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Brief Description of Proposed Priority Options
Resources and Resources-Based Industries Technical Working Group
DRAFT

RRI-1. New Criteria for Identifying Priority Protection Areas

Option Description

This option provides the technical and scientific foundation for developing and testing new and existing criteria for identifying priority protection areas. The assessment will focus on identifying undeveloped lands and ecologically and economically important lands (including important habitats and marsh migration corridors) that will be critical for targeted conservation and coordinated restoration in response to sea-level rise and its associated effects. This information will be fed into other policy options to strategically and cost-effectively direct and implement specific conservation, restoration and growth management actions.

Rising sea level will impact coastal ecosystems and natural resource lands. These resources provide important wildlife habitats, have regional significance for migratory birds, sequester large amounts of carbon, provide sediment and nutrient water quality benefits, and generate economic benefits through farming, forestry, fishing and passive recreation. Preserving undeveloped, vulnerable lands also offers a significant opportunity to avoid placing people and property at risk to sea level rise and associated hazards including storm surge, coastal flooding, and erosion.

As sea level rises, various future conditions are possible. As an example, tidal marshes, beaches and dune habitats have the potential to: 1) migrate landward if there are no barriers to migration, such as roads and buildings or other unsuitable physical factors or 2) become eliminated if the opportunity to migrate landward is blocked, or the rate of migration is exceeded by the rate of sea level rise. Identifying where these resources are, how important they are for various ecosystem values and economic services and what the likely impact of sea level rise will be provides the basic information needed to plan for the protection and management of priority coastal natural resources. Existing assessments should be used to develop GIS-based and modeled criteria. These criteria should be ground-truthed and enhanced by additional field-based criteria.

The objective of this option is to identify target areas where strategic management actions, identified in other policy options, can be focused to buffer against the impacts of sea level rise and other climate changes. These actions can include expanding the priorities for existing land conservation to promote horizontal marsh migration, risk reduction and other land use goals. Other actions may focus on appropriate areas for restoration or rehabilitation projects, such as sand and sediment replenishment to fuel the vertical growth of wetlands, barrier removal or other alternative land management practices.

Option Design

Targets:

- Identify high priority ecological and economic natural resource lands in the coastal zone (a condition assessment).
- Identify coastal land areas that will be important for wetland migration corridors, for maintaining ecosystem integrity and connectivity, to support farming, forestry and fisheries industries and to confer risk reduction to coastal communities in response to projected sea level rise inundation and coastal flooding scenarios (a functional assessment).
- Determine through conserved lands and protective zoning overlays where high priority coastal lands are currently protected and where strategic conservation and restoration targets should be identified.
- Develop a set of field-based criteria to further identify the suitability of lands for protection and/or restoration in order to ensure eligibility for implementation programs.

Timing:

- An initial and coarse level assessment of resource priorities, current level of protection and resource vulnerability to sea level rise could be conducted within the first year using results from sea level rise modeling and existing resource assessments.
- Field studies may need to be conducted in order to develop and test specific criteria. For examples, indicators may need to be developed that would allow formerly upland agricultural lands that are transitioning into wetlands to be eligible for wetland restoration funds or wetland regulatory protection. The timing of this would be dependent on the programs being concerned for adaptation responses as detailed in other policy options.

Parties Involved:

- Resource assessment and threat analysis should be completed by MD DNR, UMD and other technical and scientific organizations
- The MDP should evaluate the degree of current protection of vulnerable lands targeted as conservation and restoration priorities through local and State growth management controls MDE to evaluate degree of protection through regulatory mechanisms

Implementation Mechanisms

Implementing this recommendation would require the investment of staff and funding to complete the analysis, conduct any needed specialized studies and document and publish the results.

Related Policies/Programs in Place

Existing natural resource assessments can be used, in concert with other modeling and mapping efforts. In addition, existing conservation priorities, such as DNR's Priority Conservation Areas, those identified in Maryland's Coastal and Estuarine Land Conservation Plan and other agency conservation targets.

DNR's existing resource assessments include the following :

- The Green Infrastructure Assessment: identifies an ecological hub and corridor network across the State, prioritizes for ecological value, and is a DNR foundation for focusing conservation and restoration work.
- The Blue Infrastructure Assessment: specifically focuses on aquatic values and the aquatic/terrestrial interface; surveys aquatic, wetland and shoreline natural resources and identifies areas of highest ecological and economic value; currently under development
- Strategic Forest Lands Assessment: specifically focuses on forests; identifies forested areas of highest ecological and economic value
- Shorelines Online: A survey of shoreline condition including the occurrence of built structures, soft/hard stabilization projects and areas in a natural state.
- Sea level rise projections, elevation assessments and inundation maps

Other studies and programs

- Restoration of Blackwater Wildlife Refuge marshes: This is an ongoing study that is building up degraded marshes through sediment replenishment and marsh grass plantings. Marsh accretion and carbon sequestration is being intensely monitored at this site and will provide the basis for field and modeled criteria and factors for determining suitable marsh migration corridors and restoration sites (University of Maryland, US FWS, MD DNR, Constellation Energy).
- Sea Level Affecting Marshes Model (SLAMM): This is an EPA funded modeling effort first developed in the mid-1980s and currently being refined as version 5. Results for the Chesapeake Bay will be available by mid-2008 and were funded by The National Wildlife Federation.

Estimation of Adaptation Benefits and Costs

Capital intensity:

Flexibility:

Adaptive capacity:

Other:

Documentation of Adaptation Benefits and Costs

Data Sources:

Quantification Methods:

Key Assumptions:

Key Uncertainties:

Additional Benefits and Costs

Feasibility Issues

Status of Group Approval

Barriers to Consensus

RRI-4 & RRI-11. Forest and Wetland Protection

Option Description

Use enforcements, financial incentives, and educational outreach to retain and expand forests and wetlands in the Critical Area and other areas subject to storm surge and sea level rise to enhance adaptive response to climate change. The aim of this option is to develop actions that prioritize retention or forest and expansion of forests and wetlands in rural and developed areas that are expected to be impacted. The expected benefits of this option include protection from shoreline erosion, reducing peak runoff during storm events, and avoiding stranded infrastructure.

Critical Areas, buffers, and other future impact areas will be targeted for forest establishment and expansion based on elevation and landscape planning. Future forest and wetlands areas will provide replacement zones for wildlife migration and movement corridors. Research efforts are needed to develop more water and salt tolerant plant species as sea level rise impacts move inland. Forest conservation incentive policies will be increased in targeted areas emphasizing not only preservation and expansion, but forest management issues that optimize forest health.

The climate change benefits are multiple as these forests and wetlands will continue to sequester carbon until called upon to provide a critical storm barrier. Water and air quality, wildlife habitat and multiple other natural resource improvements will be side benefits of implementing this option. Increased forests provide "green" renewable resources for wood products for construction and fuels. Forest industry jobs and related fields help the economy of Maryland.

Option Design

Targets:

1. Undeveloped areas within 1000 ft of mean high tide (current Critical Area definition), floodplain areas in the coastal zone, and areas prone to salt water intrusion are potential areas to target for expansion and protection, preventing further development. Already developed areas will consider all opportunities for tree establishment, raingardens, and other green infrastructure.
2. Future impact areas based on elevation mapping (< 5 ft. in elevation) become priority forest retention and establishment areas. Lower areas are more suitable for salt-tolerant woody species or for wetland establishment, especially where connected to existing wetlands.
3. Realize a goal to have 70% of the riparian area in Maryland forested. Accelerate the timeline to achieve such a goal (i.e., by 2025).
4. Create or augment dedicated sources of local funding, such as through ballot initiatives, for the conservation of forests and support these through state matching grants.
5. Identify and develop programs to enhance and protect wildlife corridors and maintain connectivity of green forest core areas across the landscape.

Timing: Program will be implemented in 2009 due to the need to establish forests areas as soon as possible. This will maximize the benefits of growth prior to future needs. An intensive public relations effort will begin prior to full implementation (2008-2009) to the citizens of Maryland, but particularly to the citizens of future impacted areas of the sea level rise issue and the values of promoting and enhancing forest areas. This program should run indefinitely (continuous) and be evaluated every 5 years for effectiveness.

Parties Involved: The Maryland Dept of Natural Resources and the Dept. Of Agriculture will be lead agencies involved in the implementation of the program. Infrastructure is already in place through several cooperative programs such as CREP utilizing Soil Conservation Districts as the on-the-ground contact for landowners. DNR and Dept of Ag can provide the promotional staff and resources to identify and target contact areas. Some overlap with existing programs of the federal Natural Resources Conservation Service (NRCS) is noted. Numerous other national, regional, and local private nonprofit organizations also conduct and support land protection (e.g., land trusts) and wildlife enhancement activities (e.g., wildlife and waterfowl habitat restoration groups).

Other: County and local governments must become involved in this endeavor both in promotional and implementation efforts including land use planning and zoning efforts.

Implementation Mechanisms

For restoration of riparian forest buffers and wetland restoration, this option can be implemented through existing programs such as CREP and WRP. Other forest restoration incentives are limited and more need to be created. There may be opportunities to use other Farm Bill program and funds to promote forest restoration. Staffing and funding must accompany the program as current on-the-ground and support resources are minimal at this time due to funding cuts and staff reductions.

For conservation, ideally new state legislation that provides matching grants to local government for forest land protection would be invoked. This would accompany local government initiatives, passed by voters, to create dedicated funds to protect these lands and qualify for matching state funds. There may be opportunities to use other Farm Bill program and funds to promote forest protection and management. Staffing and funding must accompany the program as current on-the-ground and support resources for forests are dwarfed by those provided for protection of farm lands.

Related Policies/Programs in Place

Estimation of Adaptation Benefits and Costs

Capital intensity:

Flexibility:

Adaptive capacity:

Other:

Documentation of Adaptation Benefits and Costs

Data Sources:

Quantification Methods:

Key Assumptions:

Key Uncertainties:

Additional Benefits and Costs

Feasibility Issues

Status of Group Approval

Barriers to Consensus

RRI-7 & RRI-9/EBEI-6 Sustainable Shorelines and Buffer Area Management Practices

Option Description

Shoreline erosion is a significant issue facing Maryland's diverse coastal environment. Approximately 70% of Maryland's 7,700-mile coastline is experiencing some degree of erosion, which will worsen as a result of increased rates of sea level rise, and frequency and/or intensity of coastal storms from climate change. Comprehensive shoreline management must be an integral part of any future erosion control planning effort. Past efforts to mandate local shoreline erosion control plans under the Critical Areas law were unsuccessful due to a number of factors. An increased understanding of non-structural and structural erosion control alternatives at the practitioner level; new mapping resources, shoreline inventories and web enabled analytical tools are now sufficiently in place to facilitate such plans. Adopting a collaborative state-local approach to developing such plans will maximize the odds of success in designing and implementing a specific shoreline erosion control practice that achieves a balance between protecting the landowner and minimizing disruption to the coastal environment.

This option recognizes the need for both planning and permitting level efforts. Modifications to the Tidal Wetlands and Critical Areas laws and/or regulations should be made to promote sustainable shoreline and buffer area management practices on public and private lands. These modifications should incorporate the following elements:

- A requirement for state and local governments to cooperatively develop comprehensive shore erosion management plans that determine and specify the type and location of shore protection practices based on their physical and hydrodynamic setting. Additional attention should be given to encourage the use of living shorelines as a means to manage a continuum of habitat and natural resource features that extend from shallow water habitats, beaches and wetlands to upland forested buffers.

- Amend State statutes and regulations to remedy jurisdictional gaps and conflicts between State and local governments within the 100-foot Critical Area buffer.

- A requirement for permit applicants to demonstrate that their preferred erosion control alternative is least disruptive to the shoreline and critical area buffer; and has the least potential to adversely affect natural resources subject to long term erosion. To guide applicants, the State will develop a preferential order of erosion control alternatives and practices, which are presumed to progress from the least to most detrimental effect on natural resources. DNR's Shore Erosion Control Program should be reoriented to promote the installation of innovative shore protection techniques that maximize habitat restoration and enhancement, and provide technical assistance and subsidies for non-structural shoreline stabilization projects.

- A revision to current tidal wetland regulations enabling private land owners to rebuild storm damaged tidal marshes, including the placement of additional clean sandy fill, plants and

temporary biodegradable structures to protect rebuilt areas. Currently, introducing clean sandy fill material requires a state permit, while simple planting of wetland species on existing substrate in the correct hydrologic and salinity regime does not. Repairs would be authorized only if conducted under guidelines issued by the Maryland Department of Environment.

- A requirement directing state agencies to jointly develop and maintain up-to-date guidelines that describe preferred shoreline and buffer management practices that will facilitate climate adaptive strategies for coastal environments subject to sea level rise, erosion and storm hazards. This is to include modifications to existing designs and/or the creation of new design and construction standards and protocols for shore erosion control structures – both new and retrofit, to accommodate projected SLR.

- A mechanism to update the Comprehensive Shoreline Inventory (CSI) to include type and quantity, location, and conditions of shore erosion control structures, on the order of every 5 years. This could be linked to the permitting process, to create a system for automatic entry and updates to the database for projects being proposed and implemented.

Option Design

- **Targets:**

There are 4 key targets associated with this option, as outlined below:

  - Implement recommended regulatory requirements for 100% of the area subject to tidal wetlands permitting authority.
  - Work with an interdisciplinary team with expertise in wetlands, coastal processes, biology, restoration, and coastal erosion control design and engineering to modify and/or create new design and construction standards for erosion control structures and tidal shoreline habitat enhancement projects.
  - Distribute modified/new design and construction standards to engineering, contractor, local governments, NGO's and property owner communities.
  - Development of a strategy for updating the Comprehensive Shoreline Inventory every 5 or 10 years.

- **Timing:** Make required regulatory changes by 2009; promulgate guidance manual by 2010; strategy for updating CSI in place, with the first subsequent update by 2010; following CSI update, initiate shoreline management plans in 2011 with target completion date for plans by 2013.
- **Parties Involved:** Critical Areas Commission, Maryland Department of Environment, Maryland Department of Natural Resources.
- **Other:** Resource Conservation and Development agencies; local governments in the coastal zone; Board of Public Works, Wetlands Administrator; engineering, contracting, and property owner communities; Army Corps of Engineers and other federal resource management agencies; the Center for Coastal Resources Management (VIMS); and others.

Implementation Mechanisms

Implementation of this option will/could include a combination of executive, legislative and programmatic actions. The first step is the regulatory amendments to Title 16 of the Environment Article (Wetlands and Riparian Rights Act) to remedy jurisdictional gaps between State and local governments within the 100-foot Critical Area buffer and revise permitting process; modifications to COMAR Title 27 "order of preference" for shoreline protection treatments; and the Annotated Code of Maryland's Natural Resources Article (§8-1001 through 8-1008) to reorient the Shoreline and Erosion Control Program. Second, updated design and construction standards and protocols for SEC structures – both new and retrofit, should be developed to accommodate projected SLR *(e.g. SHORE EROSION CONTROL GUIDELINES For Waterfront Property Owners)*. These guidelines should be distributed to the engineering, construction, and property owner communities via state agencies, county planning offices, and Resource Conservation and Development agencies.

Additional programs that would support the implementation of this option could include an education and training program for contractors to establish a quality control mechanism, revitalizing the financial assistance program through DNR's Shore Erosion Control Program, professional development opportunities for permit reviewers, and an outreach program for waterfront landowners.

Related Policies/Programs in Place

A number of state and federal sponsored activities and programs are currently underway that relate to this option, including:

1. The *Shore Erosion Control (SEC) Program*, Department of Natural Resources, provides incentives and technical assistance for non-structural projects to Maryland property owners in resolving shoreline erosion problems along the Chesapeake Bay and its tributaries.
2. The *Comprehensive Coastal Inventory (CCI) Program*, Center for Coastal Resources Management at the Virginia Institute of Marine Science, collects, reports, and distributes information on Maryland's shoreline features including shore erosion control structures.
3. The Department of Natural Resources, various programs are conducting sea level rise and storm surge mapping.
4. The Department of Natural Resources Green and Blue Infrastructure Assessments.
5. *Erosion Vulnerability Assessment (EVA)*, Maryland Coastal Program in conjunction with the Corps of Engineers, helps various government agencies prioritize shore erosion control projects for public assistance and identify key environmental features of selected sites, among other services.
6. *Living Shorelines Suitability Tool*, Maryland Coastal Program in conjunction with VIMS, is being created for Worcester County that identifies areas that are not suitable for living shoreline treatments, those that are suitable and those that may be suitable with design restrictions.
7. The *Living Shorelines Stewardship Initiative (LSSI)* is a collaborative effort by various public and private entities to promote the use of "living shorelines" (i.e. vegetated buffers) to waterfront property owners.

8. The Maryland Coastal Program currently offers a marine contractors training course, focusing on the design and installations of "living shorelines".

Estimation of Adaptation Benefits and Costs

Capital intensity:

Flexibility:

Adaptive capacity:

Other:

Documentation of Adaptation Benefits and Costs

Data Sources:

Quantification Methods:

Key Assumptions:

Key Uncertainties:

Additional Benefits and Costs

Feasibility Issues

Status of Group Approval

Barriers to Consensus

RRI-# Resource-Based Industry - Economic Initiative

Option Description

Resource-based industries such as commercial and recreational fishing, marine trade and port activities, forestry and agriculture, and tourism represent significant economic revenue for the state of Maryland. These industries rely on the health and resiliency of the Chesapeake Bay and its tributary ecosystems. Sea level rise and associated hazards such as storm surge, coastal flooding and erosion threaten areas where the current primary land use supports these industries. In order to maintain this economic base, state agencies' should focus efforts on the development of long-range plans (i.e., fishery management plans, long-range forestry management plans, marine sensitive areas initiative, and agriculture land use plans) to ensure economic sustainability in the face of climate change and sea level rise.

- *Fisheries-based industries:*
  The impacts to the seafood industry are somewhat unknown, because crab, oyster and finfish populations may react differently to these changes. However, these resource populations and the industries associated with them are currently under stress due to overfishing, degradation and loss of nursery habitat, and extensive inshore and coastal pollution. Sea level rise impacts may further aggravate wetland and SAV loss, depressing these populations and resulting in the loss of this important economic engine for which Maryland is famous. Management of these resources should consider all aspects of the seafood industry, from managing resource populations to processing, packaging and distribution practices, in order to streamline costs and maximize profits while ensuring sustainability. Additionally, research is needed to determine populations that should be supplemented, restored in the wild, or generated for supply via aquaculture practices. Ultimately, management efforts should focus on conserving diversity of habitats to maintain functionality and persistence of populations so they can be resilient during times of stochastic climate conditions and associated coastal hazards.

- *Forest industries:*
  The forest industry is the fifth largest industry in the state, providing socioeconomic benefits related to timber, jobs, and recreational activities (hunting, fishing, and ecotourism). The long-term profitability of the forest products industry is directly linked to a sustainable forest resource base. Identifying areas where the forest products industry is likely to be viable in the long-term provides focus for effective management activities, but should also be adaptive so that if future conditions change and the forest shows signs of stress or decline, management techniques can be adjusted. Forestry plans should address re-developing forested riparian buffers with salt tolerant species, and identifying species with quick turn-over and provide quality wood for timber and pulp producing forests. Additional attention should be to modernize the processing, manufacturing, and distribution aspects of the industry.

- *Agricultural industries:*

Sea level rise could disrupt agriculture and livestock operations in low elevation areas that are subject to flooding and inundation. Further establishment of operations within these areas should be minimized, and where feasible relocated or protected to minimize impacts. The use of new non-conventional agriculture crops which are salt tolerant should be considered, and could replace traditional industries. As such, business development for this potential new industry needs to be addressed. Another concern is ground water wells and waste storage structures associated with these operations, and considerations should be made to protect or move them out of vulnerable areas.

Baseline information about how resource-based industries will respond to climate change is lacking. Research should aim to identify the impacts of climate change and sea level rise on the economics of resource-based trades and industries. Any management program needs to be flexible enough to adjust to ongoing and future change. This option addresses protection mechanisms to minimize the impacts on natural resource industries, or adaptation by the use of new non-conventional methods.

Option Design

- **Targets:**

Agriculture Industry

1. Develop new non-conventional crops for use in low elevation agricultural area, which will be subject to flooding or wet conditions in the future. This includes use or the development of salt tolerant crops, as increased saltwater impacts are generally associated with lands adjacent to the sea level rise areas.
2. Develop and assist in the funding for any ground water well protection associated with agricultural production.
3. Identify poultry and other livestock operations located in high risk areas and develop temporary protection methods to minimize flooding impacts. Work with local Planning and Zoning Offices to prevent future establishment of these operations in high-risk areas. These efforts will include the waste storage structures associated with these operations.

Seafood Industry

1. Develop and promote alternative trade businesses which can replace traditional seafood harvesting as a natural resource based industry. (example: eco-tourism)
2. Modify oyster, SAV and tidal wetland restoration targets in response to sea-level rise projections and other climatic changes to ensure project success and provide the extent and diversity of habitats needed to support sustainable fisheries-based industries.

Forest Industry

1. Identify or develop cultivars of salt-tolerant tree species that can produce fiber suitable for the forest products industry and increase the supply of nursery stock in State run nurseries.
2. Develop guidance and training programs for consultant foresters to assist the integration of climate change adaptation recommendations with forest management plans.

3. Identify opportunities within existing programs or develop a new financial assistance programs that can be used to assist landowners with the additional expenses incurred to manage and replace trees suffering from sea-level rise related stressors and to adapt forestry management practices to changing climatic conditions.

- **Timing:**

These options can be implemented as soon as sea level rise impacts are identified by the State as a priority for existing programs. Research efforts must be prioritized before alternative crops can be utilized. This option is directly associated with other climate change initiatives and alternative fuel development.

- **Parties Involved:**

Maryland Department of Natural Resources, Maryland Department of Agriculture, numerous fisheries, forestry and agricultural organizations and business interests.

- **Other:**

Implementation Mechanisms

There are many existing programs (agricultural assistance, economic development grants, etc.) and policies in place that will support the implementation of this option. Additional opportunities include the utilization of new Farm Bill program funding to promote alternative crops. State and local regulations may be needed through existing zoning programs to prohibit new poultry and livestock operations in at risk areas. The Md. Dept of the Environment may need to investigate if existing regulations are in effect for the installation of well protection devices to prevent salt water contamination of ground water sources.

Related Policies/Programs in Place

Fisheries Programs

The Task Force on Fisheries Management, formed in 2007, is charged with overseeing a full review of current fishery management processes and developing recommendations for methods to improve, modernize, and streamline fishery management. The Task Force will look in depth at a range of fisheries conservation challenges, management issues, and a variety of science concerns, including stock assessment capabilities and limitations, ecosystem based interactions, and socioeconomic considerations associated with Maryland's fisheries.

Farming and Forestry Assistance Programs

The Maryland Departments of Natural Resources and Agricultural, the U.S. Department of Agriculture, academic resources, such as those available through the University of Maryland system, and local forestry and farming boards offer a wide range of technical, financial and research assistance and training programs to members of the State's rural resource based industries. Adaptation guidance and assistance can be developed and delivered through these existing programs.

Estimation of Adaptation Benefits and Costs

Capital intensity:

Flexibility:

Adaptive capacity:

Other:

Documentation of Adaptation Benefits and Costs

Data Sources:

Quantification Methods:

Key Assumptions:

Key Uncertainties:

Additional Benefits and Costs

Feasibility Issues

Status of Group Approval

Barriers to Consensus