

Climate Change Vulnerability Assessment of the Maryland Coastal Bays Program Comprehensive Conservation & Management Plan

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MARYLAND COASTAL BAYS PROGRAM


Final Report

Climate Change Vulnerability Assessment (CCVA) of the Maryland Coastal Bays Program's (MCBP) Comprehensive Conservation & Management Plan (CCMP)

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Contents

Appendices (Digital files available on request)

Appendix A: List of Initial Risks

Appendix B: Consequences/Probability Matrix Example

Appendix C: Public Meetings to Review Consequences/Probability Matrix

Maryland Coastal Bays Program

The Maryland Coastal Bays Program (MCBP) was installed into the federal Environmental Protection Agency's National Estuary Program in 1996, the 28th program to be designated as such. Funded under the Clean Water Act, the non-regulatory Estuary Program was created to protect the most biologically and economically significant coastal areas in the United States, where natural resources support boating, fishing, swimming, hunting, and tourism that sustain the local economy.

Shortly thereafter, concerned citizens, farmers, fishermen, developers, and local, state and federal agencies joined together to discuss the future of the Coastal Bays and create the first Comprehensive Conservation & Management Plan for the Bays.

Since then, the Coastal Bays Program partnership has completed many of the actions in the original plan. These include restoring and protecting thousands of acres of forests and wetlands, managing Coastal Bays fisheries, planning better for growth, establishing permanent water quality testing, educating the public, safeguarding wildlife populations, and most significantly, leveraging between $12-40 million a year for the Coastal Bays watershed.

Despite so many improvements in seagrass protection, habitat restoration, and water quality, there is still much work to do. Nutrient levels continue to increase, and the impacts of climate change are yet to be fully understood. The 2015 updated management plan was developed to respond to these ongoing and new challenges and will result in new collaborations and focus efforts on wildlife habitat and water quality improvements through 2025.

As the program celebrates its 22nd year of conservation work, MCBP will continue to uphold its original commitment and at the same time look forward to new and innovative ways to protect the ecologically rich bays behind Ocean City and Assateague Island.

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DNR:	Maryland Department of Natural Resources
EPA:	Environmental Protection Agency
LSLT:	Lower Shore Land Trust
MCBP:	Maryland Coastal Bays Program
MDE:	Maryland Department of the Environment
MDP:	Maryland Department of Planning
NPS:	National Park Service
NWF:	National Wildlife Federation
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Executive Summary

In 2017, the Maryland Coastal Bays Program (MCBP) undertook the first five steps of EPA's "Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans." This Climate Change Vulnerability Assessment was conducted to learn about and prepare for the ways climate change stressors might affect MCBP's ability to reach the 14 goals of the 2015-2025 Comprehensive Conservation & Management Plan (CCMP). The outcome of this assessment is the identification and prioritization of 168 risks that could limit MCBP's ability to reach those goals. Chief among the priorities to address are the impacts climate change will have on the Water Quality goals and Fish and Wildlife goals of the CCMP.

Introduction and Overview

In 2017, the Maryland Coastal Bays Program (MCBP) undertook the first five steps of EPA's "Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans," (hereafter the Workbook). This Climate Change Vulnerability Assessment was conducted to learn about and prepare for the ways climate change stressors might affect the organization's ability to reach the 14 goals of the 2015-2025 Comprehensive Conservation & Management Plan (CCMP). The outcome of this assessment is the identification and prioritization of risks that could limit MCBP's ability to reach those goals.

The Maryland Coastal Bays Program chose to initiate this effort for several reasons. Action 2.2.6 of the Community and Economic Development Goal in the CCMP states:

> "MCBP will [work with the DNR Hazard Assessment and Coastal Planning and local Community Emergency Response Teams to] pursue the designation of the Coastal Bays as an EPA Climate Ready Estuary and incorporate strategies in all planning activities and projects. For example, tidal wetland projects should allow for landward migration."

One of the required steps for becoming a Climate Ready Estuary is to use the Workbook to develop a risk-based adaptation plan for the Coastal Bays. The CCMP also contains an entire chapter highlighting actions related to Coastal Resiliency, of which there are 50.

The assessment is a risk-based approach designed specifically to consider risks and impacts **to the CCMP**, and not how climate change stressors affect the entire region or watershed. The framing question used in the process was, "what are reasonably foreseeable ways that climate stressors could keep your organization from achieving its goals?" The Workbook provides seven possible climate stressors to consider (discussed below in Process).

Process

The purpose of the Workbook is to "assist organizations that manage environmental resources to prepare a broad, risk-based adaptation plan," (EPA 2014). Steps 1 through 5 comprise the Vulnerability Assessment and steps 6 through 10 are used to develop the Action Plan. The Vulnerability Assessment steps are described below:

- Step 1—Communication and Consultation
  - Informing key people about the vulnerability assessment and asking for input.
- Step 2—Establishing the Context for the Vulnerability Assessment
  - Identifying organizational goals that are susceptible to climate change.
- Step 3—Risk Identification
  - Brainstorming about how climate stressors will interact with your goals.
- Step 4—Risk Analysis
  - Developing an initial characterization of consequence and likelihood for each risk.
- Step 5—Risk Evaluation: Comparing Risks
  - Using a consequence/probability matrix to build consensus about each risk.

Steps 1 and 2

The Workbook was released in August 2014, which was after the revised CCMP had been completed. The CCMP was able to be used as a proxy for Steps 1 and 2 of the Vulnerability Assessment because of the robust stakeholder engagement process that was used in its development and because the organization had already articulated its goals during that time. These goals are:

Water Quality (WQ)

1. Decrease nutrient loading throughout the watershed.
2. Decrease inputs of toxic contaminants.
3. Implement a strategy to meet TMDL reductions.

Fish and Wildlife (FW)

1. Characterize, monitor and manage fishery resources and habitats.
2. Characterize, monitor and manage estuarine resources and habitats.
3. Characterize monitor and manage terrestrial resources and habitats.
4. Expand upon the coordinated effort to collect and report on Coastal Bays geomorphic and biometric information.

Recreation and Navigation (RN)

1. Improve recreational opportunities and access to the Coastal Bays and tributaries.
2. Balance resource protection with recreational use.
3. Continue to implement the Ocean City Water Resources Study recommendations.
4. Manage sediment alterations in a manner beneficial to the local economy and natural resources.

Community and Economic Development (CE)

1. Manage the watershed to maximize economic benefits while minimizing negative resource impacts.
2. Enhance the level of sustainability in land use decision making.
3. Educate and inform the population so it can make knowledgeable decisions for the community and its future.

Step 3: Risk Identification

A Stakeholder Panel was convened in January 2017 to brainstorm all of the potential risks that might occur as a result of the above goals being impacted by the seven climate stressors provided in the Workbook. Those stressors are:

- Warmer Summers
- Warmer Winters
- Warmer Water
- Increasing Drought
- Increasing Storminess
- Sea Level Rise
- Ocean Acidification

The framing scenario used to elicit responses was:

The Risk develops along the pathway between the cause (Stressor) and the effect (not reaching the Goal)
Ex: Stressor X could _________ and the result is we might not attain Goal Y.

From this brainstorming exercise, a list of 400+ risks were generated. See Appendix A (available on request) for the spreadsheet that lists all the initial risks. Every brainstormed risk is included in the spreadsheets so reviewers can see where ideas were combined or streamlined. These spreadsheets were then used by the Scientific and Technical Advisory Committee and small review groups in Step 4.

Step 4: Risk Analysis

Following the identification of possible risks to the CCMP goals, small review groups were formed for each goal category (i.e. Water Quality, Fish & Wildlife, Recreation & Navigation, Community & Economic Development) in order to characterize each risk. Each review group examined the risks and made a high-level characterization of the consequence, likelihood, and spatial scale of the impact, and also the time horizon until the problem begins and the habitat type likely to be affected. The Workbook provided a scale for the first four parameters:

Consequence	Likelihood	Spatial Scale	Time Horizon
Low	Low	Site	More than 30 yrs.
Medium	Medium	Place or Region	10 – 30 yrs.
High	High	Extensive	Already occurring or 0 – 10 yrs.

Habitat Type

Identification of habitat type was not used to characterize the risks; rather, the habitat type was designated now to help categorize the risks later for the Action Plan that will be created in Steps 6 – 10. Terms for the type of habitat were self-selected by the review groups and MCBP staff.

In consultation with EPA, the CCVA moderator created and delivered a webinar to members of the small review groups to familiarize them with the characterization process before they began their work and to address any questions or concerns. The webinar was recorded and shared with all review group members.

Several risks were unable to be characterized by the small review groups; those risks were reviewed and characterized by the STAC during a quarterly meeting.

Step 5: Risk Evaluation – Comparing Risks

As part of the Workbook, EPA created a companion online tool to assist with characterization and evaluation of the identified risks. The tool allows the user to input organizational goals (in this case, the 14 CCMP goals) and the identified risks with their parameters to create a Consequences/Probability (C/P) Matrix. Appendix B (available on request) is an example of the C/P Matrix for Fish & Wildlife Goal 2: Characterize, monitor, and manage estuarine resources and habitats.) Each matrix shows the Likelihood of Occurrence (Probability) vs. the Consequence of Impact for all the ways the stressors could impact a specific goal (i.e., the risks). The matrices are read from the bottom left to the top right: items in green are Low Likelihood/Low Consequence, items in yellow are Medium Likelihood/Medium Consequence, items in red are High Likelihood/High Consequence.

In Step 5, the C/P matrices for each CCMP goal were shared with stakeholders via two public meetings (location details and the agenda are in Appendix C, available on request). Meeting attendees learned about the CCVA process and had the opportunity to review each matrix and provide comment on whether each risk was valid and placed in the appropriate High, Medium, or Low category. Comments from the public meetings are noted in a separate column in the spreadsheets found in Appendix A.

MCBP staff then discussed every risk and its characterization parameters to further ground truth the overall risk identification and analysis.

Results

Through the process of comparing the 14 CCMP goals with the 7 climate stressors, a list of 400+ potential risks were initially identified. These risks were then reviewed, edited, combined, and prioritized by MCBP staff, regional experts, Scientific and Technical Advisory Committee (STAC) members, Implementation Committee (IC) members, and watershed residents. This resulted in 168 individual risks that were entered into the online tool, from which was generated a Consequences/Probability Matrix for each CCMP goal. Each matrix shows the "Likelihood of Occurrence" vs. the "Consequence of Impact" for all the ways the stressors could impact a specific goal. The matrices were then translated into tables (below) so that the Maryland Coastal Bays Program can identify the immediate and pressing concerns to focus on and prioritize the development of specific Action Plans (Workbook Steps 6-10) based on available resources and urgency of the problem.

Summary Table

A summary table was then developed to quickly determine the CCMP goals that are most vulnerable to climate change. **FW 3: Characterize, monitor and manage terrestrial resources and habitats** was the most vulnerable with 14 of 16 (88%) of the risks in the High Probability/Impact category. Next most vulnerable was **FW 2: Characterize, monitor and manage estuarine resources and habitats** with 10 of 14 (71%) of the risks in the High Probability /Impact category. The least vulnerable were **RN 1: Improve recreational opportunities and access** and **CE 3: Educate and inform the population so it can make knowledgeable decisions** with none of the risks in the High Probability/Impact category.

Goals	Number of Risks		
	Red	Yellow	Green
WQ 1: Decrease nutrient loading throughout the watershed	17	7	2
WQ 2: Decrease inputs of toxic contaminants	2	3	15
WQ 3: Implement a strategy to meet TMDL reductions	4	0	2
FW 1: Characterize, monitor and manage fishery resources and habitats	21	9	6
FW 2: Characterize, monitor and manage estuarine resources and habitats	10	3	1
FW 3: Characterize, monitor and manage terrestrial resources and habitats	14	1	1
FW 4: Expand upon the coordinated effort to collect and report on Coastal Bays geomorphic and biometric info	1	0	0
RN 1: Improve recreational opportunities and access to the Coastal Bays and tributaries	0	2	2
RN 2: Balance resource protection with recreational use	5	0	2
RN 3: Continue to implement the Ocean City Water Resources Study recommendations	3	2	1
RN 4: Manage sediment alterations in a manner beneficial to the local economy and natural resources	2	0	1
CE 1: Manage the watershed to maximize economic benefits while minimizing negative resources impacts	5	7	3
CE 2: Enhance the level of sustainability in land use decision making	2	3	8
CE 3: Educate and inform the population so it can make knowledgeable decisions for the community and its future	0	1	0
Total 168 Risks	**86**	**38**	**44**

Key:

Red	High Probability/Impact
Yellow	Medium Probability/Impact
Green	Low Probability/Impact

WATER QUALITY 1: Decrease nutrient loading throughout the watershed.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Urban areas with inadequate stormwater infrastructure will flood more often from increased storminess and large volumes of untreated water will enter the bays.	High	High	Place or region	Already occurring or 0-10 years	aquatic, estuarine
Increasing storminess may cause greater re-suspension of sediment, which may increase nutrient re-suspension and decrease light.	High	High	Place or region	Already occurring or 0-10 years	aquatic
In coastal areas, tidal flooding plus sea level rise will exacerbate stormwater flooding (untreated volume higher).	High	High	Place or region	Already occurring or 0-10 years	estuarine
As a result of sea level rise, inland areas will experience higher water tables and septic system drain fields may become inundated.	High	High	Place or region	10-30 years	estuarine
Loss of wetlands from sea level rise reduces the amount of	High	High	Place or region	Already occurring or 0-10 years	estuarine

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
nutrients removed via natural processes.					
Tidal flooding from sea level rise can slow drainage and create anaerobic conditions for turf and crops, which increases nutrient inputs for reestablishment and regrowth.	High	High	Place or region	10-30 years	terrestrial
Warmer water increases/lengthens season for micro and macro algae blooms resulting in large swings in dissolved oxygen, which could lead to fish and other marine life die offs.	High	High	Place or region	Already occurring or 0-10 years	aquatic
Warmer water holds less dissolved oxygen at higher temps; low or no bottom oxygen may lead to increased P release from sediments.	High	Medium	Place or region	10-30 years	aquatic
Increasing drought stresses cool season turf creating greater turf loss during active sport playing seasons which necessitate maximum nutrient inputs to maintain vigor in season and to perform repairs afterwards.	Medium	High	Site	Already occurring or 0-10 years	terrestrial
Increasing drought increases the use of irrigation of turf which could lead to runoff from compacted dry soils.	Medium	High	Place or region	10-30 years	terrestrial

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Marsh vegetation dieback from increasing drought will cause nutrient loads to increase.	Medium	High	Place or region	10-30 years	marsh
Increasing drought may cause a decrease in nutrient uptake which creates more residual nutrients that become mobile in flashy storms.	Medium	High	Place or region	10-30 years	terrestrial
Increasing drought could increase concentration of nutrients already in receiving waters as a result of less freshwater flow.	Medium	High	Place or region	Already occurring or 0-10 years	estuarine
Increasing drought could increase wind erosion on well drained sandy soils.	Medium	High	Place or region	Already occurring or 0-10 years	terrestrial
Increasing storminess may cause flashy high-volume rain events which may lead to increased nutrient and sediment loading, with BMPs unable to intercept or handle increased volumes.	Medium	High	Place or region	Already occurring or 0-10 years	aquatic, terrestrial
Warmer summers could negatively impact terrestrial cool season grasses	Medium	High	Extensive	More than 30 years	terrestrial, meadow
Warmer water could cause increased diebacks of SAV and microalgae that result in nutrient release.	Medium	High	Place or region	Already occurring or 0-10 years	benthic, aquatic

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Increasing storminess/coastal storm events may overwhelm septic tanks, drain fields, and municipal wastewater treatment plants.	Medium	Medium	Site	Already occurring or 0-10 years	aquatic, estuarine
Warmer summers could create a longer shoulder season, which may lead to an increase in the number of visitors and residents, straining wastewater, transportation, and recreational infrastructure.	Medium	Medium	Place or region	Already occurring or 0-10 years	terrestrial
Warmer summers result in increase in use and degradation of turf, which may require greater irrigation and fertilizer for turf.	Medium	Medium	Place or region	Already occurring or 0-10 years	terrestrial, ag fields
Warmer water has higher potential for stratification and may cause prolonged dead-zones that result in large fish kills (fish kills contribute nutrients).	Medium	Medium	Place or region	10-30 years	aquatic, benthic
Warmer winters could lead to seasonal residents staying longer and contributing more loads (including pet waste).	Medium	Medium	Place or region	10-30 years	terrestrial/estuarine
Increasing drought may decrease the survival of newly implemented BMPs (i.e. saplings/tree plantings).	Low	High	Site	10-30 years	upland, terrestrial

Risk	Consequence (low, medium, high)	Likelihood (low, medium, high)	Spatial Scale (site, place/region, extensive)	Time Horizon (>30 yrs., 10-30 yrs., already occurring)	Habitat Type
Increasing storminess creates free moisture and humidity, which results in turf disease pressure which, depending on the particular fungus, requires nutrient inputs to 'grow out' or repair damaged turf.	Low	High	Site	Already occurring or 0-10 years	terrestrial
Ocean acidification could cause more corrosive waters, which may impact the health of bivalves, reducing filtration capabilities if bivalves put less energy towards growth and reproduction and more energy towards shell building.	Low	Medium	Place or region	10-30 years	aquatic, benthic
Warmer water may increase disease/parasites, decreasing the health of bivalves and reducing filtration.	Low	Low	Place or region	10-30 years	aquatic/estuarine

WATER QUALITY 2: Decrease inputs of toxic contaminants.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Increasing storminess could cause contaminated fluids and debris from storm damaged structures/facilities/vehicles to wash into the bays.	Medium	High	Site	Already occurring or 0-10 years	estuarine
Warmer water can cause an increase in cyanobacteria.	Medium	High	Place or region	Already occurring or 0-10 years	freshwater
Sea level rise could cause more routine nuisance flooding of streets and parking lots.	Medium	Medium	Place or region	10-30 years	terrestrial
Warmer water could lead to an increase in toxicity which could decrease the LD50 (lethal dose needed to kill 50% of the organisms).	Medium	Medium	Place or region	10-30 years	aquatic
Warmer winters can cause an increase in the use of pesticides for turf because pests that usually die off due to low winter temps will survive as a result of the warmer temps.	Medium	Medium	Site	10-30 years	aquatic
Warmer summers can lead to increased traffic = more boat/car spillage/exhaust and accident-related spillage; increased mercury and nitrogen oxides.	Low	Medium	Site	Already occurring or 0-10 years	aquatic, estuarine
Warmer winters can lead to increased traffic = more boat/car spillage/exhaust and accident-	Low	Medium	Site	Already occurring or 0-10 years	aquatic, estuarine

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
related spillage; increased mercury and nitrogen oxides.					
Heavy rain induced flooding from increasing storminess may inundate storage buildings causing release of toxic product.	Medium	Low	Place or region	Already occurring or 0-10 years	estuarine
Sea level rise-induced incursion onto upland could flood toxic containment sites.	Medium	Low	Place or region	More than 30 years	aquatic/terrestrial
Warmer water may enhance the volatility of some products.	Medium	Low	Place or region	10-30 years	aquatic
Increasing drought could increase concentration of pollutants w/ less volume of water to dilute.	Low	Low	Place or region	10-30 years	aquatic
More toxic particulate matter could build up on land surfaces as a result of increasing drought and become more available for distribution during rain events that follow droughts.	Low	Low	Place or region	10-30 years	estuarine
Increasing drought could lead to wildfires, which could increase contamination from fire retardants & suppressants.	Low	Low	Place or region	10-30 years	aquatic
Increase in heavy rainfall events from increasing storminess could cause more rapid leaching of toxic contaminants--such as from landfills and wastewater systems (septic and spray).	Low	Low	Site	Already occurring or 0-10 years	estuarine

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Increasing storminess could cause re-suspension of contaminated sediments.	Low	Low	Site	Already occurring or 0-10 years	estuarine
Lower pH from ocean acidification will cause heavy metals such as cadmium, lead, and chromium to dissolve more easily	Low	Low	Place or region	10-30 years	aquatic/benthic
A more corrosive ocean may cause more toxic contaminants to leach out of stable/inert state	Low	Low	Place or region	10-30 years	aquatic/benthic
Sewage overflows from sea level rise may lead to more toxic contaminants.	Low	Low	Site	More than 30 years	aquatic
Warmer summers can cause an increased use of pesticides in residential and commercial areas.	Low	Low	Place or region	10-30 years	terrestrial, estuarine
Warmer winters can lead to increased winter residents/visitors who contribute to higher volumes of sewage with a variety of personal care products and other contaminants.	Low	Low	Place or region	10-30 years	aquatic

WATER QUALITY 3: Implement a strategy to meet TMDL reductions.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Resources from partners may be needed to deal with emergencies and may not be available for TMDL or CCMP actions as a result of warmer waters.	High	High	Extensive	10-30 years	estuarine
Warmer waters may cause water conservation measures to take precedence over water quality.	Medium	High	Extensive	10-30 years	estuarine
As a result of warmer waters, tidal flooding may extend to new areas, leading to additional sources of pollution.	Medium	High	Site	10-30 years	aquatic/estuarine
With warmer waters, the priority for resources may shift to mitigation and away from water quality.	Medium	High	Extensive	10-30 years	estuarine
With warmers waters, research and implementation funding may shift to the ocean and away from the estuary.	Medium	Low	Extensive	10-30 years	aquatic/estuarine
TMDL strategic focus may be shifted to deal with impacts related to bacteria, algae, fish, etc. caused by warmer waters.	Low	Medium	Extensive	Already occurring or 0-10 years	estuarine

FISH AND WILDLIFE 1: Characterize, monitor, and manage fishery resources and habitats.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Ocean acidification can cause a negative impact on fish reproduction and early life stages.	High	High	Extensive	Already occurring or 0-10 years	marine
Ocean acidification can cause decreases in shellfish that are unable to grow and reproduce (oysters, crabs, clams and scallops). If that occurs there will be big changes in marine food chains.	High	High	Place or region	More than 30 years	all
Sea level rise will reduce the area for horseshoe crab spawning.	High	High	Place or region	More than 30 years	sand
Warmer summers may affect the sex of sea turtles, diamondback terrapins, and other reptiles due to sand-temperature-dependent sex determination in nests.	High	High	Place or region	Already occurring or 0-10 years	nesting habitat
Warmer water could cause changes in species range and survival driven by habitat loss, shift in prey, population expansion/recovery (e.g. seeing more southern fish species, loss of eelgrass, etc.)	High	High	Place or region	Already occurring or 0-10 years	estuaries and ocean
Warmers winters may cause predators to be more active resulting in higher mortality of	High	High	Extensive	Already occurring or 0-10 years	estuaries and oceans

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
newly recruited prey species; recruitment potential reduced due to food chain impacts.					
Heavy rain events will increase sediment and nutrient flows which could impact benthic organisms.	Medium	High	Site	Already occurring or 0-10 years	all
Increasing storminess can cause more washovers which can cause nearshore habitats to change or be shifted.	Medium	High	Site	Already occurring or 0-10 years	barrier islands
Sea level rise could cause more washovers which can cause nearshore habitats to change or be shifted.	Medium	High	Place or region	10-30 years	barrier islands
Warmers summers may allow for an increase in harmful algae growth.	Medium	High	Site	Already occurring or 0-10 years	estuaries
Invasive species may thrive in warmer waters.	Medium	High	Place or region	Already occurring or 0-10 years	aquatic
Too many warm days of high water temperatures could stunt fish growth or increase mortality if there is low dissolved oxygen.	Medium	High	Extensive	Already occurring or 0-10 years	estuaries and oceans
Species spawning and migratory patterns will be negatively affected by warmer water.	Medium	High	Extensive	Already occurring or 0-10 years	all
Changes in aquatic communities from warmer	Medium	High	Place or region	10-30 years	essential fish habitat; ocean

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
winters may lead to the need for increased resources (i.e. more trawls requiring more staff & funds to quantify changes; more funds shift to seafood marketing programs).					
Warmer winters could cause the spread of invasive species.	Medium	High	Extensive	Already occurring or 0-10 years	all
Increasing drought may cause changes in species composition and range driven by habitat loss, shift in prey, population expansion/recovery, etc.	High	Medium	Place or region	Already occurring or 0-10 years	aquatic
Increasing drought may cause higher concentrations of pollutant loads.	High	Medium	Place or region	Already occurring or 0-10 years	all
Ocean acidification can cause increases in CO2 which can increase photosynthesis in SAV when carbon-limited. This may offset thermal stress.	High	Medium	Place or region	Already occurring or 0-10 years	seagrass
Warmer winters would influence winter water temperature, impacting disease prevalence and survival of overwintering populations.	High	Medium	Extensive	10-30 years	estuaries and oceans
Fish, etc. may shift reproduction cycles and use more winter reserves to stay active when normally dormant	High	Medium	Place or region	Already occurring or 0-10 years	estuaries and ocean

Risk	Consequence (low, medium, high)	Likelihood (low, medium, high)	Spatial Scale (site, place/region, extensive)	Time Horizon (>30 yrs., 10-30 yrs., already occurring)	Habitat Type
due to thermal cues from warmer winters.					
Warmer winters may cause a shift in fresh and saltwater species composition and prey; may result in physiological stress in species.	High	Medium	Extensive	Already occurring or 0-10 years	estuarine
Increasing storminess could disrupt fisheries (commercial, recreational, charter, party boat, dive operations) and the ability to fish and transport fish, cause spoilage, and cause damages to infrastructure.	Low	High	Place or region	Already occurring or 0-10 years	estuaries and ocean
Sea level rise could cause impacts to infrastructure used to access the water (ramps, marinas, parking lots).	Low	High	Extensive	More than 30 years	terrestrial
Freshwater fish species will be squeezed into a smaller area and stress would be increased as a result of sea level rise.	Low	High	Place or region	10-30 years	streams
Changes to SAV growing season from warmer winters can impact the ability to characterize, monitor and manage.	Low	High	Place or region	Already occurring or 0-10 years	seagrass
Changes in aquatic communities from increasing drought may lead to the need for increased resources (i.e.	Medium	Medium	Place or region	10-30 years	essential fish habitat; ocean

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
more trawls requiring more staff & funds to quantify changes).					
Reduction of fresh headwater flows from increasing drought will affect volume and salinity, therefore impacting freshwater-dependent fish, up to and including spawning and mortality.	Medium	Medium	Place or region	Already occurring or 0-10 years	streams
As aquatic resources become [more] stressed due to ocean acidification they may become less healthy, leading to changes in mgmt. of the fisheries and reducing the season or allowable creel limit or # of licenses, leading to more unhappy people because of user conflicts.	Medium	Medium	Place or region	10-30 years	aquatic
Warmer summers could cause a shift in fresh and saltwater species composition and prey; may result in physiological stress in species.	Medium	Medium	Extensive	Already occurring or 0-10 years	estuarine
Increased turbidity and less light penetration in the water column can result from increasing storminess.	High	Low	Place or region	Already occurring or 0-10 years	seagrass

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Larger magnitude storms can wash fish into new and unfavorable areas.	Low	Medium	Site	Already occurring or 0-10 years	estuaries and oceans
Warmer summers may make field conditions inhospitable for monitoring.	Low	Low	Place or region	More than 30 years	terrestrial/estuarine
Warmer water may precipitate additional stressors to wild and aquaculture shellfish.	Low	Low	Place or region	Already occurring or 0-10 years	estuaries and oceans
As aquatic resources become [more] stressed due to increasing drought they may become less healthy, leading to changes in mgmt. of the fisheries and reducing the season or allowable creel limit or # of licenses, leading to more unhappy people because of user conflicts.	Medium	Low	Place or region	More than 30 years	aquatic
High intensity storms and wave action could erode seagrass beds.	Medium	Low	Site	Already occurring or 0-10 years	seagrass
As aquatic resources become [more] stressed due to warmer water, they may become less healthy, leading to changes in mgmt. of the fisheries and reducing the season or allowable creel limit or # of licenses, leading to more	Medium	Low	Place or region	10-30 years	aquatic

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
unhappy people because of user conflicts.					

FISH AND WILDLIFE 2: Characterize, monitor, and manage estuarine resources and habitats.

Risk	Consequence (low, medium, high)	Likelihood (low, medium, high)	Spatial Scale (site, place/region, extensive)	Time Horizon (>30 yrs., 10-30 yrs., already occurring)	Habitat Type
Sea level rise could result in a potential loss of coastal impoundments.	High	High	Site	10-30 years	coastal impoundment
Sea level rise could cause drowning of estuarine wetlands and SAV with no landward retreat option and limited restoration opportunities.	High	Medium	Site	More than 30 years	estuarine, wetlands
Increased bacteria, HABs, and microalgae from warmer water will impact the ability to monitor and restore seagrass beds.	High	Medium	Site	Already occurring or 0-10 years	SAV beds
Increasing drought may cause increased stress in vegetation and lower the success rate and require adaptation of restoration projects.	Medium	High	Site	10-30 years	upland, wetland, marsh
Increasing drought could cause a shift in species composition.	Medium	High	Site	10-30 years	upland, wetland, marsh
Partner resources may be needed for storm related emergencies from increasing storminess and may not be available for CCMP actions.	Medium	High	Place or region	10-30 years	estuary

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Sea level rise could cause a shift in species composition and salinity.	Medium	High	Place or region	10-30 years	wetlands, marshes
Warmer summers may cause increased stress in vegetation and lower the success rate and require adaptation of restoration projects.	Medium	High	Site	10-30 years	shoreline, marshes, benthic, wetlands
Warmer water may cause a shift in species composition.	Medium	High	Site	10-30 years	upland, marshes, wetlands
Warmer winters may cause a shift in species composition.	Medium	High	Site	10-30 years	upland, marshes, wetlands
Property owners may harden the shoreline in response to increased erosion from increasing storminess.	High	Low	Site	Already occurring or 0-10 years	shoreline, marshes, wetland, benthic
Increased turbidity from erosion or re-suspension of sediments as a result of increased storminess will limit light to SAV. Large storms can physically rip up SAV beds or overwash may bury them, which could limit the success of conservation efforts.	Low	High	Site	10-30 years	SAV beds
Field work may be impaired by an increased number of storms.	Medium	Medium	Place or region	10-30 years	estuary

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Warmer summers may make field conditions inhospitable for monitoring.	Medium	Low	Extensive	Already occurring or 0-10 years	upland, marshes, wetlands

FISH AND WILDLIFE 3: Characterize, monitor, and manage terrestrial resources and habitats.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Warmer winters may cause an increase in pests overwintering.	High	High	Extensive	Already occurring or 0-10 years	uplands and streams
As urban areas are impacted by sea level rise, human relocation will encroach upon natural areas.	High	High	Site	More than 30 years	uplands and streams
Sea level rise may cause the loss of maritime and coastal forest and adjacent freshwater "seep" habitat and species. Potential die-offs of coastal forest from inundation and saltwater intrusion.	High	High	Place or region	10-30 years	barrier islands and coastal forests
Loss of groundwater from drought can lead to loss of forested wetlands or shift to more drought tolerant species.	High	Medium	Extensive	Already occurring or 0-10 years	forested wetland
Increasing drought may cause perennial streams and other small waterbodies [Delmarva bays] to dry earlier and cease to function "normally" which would lead to a loss of dependent species.	Medium	High	Site	Already occurring or 0-10 years	streams, small waterbodies
Stream restoration projects designed for current conditions may not be able to handle higher flows and more pollutants from increasing storminess.	Medium	High	Site	Already occurring or 0-10 years	streams
Upstream sediment deposition and stream channel erosion from	Medium	High	Site	Already occurring or 0-10 years	streams

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
increasing storminess could lead to a loss of habitat and species.					
Stormwater BMP effectiveness is diminished with increasing storminess.	Medium	High	Site	Already occurring or 0-10 years	developed land
Plans and tools related to conservation programs will need to be updated to be relevant to the changing landscape as a result of sea level rise.	Medium	High	Extensive	10-30 years	all
Tidal flooding from sea level rise may change the character of beaches, marshes, and shoreline areas. Conservation planning will need to consider beach/marsh migration.	Medium	High	Place or region	More than 30 years	shorelines
Sea level rise could cause a shift in species composition.	Medium	High	Site	10-30 years	uplands and streams
Warmer summers could cause a shift in species composition.	Medium	High	Place or region	10-30 years	uplands and streams
Warmer water may cause a shift in species composition and breeding seasons.	Medium	High	Site	10-30 years	uplands and streams
Warmer winters may cause a shift in species composition.	Medium	High	Site	10-30 years	uplands and streams
Increasing drought will make public acceptance of the need for conservation efforts of small waterbodies and perennial streams more difficult because there is so little left to protect.	Medium	Medium	Site	More than 30 years	small waterbodies and perennial streams

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Warmer summers may make field conditions inhospitable for monitoring.	Medium	Low	Extensive	Already occurring or 0-10 years	uplands and streams

FISH AND WILDLIFE 4: Expand upon the coordinated effort to collect and report on Coastal Bays geomorphic and biometric information.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Monitoring, data collection, and planning will be impacted by changing conditions affecting trends and funding priorities as a result of all 7 climate stressors.	Medium	High	Extensive	Already occurring or 0-10 years	all

RECREATION AND NAVIGATION 1: Improve recreational opportunities and access to the Coastal Bays and tributaries.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Warmer water could make toxic algal blooms and bacterial transmission more of a concern.	High	Low	Place or region	More than 30 years	aquatic
Sea level rise may limit access and cause significant damage to coastal recreational infrastructure, including boat ramps.	Medium	Medium	Place or region	More than 30 years	shoreline
Warmer summers leading to algal blooms may impact enjoyment of recreational waters and also may impact access.	Medium	Low	Place or region	10-30 years	aquatic
Warmer water may cause greater algal growth and make some water access areas less attractive or closed to swimming, fishing, and crabbing.	Medium	Low	Place or region	10-30 years	aquatic

RECREATION AND NAVIGATION 2: Balance resource protection with recreational use.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Movement of shoals as a result of increasing storminess may increase expenses.	High	High	Place or region	Already occurring or 0-10 years	aquatic
Sea level rise may cause a dramatic loss of tidal wetland habitat, limiting the areas available for plant and animal species and recreational pursuits, thus increasing use pressure on the remaining wetlands.	High	Medium	Place or region	More than 30 years	wetland/marsh
Public shorefront property may be lost as a result of sea level rise and may not be replaced.	High	Medium	Site	10-30 years	shoreline
Beach erosion on Assateague Island as a result of increasing storminess will increase the competition between recreational use and habitat protection, particularly in the OSV zone, because of less available beach area.	Medium	High	Place or region	Already occurring or 0-10 years	beach and barrier island
General use of Bays will increase (water-dependent uses) because of more hot days during the summer, making more work for MCBP.	Medium	High	Place or region	Already occurring or 0-10 years	aquatic
Warmer daily temperatures in winter may also increase use among water users that we didn’t see before, might have	Low	Medium	Place or region	Already occurring or 0-10 years	aquatic

Risk	Consequence (low, medium, high)	Likelihood (low, medium, high)	Spatial Scale (site, place/region, extensive)	Time Horizon (>30 yrs., 10-30 yrs., already occurring)	Habitat Type
more conflicts on the water, increase the need for more education and therefore more work for MCBP and partners.					
May become more difficult to prevent people from utilizing coastal bay habitat restoration islands and increase boat use, impacting colonial nesting birds.	Medium	Low	Place or region	Already occurring or 0-10 years	aquatic

RECREATION AND NAVIGATION 3: Continue to implement the Ocean City Water Resources Study recommendations.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Increasing storminess negatively impacts existing and restored islands and shorelines, increasing the costs for continued maintenance and restoration.	High	High	Site	Already occurring or 0-10 years	beach and barrier island
Increased shoaling in navigable areas from increasing storminess increases the need for funding to dredge and thus reduces funding for restoration projects.	High	High	Place or region	Already occurring or 0-10 years	coastal
Sea level rise may cause damage to or loss of wetland, island, and shoreline creation projects.	High	Medium	Site	More than 30 years	barrier and habitat islands
Higher summer temps could result in fewer days for staff to safely monitor and build these projects.	Low	High	Site	Already occurring or 0-10 years	beach and barrier island
Increased storminess may make it more difficult to move or pump sand due to lack of calm days.	Medium	Medium	Place or region	Already occurring or 0-10 years	beach and barrier island
Warmer water may increase the presence of fish and animal species in seasons not typically found, thus impacting permits and the ability to perform construction (time of year restrictions).	Medium	Low	Site	More than 30 years	aquatic

RECREATION AND NAVIGATION 4: Manage sediment alterations in a manner beneficial to the local economy and natural resources.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Based on changing conditions from increasing storminess, creation and updating of the plan may be more complicated, incurring more costs over time.	Medium	High	Place or region	10-30 years	coastal
Based on changing conditions from sea level rise, creation and updating of the plan may be more complicated, incurring more costs over time.	Medium	High	Place or region	10-30 years	coastal
Ocean acidification could create a more complicated planning effort to account for changing parameters of sediment chemistry and erosion of concrete structures.	Low	Low	Place or region	More than 30 years	ocean

COMMUNITY AND ECONOMIC DEVELOPMENT 1: Manage the watershed to maximize economic benefits while minimizing negative resources impacts.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Adaptation of agricultural practices will likely be necessary with increasing drought and farmers may need support to maintain a viable agriculture economy; transitioning of land from ag and forestry to other uses may become more attractive if they become less viable.	High	Medium	Place or region	Already occurring or 0-10 years	agricultural lands
Sea level rise can cause impacts to resources and therefore will impact the economic benefits to local tourism and businesses.	High	Medium	Extensive	More than 30 years	wetlands, adjacent uplands
Risk mitigation in flood prone and sea level rise (SLR) impact areas will result in costly improvements in infrastructure and building modifications. Structures may be lost with SLR (nowhere for tourists to stay/recreate).	High	Medium	Site	More than 30 years	all
Warmer summers could lead to an increase in and longer duration of ag and turf irrigation which could lead to localized groundwater depletion.	High	Medium	Place or region	More than 30 years	all

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Impacts due to fish, crab, horseshoe crab mortality, algae outbreaks etc. from warmer waters would be noticeable in the tourist and recreation economy. Impacts to species health and habitat will influence commercial/recreational activities.	High	Medium	Extensive	10-30 years	coastal bays, tributaries, wetlands, etc.
Tidal flooding from sea level rise may have an economic impact, which may be even greater if development is allowed in areas that will become more flood prone.	High	Low	Place or region	10-30 years	wetlands, adjacent uplands
Increasing storminess can result in impacts to resources and therefore will impact the economic benefits to local tourism and businesses.	Medium	Medium	Place or region	10-30 years	uplands, wetlands
Increased costs for managing stormwater runoff due to increasing storminess will erode funds from economic gains in tourism and impact local businesses.	Medium	Medium	Site	10-30 years	uplands
Ocean acidification may have negative impacts to aquaculture.	Medium	Medium	Place or region	More than 30 years	aquatic
Resource impacts may be greater with increasing recreational use as a result of warmer summers.	Medium	Medium	Place or region	10-30 years	waterways, parklands, recreational

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
					areas, beaches
Warmer winters may allow for the increase of invasive species. The damage to woodlands and loss of habitat could become more costly to control due to longer growing seasons.	Medium	Medium	Place or region	10-30 years	All types
Warmer winters could cause an increase in winter population, which could result in an increase in recreational use and greater resource impacts (increase in boaters may result in increased boat wake and increased erosion).	Medium	Medium	Place or region	Already occurring or 0-10 years	coastal bays, tributaries, wetlands, etc.
Increased competition for public and private shoreline access as a result of sea level rise may increase difficulty in balancing economic benefits while minimizing negative resource impacts.	Low	Low	Place or region	More than 30 years	aquatic, wetlands and adjacent uplands
With less land zoned for development, available land value and pressure to change zoning for less conservation may increase with sea level rise.	Low	Low	Place or region	More than 30 years	all
Flooding at headwaters may impact residential and industrial	Medium	Low	Place or region	More than 30 years	uplands

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
areas and farms and forests as a result of sea level rise.					

COMMUNITY AND ECONOMIC DEVELOPMENT 2: Enhance the level of sustainability in land use decision making.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Decision-makers will have other more urgent priorities that may take precedence over CCMP goals as a result of increased storminess.	Medium	High	Place or region	Already occurring or 0-10 years	tidal areas
Decision-makers will have other more urgent priorities that may take precedence over CCMP goals as a result of sea level rise.	Medium	High	Place or region	10-30 years	tidal areas
Ocean City will face increasing flooding from sea level rise, which may require serious consideration of relocation of some amenities; long term plan for what to abandon and what to try to preserve/protect may be needed.	High	Low	Place or region	More than 30 years	upland and wetland
Thermal expansion will increase as sea level rise covers more of the wetlands. Developed land may not allow for wetlands to migrate.	Medium	Medium	Place or region	More than 30 years	aquatic and adjacent uplands
Additional flooding risk from sea level rise may require new thinking about buffers.	Medium	Medium	Place or region	More than 30 years	all
Bay islands may be overcome/underwater from sea level rise and no longer providing protection to mainland or key habitat.	Low	Medium	Place or region	More than 30 years	all

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
Increasing drought may allow for up-zoning and building on soils heretofore unbuildable.	Low	Low	Place or region	10-30 years	uplands
Sea level rise may cause more expenditures in time, money and man-power by local emergency responders.	Low	Low	Place or region	More than 30 years	upland, wetland, water
Sea level rise may raise insurance rates of some residents to un-affordable amounts, forcing them to abandon, or sell at a loss, their coastal property.	Low	Low	Site	More than 30 years	uplands, interface with wetlands and shore
With less land zoned for development as a result of sea level rise, available land value and pressure to change zoning for less conservation may increase.	Low	Low	Place or region	More than 30 years	all
Warmer summers could cause an increase in overall seasonal population and lead to land use conflicts.	Low	Low	Place or region	More than 30 years	all
Inappropriate zoning in flood zones will exacerbate flooding from sea level rise, leading to additional cost to the county for maintaining roads and other infrastructure.	Medium	Low	Site	More than 30 years	upland, wetland, water
Inundation and saltwater intrusion from sea level rise may	Medium	Low	Place or region	More than 30 years	all

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
impact local cultural/rural land uses and groundwater.					

COMMUNITY AND ECONOMIC DEVELOPMENT 3: Educate and inform the population so it can make knowledgeable decisions for the community and its future.

Risk	**Consequence** (low, medium, high)	**Likelihood** (low, medium, high)	**Spatial Scale** (site, place/region, extensive)	**Time Horizon** (>30 yrs., 10-30 yrs., already occurring)	**Habitat Type**
MCBP and partner resources may be overwhelmed by dealing with the physical impacts of storms to land and bays, leaving less time or resources for education.	Medium	Medium	Place or region	10-30 years	all

Conclusion and Next Steps

The completed Consequences/Probability matrices provide the Maryland Coastal Bays Program with two important results: (1) a broad, risk-based assessment of climate change vulnerability in the system and (2) consensus among management and key stakeholders about how the climate change risks will affect the organization (EPA 2014).

The next step in the process is to develop an Action Plan around this information. Steps 6 through 10 of the Workbook guide the organization through that process. This includes exploring opportunities and constraints that influence what the MCBP chooses to tackle; developing partnerships to help address the chosen risks; deciding on a path of mitigation, transfer, acceptance, or avoidance of each of the 168 identified risks; developing a list of possible adaptation actions to assess further; selecting adaptation actions for implementation; and developing a plan that shows risk reduction over time as a result of implementing adaptation actions. This effort will be led by the Maryland Coastal Bays Program and its partners, in cooperation with University of Maryland Sea Grant Extension as the facilitator. The process will be funded through EPA Cooperative Agreement number CE983209-13-1.

References

EPA, Office of Water. 2014. "Being Prepared for Climate Change: A Workbook for Developing Risk-Based Adaptation Plans."