Most informed people realize that cumulative impacts have had significant adverse effects on water quality and aquatic resources. Virginia’s challenge is to find a way to implement an effective coastal management program that begins to change the current trend toward environmental degradation.

Pam Mason has been pondering the concept of integrated coastal zone management for over 15 years. Mason, a wetlands biologist with the Center for Coastal Resources Management (CCRM) and her colleagues are developing a technical guidance document that will go beyond the jurisdictional bounds of any one regulatory program to look at shorelines as an ecosystem. The ecosystem concept is important because our coastal lands, air, and water resources support jobs, produce food, provide housing and offer recreational opportunities…. all are highly inter-related. One large variable in the puzzle are the choices people make.

“Choices made about uses of the land from large county-wide, or watershed scales to decisions about individual properties can affect the extent of area beaches, the amount of tidal wetlands and the populations of blue crabs and striped bass,” Mason says. CCRM is trying to better define the links within terrestrial and aquatic systems. Mason explains that, “Natural habitats provide ecological services such as water quality improvement, terrestrial and aquatic habitat, erosion control and aesthetics. The public must come to understand that these services have economic value.”

Choices Affect us All

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Big and Complicated

In the management arena, several different decision-makers try to make the best choices for their respectively managed resources (i.e., air, water, and land.) These decisions are made regarding numerous resources (state-owned subaquaeous lands, state and locally managed wetlands, privately held uplands) using a variety of authorities (local ordinances, state legislation, federal legislation, regional agreements - see Figure 1). It gets tricky trying to stay within the guidelines and not step on any toes.

Downsizing

CCRM is trying to simplify the regulatory jungle by choosing to tackle integrated management on a smaller scale using the shoreline setting in their technical guidance document. A set of rationale will be provided for planning that includes common shoreline settings, as well as the ecologic effects of options for shoreline use and protection. The hope of CCRM is that if this theory works on the small scale, it may be possible to build from these efforts to integrate shoreline decision-making to larger scale ecosystems.

- K. Reay, Editor
Integrated coastal zone management (ICM) is a generally accepted and long touted concept to promote the best decisions regarding the coast. The concept is simple in theory. Integrated management decisions are made using a continuous and adaptive process that addresses fragmentation and supports sustainable use and protection of coastal and marine resources. In reality, integrated coastal management can be a complicated process that involves several steps which may occur at the same time and/or in sequential order for various issues and at multiple action steps for any one issue (Figure 2).

Integrated management requires that the choices made by management programs be monitored to assess the effect of the choices and that the programs be changed as necessary based on the monitoring. Evaluation of monitoring data is a critical element and serves two needs: accountability (how well the management process is working) and adaptability (can the management strategies be improved). While changing management programs to adapt to new information is difficult enough, successful integration requires not only an integrated approach to environmental management programs, but also the incorporation of social and economic issues such as coastal hazards and risk avoidance (Figure 3).

ICM Challenges in Virginia

Efforts in Virginia and elsewhere to implement integrated coastal management come up against many stumbling blocks. In addition, to the various steps of implementing the policy process, many agree that scale, regulatory complexity and ecological complexity define the greatest challenges to ICM. Rather than tackling the entire coastal zone of Virginia, a smaller scale shoreline ecosystem...
will be modeled to provide guidance for the implementation of successful integrated management. The shoreline ecosystem is comprised of nearshore shallow waters, the tidal wetlands, beaches and dunes, banks and upland riparian areas.

The relationship between shorelines and ecological functions is very complex. A simplified “function web” shows some of the various services provided by shoreline ecosystems (Figure 4). The ecological functions may be grouped into categories such as: water quality, habitat and socio-economic functions. Individual functions may be linked through both beneficial and adverse effects. For example, erosion control may have a positive link to both socio-economic function and water quality function but often has an adverse effect on habitat.

The disconnect between current management practices and the concept of integrated coastal zone management is exemplified by the disjoint management of coastal resources that promotes partially informed decision-making. There are two primary areas of impediment to integration of shoreline management from a shoreline perspective; overlap and gaps.

Jurisdictional overlap occurs both horizontally (more than one authority at the same level of government with management interests in the same resource) and vertically, as in different levels of government with management interests in the same resource, ie. tidal wetlands with local Wetlands Boards, Department of Environmental Quality (DEQ) and federal U.S. Army Corps of Engineers authority. Gaps occur where the jurisdictional boundaries of management programs meet, as opposed to overlap. For example; Subaqueous Lands management by Virginia Marine Resources Commission (VMRC) and Tidal Wetlands management by Local Wetlands Boards, or management by DEQ of non-tidal wetlands which are in the RPA and the management of the landward buffer by the local authority.

**Figure 5:** A previously stable bank becomes unstable after removal of riparian vegetation. Formation of gullies, bank slumping and loss of soil into the waterway are the result. Once disturbed, physical limitations may limit the restoration of a buffer capable of addressing bank stabilization and erosion protection.

**Figure 4:** Some of the ecological functions of the shoreline ecosystem. Functions provide ecological services which are valued by society.

**Tackling Integrated Management on Virginia’s Shorelines**

It has become increasingly apparent that in order to reduce the cumulative and secondary environmental impacts of activities within the multiple jurisdictions and multiple management programs affecting Virginia’s shorelines, better
coordination and integration of policies and practices is necessary (Figures 5 & 6). One tool that could address the limitations of the various management programs would be comprehensive technical guidance to promote integrated management decision-making.

The Center for Coastal Resources Management (CCRM) is developing a technical guidance document that goes beyond the jurisdictional bounds of any one regulatory program to look at shorelines as an ecosystem. The document will be comprised of a set of rationale for sustainable decision-making that includes common shoreline settings. As appropriate, the guidance will consider socio-economic issues.

The guidance is being developed using a geo-spatial computer model for both water quality and habitat functions. The habitat and water quality functions attributed to shorelines have been based upon the parameters of the scientific literature. Various shoreline elements are included in each of the models (Figure 7).

The guidance builds upon work recently completed to identify preferences for approaches to shoreline erosion and protection of shoreline elements. The preferences (Figure 8) are based upon scientific literature and best professional judgement from a water quality perspective. For example, expansive marshes offer the greatest opportunity to address multiple sources of water pollution such as overland flow, bank erosion and in-situ water quality treatment.

Decisionmaking on the shoreline is complicated. In addition to the many important ecological services, decisions must consider erosion rates, erosion risk and human interests. The idea of the integrated guidance is to develop and apply rationales to shoreline situations which identify the choice, or choices, that best promote sustainable ecological services while incorporating human uses.

For more information on wetlands functions and values, see http://www.ccrm.vims.edu/wetlands/selfeds.html
Figure 8: Water quality services are provided to greater or lesser degrees by various shoreline habitats. Those in Category A provide the greatest service. Category C provides little water quality improvement, and is likely a source of pesticides and nutrients from fertilizers.

The following photos give examples of these categories in real-life situations. If a choice is made to impact the shoreline with an erosion control structure, the greatest protection should be afforded Category A habitats.

Preservation of an intact natural buffer with shrubs, trees and grasses on a stable bank is the preferred environmental choice if an erosion control structure is placed on this shoreline.

There are times when the need for erosion protection is not apparent due to lack of indicators such as eroding banks, failing structures, fallen trees or large fetch. If a structure is to be built on a shoreline with Category C habitat, the preferred impact is to Category C.
The sparse trees may need to be eliminated in order to avoid impacts to the vegetated wetlands. It is possible to replace the trees landward of the present location. This allows for persistence of the wetland and a replacement of the trees.

A second example of choice between Category B and Category A, with the additional element of an existing structure. The preference is to limit new impacts to the footprint of the existing impacted area. Any additional impact area should occur in Category B with tree replacement.

Impacts associated with the protection of the upland should occur in the upland lawn area as opposed to the non-vegetated wetlands.
2002 Chesapeake Bay Program Survey Results:

94 percent. believe that restoring waterways in the Chesapeake Bay region is important;

89 percent. are concerned about pollution in the Bay. The level of concern, however, decreases with distance from the Bay; and

86 percent. would become involved in improving water quality if they believed their actions would make a difference.

Tenets of Integrated Shoreline Management:

- Designed to overcome inherent fragmentation due to different agency missions or resource management responsibilities
- Sustainable use, development, and protection of resources
- Adaptive and dynamic - a continuous and ever-changing process

Integrated Guidance

Legislative Issues:

Gap between the responsibility of state management for public trust resources and private and local decision-making.

Lack of state comprehensive planning complicates coordination of decision-making.

For more information on this topic, please contact Pam Mason at (804) 684-7158.