*

<u>Hazard Planning Programs or Initiatives</u>

PEMA implementation of NFIP
Beginning on October 1, 2018, PEMA became responsible for implementation of the FEMA NFIP within Pennsylvania. PEMA also assumed responsibility for administering floodplain management technical assistance needs in Pennsylvania. Previously these responsibilities were carried out by the Pennsylvania Department of Community and Economic Development (DCED).

As part of the 2016 - 2020 Section 309 strategy CRMP included working more closely with PEMA and the potential of adding PEMA as an official member of the CZAC. DCED has been a member of CZAC since the committee was formed in 1980. PEMA has been attending recent CZAC meetings but is not yet officially on the committee. CRMP has been coordinating more closely with PEMA and has participated in hazard mitigation, risk reduction, and NFIP strategy planning. CRMP expects this closer coordination to continue to grow. The implementation of the NFIP by PEMA is a logical change and the timing with CRMP's expanding coastal hazards priorities and closer coordination with PEMA should positively impact CRMP's ability to better address hazard adaptation and resiliency planning moving forward. This increased coordination with PEMA will allow CRMP to provide more focus on the climate change related hazards of flooding, sea level rise, and Great Lakes level changes.

Pennsylvania Coastal Resiliency Project
This project is described above in the Resource Characterization portion of this section (D2.a.i) and is a direct result of the 2016 – 2020 Section 309 strategy. Municipalities have a better understanding of potential climate change impacts and have begun to consider and discuss potential changes at the local level through the use of interactive sea level rise and storm surge mapping, which is based on regional data and includes current and future scenarios. Supporting more formal and substantial changes is a part of the proposed 2021 – 2025 Section 309 strategy.

Commonwealth of Pennsylvania 2018 State Hazard Mitigation Plan
Described in resource characterization, section D.2.a.i. CRMP participated with PEMA in the development of the 2018 State Hazard Mitigation Plan and anticipates continued coordination with PEMA planning activities. This includes participation in development of the 2023 State Hazard Mitigation Plan.

County Hazard Mitigation Plans
Described in resource characterization, section D.2.a.i. CRMP played an active role in the development of the 2018 Erie County Hazard Mitigation Plan and provided data and other information relative to coastal erosion and bluff recession. CRMP did not play an active role in Bucks, Delaware, and Philadelphia counties but anticipates a more active role during the next assessment period.

Pennsylvania Climate Action Plan 2018, Strategies and Actions to Reduce and Adapt to Climate Change
Described in resource characterization, section D.2.a.i. This DEP generated report focuses on greenhouse gas reductions as impacts and adaptation. CRMP contributed to the coastal ecosystems section of the report. CRMP will use this report, and future iterations of the report, as an important tool in developing policy and priority actions.

2020 Pennsylvania Climate Change Impacts Assessment Update
Described in resource characterization, section D.2.a.i. The report took a comprehensive look at specific climate risks and how public and private decision makers can prepare for them. The report states that rainfall and runoff events are the primary drivers of nonpoint pollution processes in agriculture and urban stormwater and how extreme weather events cause flooding. This DEP generated report, prepared by topic experts from Penn State University, relates directly to CRMP's policies and priorities moving forward.

Pennsylvania DCNR Climate Change Adaptation and Mitigation Plan, June 2018
Described in resource characterization, section D.2.a.i. DCNR is a member of the CZAC and CRMP coordinates with DCNR regularly on various projects and activities. This document will inform CRMP policies regarding climate change and natural resources, including wetlands and ocean resources policy areas.

<u>Hazards Mapping or Modeling Programs or Initiatives</u>

Coastal Effects of Climate Change in Southeastern PA Storymap
This mapping effort is part of the Pennsylvania Coastal Resiliency Project described above and was produced as part of our 2016 – 2020 Section 309 strategy. The

storymap includes an interactive sea level rise and storm surge viewer that is based on regional data and modeling. The map includes current conditions under various storm surge conditions and future projections using varying climate change scenarios. The map can demonstrate potential impacts to critical municipal facilities and potential impacts to property values. The map served as a key component of outreach and engagement with local municipalities.
https://dvrpcgis.maps.arcgis.com/apps/MapSeries/index.html?appid=8080c91a101d460a9a0246b90d4b4610

Pennsylvania Great Lakes Services Integration Project
This comprehensive effort related to bluff recession along Pennsylvania's Lake Erie coast is being led by The Pennsylvania State University and Pennsylvania Sea Grant (PASG). The project was largely funded by a Growing Greener grant from DEP. CRMP and DEP's Office of the Great Lakes have provided data and resources and contributed technical reviews during the project. Originally scheduled to be completed by 2018, the project has been extended and is on-going. An introductory component of the project, completed in 2018, is a report titled The Lake Erie Bluff Coast of Pennsylvania: A State of Knowledge Report on Coastal Change Patterns, Processes, and Management (described above). Other deliverables of this project still to be completed include:

- New bluff change mapping using 2012 and 2015 lidar as well as map data from the USACE that had incorporated rectified 1938 aerial photography (to achieve a longer-term average recession rate).
- Development of a Bluff Erosion Potential Index to assist planners and property owners. The index will consider recession rates, slopes, geology, and groundwater to map erosion hazards.
- A Pennsylvania Bluff Management Guide that will complement the existing Vegetative Best Management Practices Guide {a manual for Pennsylvania/Lake Erie bluff landowners} that was originally printed in 2007 and updated in 2017.
- Presenting the data and reports on WALTeR, a website for access to geospatial and environmental information for the Pennsylvania Lake Erie coast, discussed in more detail in the Cumulative and Secondary Impacts section (D.5).

Once completed, the Pennsylvania Great Lakes Services Integration Project will serve as a key resource for CRMP coastal erosion and bluff erosion management decisions related to monitoring, hazard assessment, mitigation, and adaptation.
http://seagrant.psu.edu/sites/default/files/The%20Changing%20Erie%20County%20Bluff%20Coast%20presentation%20by%20Dr.%20Anthony%20Foyle.pdf

FEMA Countywide Flood Insurance Study Updates
FEMA Countywide Flood Insurance Study Updates were conducted for each of Pennsylvania's 4 coastal counties during this assessment period. The most significant change was the addition of VE Zones along the Lake Erie coast. VE Zones include hazards associated with storm-induced velocity wave action.

iii. 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.*

   CRMP recognizes the national significance that NOAA has placed on coastal hazards and has developed a coastal hazards performance metric to be used in CRMP's next Section 312 program evaluation. Coastal hazards, specifically Building Capacity for Climate Adaptation Planning and Resiliency, was selected as a strategy in our 2016 - 2020 Assessment and Strategy. CRMP outreach and coordination during this assessment period have indicated that climate change will impact multiple hazards and has become a priority issue for most of our local and networked agency partners. CRMP would like to build upon the established networks and continue the momentum generated during the current strategy period and keep coastal hazards as a high priority.

   During the stakeholder engagement process CRMP had determined coastal hazards to be a high priority. CRMP then followed up with stakeholders to outline the biggest challenges to coastal resiliency and how CRMP could better address coastal hazards. With high lake levels in the LECZ causing increased damage to personal property and publicly owned access sites, bluff and shoreline erosion were outlined as a high priority by four of seven Lake Erie stakeholders. The three stakeholders who did not specifically mention bluff and shoreline erosion focused on increased stormwater impacts associated with climate change. In the DECZ all six stakeholders mentioned planning for sea level rise and on-going threats from increased flooding to be the biggest challenges. Eleven (11) of out 17 stakeholders from both coastal zones consistently suggested that increased outreach and technical assistance regarding coastal hazards should be offered to local municipalities and considered a program priority.

b. Phase II (In-Depth) Assessment:

i. 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.

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

See tables below.

Table 2.7: Three Most Significant Coastal Hazards in the DECZ

	Type of Hazard	Geographic Scope (throughout coastal zone or specific areas most threatened)
Hazard 1	Flooding	Throughout coastal zone. Exacerbated by increased heavy precipitation events which are trending upward and forecast to continue trending upward with climate change. Riverine/stream, coastal, and urban flooding.
Hazard 2	Coastal storms	Throughout coastal zone.
Hazard 3	Salinity intrusion	Threatens water intakes in Philadelphia. Managed partially by a reservoir strategy associated with the Delaware River Basin Compact and Delaware River Basin Commission.

Table 2.8: Three Most Significant Coastal Hazards in the LECZ

	Type of Hazard	Geographic Scope (throughout coastal zone or specific areas most threatened)
Hazard 1	Coastal storms/flooding	Throughout coastal zone, both coastal and inland flooding caused by storm events. Exacerbated by recent high lake levels.
Hazard 2	Shoreline and bluff erosion	Lake shoreline and adjacent bluff. Exacerbated by recent high lake levels and storm events.
Hazard 3	Invasive species*	Open waters of Lake Erie and watershed. Considered a moderate risk in 2018 Erie County Hazard Mitigation Plan.

* Not a coastal hazard listed by CZMA but listed in Erie County Hazard Mitigation Plan and the 2018 State Hazard Mitigation Plan.

2. *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.*

DECZ

The Bucks County 2016 Hazard Mitigation Plan Update ranks both flooding and coastal storms as high hazards. The Delaware County 2016 Hazard Mitigation Plan ranks flooding as a high hazard and coastal storms as a moderate hazard. The City of Philadelphia All Hazard Mitigation Plan uses a numerical ranking system based on probability, impact, spatial extent, warning time, and duration to generate an overall risk numerical value. Flooding has an overall risk of 3.6, which is the highest overall risk score of the hazards analyzed. Tropical storms and hurricanes have an overall risk score of 2.8, which results in a moderate hazard category. The City of Philadelphia All Hazard Mitigation Plan discusses climate change and sea level rise in the context of flooding; however, it does not address the potential for long-term impacts of saltwater intrusion, as that appears to be beyond the scope of the 5-year Mitigation Plan.

The Philadelphia Water Department (PWD), which serves 1.7 million drinking water customers, conducts short and long-term planning efforts that consider climate change and saltwater intrusion. The PWD conducts salinity modeling that can project potential future scenarios. The Delaware River Basin Commission (DRBC), a federal-interstate agency of which Pennsylvania is a member, and an interagency modeling group led by the United States Geologic Survey also conduct salinity modeling. This modeling helps to inform policy decisions regarding a Flexible Flow Management Program involving watershed reservoirs. It is the climate change

related combination of increased frequency of drought with sea level rise that most threatens water intakes in the Philadelphia area. PWD, DRBC and other engaged stakeholders will continue to do extensive work in modeling and forecasting to help mitigate this threat. More advanced modeling with increased data and a deeper understanding of the process will continue to be an on-going goal to address mitigation.

LECZ

The Erie County 2018 Hazard Mitigation Plan considers both flooding and coastal erosion to be moderate hazards. Recent high lake levels (record and near-record levels set in 2019 and 2020) have exacerbated threats caused by the wave action of coastal storms resulting in increased coastal erosion and associated damage such as bluff recession. As a result, public concern regarding coastal erosion hazards has elevated. The Erie County 2018 Hazard Mitigation Plan also considers invasive species to be a moderate risk. The prior Erie County Hazard Mitigation Plan considered invasive species to be a low risk.

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.*

   Harmful Algal Blooms (HABs) are an emerging issue of concern in the DECZ. See more information in the table below.

Table 2.9: Emerging Issue of HABs Concern in the DECZ

Emerging Issue	Information Needed
HABs are an on-going concern for the LECZ. With trending increases in temperature and frequency of heavy precipitation events, will the potential for HABs in the DECZ increase?	HABs have not historically been a significant problem in the Delaware Estuary. However, recent sampling events in the watershed have determined the presence at various locations. Sampling in the estuary to determine presence/absence, prevalence, and to establish a baseline may be appropriate.

ii. 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.*

   See tables below.

Table 2.10: Significant Changes in Coastal Hazards Statutes, Regulations, and Policies

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)
Shorefront setbacks/no build areas	Y	Y	N
Rolling easements	N	N	N

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)
Repair/rebuilding restrictions	Y	Y	N
Hard shoreline protection structure restrictions	N*	N	N
Promotion of alternative shoreline stabilization methodologies (i.e., living shorelines/green infrastructure)	Y	Y	N
Repair/replacement of shore protection structure restrictions	N*	N	N
Inlet management	N	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	N	N
Repetitive flood loss policies (e.g., relocation, buyouts)	N	N	N
Freeboard requirements	N	N	N
Real estate sales disclosure requirements	N	N	N
Restrictions on publicly funded infrastructure	N	N	N
Infrastructure protection (e.g., considering hazards in siting and design)	Y	Y	N

* Construction and repair of shore protection structures are reviewed through normal water obstruction and encroachment permitting processes.

CRMP did not identify any significant changes in Coastal Hazard statutes, regulations, or policies.

Table 2.11: Significant Changes to Coastal Hazard Management Planning Programs or Initiatives

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)
Hazard mitigation plans	Y	Y	Y
Sea level rise/Great Lake level change or climate change adaptation plans	Y	Y	Y
Statewide requirement for local post-disaster recovery planning	Y	N	N
Sediment management plans	Y	Y	N
Beach nourishment plans	Y	N	N
Special Area Management Plans (that address hazards issues)	Y	Y	N
Managed retreat plans	N	N	N

Hazard planning programs and initiatives often provide both resource characterization information on the level of risk and vulnerability as well as management and planning information. The State Hazard Mitigation Plan and County Hazard Mitigation Plans described in the resource characterization section (D.2.a.i) include coastal specific hazard planning initiatives related to coastal hazard mitigation and to some degree climate change. The City of Philadelphia Hazard Mitigation Plan specifically addresses sea level rise. Other relevant initiatives include the 2018 Pennsylvania Climate Action Plan, the 2020 Pennsylvania Climate Change

Impacts Assessment Update, the 2018 DCNR Climate Change Adaptation and Mitigation Plan, and the DVRPC Pennsylvania Coastal Resiliency Project. Each of these initiatives are discussed in section D.2.a.i.

Table 2.12: Significant Changes to Coastal Hazard Research, Mapping, and Education Programs or Initiatives

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)
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

The Pennsylvania Coastal Resiliency Project provides regional specific modeling and mapping information on sea level rise and storm surge, including future projections. The project also includes significant education and outreach materials primarily through the Coastal Effects of Climate Change in Southeastern PA story map (see section D.2.a.i). The Great Lakes Services Integration project, which is nearing completion, will provide lidar based Lake Erie bluff erosion rate data as well as a Bluff Erosion Potential Index modeling and mapping component (see section D.2.a.ii).

2. *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?*

   Quantifying the success of CRMP's education and outreach activities to coastal municipalities and local officials and partners is difficult. The NOAA performance measure system for coastal hazards, that CRMP reports annually, provides some indicators that provide feedback on effectiveness. CRMP would also consider the number of coastal municipalities participating in FEMA's CRS and the number of regional stormwater and/or floodplain management agreements as potential indicators. PEMA is seeking to increase, and track flood insurance participants, both inside and outside the special flood hazard areas and both NFIP and private policies.

iii. 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. (Approximately 1-3 sentences per management priority.)*

   Management Priority 1: Resiliency and adaptation planning that considers a changing climate.

   Description: Resiliency and adaptation considerations touch on multiple CRMP program priorities and the work of each of our networked agencies and local partners. This management priority was also identified as priority 1 in our previous

assessment and CRMP has taken steps to build internal and local capacity to address this priority. State agencies, local governments, and other CRMP partners have worked to address this priority and more information, tools, interest, and networking is available since our previous assessment. It is important to keep this momentum going in both coastal zones.

Management Priority 2: Bluff recession and shoreline erosion of the Lake Erie shoreline.

Description: Higher lake levels occurring during this assessment period have increased the threat associated with these hazards. Public interest and concern have increased as a result of the increased risk. Lake levels have changed from extreme lows to extreme highs and this may be a trend that continues as a result of climate change. Planning for extremes of both low and high lake levels may be appropriate. In addition, an increased frequency of heavy precipitation events, an impact of climate change, is expected to continue to trend higher. This will lead to increased bluff erosion impacts from both point and nonpoint sources of stormwater. Increased groundwater volumes, unable to infiltrate clay layers along the coast, may also cause increased erosion. Seasonally, winter and spring are forecast to receive increased precipitation, which may exacerbate groundwater causes of bluff erosion due to a lack of evapotranspiration. Insufficient littoral material entering Pennsylvania from the west continues to cause significant erosion and recession on the western portion of the coastal zone. A better understanding of littoral drift dynamics specific to Pennsylvania's coast, including those associated with Conneaut Harbor breakwaters, would be beneficial in helping to mitigate shoreline erosion. A sediment bypass process at these breakwaters would provide resiliency to Pennsylvania's coast.

Management Priority 3: Managing increased stormwater associated with increased frequencies of high precipitation events.

Description: Runoff from extreme heavy precipitation events causes increased flooding and erosion. The runoff from the increased trend of heavy precipitation events also impacts water resources of all types in both coastal zones - wetlands, streams, rivers (including the Delaware Estuary), and lakes (including Lake Erie). In Pennsylvania the frequency of extreme heavy precipitation events is expected to continue to increase with climate change.

2. *Identify and briefly explain priority needs and information gaps the CMP has for addressing the management priorities identified above. The needs and gaps identified here should not 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.*

CRMP has priority needs and information gaps as outlined in the table below.

Table 2.13: Priority Needs and Information Gaps for Addressing Coastal Hazard Management Priorities

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	DECZ: Better understanding of what increased temperatures and runoff will mean to water quality in the estuary. This includes impacts to dissolved oxygen levels and the potential for new threats such as HABs. LECZ: Better understanding of local littoral drift, especially as it pertains to Conneaut Harbor breakwaters and the potential for mitigative measures.
Mapping/GIS/modeling	Y	DECZ: Mapping/modeling that would specifically address opportunities for landward migration of tidal wetlands that would be consistent with local land uses DECZ: Modeling that combines impacts of riverine flooding and stormwater surge. LECZ: Mapping of stormwater outfalls directly impacting bluff erosion and those coastal neighborhoods with public water service but no public sewer.
Data and information management	Y	LECZ: Data synthesis regarding number and locations of stormwater outfalls directly impacting bluff erosion. Data synthesis of coastal structures supplied with public water but not public sewer.
Training/Capacity building	Y	DECZ And LECZ: Land use is decided at the local level in Pennsylvania. Training related to coastal hazards and climate change for zoning, elected and planning officials, and waterfront property owners.
Decision-support tools	Y	LECZ: Improved technical guidance for design and location of shoreline protection structures.
Communication and outreach	Y	DECZ And LECZ: Communication and outreach with municipal officials and waterfront property owners regarding current and projected coastal hazards.

iv. 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.*

CRMP will develop two strategies associated with coastal hazards, in which one strategy seeks to continue the work started in the 2016 – 2020 Section 309 strategy with regards to building capacity associated with climate resiliency planning. Significant progress has been made at all levels of government when it comes to understanding potential impacts associated with climate change and what mitigation measures may be appropriate. Providing tools for integrating these measures into specific planning processes and facilitating on the ground implementation will help to continue the progress that has been made and build upon those existing accomplishments.

In the LECZ CRMP will develop a strategy to better understand the impacts of erosion from point and nonpoint stormwater runoff and make program changes to better manage these impacts. This cause of bluff erosion has been observed but has never been well quantified in Pennsylvania. The strategy will examine both surface

water and groundwater discharges. With the increased frequency of heavy precipitation events and the cumulative impacts of development this cause of erosion is expected to continue to increase. A better understanding of the impacts will lead to development of appropriate program changes.

In the DECZ CRMP will develop a strategy that builds upon the 2016 – 2020 community resiliency strategy. Community resiliency is integrated across many aspects of local planning including: infrastructure, economics, natural resources, cultural resources, public access, threats to personal and public property, infrastructure, and threats to health and safety. CRMP's strategy will support local community efforts to integrate community resiliency into comprehensive planning and that helps facilitate the implementation of local projects. Encouraging regional, or multi-municipal collaboration is a key part of the strategy.

3. Public Access

Section 309 Enhancement Objective: *Attain increased opportunities for public access, taking into account current and future public access needs, to coastal areas of recreational, historical, aesthetic, ecological, or cultural value. §309(a)(3)*

a. Phase I (High-Level) Assessment:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. Resource Characterization:

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

Table 3.1: Public Access Status and Trends in the DECZ

Type of Access	Current number	Changes or Trends Since Last Assessment (↑, ↓, No change or Unknown)	Cite data source
Beach access sites	0	No change	CRMP GIS DB
Shoreline (other than beach) access sites	64 sites	↑ 9 new sites that provide shoreline access to a tidal DECZ waterway: - 3 new access areas along the tidal Schuylkill River (South to Christian Street section of the Banks trail, Bartram's Mile North section, and Bartram's Plaza to the South) - 3 new access areas along the Central Delaware River (Pier 68 Park, Cherry Street Pier, and West side Sugarhouse Casino Trail) - 2 new riverfront trails in Philadelphia on the North Delaware (K&T Trail and the Baxter Trail) - 1 in Bucks County, Waterside Park along the Delaware, which continues to be developed	CRMP GIS DB
Recreational boat (power or nonmotorized) access sites	14 free public sites (9 ramps & 6 canoe/ kayak access) 14 fee charged public access sites (8 fee charged marinas, 6 ramps) 26 club/private access sites (22 marinas & 4 ramps)	↓ Loss of 1 free public ramp (Chester City ramp) due to deteriorating condition Loss of 1 fee charged ramp due to closing of Center City Duck Boat ramp	CRMP GIS DB

Number of designated scenic vistas or overlook points	0	No change	-
Number of fishing access points (i.e. piers, jetties)	37+	↑ 1 new fishing access point at Pier 68 on the Central Delaware	CRMP GIS DB
Coastal trails/ boardwalks	71 total miles 9 trail systems* 49 trail segments *internal park trails counted as 1 type of trail system	↑ 6.4 miles of new trails, including: - 1.2 miles (3 segments) Schuylkill River Trail - 4.2 miles (6 segments) Delaware River Trail/ECG in Philadelphia - 0.6 miles (1 segment) ECG in Delaware County - 0.4 miles (1 trail) waterfront trail in Bucks County	CRMP GIS DB
Number of acres parkland/open space	6,394 acres & 126 sites	↑ 14 acres associated with 6 new public access sites: - Pier 68 and Cherry Street Pier Parks in Philadelphia along the Delaware River - Bartram's Plaza and South to Christian along the Schuylkill River Trail in Philadelphia - Navy Yard Central Green - Cedar Ave Park in Bucks County Loss of 1 baseball field in Delaware County converted to municipal building	CRMP GIS DB
Access sites that are Americans with Disabilities Act (ADA) compliant	Approx. 50% of trails	No change	CRMP GIS DB
Accessible tidal shoreline	27% (48 of 180 total tidal shoreline miles)	↑ 2.2 miles of newly accessible tidal shoreline due to construction of new trails and parks	CRMP GIS DB

* Note that current numbers may have increased from last assessment due to database updates that captured previously missed accessible features.
CRMP GIS DB = CRMP internally maintained Geographic Information System database

Table 3.2: Public Access Status and Trends in the LECZ

Type of Access	Current number	Changes or Trends Since Last Assessment (↑, ↓, No change or Unknown)	Cite data source
Beach access sites	10 public swimming beaches	No change	CRMP GIS DB
Shoreline (other than beach) access sites	40	No change	CRMP GIS DB

Recreational boat (power or nonmotorized) access sites	9 public canoe/kayak launches 20 public powerboat sites 17 private powerboat sites	No change	CRMP GIS DB
Number of designated scenic vistas or overlook points	0	No change	-
Number of fishing access points (i.e. piers, jetties)	46	↑ 2 new fishing points: - PFBC acquisition of property on Twelvemile Creek (CRMP funded) - Lake access at new Lake Erie Community Park West Trail	CRMP GIS DB
Coastal trails/ boardwalks	36.6 total miles 8 trail systems* *internal park trails counted as 1 type of trail system	↑ 0.7 miles of new trails, including: - Lakeside Trail in Lawrence Park Township - Bayfront public access - Linear Park Walkway - Lake Erie Community Park West Trail	CRMP GIS DB
Number of acres parkland/open space	6,160 acres & 63 sites	↑ 41 acres of 2 new public access sites: - Fishing easements on Fourmile and Twelvemile Creeks	CRMP GIS DB
Access sites that are Americans with Disabilities Act (ADA) compliant	Unknown	Unknown	CRMP GIS DB
Accessible tidal shoreline	48% including Presque Isle (37 of 77 total miles) 26% not including Presque Isle (14 of 53 total miles)	No change	CRMP GIS DB

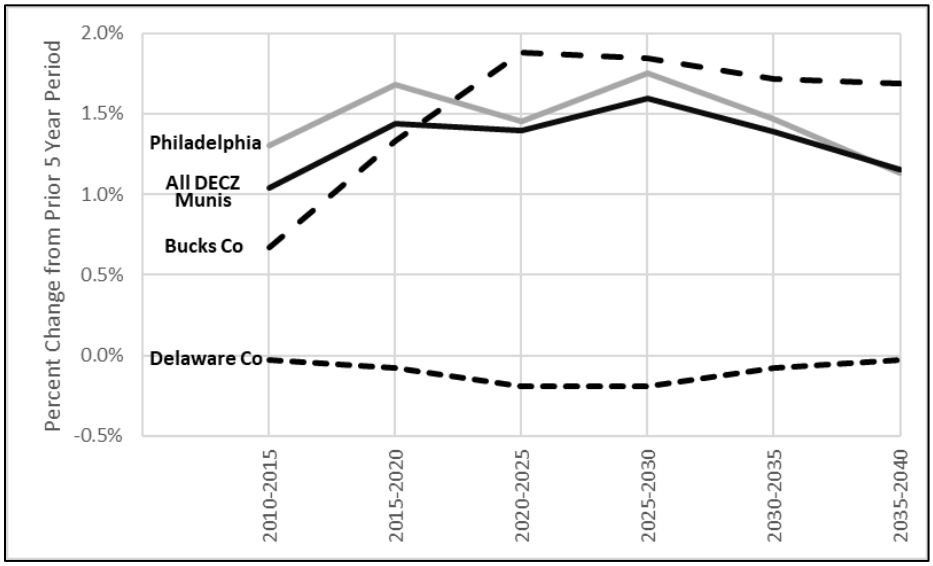
* Note that current numbers may have increased from last assessment due to database updates that captured previously missed accessible features.
CRMP GIS DB = CRMP internally maintained Geographic Information System database

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. There are several additional sources of statewide information that may help inform this response, such as the Statewide Comprehensive Outdoor Recreation Plan, the National Survey on Fishing, Hunting, and Wildlife Associated Recreation, and your state's tourism office.*

Population change in the coastal zones

According to US Census Bureau's Population Estimates Program, the population of Philadelphia County grew by 3.8% from 2010 to 2018, followed by Delaware County at 1.1% and Bucks County at 0.5%. These rates are all significantly lower than the nationwide population increase of 6% and are generally stable. DVRPC publishes demographic forecasts by municipality for 5-year increments based on 2010 Census data. This dataset was published in 2012 and amended in subsequent years to incorporate changing conditions. Municipalities in the DECZ were extracted and rolling 5-year growth rates are shown on the graph below by county. Updated data following the 2020 Census will be helpful in projecting more accurately into the future.

Figure 3.1: 5-year Growth Rates of Municipalities in the DECZ (2010-2040)



Looking further into the future, DVRPC's recently published long-range plan forecasts that the greater Philadelphia area will experience moderate population growth between 2015 and 2045. Over these 30 years, the population of Bucks County will experience the greatest population growth in the DECZ at 11.5%, followed by Philadelphia at 8.3% and Delaware at 4.1%. These estimates include population of the entire county. Meanwhile, in the northwest, Erie County lost an estimated 3% of its population from 2010-2018, according to the US Census Bureau's Population Estimates Program. Population has declined every year since 2012 which follows three decades of stagnant population growth. The City of Erie's new comprehensive plan, Erie Refocused, describes growth in the Erie region as "stalled and its population has increasingly decentralized."

Current utilization of public access

Pennsylvania DCNR polled the public in 2018 and 2019 to develop its new Statewide Comprehensive Outdoor Recreation Plan (SCORP), to be published in 2020. 1,0659,741 online surveys were completed by adult residents in 2019, aggregated by region. Information should be interpreted with care as the southeast region includes all of Bucks, Delaware and Philadelphia, in addition to Montgomery and Chester Counties. Similarly, the SCORP's northern region contains 16 counties, along with Erie County. Isolated county datasets were not made available for more detailed analysis.

Statewide, most residents indicated that they participated in hiking (72.0%) and walking or running (71.4%), while more than half said that they visited historic sites or nature centers (60.5%), did scenic driving (59.3%), camped (50.9%), or watched birds or wildlife (50.8%). When asked what new recreational activity respondents would like to try, most responded with kayaking or canoeing, rock climbing, motorized trail use, stand-up paddle boarding, bicycling, cross country skiing or snowshoeing, fishing, camping, ziplining, backpacking, hunting, and hiking. The single activity mentioned more frequently than any other activity was kayaking.

Regarding types of recreation, half of southeast regional respondents visited local park trails, pools, or other similar recreational areas, while only 16% visited state parks, forests, or game lands. This percentage is the lowest in the state, including northern region, where 50% of residents visit state parks, forests, or game lands. The survey results indicate that urban residents were more likely to visit a local park, trail, pool, or other recreational area, as compared to more rural residents.

Survey respondents in the southeast region, as opposed to the northern region, indicated that they can safely access a trail within 15 minutes of their homes. Additionally, respondents from the northern counties were the least likely to be able to access a trail within 15 minutes of their homes, as compared to the rest of the state.

In the last year, 20% of southeast residents, the largest percentage overall, did not visit any outdoor recreational areas. In the northern region, only 11% of respondents, one of the lowest percentages overall, did not visit any outdoor recreational areas. 10% of respondents in the southeast were more likely to cite safety concerns as a preventative factor to participating in outdoor recreation, compared to the statewide average of 6%. Other impediments related to public access development include: finding places that are not crowded (7%) and getting access to recreational areas (6%).

Future priorities for public access

According to SCORP surveys, most Pennsylvania residents list maintenance of existing access areas as their highest priority for funding in Pennsylvania. Noticeably farther down on the list ranks the creation of new trails and access sites. See a full list below, with new priorities for public access in **bold**:

- **Maintain existing park and recreation areas – 22.5%**
- Protect wildlife and fish habitat - 20.7%
- Restore damaged rivers and streams – 14.6%
- Provide environmental and conservation programs – 12.6%

- Acquire and protect open spaces (as undeveloped, conserved land) – 12.1%
- **Build walking paths and bicycle lanes or trails between places of work, parks, schools, and shopping areas – 7.5%**
- Provide recreation programs at parks and recreational areas – 5.6%
- **Build more greenways and trails – 2.4%**
- **Acquire additional land and water areas for developed recreation – 2.1%**

When looking at community facility investment, community or regional trail systems were identified as the highest priority. This continues the same public opinion trend from the previous 2014 SCORP survey. Community or regional parks replaced opportunities for or access to water-based recreation as the second-highest priority, although water-based recreation and outdoor environmental educational/nature facilities were closely ranked. Conversely action sports parks and opportunities for hunting and/or fishing saw decreases in overall investment priority between 2014 and 2019. In addition, 53.9% of survey respondents strongly agreed that they worry about how a changing climate is going to impact future outdoor experiences. Of these concerned respondents, most were in the younger (18-34) or older (65 and above) age bracket. Respondents age 35-65 were concerned the least on its impact on recreation.
https://www.dcnr.pa.gov/Recreation/PAOutdoorRecPlan/Pages/default.aspx

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.*

The Trust for Public Land's Analysis in Support of the Pennsylvania Outdoor Recreation Plan
This report identifies areas with the greatest need and opportunity for outdoor recreation in the state. The GIS-based analysis found areas that were outside of a 10-minute trip to accessible land, parks, trailheads, and water and assigned a level of need based on the demographic profile of the county. The study found that statewide, 53% of residents live within a 10-minute walk to recreational lands, 82% of residents live within a 10-minute drive to a trailhead, and 60% of residents live within a 10-minute drive to water. Erie ranks #1 as the county with the highest need for trail access, as 55% of its population is outside this drive. Most of this underserved population includes the coastal zone outside of a radius from Presque Isle and the western game lands and Erie Bluffs State Park. Philadelphia, similarly, lacks trailhead access in the "North Philly" area.

This study also examined equity in access to recreation. It found that lower income residents and people of color actually have greater access compared to their higher income, white counterparts, however this is due to a greater prevalence of the latter residents living in rural and suburban parts of the same county. However, this study only considers physical proximity of recreational areas and not the safety or condition of the facilities or the economic and social challenges of residents getting to them.
http://elibrary.dcnr.pa.gov/GetDocument?docId=3223603&DocName=PASCORP2020-2024Final

Pennsylvania DCNR Climate Change Adaptation and Mitigation Plan (June 2018)
This 2018 report is also mentioned in the Wetlands and Coastal Hazards sections (D.1. and D.2) of this assessment document. It is mentioned here because it describes the impacts of climate change on outdoor recreation. According to the

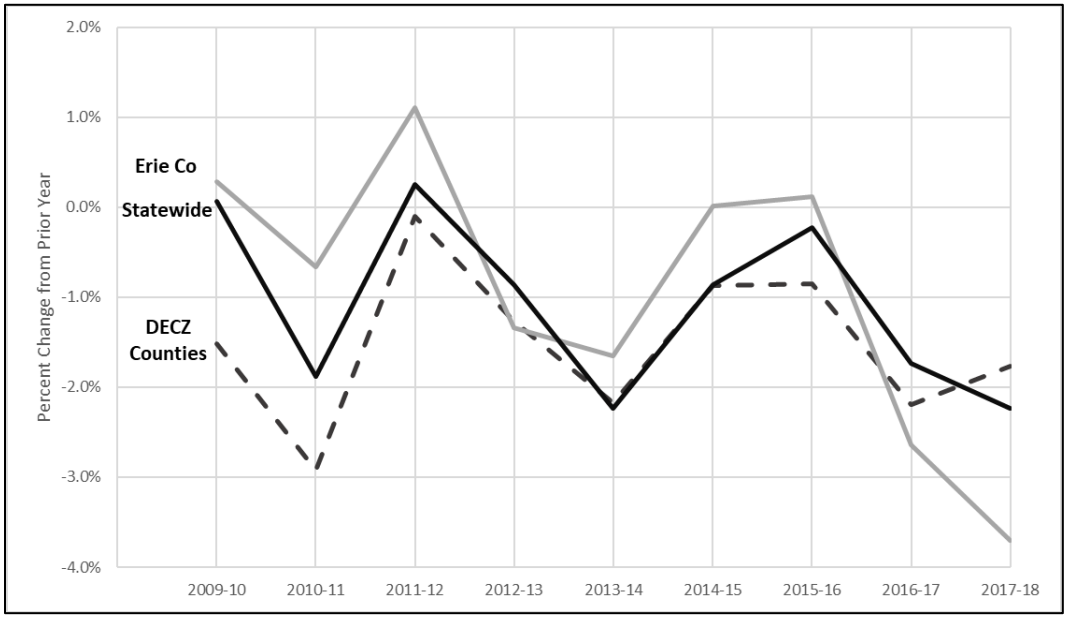
Plan, Pennsylvania can expect to see a longer outdoor recreation season and a subsequent increase in participation. There may be an increased demand for water-based recreation due to higher summer temperatures, along with negative adverse health effects such as heat or tick-related illnesses. More fishing opportunities are anticipated with this longer season, but fish populations could be reduced by lower summer stream flows and decreased water quality. While the warm outdoor season expands, cold weather winter recreation opportunities will be negatively impacted with a shorter season.
http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20033655.pdf

Boating trends

According to data published by the Pennsylvania Fish and Boat Commission (PFBC), Bucks County ranks second of Pennsylvania's 67 counties in average boat registrations over the last decade with 14,353 registrations, while Delaware and Philadelphia Counties occupy the 25th and 28th rank with 4,469 and 4,147 average annual registrations, respectively. Since 2009, the number of registrations has dropped from a high of 24,590 in the three DECZ counties to a low of 21,422 in 2018, reflecting a similar trend statewide of a gradual decline in the past 10 years. See the following graph showing change in boat registration rates from 2009-2018.

Erie County ranks #7 in boat registrations in Pennsylvania with 10,074 in 2018. Similar to the trend in the DECZ and statewide, Erie saw a high number of registrations in 2009 at 10,980, which dropped over 8% by 2018. The Port of Erie Strategic Plan cites increases in popularity of tourism, particularly in the fishing industry and increased onboard boat living/storage, where more people are keeping boats at a marina.

Figure 3.2: Changes in Annual Boat Registrations by Pennsylvania Coastal Counties

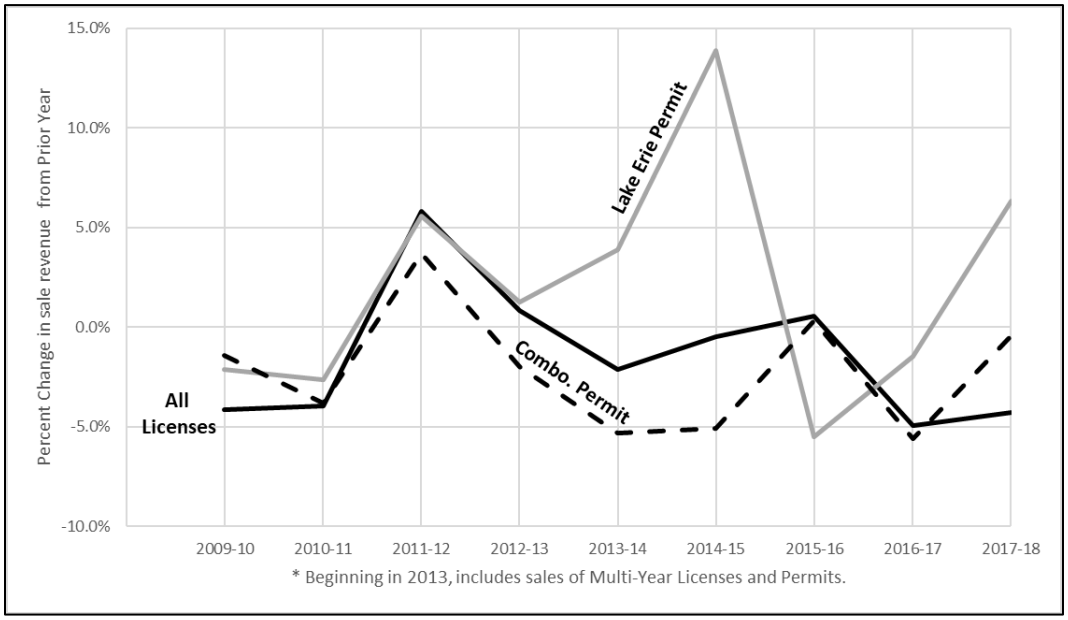


Fishing trends

The PFBC also tracks annual fishing license sales, but deciphering trends can be difficult as lifetime and multi-year licenses are sold. Figure 3.3 shows percent

change in license sales by year for fishing licenses, in addition to the Lake Erie Permit and the Combination Permit (Lake Erie permit and state-wide trout permit combined). All anglers fishing PA waters of Lake Erie and its tributaries must possess a Lake Erie or a Combination Permit. The noticeable jump in Lake Erie permit sales between 2014-2015, was due to new availability of a Senior Lifetime permit. A Performance Audit report of the PFBC (March 2019) reviewed fishing license data from 1922 to December 2018. The report found that resident sales continue to decline. From 2008-2018, resident license sales decreased 14%, indicating a waning participation rate. However, the report notes that nonresident license sales have seen increases over the same period, indicating increasing opportunities for tourism.
http://lbfc.legis.state.pa.us/Resources/Documents/Reports/640.pdf

Figure 3.3: Percent Changes in Fishing License Revenues Statewide Compared to Lake Erie Permits and Lake Erie/Trout Combination Permits



The Lake Erie Improvement Access Program, funded by the sale of the special Lake Erie fishing permit, continues to assist non-profit and government organizations in the acquisition and development of angler access in the watershed. From 2015 to September 30, 2019, there have been 16 easement/acquisition projects funded to total 350 acres and over 4.5 linear miles of new access. Additional funding was provided for an ADA accessible trail, parking, and fishing pier for anglers on Twentymile Creek. Note that these projects span the entire Lake Erie watershed, not just the coastal zone area.

Trends in the DECZ

Overall, there have been notable gains in public access in the southeast over the last five years. Considering the more developed nature of this coastal zone, what may appear to total small gains in accessible land acreage or trail mileage, are significant achievements. Between 2011-2016, DVRPC's open space inventory found a 14.9% (1,563 acres) gain in Philadelphia County and a 0.3% (27 acres) gain in Delaware County. Data comparisons in Bucks County are not valid as there were miscoding

errors in the database. This inventory includes open space that may or may not be publicly accessible.

In 2016-2017 Philadelphia City conducted resident surveys to measure the perception of the quality of Citywide services, including the City's parks and recreation. The majority (54%) of the 7,232 residents polled rated the quality of City parks as excellent or good, while 28% rated them as fair and 13% as poor. Regarding services that should be improved, only 3% of respondents included parks and recreation in the top 3 choices. The majority of residents listed streets, sanitation, and water, in addition to public safety and schools.

In 2017, The Schuylkill River Development Corporation conducted an economic impact analysis of the Schuylkill Banks trail development. A $414 million total capital investment in all projects completed by 2024, will generate an estimated economic benefit of $772 million to the Commonwealth during construction, and support 245 total employees annually, resulting in approximately $14 million in state tax revenues. Outside of direct economic impacts, construction of the Schuylkill Banks has spurred private and institutional development along the trail. As compared to the rest of the City, the area within a half-mile of the completed and in-progress sections of the Schuylkill Banks, from 2016 to 2021, is forecasted to see significant gains in median household income, population and housing units. Surrounding areas are seeing an infusion of private capital in multi-family housing, office space, in addition to education and medical centers.
https://www.schuylkillbanks.org/sites/default/files/attachments/Economic%20Impact%20of%20Schuylkill%20Banks%202017.pdf

Delaware County conducted public surveys in 2012 as part of its Open Space, Recreation, and Greenway planning effort. The majority of respondents were interested in passive health and fitness activities at parks, such as walking, hiking running and bicycling. Another notable trend was a strong interest in "enjoying nature" by over 80% of those surveyed. When asked what services should be provided in the next 10 years, respondents overwhelmingly listed passive recreation and open space, trails, and natural areas for environmental protection, versus active park facilities and park programs.

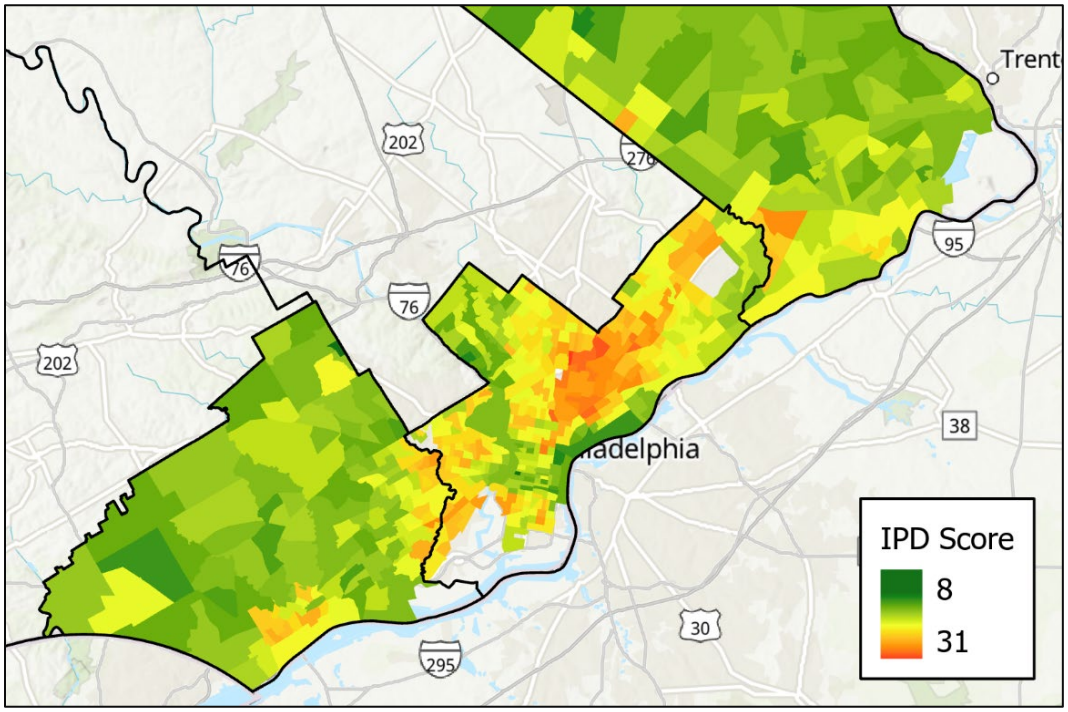
DVRPC's Equity Through Access: Greater Philadelphia's Coordinated Human Services Transportation Plan

This plan was adopted in 2016 and described in more detail in Table 3.3. To summarize, DVRPC is seeking to improve opportunities in the southeast by expanding access to essential services, including recreation/open space areas, for vulnerable populations. Most relevant to this assessment, the study calculated a vulnerability rank based on population characteristics and the number of open spaces, trails, and parks residents of a census block group could visit by a 45-minute transit trip. Within the DECZ block groups exclusively, the analysis found over 170,000 vulnerable people in Bucks County, 58,000 in Philadelphia County, and 40,000 in Delaware County. As compared to the rest of the southeast region of PA and New Jersey, the DECZ ranked average in accessible recreation.

In 2017, DVRPC developed the Indicators of Potential Disadvantage (IPD) analysis to identify protected classes and population groups including: youth, older adults, female, racial minority, ethnic minority, foreign-born, limited English proficiency, disabled, and low-income. Results from coastal counties are shown below as a "IPD

score." A higher score equals a higher concentration of the protected groups in that census tract as compared to the regional average. The average IPD scores are shown by tract on the map below with City Philadelphia averaging the highest score of 20.4, followed by Delaware County at 16.8, and Bucks County at 15.3. Examination of the map reveals high IPD values in Chester City, West, and North Philadelphia areas.
https://www.dvrpc.org/ETA

Map 3.1: Indicators of Potential Disadvantage Scores by Census Tract in the DECZ



Trends in the LECZ

There has been an increase in private and public development along the Erie Bayfront since the last assessment, which is expected to encourage the enhancement of existing and the development of new access areas. This includes the construction of several new hotels and the Harbor Place development. Under the existing waterfront zoning ordinance, existing public areas and viewsheds are to be maintained. Outside the bayfront, parks, trails and beach access sites have been maintained at their existing numbers over the past five years. The two state parks in the coastal zone, Presque Isle, which attracts over 4.2 million visitors annually, and Erie Bluffs, continue to provide residents and visitors with popular locations for fishing, swimming, boating, hiking, and bicycling. Pennsylvania State University is currently conducting a study to analyze the social carrying capacity of Presque Isle State Park, comparing current use levels with experiential quality indicators. Once completed, the project will provide management guidance for issues related to facility needs, allowable recreational uses, and allocation of use among recreational activities.

The LECZ, has been in a "planning" phase in regard to public access for the last several years. During this reporting period, there have been multiple master plans conducted for the County, City, downtown, bayfront highway, and port authority facilities. Those plans are discussed in more detail below, but generally most plans

agree that the Erie region offers its residents and visitors a satisfactory level of public access. However, the plans also indicate that there are many opportunities to improve that access, where resources allow, in addition to encouraging linkages, particularly between the downtown and waterfront areas. As these plans are implemented in the coming years, the result should be new and improved access in this coastal zone.

The Pennsylvania State University study Assessing the Effects of Water Levels and Water Quality on Water-Based Outdoor Recreationists in Pennsylvania
PASG conducted 566 questionnaires and 30 hours of interviews to evaluate the attitudes, perceptions, and responses towards changing environmental conditions within Pennsylvania's section of coastal Lake Erie. The surveys addressed a wide variety of topics helpful in quantifying the public general recreational use of the shoreline, in addition to the topic of water levels and water quality. Some relevant points include:

- Survey respondents at the 13 sites were participating in the following primary recreational activities: 25% boat angling, 22% shore angling, 19% motorized boating, 18% non-motorized boating, and 16% beaching.
- Only 6% of people polled were visiting Pennsylvania's Lake Erie shoreline for the first time. The majority of the respondents felt very strongly attached to this area. 57% agreed that "no other place can compare to this area for the types of water-based activities I do here".
- Over 85% of respondents visited Lake Erie for "enjoyment of nature", "escape", "excitement", "similar people", "physical fitness", and "family togetherness." The same majority have a high level of satisfaction and indicated their trip that day was very good, excellent, or perfect.
- 70% of polled visitors stated that public access to Lake Erie was "not a problem," 18% were neutral, and only 12% found it to be a problem. In general, the survey respondents were much more concerned of environmental impacts on Lake Erie (such as invasive species, extreme weather, and HABs), as compared to recreational impacts, such as litter and safety.
- Regarding water levels, visitors felt their recreational activity was only slightly negatively impacted with the majority of respondents feeling neutral. Water activities most impacted were non-motorized boating, along with swimming and wading.
- Regarding water quality, visitors also felt their recreational activity was only slightly negatively impacted, with the majority feeling neutral. Water activities most impacted were beach use, non-motorized boating, marina use, swimming and wading, fishing from shore, and dock use.

http://seagrant.psu.edu/topics/economic-sustainability/research/assessing-effect-lower-lake-erie-water-levels-outdoor-recreationists-and

ii. 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.*

Table 3.3 indicates if management categories are employed by the Commonwealth and if significant changes have occurred since the prior assessment. Further discussion is provided under question two below the table.

Table 3.3: Significant Changes in Public Access Management

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	N/A	N/A	N
Operation/maintenance of existing facilities	Y	N	Y
Acquisition/enhancement programs	Y	Y	Y

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.*

<u>Operation/maintenance of existing facilities</u>

Pennsylvania Climate Action Plan, April 2019
This Plan is introduced in the Coastal Hazards section (D.2) of this report and addresses climate change within eight sectors, including outdoor recreation and tourism. The main strategy presented is to help the tourism industry, including local governments and NGO organizations, manage shifting climate patterns. DEP led the development of this Plan, in collaboration with state agency partners and the Climate Change Advisory Committee. CRMP's previous 2015-2020 strategy supports the Plan's goals and actions, which include:

- Establish a formal climate change working group building on existing partnerships, comprised of Commonwealth and federal agencies, academic institutions, the business community, and environmental non-governmental organizations.
- Help public parks adapt to climate change by designing park infrastructure to be adaptable to changes in use, allocating funds to match recreation demand, and expanding operations at ski resorts to allow for warm-weather recreation.
- Explore developing new collaboratives with surrounding states.
- Create a business ombudsman or technical assistance center for affected recreational industries and establish a source of grant funding or tax incentives to help industry and municipalities transition from winter to summer activities.
- Educate facilities about diversification opportunities for more warm-weather or cold-weather activities.

The Plan also includes two final overall strategies: 1) lead by example in both Commonwealth and local government practices and assets, 2) incorporate historical and projected climate conditions into siting and design decisions for long-term infrastructure. Actions here that could be relevant to the design of new and the maintenance or redevelopment of existing public access, include:

- Incorporate climate change considerations into decision making processes and criteria.
- Implement emissions reduction and climate resilience activities in public facilities, including distributed generation, backup power generation, water efficiency, climate resilient vegetation, and proper tree maintenance.
- Establish statewide design guidelines for incorporating climate change.
- Integrate climate change considerations into agency-level capital planning processes and seek to ensure that state investments in infrastructure and development projects (direct or indirect) reflect potential climate change impacts, especially future risk projections.

https://www.dep.pa.gov/Citizens/climate/Pages/PA-Climate-Action-Plan.aspx

Pennsylvania DCNR Climate Change Adaptation and Mitigation Plan, June 2018
This Plan is mentioned under general trends above but is also mentioned here as it relates specifically to actions DCNR is taking to address climate change impacts on its state parks and forests. The Plan identifies DCNR's most significant vulnerabilities and over 120 actions to address them. DEP coordinates with DCNR to address climate change in its statewide Pennsylvania Climate Action Plan. Among the biggest impacts are flooding, increasing lake temperatures, longer recreation seasons, decreased opportunities for winter recreation, and declining forest health. There are two state parks in the LECZ, Presque Isle and Erie Bluffs, and two parks in the DECZ, Neshaminy, and a portion of Delaware Canal State Park. Little Tinicum Island in the DECZ is a designated natural area that is part of the William Penn State Forest.
https://www.dcnr.pa.gov/Conservation/ClimateChange

Erie-Western Pennsylvania Port Authority Master Development and Facilities Plan, April 2018
The Port Authority owns a significant amount, 471 acres, of bayfront property. It recently published a new development and facilities plan that outlines specific action items to maintain its existing recreational spaces, accessible natural areas, and views to the bay. CRMP routinely partners with the Port Authority and provides project funding. The Authority's 20-year development goals are mentioned in detail later in this section.
http://www.porterie.org/wp-content/uploads/2018/05/Port%20Erie%20Master%20Plan%20-%20for%20website.pdf

Acquisition/enhancement programs statewide

2020-2024 Statewide Outdoor Recreation Plan
While the 2020-2024 Pennsylvania Outdoor Recreation Plan is still in development, draft recommendations and actions have been made available. These items will be used to guide programs, policies and projects under the leadership of CRMP's network partner agency, DCNR, along with organizations on the advisory committee

and a number of other partners. High level recommendations include the following 5 items:

- Health and Wellness: Promoting Healthy Living Through Outdoor Connections
- Recreation for All: Ensuring Equity in Access to Pennsylvania's Outdoors
- Sustainable Systems: Protecting and Adapting our Resources, including considerations for climate change.
- Technology: Using New Tools to Improve Engagement
- Funding and Economic Development: Elevating Outdoor Recreation

https://www.dcnr.pa.gov/Recreation/PAOutdoorRecPlan/Pages/default.aspx

Pennsylvania DCNR Pennsylvania Land and Water Trail Strategic Plan, April 2015
DCNR's updated Plan lays out a course of action over the next five years to develop the state's trails and greenways. Since 2001, greenway corridors have been identified in both coastal zones, including the East Coast Greenway (ECG) in the DECZ and the Erie to Pittsburg Greenway in the LECZ. These long-distance corridors are recognized in county planning procedures and are used to inform and guide planners and focus trail development efforts. DCNR's trail strategy also identifies the top 10 trail gaps, including the ECG's Spring Garden Street in Center City Philadelphia. This segment will connect the Schuylkill River Trail with the Delaware River. It is being led by the Pennsylvania Environmental Council, but has experienced slow progress due to the complexity and cost of the project. There are two other identified gaps just outside the DECZ, the Bridge Street Gap in the Delaware and Lehigh Trail and the Wissahickon Gateway Gap in the Schuylkill River Trail. The latter segment will connect the existing northern trail to the Schuylkill Banks Central City section within the coastal zone.
http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20030875.pdf

Several CRMP networked state agencies completed strategic plans during this assessment period that will impact public access development and management:

Pennsylvania Fish and Boat Commission
PFBC is currently updating the agency's strategic plan. The existing plan was adopted in 2014 and is being implemented during this assessment period. Regarding public access, the plan seeks to involve youth and other target audiences in fishing and boating, provide safe and enjoyable participation in boating, and enhance fisheries to optimize fishing opportunities. PFBC also continues to implement its multi-year infrastructure plan, which includes prioritization of access area repairs.

Pennsylvania Game Commission
The Pennsylvania Game Commission (PGC) is concluding its strategic plan for 2015-2020. Most relevant to access, the plan seeks to focus acquisition efforts on lands which provide access to existing state game lands, inholdings, indentures, and sensitive habitats for special concern species and other unique landscapes. There is one PGC property in the LECZ, State Game Lands 314/Roderick Wildlife Reserve. PGC also operates the Hunter Access Program by partnering with private landowners through a term-lease agreement to allow public hunting and trapping opportunities. During this reporting period there was an effort to revise and improve the program to attract new landowners into the program. Cooperator locations are also available to view on the PA Hunting Interactive Map.

Pennsylvania DCNR Bureau of State Parks
DCNR is in the process of developing its new state park strategic plan, with the previous plan last developed 25 years ago. Entitled "Penn's Parks for All", the final report is expected to be released in summer 2020. The preliminary report provides the following recommendations: 1) improve outdoor recreation opportunities 2) expand overnight accommodations 3) protect the park's natural and cultural resources 4) pay for state parks (reduce costs and increase funding for maintenance), and 5) improve services and facilities. There are two state parks in the LECZ, Presque Isle and Erie Bluffs, and two parks in the DECZ, Neshaminy, and a portion of Delaware Canal State Park.

Acquisition/enhancement programs in the DECZ

The Circuit Trails
The Circuit Trails is a regional network of hundreds of miles of multi-use trails in the greater Philadelphia area. The Circuit Trail Coalition launched in 2012 and includes a collaboration of non-profit-organizations, foundations, and agencies working to build the trail. As of December 2018, 90 municipalities and eight county governments have adopted resolutions supporting the goal of building 500 miles by 2025, a short-term target intended to advance the region towards eventual completion of the network. During this assessment period, the Circuit Trail Coalition received two infusions of funding from the William Penn Foundation to continue trail building efforts. Starting in 2015, DVRPC received $7 million over three years to restore funding to its Regional Trails Program. Three years later, The William Penn Foundation provided an additional $6.6 million to DVRPC and $4 million to other coalition organizations for supporting work. From 2015-2019, The Regional Trails Program has awarded 54 grants to trail development in Pennsylvania to total over $8.3 million.

CRMP is not directly represented on the Circuit Trail Coalition, but its networked agencies, including DCNR and Department of Transportation are public partner organizations. CRMP has provided considerable investments into the development of the ECG/The Circuit Trails in the DECZ. Since 2001, CRMP has dedicated $1,194,780 to 29 individual projects for the construction of new trail (planning or construction funding), in addition to $604,900 for 13 projects that enhanced the existing trail.
https://circuittrails.org/

DVRPC Connections 2045 Plan
DVRPC published its long-range Plan for the greater Philadelphia region in 2018. The Plan covers a variety of topics, with the most relevant goals being sustaining the environment by preserving open space, developing livable communities by investing in community parks, and creating an integrated, multimodal transportation network by integrating biking and walking connections. The Connections 2045 Plan sets a goal of permanently protecting one million acres of open space for outdoor recreation, in addition to natural resource protection and farmland preservation. It seeks to link new and existing protected areas with populated centers into a Greenspace Network. There are 12 networks identified within the DECZ: Delaware River, Chester Creek, Ridley Creek, Crum Creek, Darby Creek, Schuylkill River, Tacony-Cresheim Creek, Pennypack Creek, Poquessing Creek, Neshaminy Creek, Cross County Corridor, and Mill-Queen Anne Creek. Regarding parks, the plan seeks to make capital investments, develop more parks in underserved areas, and

improve connections between parks and schools. CRMP provides annual funding to DVRPC for program coordination and administration.
https://www.dvrpc.org/Connections2045

DVRPC Equity Through Access
Mentioned previously, DVRPC's Equity Through Access Program addresses the ability of vulnerable populations to access essential services, including outdoor recreation areas. This is a common topic throughout the many comprehensive and development plans discussed in this analysis. Stakeholder engagement and data analyses are being used to identify unmet needs and service gaps, recommend innovative transportation access solutions, and empower communities to climb "ladders of opportunity" towards greater social and economic mobility.
https://www.dvrpc.org/ETA

City of Philadelphia
Philadelphia developed its Trail Master Plan in 2013 to advance the City's comprehensive plan, Philadelphia 2035, which is revised annually. The plan outlines four overarching goals of the City's network: connectivity, safety, encouragement of physical activity, and open space. Each update contains a revised priority ranking for proposed new trail and rehabilitation projects Citywide.
https://www.phila.gov/documents/philadelphia-trail-master-plan/

Philadelphia Parks and Recreation developed an improvement plan to East and West Fairmount Park, which total 2,000 acres at the northern end of the DECZ along the Schuylkill River. The plan was published in spring 2014 and seeks to enhance accessibly of park amenities, reduce barriers to park use, and provide "maps and apps" for citizens and visitors. The plan has been implemented this reporting period with progressing construction of the Trolley Trail loop, improvements to the Centennial Commons area of West Park, and the opening of the Discovery Center and East Park Reservoir.

Planning and development of waterfront public access in the City of Philadelphia continued at a steady pace over the past five years and was headed by the following organizations: the Schuylkill River Development Corporation, Delaware River Waterfront Corporation, and Delaware Riverfront North Partnership, in addition to the City Parks and Recreation Department. CRMP has partnered with these groups to fund both the development of new and the enhancement of existing public access sites in the DECZ. This progress is expected to continue on the Central Delaware in 2024 with the much-anticipated opening of the $225 million new 12-acre Park at Penn's Landing. Multiple private developments are on the horizon for the Central Delaware waterfront. These new structures will be required to incorporate public access under The Central Delaware Waterfront zoning Overlay and the Waterfront Setback zoning requirements. At the time of this assessment development, there were proposed modifications to the zoning overlay, which should strengthen public space requirements and allow for height allowance bonuses to encourage additional creation of public spaces.

On the northern riverfront, the 10-acre Bridesburg Riverfront Park is also in its design phase and will offer a new much needed space for the Northeast Philadelphia neighborhood. The Riverfront North Partnership is also in the process of updating its original master plan, which has been successfully implemented in the past decade with the majority of trail having already been constructed or currently

in planning phase. The new plan will focus on "softening" barriers between Northeast Philadelphia and connecting people to the riverfront. All three of these nonprofit organizations plan to continue planning and constructing waterfront trail and connector streets on the Schuylkill River, and Central and North Delaware over the next five years.

Initiated in 2018, "Rebuild" is the City of Philadelphia's new program that will invest hundreds of millions of dollars to improve neighborhood parks, recreation centers, and libraries. It is funded by a new Philadelphia beverage tax, in addition to other grant funds. By 2019, work on eight new playgrounds was underway with plans in 2020 to begin construction at five additional recreational facilities.

Delaware County Open Space, Recreation, and Greenway Plan
The coastal zone portion of Delaware County exhibits significantly different land uses from the remainder of the county to the north and west. It is a much more industrialized and urbanized landscape with challenges for access development.

Delaware County completed its Open Space, Recreation, and Greenway Plan in 2015. It examines the policies and trends identified in the updated comprehensive plan, Delaware County 2035, with the goals of 1) conserving natural and cultural resources, 2) increasing and enhancing the environmental and/or recreational value of developed and undeveloped lands, and 3) developing a greenway network that connects natural features and people to community and regional destinations. The plan recommends incorporation of open space into redevelopment of vacant industrial acreage. The Plan establishes a countywide primary trail network, which includes the ECG, PECO Right-of-Way Trail, Chester Creek Trail, Blue Route Bikeway, Heinz Refuge Trail, and Cobbs Creek Trail within the DECZ.

Since adoption of the Plan, Delaware County has convened an Open Space Task Force in 2016 and developed a recommended implementation strategy for the Open Space, Recreation, and Greenways Plan in 2018. That plan sets forth three recommendations, including 1) grants to local municipalities for open space and recreational projects, 2) capital improvements to county park and trail facilities, and 3) professional support services, such as funding for plans and studies. In 2019, the County authorized an initial borrowing of $10 million to fund the Open Space Program. This includes the "Delco Green Ways" grant program, which provides funds to local municipal projects that forward open space goals of the County.

Waterfront access development in the County has slowed during this reporting period with no new access gains. The Chester Riverwalk and associated development completed about a decade ago, including the Talen Energy stadium and the Wharf at Rivertown, is experiencing renewed interest. The Riverfront Alliance of Delaware County, rebranded in 2014 from the Institute for Economic Development, is looking to develop a Chester Waterfront Master Plan, which should be developed next assessment period. The newly renamed organization is a non-profit organization whose mission is to serve as a catalyst for economic development in communities along the Delaware County waterfront.
https://www.delcopa.gov/planning/pubs/delco2035/OpenSpaceandRecreationPlan.html

Bucks County
The Bucks County Open Space Program, initiated by a 10-year $59 million bond referendum in 1997, and followed by a second $44 million referendum in 2007,

concluded this reporting period. The funds were allocated for preservation of farmland, natural areas, municipal open space, county parkland, and the Delaware Riverfront. The Program funded 91 pass-through municipal grants that preserved 741 acres of parkland and 1,113 acres of natural areas. Some grant funds were used to improve access and utility of existing open space by adding trails or other projects. Under the natural areas allocation, 112 projects were funded totaling 5,001 acres. A Delaware Riverfront allocation was added as a separate program with the second bond referendum. These projects focused on enhancing open space opportunities by the river and funded 12 acres in three different projects. Finally, the Park allocation funded 69 projects to total 1,126 acres. Bucks County continues its Agricultural Land Preservation Program past the conclusion of the Open Space Program, in addition to protection of critical areas by considering other unique and important preservation programs as they may be presented in the future.

Bucks County continues to work on trail planning through recommendations presented in its 2011 Open Space and Greenways Plan. The County is in the early phases of planning for the Neshaminy Creek corridor. When complete, the corridor will span 33 miles and connect with the ECG at Neshaminy State Park and the Delaware River. Feasibility studies have been completed for upper, middle, and lower portions of the trail (only the lower portions are in the DECZ), in addition to plans for the Mill-Queen-Anne-Black Ditch Creeks. No trail construction occurred during this assessment period.

In the LECZ

Destination Erie, A Regional Vision
Erie County's 2015 strategic master plan includes trail network development as one of its six priority recommendations under its Land Use, Transportation, and Infrastructure section. In general, the plan highlights the county's existing abundant park and open space resources but aims to connect them to each other and neighborhoods. The plan recommends an Open Space Referendum to establish a fund to purchase and protect undeveloped areas for the purposes of preservation and recreation.

More specifically, projects recommended by workgroups conducted during the planning process related to public access include:

- Undertake an Open Space Referendum - Hold a referendum to establish an endowment through bonds or tax revenue that will be available to purchase and protect more open space including sensitive environmental areas, scenic vistas, greenways and farmland.
- Improve Pedestrian and Bike Infrastructure - Establish a capital program to improve pedestrian and bicycle infrastructure using the "complete streets" model to improve safety and safe routes to school and encourage car-free transportation. As part of this program, use GIS resources to update the regional bike plan and identify major routes that can accommodate a bike lane.
- Develop Priority Bike/Pedestrian Corridors - Develop priority bike and pedestrian corridors and recreational trails within and outside of the Erie Metro area for recreational, commuting, and touring purposes.
- Develop a Waterfront District Master Plan - Create a governing body to provide leadership and commitment to the waterfront with the authority and vision to create and implement a comprehensive waterfront master plan.

Implementation of Destination Erie is being undertaken by a new partnership entitled, "Emerge 2040: A Focused Partnership for the Erie Region's Future." This collaboration was formed in 2015 and seeks to create a thriving, educated, livable, green and connected Erie County over the next 25 years.
http://emerge2040.org/resources/destination-erie-plan/

Erie Refocused Comprehensive Plan
The City of Erie also developed a new comprehensive plan during this assessment period. The 2016 plan creates a decision-making guide for the City of Erie and its 17 planning areas, seven of which are in the coastal zone. Regarding public access, the Plan recommends creating a connection between the bayfront and downtown to allow for the comfortable movement of pedestrians and bicyclists. The Plan cites bridges that span I-95 at Penn's Landing in Philadelphia as a model for consideration. In the East Bayfront area, the plan recommends development of a network of new parks via a targeted demolition and land assemblage, once again making Philadelphia an example with redevelopment of vacant lots by the Pennsylvania Horticultural Society. Within the Lakeside area, Erie Refocused advocates for long-term reuse of underutilized industrial property that includes provisions for public access to views of Lake Erie. City-wide, the plan also recommends a new zoning code, or amendments to the current code, that offer the Planning Commission and developers more explicit and consistent design guidance when proposing development in the waterfront zoning district.
http://emerge2040.org/resources/erie-refocused-comprehensive-plan/

Port of Erie Strategic Plan & Master Development and Facilities Plan
Erie Western Pennsylvania Port Authority's 2016 strategic plan and subsequent 2018 master plan establish a vision and plan for the organization and its 471 acres of bayfront property. The plans lay out "8 great ideas" which include the development and enhancement of existing sites (Dobbins Landing, McAllister Place, Liberty Park, and the Erie Land Lighthouse), support recreational boaters and campers, enhance natural features, and preparation for new and creative land use options. In 20 years, the master plan development program recommends the acquisition of five acres of beach/water access, 17 acres of camping, and 36 acres of accessible natural open space.
http://www.porterie.org/wp-content/uploads/2018/05/Port%20Erie%20Master%20Plan%20-%20for%20website.pdf

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

   There are several different types of access guides available in PA depending on type of recreation and coastal zone, however, there is no comprehensive source for all public access specific to the coastal zones. Table 3.4 summarizes publicly available access guides in Pennsylvania's coastal zones.

Table 3.4: Publicly Available Access Guides in Pennsylvania Coastal Zones

Public Access Guide	Printed	Online	Mobile App
State or territory has? Y There are several different types of access guides available in PA depending on type of recreation and coastal zone. There is no comprehensive source for all public access specific to the coastal zones.	**Land Trails**		
	N/A	Explore PA Trails Website: https://trails.dcnr.pa.gov/ Rebooted in 2018 with updated interface & updated on a routine basis. This is the main statewide resource from DCNR to access trail guides in Pennsylvania.	N/A
	Downloadable PDFs and turn-by-turn cue sheets from ECG site	DECZ Circuit Trails: https://circuittrails.org/. Maintained and updated by The Circuit Coalition on a regular basis. DVRPC also maintains a detailed up-to-date Circuit Trails Status Map at: https://www.dvrpc.org/webmaps/thecircuit/. Most of these trails are also a part of the ECG and included on the online map at: https://map.greenway.org/	N/A
	N/A	Schuylkill Banks Trail Map: https://www.schuylkillbanks.org/trail-map	N/A
	N/A	Schuylkill River Trail Map: https://schuylkillriver.org/map/. Released Jan 2019.	N/A
	N/A	Greater Erie Regional Trails: https://erietrails.org	N/A
	Fishing		
	Can order printed region guide brochures and select water trail guides: https://pfbc.pa.gov/forms/pubs_free.htm	Multiple statewide fishing maps, including county guides: https://www.fishandboat.com/Locate/Pages/MapResources.aspx. Maintained and updated by PFBC on a routine basis.	FishBoatPA – official app from PFBC on Apple and Google Play. Updated 1/22/20.
		Lake Erie Fishing Easements map from PFBC - https://www.arcgis.com/apps/webappviewer/index.html?id=30d3c4cdaae74096b565da19cbc061d3. Maintained and updated by PFBC on a routine basis.	
	Hunting		
	State Game Lands PDF maps: https://www.pgc.pa.gov/HuntTrap/StateGameLands/Pages/State-Game-Lands-Maps.aspx	Statewide PA Hunting Interactive Map: http://www.hunting.pa.gov/bof/huntmap/index.html	PGC official app from on Apple and Google Play. Updated 1/2/20.
	Water Trails		
	Select PDF trail guides made available from different orgs: https://pfbc.pa.gov/WaterTrail.htm.	PA Water Trail Guides: https://pfbc.pa.gov/WaterTrail.htm. Can also view water trail guides on an interactive map: http://pfbc.maps.arcgis.com/apps/webappviewer/index.html?id=ef4db86320d24c0d8e05e4569b30c06c	N/A
	Printable PDF maps available: http://dev-	Tidal Delaware Water Trail Map: http://www.tidaltrail.org/trail-map/	N/A

Public Access Guide	Printed	Online	Mobile App
	tidaltrail.pantheonsite.io/printable-maps/		
	Schuylkill River Water Trail printed maps: https://schuylkillriver.org/schuylkill-river-watertrail/#watertrail-map-section	No online fully interactive map.	N/A

According to SCORP public opinion surveys, an overwhelming 76% of respondents use the internet (websites and social media) as their main source to obtain information on outdoor recreation, followed by word of mouth, printed materials, mobile apps, visitor centers, articles, and travel guides, etc. Less than 5% of respondents indicated they do not use technology to aid in outdoor recreation.

iii. 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 or this level of priority. Include input from stakeholder engagement, including the types of stakeholders engaged.*

Public Access was ranked as a high priority by half of the surveyed stakeholders, approximately 30% felt it was a medium priority, and less than 20% a low priority. These results reflect the importance of the public access topic in both coastal zones. Consequently, CRMP will assign a medium priority level to this enhancement area, but will not pursue developing a strategy. There is currently a strong network of partners already planning and implementing access successfully in the coastal zones, especially in the southeast, where it is most needed. Outside of the Section 309 process, CRMP plans to continue using Section 306A allocated funds to support park, trail, and access areas in the LECZ and DECZ. Connecting trails outside the coastal zone to trails inside the coastal zone remain a priority for CRMP. Safe access to the growing trails in the DECZ is critical for the communities that neighbor the coastal zone. The consideration of a potential boundary expansion in the DECZ that is being proposed as part of a coastal hazards strategy will include a consideration of the public access enhancement area as well.

4. Marine Debris

Section 309 Enhancement Objective: *Reducing marine debris entering the nation's coastal and ocean environment by managing uses and activities that contribute to the entry of such debris. §309(a)(4)*

a. Phase I (High-Level) Assessment:
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. 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.*

   Since Pennsylvania's coastal zones are very different, they experience different marine debris trends, sources and impacts. As such, they will be addressed in separate tables, one for the DECZ and one for the LECZ.

Table 4.1: Existing Status and Trends of Marine Debris in the DECZ

Source of Marine Debris	Significance of Source (H, M, L, Unknown)	Type of Impact (aesthetic, resource damage, user conflicts, other)	Change Since Last Assessment (↑, ↓, No change or Unknown)
Beach/shore litter	H	Aesthetic, resource damage	No change
Land-based dumping	M	Aesthetic, resource damage	No change
Storm drains and runoff	H	Aesthetic, resource damage, user conflicts	No change
Land-based fishing (e.g., fishing line, gear)	L	Aesthetic, resource damage	No change
Ocean/Great Lakes-based fishing (e.g., derelict fishing gear)	L	Minimal	No change
Derelict vessels	L	Minimal	No change
Vessel-based (e.g., cruise ship, cargo ship, general vessel)	L	Minimal	No change
Hurricane/Storm	M	Temporary, aesthetic, resource damage	No change
Tsunami	N/A	N/A	N/A

Table 4.2: Existing Status and Trends of Marine Debris in the LECZ

Source of Marine Debris	Significance of Source (H, M, L, Unknown)	Type of Impact (aesthetic, resource damage, user conflicts, other)	Change Since Last Assessment (↑, ↓, No change or Unknown)
Beach/shore litter	M	Primarily aesthetic	No change
Land-based dumping	L	Minimal impact	No change
Storm drains and runoff	M	Primarily aesthetic, some resource damage	No change

Land-based fishing (e.g., fishing line, gear)	L	Primarily aesthetic, some resource damage	No change
Ocean/Great Lakes-based fishing (e.g., derelict fishing gear)	L	Minimal	No change
Derelict vessels	L	Minimal	No change
Vessel-based (e.g., cruise ship, cargo ship, general vessel)	L	Minimal	No change
Hurricane/Storm	L	Minimal	No change
Tsunami	N/A	N/A	N/A

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.*

Sources of marine debris in the Delaware Estuary generally remained the same over the last several assessment periods. Plastic litter entering via stormwater or by simply blowing into the water is the main source of marine debris found in the Delaware Estuary. While the primary source and type of debris remains the same, the concern over the potential impacts continues to grow. Secondary microplastics, which are generated from breakdown of larger plastic pieces, are a present threat to wildlife and water quality. To gain a better understanding of the nature of the problem locally, DRBC has been conducting research in the non-tidal stretches of the Delaware River above Trenton Falls and in tributaries of the Delaware River, including the Schuylkill River, Neshaminy Creek, and several others in Pennsylvania's DECZ. With the data collected, DRBC plans to develop models to identify high-plastic loading tributaries, which will assist in targeting cleanup efforts. This particular effort is being conducted upstream of Pennsylvania's tidal waters. Rutgers University is currently conducting a study in the Delaware Bay, below Pennsylvania's waters. However, no known research is being conducted in Pennsylvania's tidal waters of the Delaware Estuary.

While marine debris is often thought of as an ocean issue, the Great Lakes also experience this problem. International Coastal Cleanup (ICC) events have been held in the LECZ since 2003 and remain well supported by local coordinators and volunteers. CRMP has been a long-time supporter of these events. ICC coordinators historically report the most common type of marine debris collected in the Pennsylvania portion of Lake Erie is cigarette butts. During the ICC events held in the Lake Erie watershed, 8,361 cigarette butts were collected. However, small foam pieces of less than 2.5cm in size were the most collected item, quantified at 8,576 pieces. Small plastic pieces rounded out the top three items collected at 6,565 pieces over the course of the event locations.

Illegal Dump Surveys

Starting in 2005, Keep Pennsylvania Beautiful conducted illegal dump surveys across all 67 counties in Pennsylvania. The data collected include what type and how much is being dumped in each county. Erie County was surveyed in 2005; Bucks County in 2011; and Philadelphia and Delaware Counties in 2012. The surveys have not been repeated since they were originally conducted for the initial assessment. At the time the surveys were conducted, the results indicated that illegal dumping was a significant problem in the DECZ. Although there hasn't been a survey in years, illegal

dumping remains a problem. As a result, several programs have been developed to address illegal dumping. They are discussed in the Management Characterization section below, see Table 4.3.
https://www.keeppabeautiful.org/keep-pennsylvania-beautiful-illegal-dump-surveys/.

ii. 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.*

Table 4.3 indicates that no significant changes to state-level management of marine debris have occurred during the 2016 – 2020 assessment period.

Table 4.3: Significant Changes in Marine Debris Management

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	N	N	N
Marine debris removal programs	N	Y	N

Marine debris statutes, regulations, policies, or case law interpreting these

Pennsylvania does not have any specific marine debris statutes, regulations, policies or case law. Pennsylvania's marine debris regulatory efforts lie with waste management, recycling, combined sewer overflow (CSO) and stormwater National Pollutant Discharge Elimination System (NPDES) permitting.

Microbead-Free Waters Act of 2015
The Microbead-Free Waters Act was enacted during the last assessment period with the date by which all manufacturers must comply occurring during the last assessment period. As of July 1, 2017, all rinse-off cosmetics could no longer contain "intentionally-added" plastic microbeads. Microbeads have been observed in high concentrations in the Great Lakes, especially Lake Erie. According to a 2012 study performed by the State University of New York researchers, microbeads were found in concentrations of up to 1.1 million microbeads per square mile in the Great Lakes. Banning use of microbeads was a single step in a complex plastic pollution problem.

Marine debris removal programs

Microplastics
While the problem of microplastics is not new, the awareness around the extent of the damage they cause continues to grow. These pieces of plastic are prevalent in our waterways and are too small to be removed by wastewater treatment plants. Microplastic pieces are being ingested by marine organisms, and are not only part of the food chain, but also now the geologic record. The NOAA Marine Debris Program is leading efforts to address the problem of microplastics. In the Great Lakes, NOAA has developed the Great Lakes Land-based Marine Debris Action Plan. Some of the goals in the Plan have been completed and others are still in progress. There is no

comparable plan in the DECZ, although research is ongoing and was discussed in the Resource Characterization heading of this section. Global concern regarding single use plastics and related pollution has increased the awareness of microplastics. Many solutions are being investigated.

Philadelphia CSO Long-Term Control Plan
This Plan was approved by the Environmental Protection Agency (EPA) and DEP in the last assessment period. The Plan is also discussed in the Cumulative and Secondary Impacts section (D.5) of this document. Most significant to marine debris is the update to Section 6 of the Updated Nine Minimum Controls Report (approved June 2015). Section 6 addresses "Control of the Discharge of Solids and Floatables in CSOs" and specifically addresses how structural and non-structural technologies will be used to address problems identified in the CSO Long Term Control Plan Update. Section 7 titled "Pollution Prevention Programs" also addresses some non-structural approaches to lessen impacts of marine debris.
https://water.phila.gov/reporting/ltcp/#:~:text=The%20EPA%20requires%20municipalities%20to,maintenance%20and%20management%20of%20stormwater.

Philadelphia Water Department Waterways Restoration Team
In 2003, the PWD started a program called the Waterways Restoration Team (WRT) as a response to the problem of debris accumulating in the Delaware and Schuylkill Rivers. The team not only performs cleanup work throughout the City, they also perform stream examinations, restore eroding streambanks and stream beds and assess conditions of the water department's infrastructure.

When a litter hotspot has been identified, the WRT works with a variety of partners to promote stewardship through education and cleanup activities. The latest report available for cleanup efforts show that in 2017, the WRT and partners conducted 740 cleanups and collected more than 1,621 tons of debris from waterways in the City. Debris ranged from vehicles to shopping carts (72) to tires (855). Since the inception of the program, the WRT removed over 100 vehicles from the waterways. Most of what is collected in these cleanups is organic in nature. A small percentage of the debris was attributed to illegal dumping and littering.
https://cleanphl.org/portfolio-item/water-departments-waterways-restoration-team-removes-over-1600-tons-of-trash-and-debris-from-philly-waterways/

Floatables control using Debris Skimming Vessels
The PWD owns two watercrafts used for the sole purpose of collecting marine debris on the Delaware and Schuylkill Rivers. CRMP assisted with the purchase of one of the vessels in 2006. The two vessels cover a total of 32 river miles for cleanup efforts, 5 days a week over 8 months every year. Since PWD began this cleanup effort, the vessels have been used to collect more than 11 tons to 48 tons of marine debris per year. Plastic items account for more than 55% of debris removed; 77% of that material is plastic bottles while 16% is plastic bags. PWD works with the Streets Department to recycle as much of the plastic as possible. The PWD also operates a pontoon skimming vessel in the tidal Delaware and Schuylkill Rivers. This vessel removes as much as four tons of materials per year using dip nets to accomplish the task.

While these activities directly improve the aesthetics of the waterfront, it also serves as a public awareness tool regarding litter in general and especially floating

plastic litter. Philadelphia's CSO Long-Term Control Plan includes the use of these vessels.

Philly 311 Illegal Dumping Reporting Program
The City of Philadelphia suffers with excessive illegal dumping, costing the City millions of dollars and countless hours every year to clean up the offending materials. To assist with reporting problem areas, the City of Philadelphia implemented a system for reporting illegal dumping within City limits. Residents can report incidents of illegal dumping by calling 311 or texting the Philadelphia Police Department (PPD). This program also has two organized cleanup events called Love Your Park Week and Fall Service Day where participants are encouraged to clean up litter and conduct various other activities. The City has installed 50 to 100 cameras per year in hopes of abating illegal dumping activities. In 2019, the PPD investigated more than 175 instances of dumping and brought at least 14 cases to trial. https://www.phila.gov/311/ABOUTUS/Pages/default.aspx

Keep Pennsylvania Beautiful Illegal Dumping Camera Program
In 2015, Keep Pennsylvania Beautiful implemented the Illegal Dump Free PA camera loan program. Municipalities can apply for a grant to place cameras to record illegal dumping activities and provide evidence to pursue prosecution of individuals who are dumping within municipal limits. While this is a statewide program, several coastal municipalities participate in the program and have had success in using the information to cite offenders. More information on the program can be found here: https://illegaldumpfreepa.org/

City of Erie Sewer Department
The City of Erie has operated a litter trap at the mouth of Mill Creek as well as on Cascade Creek, which both empty into Lake Erie. The previous report indicated the City removed approximately 56 tons of litter per year, including natural debris from the trap on Mill Creek. While these traps are still operational, the City no longer monitors nor calculates the amount of debris removed from the traps.

International Coastal Cleanup
CRMP has a long history of involvement with the International Coastal Cleanup (ICC) in both Coastal Zones. Keep Pennsylvania Beautiful is responsible for coordinating and collecting data from all ICC sites. In 2003, CRMP was involved with establishing the ICC in the LECZ, and remains involved in coordinating the annual effort. The cleanups are well supported by staff, partners and volunteers in the region. Over the past four years, the LECZ ICC has enjoyed the support of more than 7,000 volunteers and collected over 33,000 pounds of trash.

There is no steering committee for the DECZ ICC efforts, thus Keep Pennsylvania Beautiful fulfills this role to coordinate all events. Over the past four years, nearly 16,000 volunteers have collected over 492,000 pounds of trash. Some of these cleanups are outside of the coastal zone but are within the local coastal watershed. CRMP provides financial assistance to support ongoing ICC efforts in the DECZ.

Schuylkill Scrub
The Schuylkill Scrub is a cleanup initiative that occurs every year from March 1 to May 31 in the Schuylkill watershed. Founded in 2010, the event continues to grow each year. The event is coordinated by the Schuylkill Action Network, which is managed by the Partnership for the Delaware Estuary (PDE). 2019 statistics show that more than 28,000 volunteers removed more than one million pounds of litter

and bulk waste.
www.schuylkillscrub.org.

Philly Spring Cleanup
April 2020 would have been the 13th year of this event hosted by the Philadelphia Streets Department. The event was cancelled due to Covid-19. This well-organized event encourages project registration to connect volunteers to projects in need of assistance. The Streets Department provides materials and collects trash and recyclables from all registered projects.
www.philadelphiastreets.com/philly-spring-cleanup/

Annual Presque Isle Spring Cleanup
On Saturday April 20, 2019, DCNR hosted the 63rd annual Spring Clean-up at Presque Isle State Park. Over 400 volunteers removed more than 200 pounds of litter from the beaches of the park, which is an important attraction and economic driver for Erie residents and visitors. This annual event brings together a variety of partners and the public to prepare the park for the coming season.

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.*

   There are multiple partnerships involved in the efforts to manage marine debris in both of Pennsylvania's Coastal Zones. The City of Philadelphia plays a large role in the efforts to keep land-based debris from becoming marine debris and in the constant work to remove the debris that has accumulated in the DECZ waters. While there appears to have been a significant increase in organized cleanups; a continuous supply of debris is also being collected. CRMP has long supported various cleanup programs in both Coastal Zones.

   Efforts to catch and prosecute those responsible for illegal dumping has gained some momentum and may be the most significant change in marine debris during this assessment period. With both the City of Philadelphia and Keep Pennsylvania Beautiful having implemented programs to help address the problem, ongoing efforts will be monitored to determine the impacts on successfully abating illegal dumping in the DECZ. CRMP has not been involved with these programs to date.

iii. 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.*

Of the 17 key stakeholders surveyed, 23% considered marine debris to be a “high” priority concern. Responses were similar in both coastal zones and the state-wide respondents. Most respondents classified marine debris as a medium priority. CRMP agrees with this assessment. Elevating this enhancement area to a “high” priority isn’t likely to resolve the complex conditions that contribute to the problem, but the ongoing concern for this issue justifies keeping it as a “medium” priority.

5. Cumulative and Secondary Impacts

Section 309 Enhancement Objective: *Development and adoption of procedures to assess, consider, and control cumulative and secondary impacts of coastal growth and development, including the collective effect on various individual uses or activities on coastal resources, such as coastal wetlands and fishery resources. §309(a)(5)*

a. Phase I (High-Level) Assessment:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. 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 2017. You may wish to add additional trend comparisons to look at longer time horizons as well (data available back to 1970), but at a minimum, please show change over the most recent 5-year period data is available (2012-2017) to approximate current assessment period.*

   Population and housing data for the most recent 5-year period is provided in the table below.

Table 5.1: Trends in Coastal Population and Housing Units

	DECZ Counties (Delaware, Philadelphia, Bucks)			LECZ (Erie County)		
	2012	2017	Percent Change (2012-17)	2012	2017	Percent Change (2012-17)
Number of people	2,737,914	2,770,736	1.20%	281,523	273,892	-2.71%
Number of housing units	1,142,201	1,160,912	1.64%	119,933	121,412	1.23%

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 1996 and 2016. You may use other information and include graphs and figures, as appropriate, to help illustrate the information.*

   Table 5.2 provides a comparison of land cover data between 1996 and 2010. The data is compiled from NOAA's C-CAP Land Cover Atlas (the most recent data from 2016 was not available at time of writing). The NOAA C-CAP Land Cover Atlas is described in the Wetlands section (D.1).

Table 5.2: Status and Trends for Land Uses in Pennsylvania Coastal Counties, Based on NOAA C-CAP Land Cover Atlas (1996-2010)

	DECZ Counties (Delaware, Philadelphia, Bucks)		LECZ (Erie County)	
Land Cover Type	**Land Area Coverage in 2010 (Acres)**	**Gain/Loss Since 1996 (Acres)**	**Land Area Coverage in 2010 (Acres)**	**Gain/Loss Since 1996 (Acres)**
Developed, High Intensity	111,462	7,174	14,643	1,427
Developed, Low Intensity	88,096	4,384	34,003	1,338
Developed, Open Space	69,274	2,221	10,835	1,152
Grassland	4,045	-141	5,056	-224
Scrub/Shrub	29,402	-800	16,045	416
Barren Land	2,630	-1,651	1,690	147
Open Water	18,285	64	70,989	51
Agriculture	106,554	-6,605	183,040	-1,722
Forested	160,576	-4,192	196,416	-2,342
Woody Wetland	18,234	-250	44,589	-384
Emergent Wetland	2,976	-198	5,779	141

Note: The 2016 C-CAP data was not available at the time of the Cumulative and Secondary Impacts Assessment and the most recent data (2010) was used per NOAA guidance.

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 1996 and 2016 in the two tables below. You may use other information and include graphs and figures, as appropriate, to help illustrate the information.*

   Table 5.3 provides information on the status and trends of development in Pennsylvania's coastal counties based on NOAA's C-CAP Land Cover Atlas between 1996 and 2010 (the most recent data from 2016 was not available at time of writing). The percent of net change to developed land are highest in Bucks and Erie Counties, where developable land is more available. Philadelphia showed only a 0.81 % increase in developed land. Net increases in impervious surfaces were also highest in Bucks and Erie Counties. The NOAA C-CAP Land Cover Atlas is described in the Wetlands section (D.1).

Table 5.3: Development Status and Trends for Pennsylvania Coastal Counties, Based on NOAA C-CAP Land Cover Atlas (1996-2010)

		1996	2010	Percent Net Change
Percent land area developed	Delaware Co	56.12%	58.35%	3.96%
	Philadelphia	82.91%	83.58%	0.81%
	Bucks Co	27.84%	30.47%	9.43%
	Erie Co	9.53%	10.2%	7.05%
Percent impervious surface area	Delaware Co	19.97%	21.04%	5.39%
	Philadelphia	49.86%	50.73%	1.74%
	Bucks Co	8.75%	9.87%	12.87%
	Erie Co	3.27%	3.51%	7.59%

Note: The 2016 C-CAP data was not available at the time of the Cumulative and Secondary Impacts Assessment and the most recent data (2010) was used per NOAA guidance.

Table 5.4 provides information on how land use is changing in Pennsylvania's coastal counties by comparing land cover types that were converted to development between 1996 and 2010 based on NOAA's C-CAP Land Cover Atlas (the most recent data from 2016 was not available at time of writing). For this comparison the coastal counties of the DECZ were combined. Agriculture and forested lands are the land cover types with the highest conversion rates to developed land in both the DECZ and LECZ. The NOAA C-CAP Land Cover Atlas is described in the Wetlands section (D.1).

Table 5.4: How Land Use Is Changing in Pennsylvania Coastal Counties, Based on NOAA C-CAP Land Cover Atlas (1996-2010)

	Areas Lost to Development Between 1996-2010 (Acres)	
Land Cover Type	**DECZ Counties (Delaware, Philadelphia, Bucks)**	**LECZ (Erie County)**
Barren Land	1,587	166
Emergent Wetland	134	70
Woody Wetland	275	160
Open Water	224	19
Agriculture	6,893	1,984
Scrub/Shrub	1,011	192
Grassland	218	230
Forested	3,546	1,184

Note: The 2016 C-CAP data was not available at the time of the Cumulative and Secondary Impacts Assessment and the most recent data (2010) was used per NOAA guidance.

DVRPC produces a very accurate land use GIS layer for its southeast PA planning region and updates the data every five years. Table 5.5 below compares changes in land cover type from 2005 to the most recent available data from 2015 exclusively in the coastal zone. The most notable changes were a 30% loss of vacant land, resulting from changes to mostly wooded land uses. Most of this could be attributable to variability when assigning land use categories from one year to the next without actual changes on the ground. To a lesser degree, vacant land was also found to be converted to utility (765 acres), transportation (415 acres), manufacturing (329 acres), commercial (330 acres), and recreational (292 acres) uses. Military losses are attributable to redevelopment of the Philadelphia Navy Yard. Also of note is a loss of nearly all mining operations due to changes in sand and gravel operations by Waste Management Inc. in Falls Township. Alternatively, during the 10-year period, commercial land uses grew by almost 30% throughout the entire coastal zone, followed by expansion of utility, manufacturing, transportation, and community services land uses.

Table 5.5: How Land Use Is Changing in the DECZ, Based on DVRPC Data (2005-2015)

Land Use Type	Land Area Coverage in 2005 (Acres)	Land Area Coverage in 2015 (Acres)	Gain/Loss (Acres)
Wooded	8,081	9,882	1801
Utility	2,206	3,597	1391
Commercial	3,284	4,605	1321
Manufacturing	4,347	5,338	991
Transportation	5,599	6,341	742
Community Services	1,440	1,908	468
Water	15,073	15,192	119
Residential: Single-Family Detached	12,186	12,287	101
Recreation	3,389	3,483	93
Residential: Mobile Home	189	166	-23
Residential: Multi-Family	2,213	2,146	-67
Agriculture	350	221	-128
Parking	3,433	3,263	-170
Mining	473	36	-437
Military	455	143	-312
Vacant	7,641	5,907	-1734

Note: DVRPC Land Use datasets produced using orthophotography interpretation and heads-up digitizing.

Table 5.6 provides information specifically on conversions of the wooded land use. While the wooded land use category overall saw growth in the past 10 years there were 1,040 acres of wooded land in 2005 changed to a different land use in 2015. 26% of this was converted to vacant, which, as discussed previously could be due to category assignment inconsistencies or actual land clearing to prepare for development. More obvious is a conversion of 17% to single family homes, in addition to 12% for utility and 11% for recreation. Most of these new developments appear to be occurring in Bensalem, Bristol, Lower Southampton, and Middletown Townships in Bucks County.

Table 5.6 Wooded Land Converted to New Land Use, Based on DVRPC Data (2005-2015)

New Land Use in 2015	Land converted (acres)
Vacant	272
Residential: Single-Family	176
Utility	124
Recreation	113
Water	76
Transportation	75
Commercial	59
Parking	40
Manufacturing	35
Community Services	32
Residential: Multi-Family	31
Agriculture	6

4. *Briefly characterize how the coastal shoreline has changed in the past five years due to development, including potential changes to shoreline structures such as groins, bulkheads and other shoreline stabilization structures, and docks and piers. If available, include quantitative data that may be available from permitting databases or other resources about changes in shoreline structures.*

   According to the NOAA's Environmental Sensitivity Index (ESI), over half of shorelines in the DECZ are developed and armored. Details are presented in Table 5.7.

Table 5.7: DECZ ESI Shoreline Type (2014)

Armored	52.22%
Vegetated	37.82%
Rocky and steep shorelines	7.51%
Beaches	2.44%

There is not ESI shoreline data available for the LECZ, however, CRMP created a comprehensive shoreline structures database for the Lake Erie shoreline in 2008. It is summarized in Table 5.8. The LECZ is more natural and significantly less armored as compared to the DECZ shoreline.

Table 5.8: LECZ Shoreline Structure Inventory

Attached Breakwater	3	Retaining wall	85
Boat Ramp	11	Dock	1
Groin	167	Seawall/Bulkhead	15
Landing	1	Revetment	8
Other	10	Rubble Remnant	60
Pier	16	Unknown	48

In the last five years, there have been relatively minimal changes to DECZ and LECZ coastal zone shorelines. CRMP maintains a federal consistency request database that captures relevant Chapter 105 Water Obstruction and Encroachment permit applications. These projects may have been completed or are in progress. According to the consistency database, there were nine proposed projects that may result in changes to the DECZ shoreline and seven to the LECZ shoreline (See Tables 5.9 and 5.10). However, most of these projects did not propose major changes to the shoreline.

Table 5.9: Federal Consistency Requests Along the Shoreline of the DECZ (2015-2019)

Year of Consistency Request	Brief description
2015	Installation of 3 floating barges at Penn's Landing Marina in Philadelphia for Spruce Street Harbor Park
2015	Demolition of the Festival Pier and Spring Garden Street Pier in Philadelphia to be converted into an enhanced mitigation area for underwater habitat
2015	Modifications of existing Sunoco dock to allow for the loading of ethane, butane, and propane to marine vessels for Mariner East project
2016	Construction and maintenance of a new firewater intake structure at existing dock at the Marcus Hook Industrial Complex
2017	Construction of a floating small watercraft dock on the Poquessing Creek in Philadelphia
2017	Addition of 5,000 square feet of floating dock to the existing floating dock south of the Independence Seaport Museum on the Delaware River in Philadelphia

2018	Construction of the Adelphia Gateway project, including multiple pipelines and a compressor station at Marcus Hook on the Delaware River
2019	Development of Autoport at the Southport redevelopment at the Philadelphia Navy Yard, requiring filling of wetlands (to be mitigated) and portions of the Delaware River floodway
2019	Construction of pilings and a floating dock on the Schuylkill River for public safety

Table 5.10: Federal Consistency Requests Along the Shoreline of the LECZ (2015-2019)

Year of Consistency Request	Brief description
2015	Construction of personal watercraft boat lift on Niagara Pier in Presque Isle Bay
2016	Construction of the Lake Erie Connector, a 72.4-mile electric transmission interconnection to transfer electricity between Canada and US (proposed)
2016	Replenishment of beach sand and tombolo removal and redistribution at Presque Isle
2017	Installation of non-permanent floating restaurant and bar in the East Basin of Presque Isle Bay
2018	Construction of the East Canal Basin Outfall associated with the construction of a hotel in the City of Erie
2018	Installation of a new groin in Lake Erie in Millcreek Township
2019	Replacement of deteriorated seawall along East Dobbins Landing with a new steel sheet pile seawall, including necessary fill and limited dredging

5. *Briefly 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, shoreline hardening, and habitat fragmentation, since the last assessment.*

   Results of DEP stream assessments by coastal zone and source/impairment are presented under question 2 of the In-Depth Resource Characterization section that follows.

ii. 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.*

   Table 5.11 indicates that there have been significant changes in management of cumulative and secondary impacts management at the state level. These changes are described under question two below the table.

Table 5.11: Significant Changes in Management of Cumulative and Secondary Impacts of Development

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	Y	Y	Y
Guidance documents	Y	Y	N
Management plans (including SAMPs)	Y	Y	Y

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.*

Statutes, regulations, policies, or case law interpreting these

Act 68 of 2013, Act 123 of 2014, and Act 62 of 2016
These recently passed laws assist municipalities to generate revenue to address stormwater management requirements. Act 68 amends the Pennsylvania Municipalities Authorities Act authorizing the formation of an authority for the purpose of stormwater planning, management, and implementation. Act 123 also amends the Municipalities Authorities Act to provide that the reasonable and uniform rates of a storm water authority may be based on property characteristics which may include best management practices (BMPs). Act 62 amends the Second Class Township Code, allowing the aforementioned township to assess fees for stormwater management activities without the need to establish a municipal authority. There were similar bills introduced in 2019 to extend this allowance to boroughs, incorporated townships, third class cities, and first class townships.

Act 34 of 2020
This Act amends the Pennsylvania Sewage Facilities Act and allows the use of "alternative systems" for planning purposes throughout the Commonwealth. Currently, DEP only allows for "conventional systems" to be used in site planning. Once the lots are created, "alternative systems" may then be installed. Allowing for "alternative systems" in the planning process would widen the area to which development can take place and save valuable acreage that could otherwise be used for agriculture.

National Pollutant Discharge Elimination System (NPDES) General Permit for Concentrated Animal Feeding Operations ("PAG-12")
DEP issued its new NPDES General Permit for Operation of CAFOs (PAG-12) in April 2018, to update the previous PAG-12 from 2013. Significant modifications include, reporting requirements and fees, leak detection system sampling, and earthen manure storage facility inspections. The 2018 General Permit was amended again, becoming effective January 1, 2021. These new modifications included permit expiration dates, annual reports serving as Notice of Intent, removal of automatic expiration of coverage language, and requirements for daily water line inspections at larger CAFOs for leaks.
https://www.dep.pa.gov/Business/Water/CleanWater/AgriculturalOperations/CAFOs/pages/default.aspx

National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4) ("PAG-13")

DEP reissued its PAG-13 General Permit that covers stormwater discharges from small MS4s, effective March 2018. The 2018 permit created additional requirements and increased overall protection to water quality, especially waters impaired by nutrients and sediments. These changes included required Pollution Control Measures for discharges to all impaired waters (whether the waterbody has a total maximum daily load (TMDL) or not), Pollutant Reduction Plans for MS4s discharging to all nutrient or sediment-impaired waters without a TMDL (previously just included waters in Chesapeake Bay watersheds), and annual reports. Additionally, MS4s that discharge to nutrient- or sediment-impaired waters with an established TMDL must apply for an Individual Permit. DEP also developed a new model stormwater management ordinance, to replace the prior ordinance from 2013, to satisfy MS4 and the PA Stormwater Management Act (Act 167) requirements. Small MS4s are expected to update their existing ordinances to be consistent by September 30, 2022.

There are seven municipal small MS4s in the LECZ (Girard Twp, Lake City Borough, Fairview Twp, Millcreek Twp, Erie City, Lawrence Park Twp, and Harborcreek Twp). Millcreek and Harborcreek Townships are required to obtain an Individual Permit, while the remaining qualify for the General Permit. In the DECZ, all coastal zone municipalities fall within the urbanized area and are regulated MS4s. The City of Philadelphia is one of Pennsylvania's only two large MS4s.

While this was not a CZM-driven change, the program supports activities that address stormwater, including past funding to the Eastern Delaware County Stormwater Collaborative and the Erie County Municipal Stormwater Assistance Program.

USACE Pennsylvania State Programmatic General Permit-5 (PASPGP-5)

USACE's current 5-year general permit became effective July 1, 2016 and authorizes work for activities that would cause no more than minimal adverse environmental effects. There are several significant changes from PASPGP-4, including no longer covering projects that will result in a permanent loss of more than 1,000 linear feet of stream and some activities that DEP could previously issue a PASPGP permit for are now required to be reported to the USACE for processing. DEP reviewed PASPGP-5 for certification under Section 401 of the Federal Clean Water Act and for consistency with CRMP's enforceable policies as required under Section 307 of CZMA.

Living Shorelines Nationwide Permit

USACE revised and renewed its nationwide permits in 2017 to expedite review of projects that have minimal impact on the aquatic environment. The current permit (NWP 54) covers the construction and maintenance of living shorelines, a technique to protect coastal property from erosion while providing some aquatic habitat and water quality benefits. This is a federal, not CZM-driven change, but CRMP has been involved in funding the planning and continued implementation of a mussels living shoreline project at Bartram's Garden in Philadelphia. CRMP was also involved in the development of Lardner's Point Park along the Delaware in Philadelphia's Tacony neighborhood, which integrated living shoreline concepts with its construction in 2012. Despite issues with maintaining the living shoreline features

here, it provided a learning opportunity. In October 2019, DEP proposed a new general permit under the Solid Waste Management Act to authorize the processing and beneficial use (by shell planting, reef construction and living shoreline stabilization/enhancement) of post-consumer oyster shells for natural habitat restoration projects in the Delaware Estuary or other shoreline and subtidal areas.

Guidance Documents

DEP Soil Erosion and Sediment Control Manual for Agricultural Operations
DEP published a new technical guidance document under authority of The Clean Streams Law and the Erosion and Sediment Control regulations of the DEP, 25 Pa. Code 102 in October 2019. This guidance explains requirements of an Agricultural Erosion and Sediment Control Plan, which is required for activities that disturb 5,000 square feet or more (including plow/till, no-till, or Animal Heavy Use areas). This new manual provides assistance to farmers to comply with regulations which will ultimately minimize the potential for accelerated erosion and sedimentation to waters of the Commonwealth.
http://www.depgreenport.state.pa.us/elibrary/GetFolder?FolderID=96082

DEP Implementation Guidance for NPDES Concentrated Animal Feeding Operation (CAFO) Permits and Water Quality Management Permits for Manure Storage Facilities
DEP published new guidance in 2018 to assist applicants and regional permitting staff in the preparation and review of NPDES CAFO permits and Water Quality Management permits for manure storage facilities. This change will have a limited impact on the coastal zones due to the lack of CAFOs/associated impacts.
http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=13531&DocName=IMPLEMENTATION%20GUIDANCE%20FOR%20NPDES%20CAFO%20PERMITS%20AND%20WATER%20QUALITY%20MANAGEMENT%20PERMITS%20FOR%20MANURE%20STORAGE%20FACILITIES.PDF

DEP Municipal Stormwater Guidance
DEP has developed several resources to assist MS4s in understanding and meeting their obligations under the program, including requirement tables and a web-based GIS application to represent information contained in these resources. In 2018, DEP also released a “Pollutant Reduction Plan Mapping Basics” web-based training course on its new Clean Water Academy website at https://pacleanwateracademy.remote-learner.net. More recently, DEP has started work to update its existing Stormwater BMP Manual, previously published in 2006. The modernized guidance document will be released next assessment period.
https://www.dep.pa.gov/Business/Water/CleanWater/StormwaterMgmt/Stormwater/Pages/PRPTMDL-Plans.aspx

City of Philadelphia Guidance
While not statewide changes, it is worthwhile mentioning updates to several Philadelphia documents, including its Stormwater Management Guidance Manual, updated July 2018. This is a comprehensive resource for the development community, designed to help the applicant navigate the PWD’s review, construction, and post-construction maintenance processes and demonstrate compliance with the Stormwater Regulations. The City of Philadelphia also updated its Green Stormwater Infrastructure Planning & Design Manual. This document is a resource for planners and designers seeking guidance on the process for creating

green stormwater infrastructure.
https://www.pwdplanreview.org/manual/introduction
http://philadelphiawater.org/gsi/planning-design/manuals.html

Management Plans

Philadelphia's Green City, Clean Waters Plan
Philadelphia continues to implement its 25-year CSO Long Term Control Plan, adopted in 2011. The plan aims to reduce the volume of stormwater entering local waterways by about eight billion gallons per year by 2036.
https://www.phila.gov/water/sustainability/greencitycleanwaters/Pages/default.aspx

Delaware Estuary Comprehensive Conservation & Management Plan (CCMP)
The PDE revised its CCMP document in 2019 to guide environmental agencies and organizations activities to protect the Delaware Estuary over the next 10 years. The new Plan sets eight main goals, many which address cumulative and secondary impacts. The "Clean Waters" theme in the Plan seeks to: 1) reduce nutrient pollution and its impact and 2) reduce other pollutants, including contaminants of emerging concern, and their impacts. Under its "Healthy Habitats" theme, the Plan seeks to: 1) prevent wetland loss and 2) stem forest loss. DEP is a core partner of the Delaware Estuary Program and participates in development and implementation of the CCMP.
http://www.delawareestuary.org/our-plan-2/

Great Lakes Water Quality Agreement 2019 Progress Report of the Parties
This 3-year report is prepared by the partners of the 2012 Great Lakes Water Quality Agreement (GLWQA) to report on accomplishments since the previous publication. This report focused on 12 basin-wide key accomplishments. In Lake Erie, the development of the Pennsylvania Invested in Environmental Sustainability Plus Program to promote sustainable practices in agriculture and DEP funded water quality improvements at 85 outfalls were highlighted as significant accomplishments.
https://binational.net/wp-content/uploads/2019/06/Final-2019-PROP-English-June-7.pdf

Nutrients & The GLWQA
Under the 2012 Agreement Annex 4 (Nutrients), the US and Canada adopted phosphorus reduction targets in 2016. Subsequently, DEP published a Phosphorus Reduction Domestic Action Plan in 2017 and participated in development of the U.S. Action Plan for Lake Erie in 2018 and a Binational Phosphorus Reduction Strategy in 2019. The goal is to reduce nutrient loadings to the Lake and minimize problems of excessive algal growth. Pennsylvania's 2017 Plan sets to implement the following tactics: 1) provide greater assurance of phosphorus loading estimations, 2) prioritize delivery of nutrient reduction programs to central basin tributaries, and 3) partner with county/local governments, and non-governmental organizations. The Great Lakes Program within DEP is responsible for Pennsylvania's GLWQA activities and coordinates closely with CRMP.
https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Great%20Lakes%20Program/Pages/Great-Lakes-Water-Quality-Agreement.aspx
https://www.epa.gov/sites/production/files/2018-03/documents/us_dap_final_march_1.pdf

Lake Erie Lakewide Action and Management Plan
A draft 2019-2023 Lakewide Action and Management Plan (LAMP) was released for review and comment in 2019 as required under the GLWQA. The Plan includes an assessment of ecosystem condition (discussed more in the In-Depth Resource Characterization of this section), identifies threats, sets priorities for research and monitoring, and identifies a total of 41 further actions to address threats. Relevant actions related to cumulative and secondary impacts are to implement strategies to monitor and address nutrients and bacterial pollution, point and nonpoint source chemical contaminants, and improve aquatic habitat regarding shoreline softening. https://binational.net/2019/06/27/2019-erie-lamp-paap/

Pennsylvania Lake Erie Watershed Integrated Water Resources Management Plan
Finalized in 2015, the Plan provides information and data that supports informed decision-making regarding the management of water resources and guides users to the areas in the watershed where restoration, conservation, and/or monitoring projects are needed. DEP provided funding and collaboration on this Plan, along with PASG and the Erie County Conservation District. http://seagrant.psu.edu/sites/default/files/PALE%20IWRM%20Plan%20-%20FINAL.pdf

iii. 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.*

CRMP considers secondary and cumulative impacts as a program priority and selected polluted runoff as a Section 312 performance metric for the current period. Secondary and cumulative impacts are integrated with multiple coastal hazards and are a significant cause of water quality degradation. Addressing cumulative and secondary impacts are an integral part of building climate resiliency. 15 stakeholders responded to the cumulative and secondary impacts question: eight selected it as a high priority (over half), six as a medium priority, and one as a low priority. Three out of four CZAC members who responded considered this assessment area to be a high priority.

b. Phase II (In-Depth) Assessment

i. In-Depth Resource Characterization:

Purpose: To determine key problems and opportunities to improve the CMP's ability to address cumulative and secondary impacts of coastal growth and development.

1. *What are the three most significant existing or emerging cumulative and secondary stressors or threats within your coastal zone? Indicate the geographic scope of the stressor, i.e., is it prevalent throughout the coastal zone, or are there specific areas that are most threatened? Stressors can be coastal development and impervious*

surfaces; polluted runoff; agriculture activities; forestry activities; shoreline modification; or other (please specify). Coastal resources and uses can be habitat (wetland or shoreline, etc.); water quality; public access; or other (please specify). When selecting significant stressors, also consider how climate change may exacerbate each stressor.

Tables 5.12 and 5.13 indicate significant stressors and threats from secondary and cumulative impacts occurring in Pennsylvania's coastal zones. Urban runoff is considered significant in both coastal zones. Question number two, below the tables, provides an explanation as to why these are considered the most significant stressors and threats.

Table 5.12: Three Most Significant Existing or Emerging Stressors or Threats in the DECZ

	Stressor/Threat	**Coastal Resource(s)/Use(s) Most Threatened**	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	Urban runoff and resulting siltation and flow alterations	Aquatic habitat	Entire DECZ
Stressor 2	Legacy industrial contamination, including PCBs	Fish and wildlife	Tidal portions of the Delaware River
Stressor 3	Coastal development	Wetlands and forested land	Bucks and Delaware Counties

Table 5.13: Three Most Significant Existing or Emerging Stressors or Threats in the LECZ

	Stressor/Threat	**Coastal Resource(s)/Use(s) Most Threatened**	**Geographic Scope** (throughout coastal zone or specific areas most threatened)
Stressor 1	HABs	Water quality	Presque Isle Bay and Lake Erie
Stressor 2	Urban runoff and resulting siltation and flow alterations	Aquatic habitat	Presque Isle Bay and its tributaries, tributaries to the Lake (to a lesser degree)
Stressor 3	Malfunctioning septic and sewage systems	Water quality	Lake Erie watershed

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

   Table 5.14 presents the results of DEP stream assessments completed for Clean Water Act Section 305(b) reporting and Section 303(d) listing within the DECZ. The table provides information on the impaired use, sources of impairment, and causes of impairment.

Table 5.14: Impaired Streams in the DECZ

Assessed streams	195 miles
Impaired streams	187 miles
Impaired use: Source of impairment – Cause of impairment	**Percent of assessed streams:***
Fish Consumption:	**54.2%**
Source Unknown – Polychlorinated biphenyls (PCBs)	53.9%

Source Unknown – Mercury	0.3%
Aquatic Life:	**42.0%**
Urban runoff/storm sewers – Flow regime modification	26.3%
Urban runoff/storm sewers – Siltation	25.1%
Habitat modification (other than hydromodification) - Habitat alterations	15.9%
Urban runoff/storm sewers – Habitat alterations	13.3%
Urban runoff/storm sewers – Cause unknown	8.6%
Municipal point source discharges – Organic enrichment	6.5%
Agriculture – Nutrients	5.7%
Municipal point source discharges – Nutrients	4.4%
Source unknown – Siltation	4.3%
Municipal point source discharges – Cause unknown	2.3%
Agriculture – Cause unknown	2.2%
Channelization – Flow regime modification	1.3%
Industrial point source discharge – Organics	1.2%
Landfills – Cause unknown	1.2%
Landfills – Metals	1.2%
Combined Sewer overflows – Organic enrichment	1.1%
Urban runoff/storm sewers – Dewatering	1.1%
Urban runoff/storm sewers – Nutrients	0.1%
Recreational:	**18.8%**
Source unknown – Pathogens	17.6%
Municipal point source discharges – Pathogens	1.2%

*Percentage values may exceed 100% as stream reaches can be impaired for multiples uses, sources, and causes

Approximately 96% of assessed streams in the DECZ have been listed as impaired for fish consumption, aquatic life, and/or recreational uses. A high source of impairment is urban runoff/storm sewers, responsible for over 70 miles of impacted streams in the DECZ, totaling over 50% of assessed tributaries to the Delaware River. The effects of urbanization can be seen with impacts to natural flow regimes, where assessments found water/flow variability in over 51 miles of DECZ streams. Impervious surfaces result in minimized infiltration and runoff is quickly conveyed to streams, causing bank erosion, incised channels, and minimized baseflow. 49 miles of streams in the DECZ are impaired by this siltation caused by urban runoff, which causes aggradation of sediments in excess of what streams can support, resulting in observed habitat alteration impacts to 26 miles of streams. The Delaware River Watershed Initiative identifies urbanization as the greatest stressor to the Upstream Philadelphia Cluster. PDE's 2017 Technical Report for the Estuary and Basin, discussed later in this section, ranks changes in land cover with increasing development and declining forests as the top negative finding with a "near detrimental" impact.

The most widespread cause of impairment found in the DECZ is Polychlorinated biphenyls (PCB) contamination. While assessments noted their source as "unknown", the compounds predominately originate from legacy industrial operations and continue to enter the environment from various sources, including contaminated sites, nonpoint sources, industrial and municipal point source discharges, sediment in the river and its tributaries, the atmosphere, and CSOs. Despite their ban in the late 1970s, PCBs, and other legacy industrial contaminants, persist as a water quality and human health issue in the Delaware Estuary. DRBC has

headed efforts over the last 20 years to address PCB contamination by developing a TMDL for the DECZ section of the River in 2003, adopting an updated water quality criterion, and requiring dischargers to complete Pollutant Minimization Plans. From 2005-2016, the top 10 PCB point sources have decreased their loadings by 76%. DRBC's 2019 State of the Bay report rates the issue of contaminants as "fair". In addition to PCBs, the toxic elements and compounds of concern in the DECZ include metals, pesticides, and polycyclic aromatic hydrocarbons (PAHs). Minor declines in these substances could occur with improvements in water quality, however, it is more likely that levels will remain relatively stable. Accurately detecting trends in these contaminants is difficult due to lack of historic datasets. DRBC expects an increasing need to coordinate criteria and assessment methodologies in the future as analytical measurement methods and models for these substances improve.

Coastal development is a significant threat to wetland and forested land and has contributed to significant habitat fragmentation. NOAA's C-CAP

Land Cover Atlas data was extracted by the DECZ coastal zone boundary and analyzed by county, as shown in Table 5.15. The NOAA C-CAP Land Cover Atlas data is described in the Wetlands section (D.1).

Table 5.15: Summary of Natural Land Conversion in the DECZ, Based on NOAA C-CAP Land Cover Atlas Data (1996-2010)

	Delaware County Coastal Zone	**Philadelphia Coastal Zone**	**Bucks County Coastal Zone**
Natural land lost to development 2006-2010	13.8 acres (of 12,664 total acres)	13.6 acres (of 18,481 total acres)	149 acres (of 43,434 total acres)
Predominant land converted	• 60% deciduous forest • 24% palustrine forested wetland • 10% estuarine emergent wetland	• 34% deciduous forest • 21% unconsolidated shore • 16% grassland • 15% palustrine forested wetland	• 53% deciduous forest • 22% scrub/shrub • 14% palustrine forested wetland

Note: The 2016 C-CAP data was not available at the time of the Cumulative and Secondary Impacts Assessment and the most recent data (2010) was used per NOAA guidance.

Within the span of five years, 149 acres of natural land was developed within Bucks County and converted to low (40%), medium (29%), and high-intensity development (17%), in addition to developed open space (15%). In all DECZ areas, deciduous forest experienced the most loss, followed by loss of scrub/shrub and palustrine wetlands. Areas of forest loss were generally spread evenly throughout the coastal zone.

A brief analysis of selected sites using aerial photography found most loss was attributable to new residential, commercial, warehouse, and industrial structures, new and expanded parking lots, construction of water detention basins, in addition to construction of the new soccer stadium in Delaware County. Overall, development continues at a steady pace despite minimal population growth. Loss of unconsolidated shore in Philadelphia was due to changing water levels in artificial inland holding ponds. Small losses of natural areas from the built landscape of southeast Pennsylvania should be minimized as these areas only make up 20% of the DECZ, as compared to 60% of the zone being developed. Impervious surfaces from these new developed areas increase stormwater runoff, as compared to

natural areas, further aggravating siltation and flow variability discussed in Stressor #1.

These three main DECZ stressors directly align with the three primary factors that impact health of the Delaware Basin identified by DRBC in their 2019 State of the Basin Report. These include: 1) point and nonpoint source pollution, 2) climate change associated rising sea levels, flooding, and droughts, and 3) population growth and development.

Results of DEP stream assessments completed for Clean Water Act Section 305(b) reporting and Section 303(d) listing within the LECZ are shown below in Table 5.16 summarized by impaired use, sources of impairment, and causes of impairment:

Table 5.16: Impaired Streams in the LECZ

Assessed streams	131 miles
Impaired streams	48 miles
Impaired use:	**Percent of assessed streams:***
Aquatic Life	**20.9%**
Agriculture - Siltation	3.7%
Urban runoff/storm sewers - Siltation	3.7%
Rural (residential areas) - Siltation	2.7%
Crop production - Siltation	1.9%
Crop production - Nutrients	1.9%
Municipal point source discharges - Siltation	1.8%
Site clearance (land development or redevelopment) - Siltation	0.9%
Site clearance (land development or redevelopment) – Flow regime modification	0.9%
Site clearance (land development or redevelopment) – Habitat alterations	0.9%
Urban runoff/storm sewers – Habitat alterations	0.9%
Golf courses - Siltation	0.7%
Recreation and Tourism (non-boating) - Siltation	0.6%
Streambank modifications/destabilization - Siltation	0.3%
Highway/road/bridge runoff (non-construction related) - Siltation	0.3%
Recreational	**19.9%**
Source Unknown - Pathogens	19.9%
Fish Consumption	**3.1%**
Source Unknown – Polychlorinated biphenyls (PCBs)	3.1%

Percentage values may exceed 100% as stream reaches can be impaired for multiples uses, sources, and causes.

HABs are a reemerging issue in the Lake Erie basin, beginning in the late 1990s in the western basin, and have been increasing in frequency and distribution in the central and eastern basin, including Presque Isle Bay. The draft 2019-2023 LAMP, summarized previously under Table 5.11, identifies nutrients and bacterial pollution as one of the five priority threats to Lake Erie. HABs are mainly attributed to warm waters and phosphorus loading, particularly soluble reactive phosphorus (SRP) found in sewage and fertilizers. According to Lake Erie phosphorus loading research conducted by Moccoux et al., summarized later in this section, half of SRP originated from nonpoint sources and approximately 40% from point sources. These

contributions by tributaries can be especially high during periods of stormwater runoff. HABs pose a risk to human health through drinking water contamination and recreational contact, including its associated economic revenue generated from tourism. HABs in small farm ponds have resulted in numerous livestock and dog illnesses and deaths. They can also impact fish communities by decreasing levels of dissolved oxygen and degrade nearshore and wetland habitats. Climate change is anticipated to exacerbate HABs as water temperatures continue to increase, ice cover decreases, and stormwater runoff that delivers most of the phosphorus to the lake will increase with more severe and frequent storm events. A 2016 study by Diz and Campbell, summarized in the In-Depth Management Characterization section under Table 5.19, modeled a 163% increase in the maximum concentration of microcystins from a 1 degree increase in water temperature.

Urban runoff negatively impacts streams in the LECZ including portions of tributaries to Presque Isle Bay, Walnut Creek Watershed, and many other unnamed tributaries. 65% of LECZ streams assessed as impaired for aquatic life are due to siltation linked to development. Untreated runoff in the LECZ can be attributed to large, contiguous impervious areas with little stormwater management infrastructure. As populations in the LECZ grew through the 1900's, these impervious areas created an environment where the volume of water entering streams after a significant rainfall caused stream bank and ravine erosion, stream scour and streambed down cutting, and sediment laden water to enter Lake Erie. Urban runoff causes many impacts on coastal resources by increasing sedimentation in Presque Isle Bay and the nearshore coastal zone, reducing aquatic habitat through high volume flows, increasing water treatment costs for public water treatment plants, forcing beach closures along Presque Isle State Park, and impairing almost 14 miles of LECZ stream reaches.

A third identified stressor/threat to LECZ resources are malfunctioning on-lot septic and sewage treatment and discharge systems that release improperly treated wastewater. There are 181 (2 more since last assessment) active water discharges within the state's Lake Erie watershed that are registered in Pennsylvania's Environment Facility Application Compliance Tracking System. That number does not include residential septic systems. 23 (1 more discharge since 2015) of these discharges are municipal sewage treatment systems, 140 industrial, 7 mineral use, and 11 commercial discharges. According to the Lake Erie Phosphorus Reduction Domestic Action Plan, there are 166 permitted Non-Publicly Owned Wastewater Treatment Systems and Small Flow Treatment Facilities (SFTF) in Pennsylvania's central basin tributaries. The county has the greatest number of SFTFs in the state. The Erie County Department of Health notes that a significant percentage of these systems were in noncompliance for violations such as lack of disinfection, inadequate operation and maintenance, and failure to submit reports. Malfunctioning municipal and residential systems contribute bacteria and other pathogens, nutrients, improperly disposed household chemicals, pharmaceuticals, and other contaminants. Most notable is the impact on the state's 10 permitted beaches along the lake, which include nine beaches on Presque Isle and Freeport Beach in North East Township. According to EPA's Beach Advisory and Closing Online Notification system, from 2015-2019, monitored Pennsylvania beaches along Lake Erie were under advisory for 316 days or about 7% of the swim season and closed for a total of 5 days due to elevated bacteria (and 8 days due to other reasons). Beach advisories and closures were greatest in 2016-2018 and lowest

most recently in 2019. 19% of samples taken at these monitored beaches exceeded the single sample E. coli criteria of 235 CFU/100 mL. Table 5.17 shows the frequency of samples exceeding this threshold from 2015-2019, by beach.

Table 5.17: Frequency of Samples Exceeding Single Sample E. Coli criteria at Pennsylvania Lake Erie Public Swimming Beaches

Beach Name	% of samples exceeding criteria	Min	Max	Avg
		(CFU/100 mL)		
Beach 1 East	10.4%	4	1640	92
Barracks Beach	9.3%	4	1510	95
Beach 6	8.1%	4	1510	84
Beach 7 (Water Works Beach)	7.6%	4	1460	84
Beach 8 (Pettinato Beach)	10.0%	4	1450	94
Mill Road Beaches	11.1%	4	3100	115
Beach 9 (Pine Tree Beach)	7.9%	4	1180	66
Beach 10 (Budny Beach)	6.4%	4	880	65
Beach 11	13.7%	4	3100	118
Freeport Beach	5.7%	4	1290	65

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.*

   Table 5.18 shows emerging issues of concern for the DECZ and LECZ associated with cumulative and secondary impacts. The table also indicates the information needed to better understand and address the emerging threats.

Table 5.18: Emerging Issues of Concern and Information Needed in the DECZ and LECZ

Emerging Issue	Information Needed
Emerging contaminants – Perfluorinated chemicals, brominated flame retardants, pharmaceuticals and personal care products, hormone, detergents	More data needed for fish consumption advisories, occurrence levels and sources, to set water quality criteria
Microplastics	Attachment of persistent pollutants onto plastic particles; Impacts on aquatic organisms; Amounts passing through sewage treatment systems
Reliable climate change predictions and impacts on current stressors	Reliable SLR/lake level change, flooding, extreme weather models to predict affected areas; Strategies to address impacts of climate change

ii. In-Depth Management Characterization

Purpose: To determine the effectiveness of management efforts to address identified problems related to the cumulative and secondary impacts enhancement objective.

1. *For each additional cumulative and secondary impact management category below that is 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.*

Table 5.19 indicates there were additional changes to management of cumulative and secondary impacts. These changes are described in more detail in question two below the table.

Table 5.19: Significant Changes to Management of Cumulative and Secondary Impacts of Development in the DECZ and LECZ

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)
Methodologies for determining cumulative and secondary impacts	Y	Y	N
Cumulative and secondary impacts research, assessment, monitoring	Y	Y	Y
Cumulative and secondary impacts GIS mapping/database	Y	Y	Y
Cumulative and secondary impacts technical assistance, education and outreach	Y	Y	Y

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.*

Cumulative and secondary impacts research, assessment, monitoring

Clean Water Act Updated Stream Assessments
Lake Erie tributary streams were reassessed by DEP for aquatic life and recreation use in 2016. Results from this monitoring are included in the impaired streams tables described above under In-Depth Resource Characterization, question #2. Between the 2016 to the 2018 303(d) listing and 305(b) report to EPA, eight miles of streams in the Chautauqua-Conneaut Watershed previously attaining their aquatic life use were reassessed as impaired. In the same watershed, an additional 491 miles of streams not previously assessed were examined for recreational use. For the first time, DEP has presented the 2018 Integrated Report in an interactive format, described in the GIS Mapping/Database management category later in this section. Resulting information will be used to better inform the public and stakeholders on the current condition of coastal streams and be utilized to protect and improve these waters.
https://padep-1.maps.arcgis.com/apps/View/index.html?appid=bc6729013e93428ca6603a32238f83bb

PA Perfluoroalkyl and polyfluoroalkyl substances (PFAS) Response and Monitoring
Pennsylvania organized its PFAS Action Team in 2018 under Executive Order, to include officials from 10 Commonwealth agencies and commissions. Its goal is to research the sources of PFAS contamination, examine the scientific understanding of these chemicals, listen to residents who have been impacted by these chemicals,

and assert collective authorities to reduce human exposure to PFAS pollution. The Action Team published an initial report in 2019 with actions and recommendations. DEP began sampling for six PFAS chemicals in June 2019 and released a first round of statewide sampling results. Three of the four water systems sampled in Erie County found no detectable PFAS chemicals and one was tested at levels well below the statewide average. In early 2020, DEP created a new section within the Bureau of Safe Drinking Water specifically dedicated to researching and addressing (through assistance to the regions, guidance development, and regulatory development, as needed) emerging contaminants and assisting with responding to other water supply emergencies, such as chemical spills, treatment overfeeds, waterborne disease outbreaks, and other activities. After a six-month stoppage due to the pandemic, sampling resumed in August 2020. Samples collected in 2020 are being analyzed using EPA Method 537.1 for 18 PFAS. Sampling was completed in January 2021 and the results will be made available to the public. In addition, Drexel University is reviewing/evaluating toxicity data and studies and will be documenting its findings/recommendations in a final draft report to DEP.
https://www.dep.pa.gov/Citizens/MyWater/drinking_water/PFAS/Pages/default.aspx

DECZ

DRBC Delaware River and Bay Water Quality Assessment Report
This biennial report presents the extent to which waters of the Delaware River and Bay are attaining designated uses in accordance with DRBC's Water Quality Regulations. Overall results of the assessment are summarized below in Table 5.20 for the three zones that fall within the DECZ.

Table 5.20: Delaware River Water Quality Assessment Report by Assessed Use (Zones 2-4)

Designated Use:	Aquatic Life		Drinking Water		Recreation		Fish Consumption	
Year:	2016	2018	2016	2018	2016	2018	2016	2018
Zone 2	NS*	NS*	NS*	S	S	S	NS	NS
Zone 3	NS*	NS*	S	S	S	S	NS	NS
Zone 4	NS*	NS	N/A	N/A	S	S	NS	NS

S – The assessed use is supported
NS – The assessed use is not supported
N/A – No drinking water designated use in Zone 4
* Based primarily on fewer than 10% exceedances of criteria

https://nj.gov/drbc/quality/reports/wq-assessment-rpts.html

Emerging Contaminants Research
Initiated in the 2000s, DRBC has been working to understand and address emerging contaminants. During this reporting period, the Commission continued its ongoing monitoring for select contaminants (PFAS/PFC) in the mainstem of the Delaware River, in addition to partnering with other organizations to conduct research on these and other emerging substances. DRBC's Toxics Advisory Committee is currently working to develop a Contaminants of Emerging Concern Strategy.

DRBC Designated Use Study
Current DRBC regulations set the designated aquatic life use in Zones 3 and 4 (Tacony-Palmyra Bridge in Philadelphia and downstream to state border) for the

maintenance of resident fish and movement of migratory fish through these waters to and from spawning areas. In light of significant water quality improvements, DRBC approved a resolution in September of 2017 to study evidence on the reproduction of resident and migratory fish. While this was not a Section 309 or CZM-driven change, a 2017 coastal zone grant was provided DRBC to conduct a technical and economic evaluation of nutrient treatment to support goals of the updated designated use study. Additionally, CRMP is housed within the Compacts and Commissions Office within DEP, which coordinates the state's responsibilities as a member of interstate river basin commissions, including DRBC. The study may provide information to allow DRBC to revise water quality criteria and upgrade the designated use from maintenance (survival) with the goal of continued water quality improvement.
https://www.nj.gov/drbc/quality/conventional/designated-use.html

PASG has funded several relevant research projects over the last several years and are summarized below.

Occurrence Survey for Emerging Contaminants of Concern in Pennsylvania Tributaries of the Delaware River
This research conducted from 2012-2014 by Temple University sampled 10 sites above and below potential source discharges for 15 emerging contaminants of concern. Obtaining this environmental exposure research data will facilitate and inform initiatives aimed at assessing the occurrence of these emerging contaminants in order to begin to determine their fate, transport and any potential adverse effect implications within the Delaware River watershed.
http://seagrant.psu.edu/topics/ecosystem-health/research/occurrence-survey-emerging-contaminants-concern-pennsylvania

Assessment of the Spatial Distribution of Brownfield Sites in Chester, PA at Risk of Flooding and Release of Pollutants to the Delaware River
This 2014 study by Widener University combined modeling of hydrology, brownfield locations, and environmental risks to quantify the risk of contamination during extreme hydrologic events. The research concluded that 19 of the 31 identified brownfield sites were of concern to release potential contaminants, including heavy metals, heavy-ended hydrocarbons and arsenic.
http://seagrant.psu.edu/topics/stream-restoration-and-stormwater management/research/assessment-spatial-distribution

Living Shorelines Assessment for Community Resiliency in Coastal Pennsylvania
This study identifies locations amenable to living shoreline implementation with the DECZ using a 2-tiered rapid assessment methodology to assess potential locations and conditions. It also presents conceptual designs for 3 locations, Bartram's Garden, Windy Point, and Paine's Park along the Delaware and Schuylkill Rivers.
https://s3.amazonaws.com/delawareestuary/PDE+Reports/18-04_Living-Shorelines-Assessment-for-Community-Resiliency-in-Coastal-Pennsylvania.pdf

LECZ

HAB Research and monitoring
The Erie County Department of Health HAB Task Force, formed in 2014, published the Lake Erie Harmful Algal Bloom Monitoring and Response Strategy for

Recreational Waters in 2017. Since then, the Regional Science Consortium (RSC) has monitored for cyanotoxins from currently 28 locations along the coastline and drinking water facilities. Toxin concentrations are reported to the Erie County Department of Health, DEP and DCNR at Presque Isle State Park. When thresholds are exceeded, advisories are posted warning against contact with the water. The Task Force has developed an interactive beach sampling map available at: https://eriecountypa.gov/departments/health/what-we-do/beach-sampling-results/harmful-algal-blooms/
https://seagrant.psu.edu/topics/pa-coastal-ecosystems/harmful-algal-blooms/resources

To coordinate HAB awareness, monitoring, and management activities, several Commonwealth agencies and commissions – including DEP, DCNR, the Department of Health, the Fish & Boat Commission, the Game Commission, and PEMA – formed the Pennsylvania HABs Task Force. https://www.dep.pa.gov/HABs

A 2016 Coastal Zone grant provided to RSC examined the relationship between cyanobacteria cell counts, and cyanotoxin concentrations with other environmental parameters (water temp, air temp, wind speed, wind direction, relative humidity, and rainfall). Results were able to make some connections (more HABs with warmer winters, nutrient runoff from storm events), but more work needs to be done to develop a successful predictive model. A PASG funded study to Gannon University sought to determine the factors that contribute to HABs specifically in Presque Isle Bay. Samples and modeling results found that occurrence was affected by temperature (see Table 5.13). The model found reductions in dissolved phosphorus and sediment discharged from the watershed to the bay would reduce the abundance of microcystins, but it would require significant reductions over several years. CRMP provided funding again in 2018 to RSC to work with veterinarian clinics to determine dog illness and deaths related to HABs. RSC is currently looking to increase the frequency of sampling for anatoxin and saxitoxin, which are not routinely monitored since the focus of most analysis is on microcystin.

E. coli Research and Monitoring

Since its inception in 2006, DEP has participated in the interagency E. coli Task Force convened to study the causes of unprecedented beach closings at Presque Isle State Park. For the past 15 years, the E. coli Task Force and its representative organizations have dedicated much research, predictive modeling, and monitoring on this subject, partially funded by several coastal zone grants. Lake Erie tributaries were assessed by DEP for recreational contact use in 2016 and results were analyzed for the LECZ (see Table 5.16). Erie County Department of Health and RSC continue to monitor swimming beaches during the season, as discussed in this section previously (see Table 5.13). RSC also uses weather station and water quality buoys for real-time data to support predictive models. A PASG study published in 2014 by Mauro found no clear evidence that water temperature or phosphorus concentrations were related specifically to E. coli concentrations on Cladophora and attributed other unknown factors. As a result, the study suggests that Cladophora abundance should not be used as a basis for beach management decisions. More recently, RSC is utilizing 2019 CRMP funding to determine fecal and geographic sources to more effectively implement BMPs and regulations to reduce contamination.

https://seagrant.psu.edu/sites/default/files/Mauro%20Final%20Report%20%282012-14%29.pdf

Phosphorus Research - Total and Soluble Reactive Phosphorus Loadings to Lake Erie: A Detailed Accounting by Year, Basin, Country, and Tributary, Maccoux, et al.
Developed to support goals of Annex 4 of the GLWQA, this research estimates sources and loadings of annual total phosphorus (TP) (2003-2013) and SRP (2009-2013). Across Lake Erie, the study attributed loads to the following sources: nonpoint sources (71% TP, 49% SRP), point sources (19% TP, 39% SRP), atmospheric deposition and upstream sources (10% TP, 12% SRP). This was not a Section 309 or CZM-driven change, but was utilized, as much as scale issues allowed, to develop objectives of the Pennsylvania Lake Erie Phosphorus Reduction Domestic Action Plan.
https://www.sciencedirect.com/science/article/pii/S0380133016301460

Assessing Changes in the Presque Isle Bay Watershed Fish Community using a Modified Index of Biotic Integrity: Before and After the Elimination of CSOs
This study found significant increases in species richness and index of biotic integrity values over a 10 year period (2001-2011) at 12 locations on 4 tributaries to the bay. Despite these improvements, it describes the fish community as in poor condition.
https://link.springer.com/article/10.1007/s10661-013-3344-7

Cooperative Science and Monitoring Initiative under the GLWQA in Lake Erie
Lake Erie was monitored in 2019 under a 5-year research cycle. Lakewide priorities related to cumulative and secondary impacts include: Improved understanding of nutrient dynamics and nutrient-related issues and characterization of chemical contaminant loading and cycling. Data is still being analyzed.
https://www.epa.gov/great-lakes-monitoring/cooperative-science-and-monitoring-initiative-csmi

Cumulative and secondary impacts GIS mapping/database

2018 Interactive Integrated Report and Viewer
Pennsylvania is the first state in the country to present its Clean Water Act 303(d) listing and Section 305(b) in a fully interactive online format. This resource offers the ability to convey tremendous amounts of information in a way that is easy to understand. As a supplement to the Integrated Report, DEP has also created the 2018 Integrated Report Viewer, which provides enhanced search capabilities and export functions. This interactive application was developed by DEP, but is not a CZM-driven change. The combination of these two tools will greatly facilitate the public's access to water quality assessment information and better inform the public on the steps DEP takes every day to protect Pennsylvania's waters.
https://www.depgis.state.pa.us/2018_integrated_report/index.html

Impervious Cover Data for Lake Erie Watershed
A DEP Growing Greener grant to PASG funded development of a high-resolution impervious cover GIS layer for the entire watershed. An automated land cover feature extraction process was used to perform the impervious delineation using orthoimagery and lidar acquired in 2012. This was not a CZM-driven change, but utilized agency state funding. This data set is useful for local and regional stormwater planning. For long-term planning purposes, this dataset should be reproduced using similar methods with updated imagery and lidar in the future, if

funding is available.
https://www.pasda.psu.edu/uci/DataSummary.aspx?dataset=3160

DRBC Delaware Estuary Water Quality (Boat Run) Explorer
This interactive online application allows the users to explore water quality data collected from 1999-2016 by DRBC's Delaware Estuary Water Quality Monitoring Program. Since 1967, this data collection effort operates annually from Trenton, NJ to the mouth of the Delaware Bay. Users can select the water quality variable, data year, and river mile to display as box plots.
https://johnyagecic.shinyapps.io/BoatRunExplorer/

Pennsylvania Great Lakes Water and Land Technical Resources (WALTeR) website
The WALTeR web site was released in 2018 to serve as the "central" location for Great Lakes related data, studies, and information. Funding for WALTeR was provided by the DEP Growing Greener Program, Pennsylvania Sea Grant College Program, Pennsylvania State University, and Penn State Behrend.
https://pawalter.psu.edu/

Cumulative and secondary impacts technical assistance, education and outreach

MS4 Assistance and Stormwater Collaboration
DEP strongly encourages collaboration between MS4 permittees and has published a variety of resources to encourage these partnerships. In the LECZ, the Erie County Municipal Stormwater Assistance Program was created to help municipalities meet stormwater permit requirements, educate residents and decision makers on stormwater issues, and promote effective planning across the region. CRMP is providing financial support to the Erie County Department of Planning to support its municipalities in the following: 1) education and outreach, 2) data collection, information systems, and mapping, and 3) planning and administrative support.

The Eastern Delaware County Stormwater Collaborative is a partnership of 11 municipalities within the Darby and Cobbs Creek Watersheds. The collaborative was formed in 2010 to address MS4 permit requirements. Nine of the 11 municipalities worked to develop their Pollution Reduction Plan, which was finalized in 2019. The document includes information on public participation, mapping of outfalls and other discharges, description of pollutants of concern, BMP selection, identification of potential funding sources, and operation and maintenance activities.
https://www.dep.pa.gov/Business/Water/CleanWater/StormwaterMgmt/Stormwater/Pages/default.aspx
https://eriecountypa.gov/departments/planning-and-community-development/programs/municipal-stormwater-assistance/
http://www.edcsc.org/

Homeowner Septic Program Expansion
There were several changes to the existing program between the Pennsylvania Infrastructure Investment Authority (PENNVEST) and the Pennsylvania Housing Finance Authority to increase assistance to homeowners and protect water quality. Modifications to the program in 2016 expands eligibility criteria, increases loan amounts, and covers first-time sewer connections (not previously covered).
https://dced.pa.gov/programs/pennsylvania-infrastructure-investment-authority-pennvest/

Delaware River Watershed Initiative
This coordination effort was launched in 2014 to address stormwater, agricultural runoff, forest loss, and groundwater depletion in the entire Delaware River watershed. The initiative focuses on eight sub-watershed "clusters", one of which is the Upstream Suburban Philadelphia cluster in the DECZ. The William Penn Foundation provides grants to local partners for protection and restoration projects, in addition to high-level technical assistance and capital re-grant programs to support these local efforts.
https://4states1source.org/

Pennsylvania Vested in Environmental Sustainability (PA VinES)
This voluntary program was developed last assessment period and continues to be implemented by the Erie County Conservation District, funded by a 2016 DEP Growing Greener Grant. PA VinES seeks to reduce nutrient and sediment pollution to Lake Erie through outreach and education to the vineyard industry to implement BMPs. Interested growers can complete a self-assessment workbook, allowing them to become eligible to apply for Growing Greener grant funds to install BMPs on their operation, such as cover cropping and stabilized access roads.
https://www.erieconservation.com/pavines

Erie County Small Flow Treatment Facility Program
Erie County Department of Health provides oversight for municipalities to satisfy DEP regulations and education and outreach to homeowners. Erie County Department of Health received Great Lakes Restoration Initiative funding to develop its SFTF program, including GIS mapping, owner education and outreach, monitoring, and developing an improved compliance program.

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 addressing cumulative and secondary impacts of development since the last assessment. If none, is there any information that you are lacking to assess the effectiveness of the state and territory's management efforts?*

   The recurring reports summarized below assess the status and trends of important indicators in the Delaware Basin and Lake Erie. Results can be used to determine how effectively these issues are managed on a wider scale. A state-based assessment in each coastal zone is lacking and would be helpful to determine the effectiveness of Pennsylvania's management efforts.

   DRBC State of the Basin Report
   This 2019 report evaluates 31 indicators and tracks progress toward achieving key water resource management goals in the entire Delaware River Basin. It is the third installment of this report, previously published in 2013 and 2008. Overall, the report finds the state of Delaware River Basin water resources are generally good and improving. Table 5.21 summarizes more specific indicators related to cumulative and secondary impacts and their present condition and trends where indicators with lower ratings or declining trends indicate where additional study and stewardship activities are required:

Table 5.21: DRBC State of the Basin Indicators Related to Cumulative and Secondary Impacts, 2019

Indicator	2019 Status	Present Condition/Trend
Impervious Cover	Good	Worsening
Dissolved Oxygen	Good	Improving
Nutrients	Very good	Improving
pH	Not rated	No trend
Salinity	Good	Worsening
Temperature	Good	Stable
Contaminants	Poor	Improving
Fish Contaminants	Good	Improving
Emerging Contaminants	Poor	Improving
Whole Effluent Toxicity	Poor	Improving

https://www.nj.gov/drbc/about/public/SOTB2019.html

PDE Technical Report for the Delaware Estuary and Basin

This 2017 report is published every five years by PDE and analyzes the status and trends of more than 50 environmental indicators to measure the overall health of the Delaware River and Bay. The overall results suggest that the current health of the Estuary continues to be fair with some indictors improving and others worsening. Table 5.22 presents assessed indicators related to cumulative and secondary impacts with an "impact" score (qualitative score, where 1 for a positive are very good and 6 for a negative is near detrimental).

Table 5.22: PDE Technical Report Indicators Related to Cumulative and Secondary Impacts, 2017

Chapter	Indictor	Condition	Impact
Water Quality	Dissolved Oxygen	Increased dramatically 1960s to present	1
Sediments	Total Organic Carbon	Decreased, suggesting lower organic pollution	2
Watersheds	Land Cover	Development continues to increase; forest acreage continues to decline	6
Water Quality	Nutrients	Nitrogen remains high relative to other estuaries	5
Water Quality	Contaminants	Exceeds risk thresholds for consumption of many fish	5
Sediments	Sediment Budget	Sediment removal exceeds inputs, possibly impairing estuary habitats	6

The report also assesses the success of collective efforts to improve conditions across the entire Basin. Progress since 2006 has typically exceeded annual goals set by PDE and EPA when considering voluntarily protected and restored acres of land. The report describes the need for continued restoration as high, requiring federal investment, supplemented with state, local, and private resources. http://www.delawareestuary.org/wp-content/uploads/2018/01/TREB-2017-complete.pdf

State of the Great Lakes Technical Report

This report from 2017 assesses the health of the Great Lakes based on nine indicators and 44 sub-indicators developed by the GLWQA. Relevant indicators related to cumulative and secondary impacts specifically for Lake Erie are shown in the Table 5.23.

Table 5.23: State of the Great Lakes Technical Report Indicators for Lake Erie Related to Cumulative and Secondary Impacts, 2017

Indicator	Sub-indicator	Status	Trend
Beaches	Beach Advisories	Poor	Deteriorating
Fish Consumption	Contaminants in Edible Fish	Fair	Deteriorating
Toxic Chemicals	Toxic Chemical Concentrations	Fair	Unchanging
	Toxic Chemicals in Sediments	Fair	Improving
	Toxic Chemicals in Great Lakes Whole Fish	Fair	Unchanging
	Toxic Chemicals in Great Lakes Herring Gull Eggs	Fair	Unchanging
	Atmospheric Deposition of Toxic Chemicals	Fair	Improving
Habitat and Species	Aquatic Habitat Connectivity	Fair	Improving
Nutrients and Algae	Nutrients in Lakes	Poor	Deteriorating
	Cladophora	Poor	Undetermined
	HABs	Poor	Deteriorating
	Water Quality in Tributaries	Poor	Unchanging
Watershed impacts and climate trends	Forest Cover	Poor	Improving
	Land Cover	Poor	Unchanging
	Watershed Stressors	Poor	Unchanging
	Hardened Shorelines	Undetermined	Undetermined
	Tributary Flashiness	Undetermined	Unchanging
	Human Population	Undetermined	Increasing

https://binational.net/wp-content/uploads/2017/09/SOGL_2017_Technical_Report-EN.pdf

The draft 2019-2023 Lake Erie LAMP (discussed previously under Table 5.11) finds the Lake's ecosystem in poor condition with an unchanging trend. More specifically, it scores the status of the Lake in relation to the 2012 GLWQA objectives. Relevant items to cumulative and secondary impacts are included in Table 5.24.

Table 5.24: Lake Erie Status Relative to 2012 GLWQA Objectives, Lake Erie LAMP

General Objective	Status
Allow for unrestricted swimming and other recreational use.	Fair
Allow for unrestricted human consumption of fish and wildlife.	Fair
Be free from pollutants that could harm people, wildlife or organisms.	Fair
Support healthy and productive habitats to sustain our native species.	Poor-Good
Be free from nutrients that promote unsightly algae or toxic blooms.	Poor
Be free from the harmful impacts of contaminated groundwater.	Fair
Be free from other substances, materials or conditions that may negatively affect the Great Lakes.	NA

iii. Identification of Priorities:

1. *Considering changes in cumulative and secondary impact threats and 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 the effectiveness of its management effort to better assess, consider, and control the most significant threats from cumulative and secondary impacts of coastal growth and development. (Approximately 1-3 sentences per management priority.)*

***Management Priority 1**:* Support local officials in stormwater planning and implementation efforts, promoting regional collaboration.

Description: Land use decisions that address cumulative and secondary impacts are largely made at the local level. Municipalities in the built-out urbanized areas of our coastal zones struggle to find available land and funding to retroactively address prior planning issues with regard to stormwater and associated flooding. CRMP seeks to provide tools and technical assistance involving planning, regional collaboration, and assistance in successfully applying for implementation funding. CRMP can act as a conduit to facilitate the necessary partnerships to support the coastal municipalities in the challenges they are facing.

Management Priority 2: Support multi-benefit projects that integrate benefits to cumulative and secondary impacts with other enhancement area priorities.

Description: Cumulative and secondary impacts include impacts to other enhancement areas such as coastal hazards. Impacts associated with cumulative and secondary impacts can be mitigated with projects that include public access enhancements, by including greening elements. Climate impacts such as increased water and air temperatures, flooding, and erosion can be integrated with cumulative and secondary impacts projects. CRMP seeks to support and encourage better networking and integration of partners normally involved in projects that address individual enhancement area priorities and integrate resiliency into project planning and design, where feasible.

Management Priority 3*:* Evaluate the role of the Coastal Nonpoint Pollution Program (CNPP)

Description: CRMP should evaluate the priority of the CNPP within the CRMP and strategies to implement management measures, with a focus on urban and hydromodification measures. This opportunity is relevant considering the recent selection of a 312 metric to address polluted runoff. CRMP should evaluate the applicability and benefits of updating its existing 5-year plan and 15-year strategy. Program staff will continue to participate in coastal nonpoint coordination at the national level and work with the state 319 program.

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.*

   Table 5.25 indicates that priority needs and information gaps include research, mapping/GIS, data and information management, training/capacity building, and communication and outreach. The table also provides a brief explanation of the needs and gaps.

Table 5.25: Priority Needs and Information Gaps Related to Cumulative and Secondary Impacts Management Priorities

Priority Needs	Need? (Y or N)	Brief Explanation of Need/Gap
Research	Y	Refined modeling and predictions on effect of climate change on stream hydrology, sea level rise, and salinity.
Mapping/GIS	Y	High-resolution land cover and impervious surface layers with consistent use categories to allow for better change analysis.

		Comprehensive mapping of stormwater outfalls that discharge to Lake Erie bluffs and ravines. Mapping of additional groundwater inputs associated with public water supplies to bluff properties without public sewer.
Data and information management	Y	Data and data management associated with the GIS mapping mentioned above.
Training/Capacity building	Y	PEMA risk consultation and CRMP stakeholder engagement indicate the need for better education and outreach at the municipal level, to zoning staff as well as to elected officials.
Decision-support tools	N	_
Communication and outreach	Y	Continued outreach and education to local municipal officials. Better coordination of stormwater management efforts across federal, state, and local entities as stated in DRBC's State of the Basin Report.

iv. **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.*

   CRMP's proposed strategies focus on coastal hazards that are related to cumulative and secondary impacts. In addition to coastal hazards, the strategies will also target program changes in order to better address cumulative and secondary impacts. Recent trends of an increased frequency of heavy precipitation events are associated with climate change and are expected to increase in frequency and intensity. Climate resiliency planning, and implementation projects, must consider the increased secondary and cumulative impacts associated with the increased intensity of stormwater. This is especially challenging in the urbanized areas where existing open space for green stormwater infrastructure projects is limited. DEP's Bureau of Waterways Engineering and Wetlands has successfully implemented and studied the benefits of mitigating cumulative and secondary impacts associated with projects which reconnect streams to floodplains. Removing legacy sediments and other floodplain fills can improve water quality, habitat, and provide additional resiliency to flooding hazards. The CRMP recognizes there are opportunities to support increased implementation of these types of projects in the coastal zones. The proposed strategies specifically relate to sea level rise and storm surge, increased frequency of flooding due to climate change, and exacerbated bluff erosion caused by stormwater. The strategies will include benefits to both cumulative and secondary impacts and coastal hazards. The proposed strategies compliment current DEP initiatives such as flood protection projects and stream improvements.

6. Special Area Management Planning

Section 309 Enhancement Objective: *Preparing and implementing special area management plans for important coastal areas. §309(a)(6)*

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

a. Phase I (High-Level) Assessment:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. 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 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.*

   Table 6.1 provides geographic areas where a new or updated SAMP may be an appropriate tool to better manage coastal resources. CRMP is not proposing a new or updated SAMP at this time.

Table 6.1: Potential Geographic Areas in the DECZ and LECZ Where a SAMP May Be Beneficial

Geographic Area	Opportunities for New or Updated Special Area Management Plans Major conflicts/issues
Sea-level rise vulnerable areas in the DECZ	The majority of the DECZ shoreline is armored and protected and structural actions to mitigate the threat of sea-level rise is expected. Those areas that are currently undeveloped, where landward migration of tidal areas including tidal wetlands is possible, could potentially be addressed through a SAMP. While vulnerable at current elevations, these areas are also developable lands where competition for developable lands is very high.
Lake Erie Bluffs and Shoreline	A Lake Erie Bluffs and Shoreline SAMP was developed in 1997 that focused on updated studies of bluff erosion issues and shoreline protection structures. A new or updated SAMP could build upon existing efforts to manage these coastal hazards. Bluff and shoreline erosion are discussed in the Coastal Hazards section (D.2). Management of bluff erosion largely relies on the BRSA, public outreach, and technical assistance. Design standards for shoreline protect structures in largely managed through the Chapter 105 Water Obstruction and Encroachment permitting process. The desire for lake views, sandy beaches, and personal property protection must be done in a way that does not inadvertently contribute to erosion or damage neighboring properties.

ii. 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.*

   Table 6.2 indicates that no significant changes to Special Area Management Planning have occurred.

Table 6.2: Significant Changes in Special Area Management Planning

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	N	N	N
SAMP plans	N	N	N

iii. 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.*

   CRMP has decided not to develop a SAMP during this strategy period. CRMP can utilize existing program priorities and policies to address the concerns expressed by those stakeholders who selected SAMP as a high priority.

   Coastal erosion along Pennsylvania's Lake Erie shoreline has historically been a high priority for CRMP and remains so today. CRMP's efforts regarding coastal erosion are discussed in more detail in the Coastal Hazards Assessment section (D.2). CRMP is proposing a coastal hazards strategy to better manage and mitigate bluff erosion caused by land-based stormwater runoff. With the recent high lake levels, coastal erosion has become a high priority and focal point for our local partners and shoreline property owners. Six of seven LECZ stakeholders who provided input on CRMP priorities selected SAMP as a high priority and 5of those 6 specifically mentioned the Lake Erie shoreline. Most also mentioned the high lake levels. These stakeholders included municipal representatives, county planners, DCNR, and a stakeholder who prioritizes tourism. CRMP recognizes the comments of these stakeholders and agrees with the sentiment that the Lake Erie shoreline should remain a high priority. Specific comments and suggestions related to selection of SAMP as a high priority can be implemented, or strengthened, with existing programs and our coastal hazards strategy.

   Two CZAC agency partners also selected SAMP as high priority, specific to areas vulnerable to sea level rise, including communities and infrastructure. CRMP intends to enhance program capacity in this area with a related coastal hazards strategy that is described in the Strategy (section E.1). The other CZAC agency comment related

to SAMP as a high priority involved identifying specific cultural resource sites that are susceptible to both coastal hazards and the cumulative effect of development. CRMP's program plan has existing policies regarding historic sites and structures.

One planning stakeholder in the DECZ selected SAMP as a high priority. These comments involved the built-out environment of the Delaware County shoreline, the scarcity and associated high value of the existing wetlands and public access areas, and the competing land uses and economic challenges in the area.

7. Ocean and Great Lakes Resources

Section 309 Enhancement Objective: *Planning for the use of ocean [and Great Lakes] resources. §309(a)(7)*

a. **Phase I (High-Level) Assessment:**
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. Resource Characterization:

Understanding the ocean and Great Lakes economy can help improve management of the resources it depends on. Using Economics: National Ocean Watch (ENOW), indicate the status of the ocean and Great Lakes economy as of 2016 (the most recent data) in the tables below. Include graphs and figures, as appropriate, to help illustrate the information.

Tables 7.1 and 7.2 indicate the significance of coastal related resources to the economies in each of Pennsylvania's coastal zones. The data is primarily derived from Economics: National Ocean Watch (ENOW) mentioned above (www.coast.noaa.gov/digitalcoast/tools/enow.html)

Table 7.1: Status of Ocean and Great Lakes Economy for Coastal Counties in the DECZ (2016)

	All Ocean Sectors	Living Resources	Marine Construction	Ship & Boat Building	Marine Transpor-tation	Offshore Mineral Extraction	Tourism & Recreation
Employment (# of Jobs)	48,636	808	27	749	6,869	34	39,264
Establishments (# of Establishments)	2,419	70	5	0	139	6	2176
Wages (Millions of Dollars)	$1,373	$32	$11	$50	$302	$2.6	$924
GDP (Millions of Dollars)	$2,801	$80	$25.8	$82.5	$455	$4.1	$2042

Table 7.2: Status of Ocean and Great Lakes Economy for Erie County in the LECZ (2016)

	All Ocean Sectors	Living Resources	Marine Construction	Ship & Boat Building	Marine Transport ation	Offshore Mineral Extraction	Tourism & Recreation
Employment (# of Jobs)	3374	23*	12**	ND	30**	49***	2,811
Establishments (# of Establishments)	215	ND	ND	ND	ND	ND	180
Wages (Millions of Dollars)	$58.6	ND	ND	ND	ND	ND	$38.5
GDP (Millions of Dollars)	$122.6	ND	ND	ND	ND	ND	$79.5

ND = No data available. The number is not "0" but the data is suppressed for legal reasons.
*ENOW shows suppressed data for living resources, listing self-employed only. However, at least 1 commercial fisherman operates out of Dobbins Landing in the City of Erie, Erie County.

**ENOW shows suppressed data for marine construction, ship and boat building, and marine transportation, listing self-employed only. However, Donjon Shipbuilding and Repair operates a shipyard and 1,250-foot by 120-foot dry dock at Erie Harbor.
***ENOW shows suppressed data for offshore mineral extraction, listing self-employed only. However, Erie Sand and Gravel runs an offshore sediment mining operation.

Tables 7.3 and 7.4 indicate economic changes that have occurred between 2005 and 2016 in the DECZ and LECZ. This data is based on the ENOW data that was used in Tables 7.1 and 7.2.

Table 7.3: Change in Ocean and Great Lakes Economy for Coastal Counties in the DECZ (2005-2016)

	All Ocean Sectors	Living Resources	Marine Construction	Ship & Boat Building	Marine Transpor-tation	Offshore Mineral Extraction	Tourism & Recreation
Employment (# of Jobs)	18,342	520	27	749	1,000	18	15,270
Establishments (# of Establishments)	638	12	5	0	29	0	594.7
Wages (Millions of Dollars)	$663.80	$25.4	$7.5	$50.4	$99.6	$2.0	$457.1
GDP (Millions of Dollars)	$1,067	$65.6	$19.8	$82.5	$71.5	$2.9	$884.4

Table 7.4: Change in Ocean and Great Lakes Economy for Erie County (LECZ) (2005-2016)

	All Ocean Sectors	Living Resources	Marine Construction	Ship & Boat Building	Marine Transpor-tation	Offshore Mineral Extraction	Tourism & Recreation
Employment (# of Jobs)	647.0	3.0	-6.0	0.0	-100.0	-39.0	425.0
Establishments (# of Establishments)	21.0	0.0	0.0	0.0	-10.0	-17.0	20.0
Wages (Millions of Dollars)	$22.4	0.0	0.0	0.0	$-3.2	$-1.2	$15.5
GDP (Millions of Dollars)	$23.8	0.0	0.0	0.0	$-6.0	$-7.3	$29.2

1. *Understanding existing uses within ocean and Great Lakes waters can help reduce use conflicts and minimize threats when planning for ocean and Great Lakes resources. Using Ocean Reports, indicate the number of uses within ocean or Great Lakes waters off of your state. For energy uses (including pipelines and cables, see the "Energy and Government Facility Siting" template following). Add additional lines, as needed, to include additional uses that are important to highlight for your state. Note: The Ocean Reports tool does not include data for the Great Lakes states. Great Lakes states should fill in the table as best they can using other data sources.*

   Table 7.5 indicates the importance of port facility uses in both coastal zones. The information was derived from the Ocean Reports tool mentioned above (www.coast.noaa.gov/digitalcoast/tools/ort.html).

Table 7.5: Uses within Ocean or Great Lakes Waters in the DECZ and LECZ

Type of Use	Number of Sites	
	DECZ	LECZ
Federal sand and gravel leases *(Completed)*	0	0
Federal sand and gravel leases *(Active)*	0	1*
Federal sand and gravel leases *(Expired)*	0	0
Federal sand and gravel leases *(Proposed)*	0	0
Beach Nourishment Projects	0	1
Ocean (Great Lakes) Disposal Sites	0	1
Principle Ports *(Number and Total Tonnage)*	3; 19.8 million tons	1; 600K tons
Coastal Maintained Channels	6	1
Designated Anchorage Areas	8; 6.27% coverage	None
Danger Zones and Restricted Areas	0	0
Other (please specify)		

*Erie Sand and Gravel, a division of Carmeuse, conducts a dredge-mining operation within the Pennsylvania waters of Lake Erie under a state (not federal) lease.

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.*

   Table 7.6 indicates that there have been potential increases to the threat of resources or use conflicts in both the DECZ and LECZ. These changes are further described in Table 7.7 and Table 7.8 and the narrative following those tables.

Table 7.6: 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 (↑, ↓, No change or Unknown)	
	DECZ	LECZ
Benthic habitat (including coral reefs)	↑	No change
Living marine resources (fish, shellfish, marine mammals, birds, etc.)	↑	↑
Sand/gravel	No change	No change
Cultural/historic	No change	↑
Transportation/navigation	No change	No change
Offshore development	No change	↑
Energy production	No change	↑
Fishing (commercial and recreational)	No change	No change
Recreation/tourism	No change	No change
Sand/gravel extraction	No change	No change
Dredge disposal	No change	No change
Aquaculture	↑	No change

3. *For the ocean and Great Lakes resources and uses in the table 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. Place an "X" in the column if the use or phenomenon is a major contributor to the increase.*

   Tables 7.7 and 7.8 indicate the resources that have a potential increased threat and the contributing factors associated with that threat. Additional information is discussed in the text below the tables.

Table 7.7: Major Contributors to an Increase in Threat or Use Conflict to Ocean and Great Lakes Resources in the DECZ

		Land-based development	Offshore development	Polluted runoff	Invasive species	Fishing (Comm and Rec)	Aquaculture	Recreation	Marine Transportation	Dredging	Sand/Mineral Extraction	Ocean Acidification	Other (Specify)
Benthic Habitat			X	X						X			
Living Marine Resources			X		X					X			
Aquaculture													X

Table 7.8: Major Contributors to an Increase in Threat or Use Conflict to Ocean and Great Lakes Resources in the LECZ

	Land-based development	Offshore development	Polluted runoff	Invasive species	Fishing (Comm and	Aquaculture	Recreation	Marine Transportatio	Dredging	Sand/Mineral Extraction	Ocean Acidification	Other (Specify)
Benthic Habitat		X	X	X								
Living Marine Resources			X		X							
Cultural Historic		X		X								
Offshore Development								X		X		
Energy Production								X		X		

DECZ

Benthic Habitat/Living Marine Resources

In the DECZ, the threats to and use conflicts with benthic habitat and living marine resources is unchanged, however, there is now a better understanding and documentation of the spatial extent of freshwater mussel beds in the tidal Delaware River. Once thought to be largely extirpated from the tidal main-stem of the river, native mussel populations were rediscovered in the late 2000's. Subsequent investigations by PDE and associated scientific and academic institutions have documented specific established mussel beds, including species composition and the identification of Commonwealth threatened and endangered species. During this assessment period, CRMP has conducted hydroacoustic surveys of the Pennsylvania portion of the estuary and has mapped the broader spatial extent of freshwater mussel beds, including some within maintained navigation channels. GIS layers and a final technical report are available on the CRMP web site at https://www.dep.pa.gov/Business/Water/Compacts%20and%20Commissions/Coastal%20Resources%20Management%20Program/Pages/New-Program-Initiatives-and-Technical-Projects.aspx. These Delaware Estuary mussel beds are under continued threat from dredging activities, industrial and legacy pollution, stormwater and sedimentation, and invasive species competition. Improved documentation of freshwater mussel spatial extent and species composition may lead to increased acknowledgement of use conflicts.

Aquaculture

PDE and PENNVEST have signed a multi-million-dollar funding agreement for the development and construction of a large-scale freshwater mussel hatchery and

research center. This agreement is the culmination of two years of work toward the Mussels for Clean Water Initiative and represents the introduction of aquaculture to the DECZ. The initiative is part of the multifaceted Freshwater Mussel Recovery Program which aims to restore native species of freshwater mussels to streams, rivers and lakes in the upper mid-Atlantic region, particularly the Delaware River Basin. PDE has initiated a Freshwater Mussel Advisory Workgroup to advise the Freshwater Mussel Recovery Program and the Mussels for Clean Water Initiative, and also foster collaboration between experts and resource managers.
http://www.delawareestuary.org/science-and-research/freshwater-mussels/

LECZ

Benthic Habitat/Living Marine Resources
Eutrophication and invasive species continue to pose the greatest risks to living marine resources in the Lake Erie. The invasive *Dreissena* species alter the substrate making it less suitable for the spawning of native fishes, compete with native mussels for space and resources, and promote *Cladophora* algal blooms and subsequent hypoxic conditions by increasing the photic zone. HABs are also a re-emergent issue. HABs are discussed in detail in the Cumulative and Secondary Impacts section (D.5). The threat of offshore development to benthic habitat has increased with renewed interest in offshore wind power discussed in next two paragraphs and in the Energy and Government Facility Siting section (D.8).

Cultural/Historic Resources
There is growing interest in energy development within Lake Erie (see Offshore Development/Energy Production, below, and the Energy and Government Facility Siting section (D.8)) including the installation of an international high-capacity electrical transmission line and offshore wind power development. This development can potentially conflict with Pennsylvania's shipwreck sites (known or unknown) or archaeological sites along submerged paleo shorelines. CRMP has conducted an effort during the past 5-year period to document known shipwreck sites, including refined positional data and debris field extents. CRMP is an active member in the Pennsylvania Archaeology and Shipwreck Survey Team, along with the Pennsylvania Historical and Museum Commission, DCNR, and Indiana University of Pennsylvania, coordinated by the Regional Science Consortium, whose mission is to document and conduct educational activities for Pennsylvania's submerged cultural and historic resources, partly in preparation for use conflicts. There are presently no efforts to search for or discover currently unknown sites that may be at risk for impacts related to future development.
http://www.regsciconsort.com/lake-erie-shipwrecks/

Offshore Development/Energy Production
(More information is available at Energy and Government Facility Siting, below.)
The ITC Lake Erie Connector
https://www.itclakeerieconnector.com/
Icebreaker Wind
http://www.leedco.org/index.php/about-icebreaker

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.*

LECZ

2017 State of the Great Lakes Technical Report
The EPA and Environment and Climate Change Canada produces this report which relies on nine indicators and 44 sub-indicators to evaluate the status of the Great Lakes. The report establishes an overall status and trend rating for each Great Lake; the status of Lake Erie is rated as poor and the trend is deteriorating. Notably, Lake Erie's status is rated as poor for all three wetland habitat and species sub-indicators that were assessed separately and two of those, Coastal Wetland Birds and Coastal Wetland Plants are continuing to deteriorate. Of the 44 sub-indicators, only four (Toxic Chemicals in Sediment, Aquatic Habitat Connectivity, Dreissenid mussels, and Sea Lamprey) were trending toward improvement. This report is issued every three years. It is also discussed in the Cumulative and Secondary Impacts section (D.5).
https://binational.net/wp-content/uploads/2017/09/SOGL_2017_Technical_Report-EN.pdf

2018 Lake Erie Lakewide Action and Management Plan Annual Report
This Lake Erie Partnership 2018 Annual Report provides information and updates on recent actions taken to restore Lake Erie, including watershed nutrient management initiatives; coastal habitats and species protection efforts; Lake Erie science and monitoring; and other Lake Erie Partnership activities including the ongoing restoration of 5 listed areas of concern.
https://binational.net/wp-content/uploads/2019/03/LE_LAMP_AR_2018_final.pdf

Presque Isle Bay Habitat Improvement Plan
This 1-page spatial plan from PFBC indicates the locations and types of fish habitat improvement projects located within and near Presque Isle Bay, Erie County.
https://www.fishandboat.com/Resource/Habitat/Documents/lakePlans/presque_isle.pdf

DECZ

Partnership for the Delaware Estuary Annual Report
PDE is the National Estuary Program for the Delaware Estuary. The annual report summarizes its activities and accomplishments during the previous year. PDE lists 1,160 feet of living shoreline installed in 2018 and a running total of 46,000 acres of restored habitat since 1996 among its accomplishments.
http://www.delawareestuary.org/publications-2/annual-report/

2017 Technical Report for the Delaware Estuary and Basin
PDE is tasked with publishing a state of the Estuary report every 3-to-5 years. PDE relies on more than 50 environmental indicators within eight key categories: watersheds and landscapes, water quality, water quantity, sediments, aquatic habitats, living resources, climate change, and restoration. The most recent report was released in December of 2017 and rates the status of the Estuary as "fair' with a mix of positive and negative trends. Land cover, sediment budget, Atlantic sturgeon, and funding for restoration were identified as having the most negative status, while ecosystem services, dissolved oxygen, fish passage, and striped bass all rated

most positive.
http://www.delawareestuary.org/publications-2/state-estuary-report/

ii. 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?*

   Table 7.9 indicates that there have been significant changes to regional comprehensive management plans and single-sector management plans associated with ocean and Great Lakes resources. These changes are described under question two below the table.

Table 7.9: Significant Changes to Management of Ocean and Great Lakes Resources in the DECZ and LECZ

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	Y	Y	N
Regional comprehensive ocean/Great Lakes management plans	Y	Y	Y
State comprehensive ocean/Great Lakes management plans	N	N	N
Single-sector management plans	Y	N	Y

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.*

   Statewide

   Controlled Plant and Noxious Weed Act (Act 46 of 2017)
   This act establishes the Controlled Plant and Noxious Weed Committee and provides for its powers and duties. The committee is administered by the Pennsylvania Department of Agriculture (PDA). The Act authorizes PDA, through the committee, to establish and regulate the Noxious Weed Control list. CRMP currently participates as a DEP designee to the committee.

   iMapInvasives Database
   This GIS based tool discussed in the previous assessment is live and accessible online. The portal is an online reporting and data management tool used to track invasive species and assist natural resource professionals and citizen scientists by

advancing their knowledge of species distributions across the Commonwealth. Pennsylvania iMapinvasives is part of the Pennsylvania Natural Heritage Program. New York, Maine, Oregon, Arizona, and Kentucky also participate in the iMapInvasives network (Vermont, New Hampshire, Virginia, West Virginia, and Florida are inactive members).
https://www.paimapinvasives.org/

DECZ

Comprehensive Conservation Management Plan for the Delaware Estuary
PDE manages the coordination of CCMP through the Estuary Implementation Committee. During the last assessment period, PDE began discussing with partners, including CRMP, more significant updates to the CCMP for the Delaware Estuary in response to new requirements for CCMP revisions for all National Estuary Programs issued by EPA through its FY 15-16 guidance document. The revised CCMP is built on a 3-pronged framework of "clean waters, healthy habitats, and strong communities." The revisions to the plan were finalized in early 2019.
http://www.delawareestuary.org/our-plan-2/

Mid-Atlantic Regional Council on the Ocean (Mid-Atlantic Regional Planning Body)
In 2010, a Presidential Executive Order established a National Ocean Policy to guide the protection, maintenance, and restoration of America's oceans and coasts. The policy requires federal agencies to coordinate regional ocean planning with states, tribes, and stakeholders. The National Ocean Policy also calls for the creation of Regional Planning Bodies to coordinate and implement regional ocean planning by states and regional entities and engage stakeholders and technical experts at every key step. Accordingly, DEP, via the CRMP, was involved in the early developmental stages of the Council and its planning processes as a voluntary, regional partner state in order to account for our vital interests including the Port of Philadelphia, water quality, natural resources/habitat/living resources in the Delaware Estuary region. The Council is continuing with its ocean planning activities, but Pennsylvania is no longer a state partner.

LECZ

Pennsylvania Lake Erie Harmful Algal Bloom Task Force
HABs are caused by a cyanobacteria, or blue-green algae. While detected in Ohio previously, Pennsylvania first detected a bloom of the toxic algae in Presque Isle Bay in 2013. Presque Isle State Park forms the northern, lakeward border of Presque Isle Bay, and recreational restrictions and health advisories became an immediate concern. The response was to form a diverse local task force, the Pennsylvania Lake Erie Harmful Algal Bloom Task Force, to develop a monitoring and response strategy including program design and techniques for algae monitoring. DEP and CRMP have taken a lead role working with the task force. The monitoring strategy was initially implemented in 2014. Throughout implementation, needs and gaps were identified and revisions were planned to incorporate new science, changes in policies, and improved practices and techniques. The revised Lake Erie Harmful Algal Bloom Monitoring and Response Strategy for Recreational Waters was finalized in July of 2017. A new online dashboard has also been made available by the Task Force. The application allows users to view samples by date, waterbody, and collection type on an interactive map. More information on HABs is available from DEP's website, including a YouTube video with HAB images.

https://seagrant.psu.edu/sites/default/files/PA%20Lake%20Erie%20HAB%20Response%20Strategy%207-24-2017_0.pdf

Pennsylvania Harmful Algal Bloom Task Force

To coordinate HAB awareness, monitoring, and management activities, several Commonwealth agencies and commissions – including DEP, DCNR, the Department of Health, the Fish & Boat Commission, the Game Commission, and PEMA – formed the Pennsylvania HABs Task Force. https://www.dep.pa.gov/HABs

2019-2023 DRAFT Lake Erie Lakewide Action and Management Plan
The 2019-2023 DRAFT Lake Erie LAMP, discussed previously under Table 5.11, was developed by the Lake Erie Partnership to satisfy an international commitment of the GLWQA to assess ecosystem condition, identify threats, set priorities for research and monitoring, and develop an action plan. Lake Erie continues to be degraded by impacts from polluted runoff, HABs, benthic algal blooms and die-off, and invasive species. Observable impacts from climate change include earlier seasonal stratification (furthering hypoxia and dead-zone development) and decreases in seasonal ice cover. Priority science and monitoring activities identified relate to: nutrient dynamics, critical habitat assessment, and chemical contaminant loading and cycling. The plan identifies 41 actions to be taken over the next 5 years and the agencies and organizations responsible. Actions relating to Great Lakes resources include strategies for prevent and contain invasive species and to protect and restore habitat and native species.
https://binational.net/wp-content/uploads/2019/06/Draft-Lake-Erie-LAMP-061819-English.pdf

2019 Lake Erie Binational Phosphorus Reduction Strategy
Phosphorus inputs, eutrophication and dead zone development heavily impact Lake Erie's living resources. Large sections of the Lake become hypoxic and are excluded from use by aquatic life. A comprehensive strategy for addressing eutrophication is necessary for the restoration of living resources. The elements of the strategy are discussed in the Cumulative and Secondary Impacts section (D.5).
https://binational.net/wp-content/uploads/2019/06/19-148_Lake_Erie_Strategy_E_accessible.pdf

2017 Lake Erie Phosphorus Reduction Domestic Action Plan

Developed out of Pennsylvania's obligations under the 2012 GLWQA, this plan details actions that DEP commits to for achieving targeted phosphorus reductions in Lake Erie. This plan is discussed in the Cumulative and Secondary Impacts section (D.5).
http://files.dep.state.pa.us/Water/Compacts%20and%20Commissions/GreatLakesProgram/PA%20DAP%20-%20PA%20Lake%20Erie%20Phosphorus%20Reduction%20Domestic%20Action%20Plan.pdf

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

Pennsylvania does not have a state comprehensive ocean or Great Lakes management plan. Links to regional plans for each coastal zone are provided in Table 7.10.

Table 7.10: Comprehensive Ocean or Great Lakes Management Plans

Comprehensive Ocean/Great Lakes Management Plan	State Plan	Regional Plan
Completed plan (Y/N) (If yes, specify year completed)	N	Y, 2019
Under development (Y/N)	N	Y
Web address (if available)		DECZ http://www.delawareestuary.org/our-plan-2/ LECZ https://binational.net/2019/06/27/2019-erie-lamp-paap/
Area covered by plan	NA	DECZ Delaware Bay, Delaware River, and Watershed LECZ US and Canadian Lake Erie and the international watershed

iii. 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.*

   Ocean and Great Lakes resources cover a broad area and are critical to the economies and quality of life of both coastal zones. Ocean and Great Lakes resources will remain a high priority for the CRMP even though the enhancement area was selected as a medium priority for a program change. Existing CRMP policies are adequate for supporting efforts related to threats to ocean and Great Lakes resources although more resources to implement policies may be warranted. Additional funding, through CRMP or other sources, would benefit CRMP and partners in better understanding and managing threats to resources associated with climate change, ecological transformations, nutrient enrichment, dredge management and disposal (including beneficial reuse), fisheries management, and others. CRMP will be focusing particular effort on investigating littoral drift and sediment budget by participating in multistate and federal collaboratives as they develop. The Ocean and Great Lakes resources enhancement area interacts with all of the other enhancement areas, and CRMP's proposed strategies will partially touch on issues associated with this enhancement area even if it is not specifically identified. By examining each program policy area for climate change implications, new threats to ocean and Great Lakes resources will be considered.

   Only 7% of total stakeholder respondents indicated ocean and Great Lakes resources to be a high priority for program changes in the current strategy and assessment. No DECZ respondents and only one out of seven of LECZ stakeholders considered it a high priority. Individual comments regarding ocean and Great Lakes resources from this sole stakeholder focused on climate change impacts, resource/asset inventories, shoreline processes (erosion), invasive species, and

HABs. Cumulative and secondary impacts are a significant driver for threats related to ocean and Great Lakes resources, and these specific concerns are addressed in more detail in the Cumulative and Secondary Impacts section (D.5) of this document.

8. Energy and Government Facility Siting

Section 309 Enhancement Objective: *Adoption of procedures and enforceable policies to help facilitate the siting of energy facilities and government facilities and energy-related activities and government activities which may be of greater than local significance. §309(a)(8).*

a. Phase I (High-Level) Assessment:

Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. **Resource Characterization:**

1. *In the table below, characterize the status and trends of different types of energy facilities and activities in the state's or territory's coastal zone based on best-available data. If available, identify the approximate number of facilities by type. For ocean-facing states and territories (not Great Lakes states), Ocean Reports includes existing data for many of these energy facilities and activities.*

Table 8.1 indicates that changes to energy facilities and activities have occurred in the DECZ during the 2016 – 2020 assessment period. Details of these changes are described in the narrative below the table.

Table 8.1: Status and Trends in Energy Facilities and Activities in the DECZ

Type of Energy Facility/Activity	**Exists in Coastal Zone** (# or Y/N)	**Change in Existing Facilities/Activities Since Last Assessment** (↑, ↓, No change or Unknown)	**Proposed in Coastal Zone** (# or Y/N)	**Change in Proposed Facilities/Activities Since Last Assessment** (↑, ↓, No change or Unknown)
Pipelines	Y	↑	Y	↑
Electrical grid (transmission cables)	Y	Unknown	Unknown	Unknown
Ports	Y	↑	N	No change
Liquid natural gas (LNG)	Y*	↑	Y	↑
Oil and gas	Y	↑	Y	↑
Coal	N	No change	N	No change
Nuclear	N	No change	N	No change
Wind	N	No change	N	No change
Wave	N	No change	N	No change
Tidal	N	No change	N	No change
Current (ocean, lake, river)	N	No change	N	No change
Hydropower	N	No change	N	No change
Ocean thermal energy conversion	N	No change	N	No change
Solar	Y	No change	Y	↑
Biomass	Y	↑	Y	↑
Other (please specify)				

*Storage and transfer only

DECZ has been a keystone refining center for the northeast since the beginning of petroleum refining. Although the DECZ does not contain shale energy reserves, the shale energy boom in Pennsylvania has impacted the energy facilities present along the tidal Delaware and Schuylkill Rivers. The resurgence of domestic crude oil that occurred during the last reporting period has waned in competition with foreign markets during this assessment period. The previously existing transportation infrastructure and port facilities have transitioned to accommodate the oil, gas, and gas liquids being produced from shales in other parts of the state and country. A catastrophic fire at the Philadelphia Energy Solutions refinery in 2019 resulting in the closing of that facility is contributing to a potential reshaping of the local industrial area to other forms of energy generation and associated support functions. A key characteristic of the energy industry in the DECZ has been its adaptability and proficiency in weathering change.

Pipelines

Pipeline activities include the Mariner East 1 and 2, and Adelphia Gateway. The Mariner East 1 project involved reversing flow from refined products heading west to natural gas liquids heading east to Marcus Hook. Mariner East 2 is a pipeline currently under construction immediately parallel to the existing Mariner East 1 pipeline and would dramatically increase the amount of natural gas liquids flowing to Marcus Hook. Thousands of miles of new gathering lines and pipelines are being built to accommodate Marcellus Shale gas and related products. The construction of Mariner East 2 has been controversial. It is the subject of an ongoing grand jury investigation and has been subjected to permit suspensions and more than $13 million of fines and penalties. The proposed Adelphia Gateway project involves repurposing existing oil infrastructure, including 84 miles of pipeline, to convey natural gas.
https://marinerpipelinefacts.com/
https://adelphiagateway.com/

Port Facilities

Southport Auto Terminal
PhilaPort opened the new Vehicle Processing Center at the Southport Auto Terminal on October 29, 2019. The new facility increases the port's automobile capacity by 70% and provides capacity to process over 350,000 vehicles per year.
http://www.philaport.com/facilities/southport-auto/

The Eddystone Rail Facility
The Eddystone Rail Facility is an energy port facility operating on a former portion of the Eddystone Generating Station. The facility is designed to be a trans-shipment facility receiving crude oil by rail and transferring to barge for delivery to Philadelphia-area refineries. The facility began operating in the spring of 2014 with a 90,000 barrel/day capacity. The terminal ceased crude oil operations beginning in January of 2016. Deliveries of crude oil to the facility then resumed in September of 2018.

Oil and Gas

ME-2X Project at the Marcus Hook Industrial Complex
ME-2X is currently proposed to include the construction of processing units, 2 600,000 barrel cryogenic ethane storage tanks, and other facility infrastructure.

Only Phase 1 (demolition and storm sewer modifications) of the project has been submitted for permitting; construction of the processing units and tanks is proposed to begin during Phase 2.

Philadelphia Gas Works Liquified Natural Gas Facility
Philadelphia Gas Works is proposing a $60 million Liquified Natural Gas plant at an existing facility along the Schuylkill River in South Philadelphia as part of public-private-partnership with Liberty Energy Trust, who would finance construction of the facility.

Philadelphia Energy Solutions
Philadelphia Energy Solutions (PES) was formed in 2012 to continue refining operations at the former Sunoco refinery along the Schuylkill River in South Philadelphia. On June 21, 2019 a portion of the refinery was destroyed by fire and several large explosions. PES ended operations at the facility and filed for bankruptcy protection in July 2019. This refinery was considered the largest refinery complex on the U.S. East Coast at 335,000 barrels per day, and the 10th largest refinery in the U.S. It was also the longest continuously operating refinery on the east coast.

Biomass

RNG Energy Solutions/PES Refinery
RNG Energy Solutions has partnered with the retired CEO of PES and has placed a bid to purchase the fire-damaged PES refinery. The refinery would be restarted as conventional fuel manufacturing facility under the company Philadelphia Energy Industries (PEI) and would include the construction of a $120 million digester to convert food waste into methane gas and a facility to produce 100 million gallons of renewable diesel fuel per year from fats, oils and grease.

Exelon Fairless Hills Landfill Gas Power Plant
In February 2019 Exelon Corporation announced plans to close its 24-megawatt landfill gas power generation station in Fairless Hills. The plant was in operation for more than 20 years and will be closed no later than June 2020.

Solar

RNG Energy Solutions/PES Refinery
RNG Energy Solutions is also proposing to construct a 78-acre, 10-megawatt solar generation facility at the fire-damaged PES refinery.

Table 8.2 indicates only minor changes in status and trends in energy facilities and activities in the LECZ. Additional details are provided in the narrative below the table.

Table 8.2: Status and Trends in Energy Facilities and Activities in the LECZ

Type of Energy Facility/Activity	Exists in Coastal Zone (# or Y/N)	Change in Existing Facilities/Activities Since Last Assessment (↑, ↓, No change or Unknown)	Proposed in Coastal Zone (# or Y/N)	Change in Proposed Facilities/Activities Since Last Assessment (↑, ↓, No change or Unknown)
Pipelines	Y	No change	N	No change
Electrical grid (transmission cables)	Y	Unknown	Y	↑
Ports	Y	No change	N	No change

Liquid natural gas (LNG)		No change	N	No change
Oil and gas	Y	Unknown	N	No change
Coal	N	No change	N	No change
Nuclear	N	No change	N	No change
Wind	N	No change	N	No change*
Wave	N	No change	N	No change
Tidal	NA	No change	NA	No change
Current (ocean, lake, river)	N	No change	N	No change
Hydropower	N	No change	N	No change
Ocean thermal energy conversion	NA	No change	NA	No change
Solar	N	No change	N	No change
Biomass	Y	No change	N	No change

*See Icebreaker Wind project, below.

Lake Erie Connector

The Lake Erie Connector is a proposed 73-mile, 1,000 MW, bidirectional electricity transmission cable running under the bed of Lake Erie from Ontario to Pennsylvania. The project developer, ITC Holdings Corps, has acquired all the necessary permits and authorizations from U.S. and Canadian national, state, provincial, and local authorities. While originally expected to be operational in 2019, construction has been delayed until 2020. Commercial operation of the transmission cable is now expected in 2023.
https://www.itclakeerieconnector.com/

HERO BX Biodiesel Facility

HERO BX continues to produce about 50 million gallons of biodiesel annually and remains Pennsylvania's largest producer. HERO BX continues to operate at its Erie, PA facility.

Oil and Gas wells

The LECZ and Lake Erie watershed have numerous conventional oil and gas wells. During this assessment period, unconventional (fracking) wells targeting the Utica Shale have been developed in other states where the formation is not as deep as in Pennsylvania. Technical difficulties remain in making Utica Shale reserves economically recoverable. As the industry and associated technologies continue to advance, it is possible that unconventional wells targeting the Utica formation may be proposed within the coastal zone and/or watershed. According to the USGS, the Utica Shale formation in the LECZ is more likely to yield crude oil rather than natural gas.

Wind Energy

Icebreaker Wind in Ohio

Although the momentum for developing wind energy in Lake Erie subsided substantially, it has seen a modest revival during this assessment period. LEEDCo is currently planning to develop a 6-turbine, 20.7 MW windfarm approximately eight miles offshore of Cleveland, Ohio entitled "Icebreaker". While not in Pennsylvania, the project is intended to demonstrate the viability of offshore, freshwater wind power generation in the Great Lakes. LEEDCo's stated vision is for a "…robust offshore wind industry by 2030." If successful, the project is expected to drive further interest in offshore wind development lakewide, including within Pennsylvania. Construction of the Icebreaker project is expected to begin in 2022

with commercial operation by the end of the same year.
http://www.leedco.org/index.php/about-icebreaker

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.*

DEP Online Energy Facility Mapping
DEP provides the following online mapping tools for viewing the locations and numbers of energy facilities that have received financial aid or incentives from Commonwealth funding sources.
https://www.dep.pa.gov/Business/Energy/OfficeofPollutionPrevention/Energy_Data_and_Maps/Pages/Energy-Maps.aspx

DEP Oil and Gas Annual Report
DEP releases an annual report on the oil and gas activities occurring within the Commonwealth. This is a statewide report and data and information are not differentiated specifically for activities within the coastal zones. The most recent available report includes activities through 2018 and document no new conventional or unconventional well development in either coastal zone for 2018, continuing recent trends.
https://www.depgis.state.pa.us/2018OilGasAnnualReport/index.html

3. *Briefly characterize the existing status and trends for federal government facilities and activities of greater than local significance[1] in the state's coastal zone since the last assessment.*

There are currently four properties on the federal General Services Administration (GSA) inventory within the DECZ and nine within the LECZ. Additionally, the Naval Support Facility at the Philadelphia Navy Yard, the United States Coast Guard Station at 1 Washington Avenue, and the United States Army Corps of Engineers Fort Mifflin Field Office, all within the City of Philadelphia, are located within the DECZ and do not appear on the GSA inventory. Likewise, Unites States Coast Guard Station Erie within the LECZ does not appear on the GSA inventory. CRMP is aware of no current proposals for new or expanded government facilities within either coastal zone.

ii. 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.*

Table 8.3 indicates that significant changes to the management categories have occurred during the 2016 – 2020 assessment period. These changes are described under question number two below the table.

Table 8.3: Significant Changes in Energy and Government Facility Management in the DECZ and LECZ

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	Y	N	Y
State comprehensive siting plans or procedures	Y	N	Y

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.*

   None of the changes described below were CRMP-driven. CRMP had been developing a decision support tool as part of a marine spatial planning effort using Section 309 funding. That effort has not progressed beyond the data gathering stage. However, the data have been used to inform the planning process behind the Lake Erie Connector project, discussed in this section. CRMP anticipates the data to likewise be useful if offshore wind development becomes a reality in Pennsylvania's Lake Erie Waters. CRMP is in discussion with the agency GIS Coordinator regarding the development of a storymap to portray non-sensitive data collected during the marine spatial planning effort.

   Statutes, regulations, policies, or case law interpreting these

   PA Act 85 of 2019 - Cross Unit Drilling for Unconventional Wells
   This act amends the Oil and Gas Lease Act of 1979 to allow operators with lease rights on adjacent lease units to use horizontal drilling methods across the boundaries of those units. The Act requires operators to allocate production accordingly to the units from which gas resources were obtained, with respect to any unit boundaries that were crossed during drilling operations.
   https://www.legis.state.pa.us/cfdocs/legis/li/uconsCheck.cfm?yr=2019&sessInd=0&act=85

   Environmental Protection Standards at Oil and Gas Well Sites (25 Pa. Code Chapter 78)
   This final form rulemaking went into effect on October 8, 2016. The Chapter 78 regulations were amended and Chapter 78a was inserted to establish development requirements for unconventional wells and eliminate any remaining conflicting requirements within the rest of Chapter 78. The new rule establishes requirements regarding public resource impact screening, water supply replacement standards, waste management and disposal, and establishing identification and select monitoring of wells located proximal to hydraulic fracturing activities. Other new requirements include standards for well development impoundments, a process for the closure or waste permitting for wastewater impoundments, onsite wastewater

processing, site restoration, standards for borrow pits, and reporting and remediating spills and releases.
http://www.pacodeandbulletin.gov/Display/pabull?file=/secure/pabulletin/data/vol46/46-41/1757.html

State comprehensive siting plans or procedures

Pennsylvania's Solar Future: Strategies to increase electricity generation from in-state solar energy
This solar energy development plan was published in 2017 in coordination between the DEP Energy Office and the PennFuture Energy Center. This is a statewide plan that does not differentiate any data or information specifically within the coastal zones. The report discusses statewide trends in the solar industry and described projections for the future of the industry in Pennsylvania. From 2000 to 2017, Pennsylvania's total installed solar power capacity increased from less than one MW to over 300 MW. The plan calls for achieving a 10% energy market share for solar installations by 2030, resulting in greenhouse gas reductions of 10% and a net economic gain of $25 billion through 2030 when accounting for environmental benefits.
http://www.depgreenport.state.pa.us/elibrary/GetDocument?docId=1413595&DocName=PENNSYLVANIA%26%2339%3bS%20SOLAR%20FUTURE%20PLAN.PDF%20%20%3cspan%20style%3D%22color:blue%3b%22%3e%28NEW%29%3c/span%3e

iii. 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 Marcellus Shale gas energy boom of the mid 2000's has mostly stabilized and prices for natural gas have declined due to the expanded supply and competition from other fuel sources. As a result, the potential for new exploitation of less accessible energy sources (e.g., Utica Shale gas under Lake Erie) is likewise reduced. Simultaneously, new energy infrastructure developed during the last assessment period, specifically oil and gas pipelines, processing, and port facilities in the DECZ, has renewed the energy industry as a significant coastal economic fixture in that region.

The future of offshore wind energy in Lake Erie remains uncertain and will hinge upon the success or failure of planned pilot projects. Still, the renewed interest in Great Lakes wind energy by energy producers necessitates planning and preparation by CRMP for the siting and development of potential installations. CRMP will continue to monitor the progress and results of the pending pilot projects and will review CRMP policies for the siting of wind facilities if necessary.

CRMP continues to provide support in the DECZ by supporting a dedicated biologist to conduct environmental reviews on water obstruction and encroachment permits and through CZMA federal consistency reviews. By having a dedicated reviewer, familiar with the unique resources and regulations of the tidal Delaware Estuary, critical project reviews are actively coordinated with CRMP and are conducted in an efficient manner that expedites review and protects the resources.

CRMP can continue to support Energy and Government Facility Siting where applicable through our existing procedures and a program change is not necessary. CRMP will continue to monitor developments and will assist DEP decision making in management of emerging issues when needs are identified.

During CRMP's stakeholder engagement process, Energy and Government Facility Siting was selected as a high priority by just 16% of total respondents. Respondents equally selected medium and low priority assignments. The relatively recent developments of new pipeline and processing facilities in DECZ and the renewed potential for offshore wind development in Lake Erie leads CRMP to assign a medium priority to Energy and Government Facility Siting.

9. Aquaculture

Section 309 Enhancement Objective: *Adoption of procedures and policies to evaluate and facilitate the siting of public and private aquaculture facilities in the coastal zone, which will enable states to formulate, administer, and implement strategic plans for marine aquaculture. §309(a)(9)*

a. **Phase I (High-Level) Assessment:**
Purpose: To quickly determine whether the enhancement area is a high-priority enhancement objective for the CMP that warrants a more in-depth assessment. The more in-depth assessments of Phase II will help the CMP understand key problems and opportunities that exist for program enhancement and determine the effectiveness of existing management efforts to address those problems.

i. **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. Your state Sea Grant Program may have information to help with this assessment.

Table 9.1 indicates an increase in aquaculture activity in both the DECZ and LECZ. These increases are not associated with commercial facilities but support important recreational and conservation efforts.

Table 9.1: Status and Trends of Aquaculture Facilities and Activities in the DECZ and LECZ

Type of Facility/Activity	Number of Facilities	Approximate Economic Value	Change Since Last Assessment (↑, ↓, No change or Unknown)
DECZ: Watershed restoration and conservation	1: PDE Mussel Hatchery and living laboratory exhibit – Fairmount Water Works	N/A: mussels utilized for educational and conservation purposes, not sold back to the market for profit	↑
LECZ: Recreation and conservation support	5: - PFBC Fairview Hatchery - Save our Native Species (S.O.N.S.) Hatchery – Presque Isle Bay - Ro-Ze Nursery – 3C.U. Trout Association - TREC Nursery – Presque Isle State Park Wesleyville Nursery – Wesleyville Conservation	* Total economic significance of Lake Erie recreational angling industry estimated $49.5 million for the 2016 season; for every $1 spent on recreational angling, $1.65 was generated for the Erie County economy	↑

*2018, Assessing the Economic Impact and Significance of Recreational Angling on Lake Erie Waters: Final Report by Pennsylvania State University

In addition to PFBC's state hatcheries, PFBC partners with cooperative nurseries to fulfill their recreational fishing hatchery effort. There are nine cooperative nurseries within the Erie watershed, four of which reside within the coastal zone. These four include nurseries and hatcheries run by 3C.U. Trout Association, S.O.N.S., Presque Isle State Park, and Wesleyville Conservation. Table 9.2 lists the cooperative

nurseries that operate within the Lake Erie watershed (those with an asterisk are located inside of the coastal zone).

Table 9.2: Cooperative Nurseries in the Lake Erie Watershed

Facility Name	Sponsor
Albion	Albion Sportsmen Club, Inc.
Kendra	3C.U. Trout Association
Mission	3C.U. Trout Association
Mitchell	3C.U. Trout Association
*Ro-Ze	3C.U. Trout Association
Peck	3C.U. Trout Association
*Save our Native Species (S.O.N.S.) Hatchery	S.O.N.S.
*Tom Ridge Environmental Center (TREC)	Presque Isle State Park
*Wesleyville	Wesleyville Conservation Club

*=Nurseries located within the LECZ.

The private and public aquaculture industry within Pennsylvania is experiencing an increase in sales since the last assessment period. According to the 2018 Census of Aquaculture (conducted by the United States Department of Agriculture, USDA and National Agricultural Statistics Service) the total value of aquaculture sales in Pennsylvania in 2018 was $8,364,000 from 55 farms as opposed to the $6,927,000 in sales from 56 farms in 2013. Within these total sales, food fish sales and trout sales increased since 2013 as well. Pennsylvania State University reports that approximately 79% of all sales from aquaculture farms in Pennsylvania are used to supply recreational fishing markets.

Trout farms have historically dominated Pennsylvania's aquaculture market and continue to do so today. Pennsylvania State University states that trout farms make up approximately 2/3rds of the total value of aquaculture production for the state. Nationally, Pennsylvania ranks fifth in trout production for food sales falling behind Idaho, Washington, North Carolina and California. Trout produced and distributed for conservation, recreation, enhancement, or restoration purposes has remained relatively consistent nationally as Pennsylvania has been ranked third since 2011. Since the last assessment period, the value of trout produced for conservation increased. The value of trout produced for conservation in 2013 was $9,200,000 and in 2018 rose to $14,823,000.

LECZ

Within the LECZ, aquaculture practices continue to be primarily driven by recreational purposes, mainly the sport fish industry. In addition to the PFBC Fairview State Hatchery and S.O.N.S. Hatchery, three cooperative nurseries moved within the coastal zone including, Ro-Ze, Wesleyville and the TREC nurseries. Annually, about 1,000,000 steelhead and 500,000 brown trout are supplied to Lake Erie and its tributaries by the PFBC. Cooperative nurseries additionally stock over 65,000 steelhead and nearly 55,000 brown trout every year. Nurseries located outside of the coastal zone are typically released into Lake Erie's tributaries.

The steelhead fishery in Erie is supported by three PFBC state hatcheries, of which only one, the Fairview Hatchery, is located within the coastal zone. The Fairview Hatchery supplies about 300,000 steelhead a year and serves as the primary

location for egg removal and fertilization. After spawning, most of the specimens are sent to the other two state hatcheries, Tionesta and Linesville.

Lake Erie's "Put-Grow-Take" Brown Trout Program has improved every year since its inception in 2009. The PFBC and cooperative nurseries work collaboratively to maintain the fishery. The program's stocking objective of 100,000 brown trout per year has not yet been met; however, the amount of brown trout stocked has increased annually. In 2014, 73,000 brown trout were stocked into Lake Erie's waters. Issues with egg availability and hatchery biosecurity have prevented maximum brown trout stocking.

DECZ

Aquaculture efforts to aid in the restoration and conservation of the Delaware Estuary and its surrounding waters has gained momentum after years of interest. In May of 2018, a memorandum of understanding was signed by the Academy of Natural Sciences and the College of Arts and Sciences of Drexel University, PWD and the Department of Parks and Recreation, Bartram's Garden, and the Independence Seaport Museum. These organizations share a main objective of improving the health and quality of Philadelphia's waterways through large-scale restoration projects. The coalition will specifically focus on freshwater mussel and shad propagation and restoration within the Delaware Estuary and its surrounding waters using hatcheries.

PDE has signed a funding agreement with the PENNVEST to plan, design and build a large freshwater hatchery at Bartram's Garden in Philadelphia. This new, large-scale production hatchery works in tandem with the existing mussel hatchery and living laboratory exhibit at the Fairmount Water Works, erected in 2017, to not only begin a watershed-wide restoration effort, but also educate local youth and students.

Further explanation of the freshwater mussel recovery program can be found within the Ocean Resources section (D.7).

There are no existing aquaculture facilities for the restoration of shad in the DECZ. 2 facilities, located outside of the coastal zone, serve to supplement shad restoration on the Schuylkill River. Eggs from Delaware River Shad are collected by PFBC and used in their hatchery operation to fulfill restoration efforts on the Schuylkill River. Fairmount Dam Fishway, a small-scale shad hatchery operation by PDE and the PWD, is located along the Schuylkill River and serves mainly as an educational outreach program. The facility completed its 2-year proof of concept trial successfully in 2017. As of 2019, local students are involved in the grow-out of fertilized eggs at the hatchery. Interest in shad propagation within the DECZ has increased since the last assessment. The coalition mentioned above has proposed the creation of a shad hatchery located at the Independence Seaport Museum.

ii. 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.*

The management changes identified in Table 9.3 refer to policy changes regarding biosecurity measures. These changes are described in question two below the table.

Table 9.3: Significant Changes in Aquaculture Management

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	N	N	N
Other aquaculture statutes, regulations, policies, or case law interpreting these	Y	N	Y

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.*

Biosecurity measures

Issues of parasitic gill lice (*Salmincola*) became apparent in 2016 as multiple sightings were reported in angler reports and PFBC biologist observations. This parasite is host specific targeting brook trout (*S. edwardsii*) and rainbow trout (*S. californiensis*). As of December 2018, gill lice had been found in 6 streams in Erie originating from hatchery rainbow trout. In response, the PFBC imposed zero tolerance for stocking gill lice infected fish. Positive fish must be euthanized and replaced by less-susceptible species. In coordination with the PDA, PFBC encouraged commercial hatcheries to monitor and eradicate gill lice. To do so, a protocol for certification of the presence of gill lice was developed and introduced. PFBC was mainly responsible for this change in management, CRMP had no direct involvement in the change. The new biosecurity measures are hoped to decrease the spread of disease and increase the amount of stocking possible.

Cooperative Nursery Statement of Policy Changes

The statement of policy for PFBC's Cooperative Nursery program was revised in 2017 to reflect changes in operation regarding fish purchases and disease treatment. Following issues with pathogens and fish health, stricter regulations have been introduced when purchasing fish from outside sources. Cooperative Nurseries must obtain approval from the Cooperative Nursery Unit (CNU) in order to purchase fish from commercial or private hatcheries. These fish must have CNU approved health certificates and will be held in separate raceways from fish provided by the PFBC. Policies were also introduced in 2017 as a result of the spread of Gill Lice. All Cooperative Nurseries are required to be inspected annually for gill lice by a certified gill lice inspector. If gill lice are found, the Nursery must report to the CNU, FHU, Bureau of Hatcheries staff, Bureau of Fisheries Director, Fisheries Management Chief, and Area Fisheries Manager to determine the correct response. The PFBC was responsible for the revision in the statement of policy for the Cooperative Nursery program, CRMP had no direct involvement in this change.

iii. **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.*

   Commercial aquaculture opportunities remain limited within Pennsylvania despite the increase in facilities in the DECZ. Historically, CRMP has supported aquaculture efforts for recreational and restoration purposes. Early research stages for the mussel hatchery project by PDE were funded using Section 306A grants by CRMP. CRMP could continue to support conservation and recreational aquaculture practices in the future as well. Within Pennsylvania, primary responsibility for the regulation and support of the aquaculture industry lies with PDA and PFBC. CRMP will continue to coordinate with both state agencies concerning recreational and conservation aquaculture practices. In our Section 309 stakeholder engagement survey "Aquaculture" was the lowest ranked enhancement area with zero out of 16 stakeholders ranking it as a high priority. Developments and changes within the aquaculture industry and amongst PDA, PFBC, PASG and other partners and stakeholders will be closely monitored by CRMP. If opportunities arise to increase commercial aquaculture within the coastal zones, CRMP will work closely with PDA and PFBC to ensure the safety and quality of the coastal zones' resources.

E. Strategy

As explained previously in the Current Enhancement Area Analysis Summary, CRMP identified two "high priority" enhancement areas; coastal hazards and cumulative and secondary impacts. These two enhancement areas continue to be a high priority for CRMP. CRMP has developed two strategies relating to these enhancement areas, as indicated in item a. Issue Area(s) below.

1. Strategy 1

Integrating and Strengthening Climate Adaptation and Resiliency Planning in the DECZ

a. Issue Area(s)

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

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

b. Strategy Description

i. 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.

ii. Strategy Goal: To continue building community resiliency in the DECZ by supporting an integrated approach to climate adaptation and resiliency planning and supporting multi-benefit implementation projects. The goals include outlining a process to achieve potential coastal zone boundary expansion that facilitates inclusion of additional geographic areas threatened by sea level rise and climate change and a more engaged, informed, and active group of municipal officials. The goal includes the formation of

multi-municipal planning and implementation efforts, including formal agreements, to address the difficult challenges of urban stormwater management and associated flood reduction.

iii. **Description:** The strategy includes 2 parts to achieve the strategy goals:

Part 1: DECZ Coastal Zone Boundary Expansion Analysis
CRMP proposes to investigate opportunities to expand the DECZ boundary in areas where the impacts of climate change and sea level rise may extend beyond the current coastal boundaries. This is consistent with a NOAA recommendation from CRMP's 2019 program evaluation. The proposed boundary expansion investigation will also consider needs of underserved communities with a focus on coastal hazards, safe and welcoming linkages to growing waterfront public access sites, and the potential for green infrastructure opportunities that will provide resiliency to stormwater flooding and urban temperature rises. The investigation will also consider natural and cultural resources that could be better linked to resources within the coastal zone.

Part 2: Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency in the DECZ: Phase II
CRMP will continue to expand upon the Pennsylvania Coastal Resiliency project being led by DVRPC in the DECZ. Phase I of this climate adaptation and community resiliency capacity building project started in our 2016 – 2020 strategy. This strategy involves integration of additional tools and resources into the Coastal Effects of Climate Change in Southeastern PA storymap. This storymap has become a key component for outreach and the sharing of specific tools that are available for coastal municipalities. More detailed goals of the added resources are to provide better assistance in supporting regional or multi-municipal approaches, providing tools to support local efforts to apply for funding in support of coastal hazard planning and implementation projects, and supporting municipalities expressing interest in participating in the FEMA Community Rating System. Tools focusing on economic resiliency and the reduction of risk for waterfront property owners are also planned.

A significant component of this project is for CRMP to help encourage and ultimately support multi-municipal stormwater planning and/or implementation projects. CRMP will progress towards achieving this goal by working closely with DVRPC and other local partners to ultimately develop a regional (multi-municipality) stormwater infrastructure plan that incorporates climate change. Urban flooding is a persistent problem in the DECZ that is being exacerbated by climate change. The DECZ consists of a built-out landscape and opportunities for individual stormwater implementation projects can be challenging. Cost/benefit efficiencies can be achieved if larger, multi-partner projects are implemented in the watershed. Existing CRMP networks and resources, such as DVRPC's Pennsylvania Coastal Resiliency webpage, can be used as a catalyst to inspire cooperation, as participation by municipalities could be a challenge. CRMP has worked with the Eastern Delaware County Stormwater Collaborative which could serve as an example for other municipalities in the coastal zone. CRMP policies and grant documents will be reviewed to determine what revisions are needed in order to better support these efforts.

c. Needs and Gaps Addressed

Pennsylvania's current coastal zone boundary does not extend to the limit of storm surge predictions under various future case scenarios that consider sea level rise, post-glacial subsidence, and storm surge. Future case scenarios, and information about the data that was used to derive them, are presented in the Pennsylvania Coastal Effects of Climate Change in Southeastern PA storymap (https://dvrpcgis.maps.arcgis.com/apps/MapSeries/index.html?appid=8080c91a101d460a9a0246b90d4b4610). Concurrent with analyzing sea level rise and coastal storm flooding as it relates to the boundary, CRMP will seek to address additional gaps such as linking trails, connecting natural resources, and providing safe and attractive connections from heavily urbanized areas to public access sites available on the waterfront.

Land use decisions in Pennsylvania are made at the local municipal level and increasing the capacity of local officials to support their land use decisions is critical in planning for mitigating coastal hazards. Local officials often focus on immediate problems, with long-term planning associated with climate change historically not being as prioritized as the more current issues. However, awareness and consideration of future impacts continues to grow. Many municipalities in the DECZ struggle with funding for green infrastructure projects. Outreach on existing funding sources and the tools needed to develop a strong application for available funding is an important gap that could be addressed by this strategy. The 2020 Pennsylvania Risk Reduction Consultation meeting, hosted jointly by PEMA and FEMA, offered the following top 3 priorities:

1. Engage more stakeholders to support local Floodplain Managers.
2. Increase outreach to priority communities.
3. Conduct outreach to elected officials to educate them about risk and mitigation.

The proposed strategy would help in addressing some of these priorities. Providing outreach and technical assistance to municipal officials was mentioned by 11 out of 17 stakeholders providing input. While only four out of 17 stakeholders specifically mentioned regional approaches to stormwater and floodplain management on the engagement questionnaire, it was a consistent point mentioned during discussions with local planners, municipal officials, and stormwater professionals. During implementation of CRMP's 2016 – 2020 strategy municipal officials discussed the challenges of addressing stormwater from upstream municipalities, the need to work together, and the challenges of entering into formal multi-municipal agreements.

d. Benefits to Coastal Management

An expanded coastal zone boundary would allow for funding implementation projects in an expanded geographic area that is vulnerable to sea level rise and storm surge flooding threats and would allow CRMP to better support regional planning efforts. The expanded boundary would also allow CRMP to pursue other program priorities such as linking residential neighborhoods to waterfront public access sites, natural resources, and historic resources.

A Phase II assessment of the Building Capacity to Facilitate Climate Adaptation Planning and Community Resiliency in the DECZ strategy will allow CRMP to build on lessons learned during the 2016 – 2020 strategy and continue the momentum and local interest that has

evolved. Local municipalities will be provided more tools and information to make local decisions to address their unique challenges and will have the opportunity to gain assistance in developing regional stormwater initiatives. The coastal municipalities will be more aware of funding sources, have the tools to develop competitive grant applications that may be more competitive if working regionally.

Climate change will not only impact coastal hazards, it will have some level of impact on all 11 CRMP's program policy areas. This strategy will continue the efforts of the 2015 Assessment and Strategy (FY2016 – FY2020) to address changes to each of the policy areas related to climate change. CRMP will be better informed to coordinate efforts with the networked partners in the CZAC as they address climate change issues that fall under their responsibilities.

e. Likelihood of Success

Coastal zone boundary expansion in the DECZ has received local support in the past and continues to be discussed by local partners. With local support from various levels of stakeholders, the potential exists for a successful coastal zone boundary expansion. Ultimately local municipal officials' input will provide the main influence for the success and configuration of any potential boundary expansion. Outreach to municipalities will be an important component of this strategy.

Continuing the effort to support local officials in climate adaptation and resiliency planning will be strengthened by the contacts made during implementation of the 2015 Assessment and Strategy (FY2016 – FY2020). DVRPC has the experience and expertise to facilitate a successful Phase II strategy project. The goals of the currently proposed strategy build upon the lessons learned during the 2016-2020 strategy. Local officials have expressed a growing interest in hazard mitigation and the opportunities to pursue multi-benefit projects such as green stormwater infrastructure. To date, there is only one multi-municipal stormwater collaborative in the DECZ. While various municipalities have expressed interest, the likelihood of success will ultimately be subject to the level of willingness to participate from the coastal municipalities.

f. Strategy Work Plan

Strategy Goal: To more comprehensively address local coastal resiliency by conducting a preliminary investigation into expanding the DECZ boundary and strengthening local capacity to address coastal hazards associated with sea level rise, increased heavy precipitation events, and urban flooding. CRMP seeks to be a catalyst for multi-municipal partnerships and engage municipal officials seeking to strengthen their local capabilities.

The strategy also includes an on-going evaluation of existing CRMP policies for changes that would better support climate resiliency planning.

Total Years: 5 years
Total Budget: $300,000

Year: 1

Description of activities: Using existing lidar, digital elevation models, and other sea-level and climate change related products and models, conduct an analysis of our existing coastal zone boundary to determine where future coastal hazards will not be adequately addressed within the existing boundary. Develop mapping to illustrate potential boundary expansion scenarios that would be more inclusive of future coastal hazards associated with sea level rise and storm surge.

Working with DVRPC, continue to build upon the Coastal Effects of Climate Change in Southeastern PA storymap tool by adding new components to the existing application. New data is available every few years and the purpose of building on this storymap is to provide the most current data and tools. This includes additional tools to support municipal grant applications and community resiliency, including community economic resiliency. Engage regional and central office DEP stormwater experts to participate in the CRMP strategy and help coordinate efforts.

Major Milestone(s): GIS mapping that indicates vulnerable geographic areas and specifically those areas not currently within the existing coastal zone boundary.

Budget: $65,000

Year: 2

Description of activities: Using the sea level rise/storm surge GIS basemap developed during year 1 add additional layers including environmental justice areas, public access trails, critical infrastructure, and natural and cultural resources. Develop some preliminary mapping with potential boundary expansion options.

Continue to maintain and build upon the Pennsylvania Coastal Resiliency webpage and Coastal Effects of Climate Change in Southeastern PA storymap. Add information including modeling or example multi-municipal stormwater agreements and success stories. Add tools addressing community economic resiliency, from tools examined in Year 1. Use these tools to inform outreach efforts. Ascertain municipal interests in multi-municipal stormwater planning and consider altering draft GIS boundary expansion mapping if appropriate.

Major Milestone(s): GIS mapping that delineates various potential boundary expansion options. Develop a public outreach plan to present boundary expansion options to local partners and municipalities.

Availability of additional climate resiliency tools for municipalities and vulnerable waterfront property owners. Outreach efforts as appropriate. Provide support for multi-municipal or regional climate resiliency projects where appropriate. Support municipal interest in the Community Rating System.

Budget: $65,000

Year: 3

Description of activities: Produce boundary expansion outreach materials and implement the outreach plan developed in year 2. Begin to receive municipal feedback on potential boundary expansion options.

Build upon available tools at Pennsylvania Coastal Resiliency project webpage and look to highlight success stories. Continue to support municipal efforts for regional collaboration and efforts to leverage available funding resources. If regional or multi-municipal stormwater collaboratives are forming, consider adjusting boundary expansion maps to accommodate and support these efforts.

Begin examination of CRMP's 11 policy areas for potential changes to policies to better manage and address climate change resiliency. Coordinate efforts with other state agencies through the CZAC.

Major Milestone(s): Outreach to municipalities regarding potential boundary expansion options.

Continued outreach to coastal municipalities to support local changes to better support coastal resiliency.

Agency input on potential climate resiliency changes to CRMP's approved program plan.

Budget: $65,000

Year: 4

Description of activities: Based on year 3 outreach and feedback adjust proposed boundary expansion mapping to incorporate public and municipal feedback. Finalize municipal responses to proposed boundary expansion options and develop final boundary expansion mapping. Propose final boundary expansion mapping for internal DEP consideration and approval.

Activities associated with supporting municipal coastal resiliency planning and stormwater management will be guided by prior year efforts. Potential activities include supporting formal multi-municipal agreements, integrating climate resiliency into comprehensive planning, and assisting with participation in the Community Rating System.

Draft policy changes to the 11 program policy areas in CRMP's approved program plan.

Major Milestone(s): Finalized municipal input on proposed boundary expansion and development of final drafts of boundary expansion maps.

Budget: $65,000

Year: 5

Description of activities: Present official program change documentation and request to NOAA for approval. This will include the revised coastal zone boundary as well as program changes to the 11 program policy areas specifically related to better addressing and managing climate change adaptation and resiliency.

Continue to provide outreach and technical assistance to municipalities to support local changes in climate resiliency, stormwater management, and hazard mitigation. Specific activities will be driven by prior year experiences and input.

Major Milestone(s): Program change documentation will be submitted to NOAA for approval.

Budget: $65,000

g. Fiscal and Technical Needs

i. Fiscal Needs: CRMP will use Section 309 funding to carry out the proposed strategy. Additional DEP staff, funded from other sources, will provide assistance to the strategy that supports multi-municipal planning and implementation efforts for regional stormwater or flood resiliency planning. CRMP and DVPRC will look to leverage additional funding when appropriate and available.

ii. Technical Needs: CRMP has the technical ability to carry out the strategy. CRMP will reach out to other DEP staff and members of the CZAC to provide additional assistance. DVRPC has a variety of technical resources available to support this effort.

2. Strategy 2

Development of a Comprehensive Program to Identify and Mitigate the Impacts of Stormwater on Lake Erie Bluff Erosion and Recession

a. Issue Area(s)

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

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

b. Strategy Description

i. 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.

ii. Strategy Goal: To make program changes that will increase the CRMP's ability to mitigate bluff recession and coastal erosion impacts from stormwater discharges.

Ultimately, local government and local partners, will play a critical role in implementing CRMP changes. Their input will help inform and shape the most appropriate form for some of the CRMP changes. In addition to CRMP guidance and policy development, the use of local ordinances will be evaluated.

The technical guidance developed under this strategy will be incorporated into existing municipal reference documents or updates to existing DEP guidance documents such as Pennsylvania's Stormwater Best Management Practices (BMP) Manual (Stormwater BMP Manual) and Erosion and Sediment Pollution Control Program Manual (E&S Manual), as appropriate. Changes to policies in the program reference document are also anticipated.

iii. **Description:** This proposed strategy is intended to build coastal resiliency by addressing point and nonpoint sources of stormwater that are released to the bluff face through both surface water and groundwater. A comprehensive program that identifies the locations, documents the impacts, determines why the erosion is occurring and ultimately provides additional outreach and education on BMP usage in this unique landscape will lead to less bluff recession and shoreline erosion resulting in a more resilient coast. The CRMP will provide local officials and property owners with bluff-specific fact sheets to assist in local land use and stormwater management decisions. The Commonwealth of Pennsylvania Coastal Resources Management Program Guidance Document will be amended to reflect changes to encourage policies associated with the review and awarding of CRMP grants. If applicable, enforcement and direct action policies will also be amended.

c. Needs and Gaps Addressed

Recent record and near-record high lake levels, combined with recent storms and high energy waves, have elevated citizen concerns regarding bluff erosion and recession. In many areas the bluff face has become steeper, and as the bluff slope moves landward to become more stable, the impacts to bluff crest recession continue to increase. Efforts to reduce bluff erosion and subsequent bluff crest recession are a high priority and will likely remain a high priority. Further investigation into unpermitted stormwater outfalls is necessary, along with evaluating the resiliency of permitted stormwater outfalls to the changing landscape. Identifying mandatory maintenance needs is also warranted to ensure long-term viability of the discharges.

d. Benefits to Coastal Management

The results of this strategy will lead to program changes that will better equip CRMP in its role to provide technical and administrative guidance to local residents and municipalities. Local county and municipal officials will be better informed to evaluate the applicability of local ordinances specific to stormwater discharges to the bluff face. The strategy will also inform and encourage policy decisions in the form of grants specific to bluff erosion. Ultimately the benefit to coastal management will be a more resilient bluff and shoreline with decreased erosion and recession.

e. Likelihood of Success

Due to higher lake levels, bluff erosion and recession have become a higher priority for shoreline property owners, municipal officials, and those involved in local planning and management. Strong local support for the project is anticipated. CRMP and associated partners have the experience and expertise to successfully guide this strategy. This project will also be complementary to other local stormwater projects. Some program changes being considered under this strategy, such as local ordinances, will be outside of the CRMP's control. The strategy will provide outreach and education to local officials to fully consider the most appropriate program changes to reduce risk and build resiliency.

f. Strategy Work Plan

Strategy Goal: Update the Stormwater BMP and E&S Manuals through incorporating further exploration of coastal resiliency and provide fact sheets for public and local government use.

Total Years: 5 years

Total Budget: $225,000

Year: 1

Description of activities: Identify key partners and form an organized workgroup for implementing the initial stages of the proposed project.

Identify and compile existing information regarding the locations and sources of stormwater releases to the bluff face, and develop criteria used to document visible and potential impacts. Consider groundwater seeps resulting from stormwater. Begin to categorize types of sources.

Identify data gaps where additional investigation and ultimately mapping is required.

Major Milestones: Identification of key partners, their roles, initial compilation of existing data and identification of data gaps.

Budget: $45,000

Year: 2

Description of activities: Seek additional sources of existing information. Develop a plan for managing locational data for the existing data set and capture the currently unmapped sources of discharge. This plan will include the use of existing data, remote sensing, and field work to identify maintenance needs and unpermitted discharge sources.

Conduct research on BMPs for bluff related stormwater being implemented in other Great Lakes and high bluff states.

Utilize workgroup in outreach efforts and incorporate updates of the plan being developed into municipal official workshops, local LECZ Advisory Committee meetings, and state-wide CZAC meetings. Identify other audiences where outreach and information sharing would be appropriate.

Major Milestones:

Development of a geospatial database and written procedures for collecting data, and documenting impacts, unpermitted outfalls and necessary maintenance activities. Initiation of early outreach to stakeholders.

Budget: $45,000

Year: 3

Description of activities: Develop a report that summarizes year 2 investigations and documents the types, numbers, and potential impacts of the sources of stormwater discharges that impact the bluff face through surface or groundwater. The report will include an analysis of existing hydrologic studies and identify needs for additional hydrologic studies using existing lidar data and associated digital elevation models. The report will also identify and examine climate-related changes to the hydrologic cycle in the LECZ and how those changes may have impacted existing structures.

Evaluate and update options for the Stormwater BMP and E&S Manuals to address retrofitting of permitted sites due to the changing landscape. Inclusion of additional coastal resiliency options will also be considered.

Hold a workshop with a target audience of municipal officials and stormwater experts to share information, discuss technical BMPs, specific maintenance needs identified and the locations of unpermitted outfalls. Municipal input on potential implementation actions to mitigate bluff erosion impacts from stormwater will also be discussed along with the feasibility of developing municipal stormwater ordinances specific to bluff related discharges or other preferred local actions.

Major Milestones: A summary report and comprehensive outreach to local municipal officials, planners, technical experts, and other stakeholders.

Budget: $45,000

Year: 4

Description of activities: Update the Stormwater BMP and E&S Manuals. Prioritize key areas for BMP implementation, maintenance activities and the reduction of unpermitted discharges. Develop bluff-specific fact sheets that will outline the importance of implementing and maintaining BMPs.

Evaluate potential changes to policies in the Commonwealth of Pennsylvania CRMP Guidance Document, including encouragement, direct action, and enforcement policies.

Continue outreach and education efforts to local officials and partners and provide technical support for any local actions that may be considered, including local ordinances if applicable.

Major Milestones: Complete updates of manuals, development of fact sheets and list of priority sites.

Budget: $45,000

Year: 5

Description of activities: Make changes to CRMP Guidance Document. Seek formal NOAA approval of program changes incorporated into CRMP Guidance Document.

Workgroup will continue to monitor BMPs to determine long-term effectiveness, identify any additional maintenance needs and monitor progress of addressing unpermitted discharges.

Major Milestones: Completion of program changes.

Budget: $45,000

g. Fiscal and Technical Needs

i. **Fiscal Needs:** CRMP will use Section 309 funding to support the development of program changes that will result from this strategy. CRMP will also rely on technical support from the local CRMP staff person and participation from local partners contributing their time and expertise.

ii. **Technical Needs:** CRMP has been involved with bluff erosion recession studies and management for several decades resulting in extensive technical expertise within the program. Additional DEP staff as well as local partners, including the Erie County Department of Planning and Community Development, can provide technical expertise on the mapping and control of stormwater discharges. While CRMP has internal expertise in remote sensing technologies, including lidar, there are certain lidar related tasks where outside technical expertise may be required. Lidar has the ability to not only determine bluff crest recession but also provide information on volumes of material being eroded and entering the lake/littoral drift from the bluff face. This strategy may be enhanced by the use of historical and more current or upcoming lidar data and analysis.

h. Projects of Special Merit

Bluff face erosion is one part of a complex and integrated series of factors that contribute to bluff crest recession. Prior studies have indicated that the majority of coarse size (sand) littoral materials entering the littoral drift in Pennsylvania originate from the bluff, as compared to stream sources which typically provide finer grained materials. Additional work is needed to confirm past conclusions and better quantify individual shoreline reaches and watersheds. Identifying sources of littoral drift material in Pennsylvania is extremely important due to the major impact the Conneaut Harbor breakwaters have on the amount of updrift littoral material entering Pennsylvania from Ohio. CRMP does not have a specific project of special merit identified at this time but may consider projects related to the following: volumes and types of materials eroded from the bluff, the relationship to other sources of littoral drift material, and the fate and transport of that material. CRMP may also consider further hydrologic analysis using existing lidar data as a potential project of special merit.

3. 5-Year Budget Summary by Strategy

The following budget table summarizes the anticipated Section 309 expenses by strategy for each year.

Table 10.1: 5-Year Budget Summary by Strategy

Strategy Title	Anticipated Funding Source (309 or Other)	Year 1 Funding	Year 2 Funding	Year 3 Funding	Year 4 Funding	Year 5 Funding	Total Funding
Integrating and Strengthening Coastal Adaptation and Resiliency Planning in the DECZ	309	$65,000	$65,000	$65,000	$65,000	$65,000	$325,000
Development of a Comprehensive Program to Identify and Mitigate the Impacts of Stormwater on Lake Erie Bluff Erosion and Recession	309	$45,000	$45,000	$45,000	$45,000	$45,000	$225,000
Total Funding 309		$110,000	$110,000	$110,000	$110,000	$110,000	$550,000

F. Summary of Stakeholder Engagement and Public Comment

1. Stakeholder Engagement

CRMP used a questionnaire to gather input from key stakeholders to seek input on enhancement area program priorities and opportunities to make changes to address those priorities. The questionnaire was supplemented by a presentation on the basics of the Section 309 process and current and historic CRMP Section 309 projects. Given the national significance, and CRMP's existing prioritization, CRMP pre-determined coastal hazards to be a high priority and asked stakeholders to offer specific input on existing challenges and how CRMP could make changes or otherwise better support coastal hazards mitigation.

CRMP identified the following key stakeholders when seeking input on drafting our coastal enhancement priorities:

Statewide:

- Pennsylvania CZAC
- Pennsylvania Sea Grant

DECZ:

- DECZ Advisory Committee
- DVRPC
- PDE
- Delaware County Coastal Zone Task Force
- DEP Southeast Regional Office

LECZ:

- LECZ Advisory Committee
- Erie County Department of Planning
- Community Resilience Action Network of Erie
- DEP Northwest Regional Office

a. Tabular Summary of Stakeholder Engagement Responses

(Note: Not all respondents prioritized all enhancement areas. Thus, the numbers may not appear to add up correctly.)

Table 10.2:
Total Stakeholder Responses Indicating Prioritizing of Section 309 Enhancement Areas (17 responses)

	Coastal Hazards	Wetlands	Public Access	Marine Debris	Cumulative and Secondary Impacts	Special Area Management Planning	Ocean and Great Lakes Resources	Energy and Government Facility Siting	Aquaculture
High	*	5	8	4	8	9	1	2	0
Medium	N/A	10	5	7	6	5	9	7	8
Low	N/A	0	3	3	1	2	4	6	6

***** The coastal program predetermined Coastal Hazards to be a high priority enhancement area and asked for input specific to that priority.

Table 10.3: Delaware Estuary Responses (6)

	Coastal Hazards	Wetlands	Public Access	Marine Debris	Cumulative and Secondary Impacts	Special Area Management Planning	Ocean and Great Lakes Resources	Energy and Government Facility Siting	Aquaculture
High	*	4	4	1	1	1	0	2	0
Medium	N/A	2	1	3	3	3	2	3	3
Low	N/A	0	0	1	1	1	3	1	2

***** The coastal program predetermined Coastal Hazards to be a high priority enhancement area and asked for input specific to that priority.

Table 10.4: Lake Erie Responses (7)

	Coastal Hazards	Wetlands	Public Access	Marine Debris	Cumulative and Secondary Impacts	Special Area Management Planning	Ocean and Great Lakes Resources	Energy and Government Facility Siting	Aquaculture
High	*	0	2	2	4	6	1	0	0
Medium	N/A	6	3	3	2	0	4	2	2
Low	N/A	0	2	1	0	1	1	4	4

***** The coastal program predetermined Coastal Hazards to be a high priority enhancement area and asked for input specific to that priority.

Table 10.5: Statewide Responses (4)

	Coastal Hazards	Wetlands	Public Access	Marine Debris	Cumulative and Secondary Impacts	Special Area Management Planning	Ocean and Great Lakes Resources	Energy and Government Facility Siting	Aquaculture
High	*	1	2	1	3	2	0	0	0
Medium	N/A	2	1	1	1	2	3	2	3
Low	N/A	0	1	1	0	0	0	1	0

***** The coastal program predetermined Coastal Hazards to be a high priority enhancement area and asked for input specific to that priority.

b. Summary of Stakeholder Comments on Section 309 Development Related Specifically to the Coastal Hazards Enhancement Area

What are the biggest challenges related to building coastal resiliency and mitigating loss due to coastal hazards?

- One of our region's (DECZ) biggest challenges regarding coastal hazards is getting municipalities and residents to understand the potential impacts of climate change and prioritize action now to address future hazards.
- Municipalities are dealing with many current problems (tax base, municipal services, growing economic opportunities, etc.) and may not have the bandwidth or funding to address future problems.

- In the DECZ, most of the coastal communities are older, built-out communities, where the standard recommendation to "add open space and greening" will not work.
- Economic challenges and competing interests.
- Municipalities in our region (DECZ) are not equally prepared for future flooding.
- Municipalities could (should more frequently) pool their resources to create regional floodplain ordinances, share funding for regional flood protection.
- Need more vulnerability assessments of transportation infrastructure that account for sea-level rise and climate change.
- Ensuring adaptations also advance environmental justice.
- Changing local/state policies to 1) reflect value of ecosystem services and 2) to take the long view (10-50 years, rather than 1-2 years)
- Bluff related: The increase in precipitation has resulted in higher ground water runoff on the clay shelf along the coast while washing out the sandy loam and fine sandy soils above the clay.
- Education of municipal officials, landowners, land development professionals, Real Estate professionals and the news media on Lake Erie natural processes, geology, groundwater hydrology and vegetation. Provide an understanding of BMPs and behaviors to enhance the coastal areas.
- Accurate and reliable sea-level rise projections that are needed to facilitate proper resiliency planning and implementation.
- Economic evaluation and the understanding of the return on investment/the cost of action versus inaction.

Where do you see Coastal Resources Management's role, or how could the program change or enhance itself, to better support efforts to build coastal resiliency, adapt to climate change, or address other coastal hazards?

- Municipalities need larger amounts of funding to implement infrastructure solutions to climate change, such as living shorelines and stormwater parks.
- How can CRMP support communities applying to the Community Rating System?
- Support more professional, designated floodplain managers?
- Provide education and outreach to municipalities, residents, and waterfront business owners, continually making them aware of future flooding threats and existing resources to prepare for those threats.
- Continue to be aware of and promote the newest science around sea level rise and future flooding.
- Advocate to the county, state, and federal government for more funding for local resiliency planning and flood protection measures.
- Education and outreach to work towards buy-in from local communities.
- Support (through resources and technical assistance) and share data for the completion of vulnerability assessments. Include development and/or sharing of BMPs for infrastructure and culvert designs.

- Where should new transportation infrastructure be targeted or avoided.
- Data sharing and technical support.
- Comprehensively identify and prioritize cultural sites in need of protection from coastal hazards (vulnerability assessments?).
- Help municipalities work regionally. Identify needs on a regional basis.
- Help connect local entities with national BMPs
- Where we need action is on the beach. Relocating some existing shoreline stone to the shore doesn't add foreign materials to the lakes ecosystem so it may be an easier, less costly idea to consider.
- To serve as an active liaison to the municipalities, decision makers and leaders and providing technical guidance and assistance. Increased efforts to assist municipalities with understanding and compliance of the state statute (BRSA), through development of zoning setbacks and local ordinances (i.e., stormwater), to enhance coastal resiliency.
- Provide funding support for projects and programs to enhance coastal resiliency.
- Bluff related: Have annual training seminars to educate townships, public or anyone involved. This would minimize room for interpretation between all the different organizations federal, state, local and public. Currently there is so much room for interpretation.
- Assist communities with the development of coastal resiliency plan, green infrastructure projects & BMPS.
- Provide case studies to showcase examples of what other Great Lakes coastal communities are doing to address resiliency barriers and impacts.
- Provide model policies and ordinances to support climate resilience.

2. Public Comment

The availability of the draft Section 309 Assessment and Strategy for review was published in the *Pennsylvania Bulletin* on April 10, 2021, initiating a 30-day public comment period. The draft document was also made available on the CRMP – DEP webpage. Notice of the availability of the document was sent to the Coastal Zone Advisory Committee and both local advisory committees. CRMP did not receive any public comment on the draft document.