

## 8.0 COASTAL RESOURCES

### 8.1 BACKGROUND

Bayfield County is one of four northern Wisconsin coastal counties whose shoreline is bounded by Lake Superior. Coastal resources of Bayfield County serve as important environmental, economic, and aesthetic resources. The coastal environment provides critical habitat for several species of plants and animals, many of which are dependant on this unique environment. Coastal environments in Wisconsin are currently threatened by development, pollution, shoreline erosion, and other land use activities. The development of conservation strategies and long-range planning for Bayfield County's coastal resources is an important step to ensure the vitality and sustainability of these resources for decades to come.

#### *Coastal Area*

Bayfield County has 86.2 miles of mainland shoreline on Lake Superior, in excess of one-third of Wisconsin's total Lake Superior shore. Additionally, four of the Apostle Islands (Eagle, Raspberry, Sand and York) are part of Bayfield County and account for a further 18.5 miles of shoreline. The coastal area of Bayfield County extends from the western boundary of the Town of Orienta and Douglas County to the northeastern boundary of the Town of Eileen and the City of Ashland, Ashland County. Examination of the coastal environment requires analysis of the coastal drainage network. Coastal issues often have their origins far inland, as terrestrial land uses directly impact the quality and quantity of waters that eventually spill into Lake Superior through tributary streams and rivers. Wetlands, which act as natural water purification systems, can have a relatively high degree of impact on the water quality of tributary streams. In addition, these wetlands and tributaries provide habitat for plant and animal life unique to the coastal environment. An example would be the anadromous fish species found in Lake Superior which migrate up the tributary streams each year to spawn. It is through this connectivity of natural processes and systems that areas far removed from the coast can be classified as "coastal environments".

### 8.2 COASTAL TYPES

Bayfield County has several different coastal types ranging from sandstone coastal bluffs and caves to clay bluffs and narrow sand beaches.

#### *Bayfield County Coastal Drainage Network*

The Bayfield County coastal drainage network is located within seven watersheds. The great divide crosses the southern portion of Bayfield County. To the north of the divide, waters drain into Lake Superior; south of the divide, waters drain to the Mississippi River Basin. Streams and tributaries have a significant impact on the quality of the coastal environment due to the fact that these waterways act as conduits, which transport sediments and chemical components into Lake Superior. The quality of waters found in the tributary streams is closely related to the quality of the coastal wetlands often found near the outlet of these waterways.

### Bayfield Peninsula Northwest

Bark River, Cranberry River, East Fork Cranberry River, Flag River, East Fork Flag River, Lenawee Creek, Lost Creek (1-3) Racket Creek Sand River, Saxine Creek Siskiwit River, Squaw Creek, Unnamed Tributaries.

### Bayfield Peninsula Southeast Watershed

Birch Run, Bono Creek, Boyd Creek, Brickyard Creek, Chicago Creek, Fourmile Creek, Frog Creek, Little Sioux River, Onion River, Pikes Creek, North Pikes Creek, Raspberry River, Red Cliff Creek, Sioux River, Thompson Creek, Whittlesey Creek, North Fork Whittlesey Creek, Unnamed Tributaries.

### Iron River Watershed

Blaine Creek, Dahl Creek, DeChamps Creek, Fish Creek, Halls Creek, Hills Creek, Iron River, East Fork Iron River, Middle Creek, Muskeg Creek, Reefer Creek, Resch Creek, Schacte Creek, Townsend Creek, Unnamed Tributaries.

### Fish Creek Watershed

Bay City Creek, North Fish Creek, Fish Creek Slough, South Fish Creek, Little Pine Creek, Pine Creek, Slaughterhouse Creek, Unnamed Tributaries.

### Marengo River Watershed<sup>1</sup>

Deer Creek, Marengo River, Morgan Creek, Pearl Creek, Pre-emption Creek, Schramm Creek, Spring Creek, White River.

### White River Watershed<sup>1</sup>

Bolen Creek, Deer Creek, Eighteen Mile Creek, Hanson Creek, Jader Creek, Long Lake Branch, Porcupine Creek, Pre-emption Creek, Spring Creek, Tader Creek, Twenty Mile Creek, White River, White River (East, South, West Forks), Unnamed Tributaries.

### Lower Bad River Watershed<sup>1</sup>

Unnamed Creek

### Bois Brule River<sup>2</sup>

Unnamed Creek

## 8.3 COASTAL HABITATS

Coastal areas are a unique physical environment that provide critical habitat for a wide range of plant and animal species. Examples of the unique coastal habitats found in Bayfield County include:

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<sup>1</sup> Outlet in Ashland County

<sup>2</sup> Outlet in Douglas County

The Apostle Islands National Lakeshore – A unique coastal environment managed by the National Park Service. The Apostle Islands contain a unique blend of coastal features including wetlands, remnant old growth forests, and sandstone cliffs. These areas provide habitat for a wide range of breeding and migratory birds as well as federally and state listed plant and animal species.

The Bayfield Peninsula Tributaries – An extensive stream network draining the lands of the Bayfield ridge, a 10-15 mile wide prominent range of hills extending from the tip of the peninsula to the southwest. These tributaries include the Raspberry River, Sand River, Flag River, Bark River, Sioux River, Onion River, and numerous other perennial and intermittent waterways. The tributaries of the Bayfield Peninsula account for nearly 50 percent of the trout and salmon reproduction along Lake Superior's south shore.

South Shore Fishery/Wildlife Area – Two sites in the Bayfield Peninsula southeast watershed that drain to Chequamegon Bay, Pikes Creek and the Sioux River, are part of the South Shore Fish and Wildlife Area, a Wisconsin Department of Natural Resources land acquisition project. The project was approved in 1992 with an acquisition goal of 8,690 acres. The project aims to maintain and enhance highly valuable coastal wetlands and watersheds supporting migratory trout and salmon species.

#### 8.4 COASTAL WETLANDS

The wetland networks found only along the Lake Superior coasts include freshwater estuaries, interdunal wetlands, ridge and swale systems, and lakeplain prairies. Coastal wetlands in Bayfield County differ from inland wetlands in both form and function. These communities have survived and exist because of the continuous interaction of the lake, streams, and shore. Bayfield County's coastal wetland communities serve many biological and ecological functions. Coastal wetlands provide spawning habitat for many species of fish; they provide rest areas and habitat for migratory birds; and they provide critical habitat for many rare, threatened, and endangered species of plants and animals. Coastal wetland habitats are biologically very diverse and contain many unique plant communities including coastal fen, coastal bog, northern sedge meadow, lagoon, and dry pine forest.

Coastal wetlands on the south shore of Lake Superior are coming under increasing development pressure. In 1996 under the Lake Superior Binational Program, the Wisconsin Department of Natural Resources defined the areas of important habitat in the Wisconsin portion of the Lake Superior basin. In Bayfield County, the Bayfield Peninsula streams, estuaries, coastal wetlands, and the Apostle Islands were identified as significant areas that represent the pre-settlement conditions of the lake basin and contain diverse and unique habitats. Primary Coastal Wetlands are depicted in Map 8.1.

Map 8.1 Primary Coastal Wetlands

*Significant Coastal Wetland Communities in Bayfield County*

(Priority Wetland Sites as identified by the Wisconsin Department of Natural Resources)

Bark Bay  
Lost Creek Wetlands  
Port Wing Wetlands  
Sand Bay  
Sultz Swamp

Bayview Beach – Sioux River Slough  
Wetland Communities of the Apostle Islands  
Fish Creek Slough  
Red Cliff Reservation  
Bibon Marsh

**Bark Bay Wetlands**



Photo courtesy: WDNR

**Red Cliff Wetlands**



Photo courtesy: WDNR

**Bibon Marsh**



Photo courtesy: WDNR

**Sand Bay Wetlands**



Photo courtesy: WDNR

Port Wing Wetlands



Photo courtesy: WDNR

Sultz Swamp



Photo courtesy: WDNR

Bayview Beach – Sioux River Slough



Photo courtesy: WDNR

Fish Creek Sloughs



Photo courtesy: WDNR

## 8.5 COASTAL HAZARDS

Erosion/Sedimentation – Highly erodible sand and red clay soils are characteristic of much of the southern Lake Superior basin and are responsible for the greatest impact to water quality within the Lake Superior Watershed. Land use practices within the basin that increase peak flows of water off the landscape increase instream erosion through channel incising and slumping of destabilized streambanks, resulting in bank erosion and downstream sedimentation. Disturbed soils coupled with high volume and velocity of water flowing off the landscape creates a severe instream erosion hazard, especially following major rainfall events and in the spring snowmelt. Instream sedimentation, as well as sediment accumulation in Lake Superior, poses a threat to native plant and animal life. As the sediment builds up in the basin, it impedes the natural function of the system inhibiting fish spawning and restricting plant growth. A Wisconsin nonpoint source pollution abatement project has been undertaken for

### South Shore Red Clay Erosion



Photo courtesy: Albert Dickas, UW-Superior

### Slump Erosion



Photo courtesy: USDA-Natural Resources Conservation Service

Whittlesey Creek, one of several streams flowing through the Lake Superior clay plain, where erosion and sedimentation are accelerated. Guidelines are being developed by the Wisconsin Department of Natural Resources and partners for Wisconsin's portion of the Lake Superior basin to identify and/or modify land use practices that accelerate runoff rates and increase peak water flows that accelerate the instream erosion process, contributing to increased sedimentation.

### Storm Erosion



Photo courtesy: Robert F. Beltran

### Shoreline Erosion



Photo courtesy: National Park Service

### Coastal bluff erosion/shoreline recession

The Wisconsin Coastal Management Program has identified the erosion of coastal bluffs, banks, and beaches as one of three primary types of natural hazards affecting Wisconsin's great lakes shores. Temporary fluctuations in water levels due to storm events or storm-induced surges producing elevated wave activity are the principal causes of coastal bluff erosion. Along the Bayfield County coast, the high clay bluffs extending from Bark Point, westward toward Wisconsin Point, Douglas County, are the most vulnerable shoreline to this type of erosion (Springman and Born 1979).

## 8.6 BAYFIELD COUNTY SHORELINE RECESSION STUDY

A study<sup>1</sup> conducted in 2001 indicated the significant impact that the coastal erosion process has had along a portion (28 miles) of Lake Superior shoreline in Bayfield County. The results of the 2001 study reaffirm results of studies conducted during the 1970's, indicating that coastal erosion processes have had a significant impact on the coastline of Bayfield County. According to the 2001 study, an estimated 5,000,000 yds<sup>3</sup> (cubic yards) of shoreline were lost from 1938 to 1990. This loss translates to an annual loss in excess of 100,000 yds<sup>3</sup> per year or nearly 3,600 yds<sup>3</sup> per shoreline mile per year. The level of shoreline recession is dependant on many factors, including nature of the substrate, stabilizing vegetative cover, and shoreline alteration. The most extreme recession rate (bluff) was 187 feet, although beach erosion at the Port Wing Harbor had retracted the shoreline nearly 500 feet.

### *Economic Impact of Coastal Recession on Bayfield County*

Nearly 1,200 coastal land parcels exist in Bayfield County. These parcels comprise 1 percent of the total land area in the county but account for nearly 10 percent of the county's total private land value. The loss of land and structures in these areas reduces the overall county tax base. In addition, costly remediation procedures place economic burdens on local government.

Pollution – Agricultural runoff and municipal effluent discharge are the primary sources of water quality degradation in Bayfield County. Potential pollution sources such as barnyard runoff, livestock operations, cropland chemical applications (pesticides, fertilizers), and failing septic systems contribute to pollutant loading in local streams. Surface runoff from roads, parking lots, or other impervious surfaces introduces chemicals such as oil, heavy metals, road salts, mercury, and lead into surface waters.

Habitat Loss / Fragmentation / Development – Demand for coastal property in Bayfield County and all of northern Wisconsin is at an all time high. Pressure to convert existing undeveloped land for residential/recreational uses is very high and some coastal areas are being developed at a rate that rivals inland lakeshore development. Coastal development threatens the sensitive natural environment by destroying fragile habitats, reducing habitat connectivity (fragmentation), disrupting coastal processes, creating more impervious surface cover, and adding pollutants to the system. Development of the coastal environment also detracts from the natural setting and aesthetic qualities, which attract tourists and vacationers to northern Wisconsin.

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<sup>1</sup> 2001 Wisconsin Coastal Management Program, Bayfield County Land Records, Benchmark GIS



## 8.7 RARE SPECIES FOUND IN THE COASTAL WETLANDS OF BAYFIELD COUNTY

The following is a partial list of rare plant and bird species found in Bayfield County coastal wetland environments that have been identified by the Wisconsin Department of Natural Resources.

### Plants

Arrow-leaved sweet-coltsfoot  
Autumnal water-starwort  
Bog copper  
Bog fritillary  
Brown beak-rush  
Common bog arrow-grass  
Crinkled hairgrass  
Downy willow-herb  
Farwells water-milfoil  
Fly honeysuckle  
Large roundleaf orchid  
Leafy white orchid  
Livid sedge  
Marsh horsetail  
Michaux sedge  
New England violet  
Showy ladie's Slipper  
Sparse flowered sedge  
Sparse-flowered sedge  
Swamp pink  
Tawny crescent spot  
Yellow bellied flycatcher

### Birds

American bittern  
Black meadowhawk  
Boreal chickadee  
Yellow bellied flycatcher  
Yellow Rail  
Evening grosbeak  
Connecticut warbler  
Gray jay  
Tennessee warbler  
Merlin  
Cape may warbler  
Red-breasted merganser

## 8.8 COASTAL PROTECTION TOOLS

Managing and protecting coastal resources requires the use of engineering practices and land management tools such as setbacks and construction best management practices (BMP's) According to the 1990 National Research Council's report titled "Managing Coastal Erosion", various shoreline engineering practices can be implemented to reduce the coastal erosion hazard.

### *Beach Nourishment*

A practice involving the excavation of sand from one location and deposition in another. (NRC 1990, pp 56-57)

### *Sand Bypassing*

Coastal features such as harbors and navigation channels can disturb the movement of sediment in the littoral zone. Sand bypassing restores the natural flow of sediment downdrift of human-constructed barriers through the use of fixed or floating pumping systems. (NRC 1990, p 61)

### *Dune Construction*

Dunes act as erosion barriers by holding reserve sands to protect shoreline from wave and flood events. The construction of artificial dunes to replicate this process can reduce the impact of these coastal hazards. (NRC 1990, p 61)

### *Groins*

Constructed structures aligned perpendicular to the shoreline. Designed to minimize the sediment transport along the shore. (NRC 1990, p 55)

### *Seawalls*

Physical structures constructed on eroding shorelines. (NRC 1990, p 59-60)

### *Breakwaters*

Offshore structure design to absorb wave energy while promoting sediment deposition on the protected side. (NRC 1990, pp 60-61)

Additional non-structural coastal protection tools may be implemented as part of a public coastal protection policy or implemented on a voluntary basis by shoreland owners. These tools include:

### *Setbacks*

Placement of structures at sufficient distance from the shoreline in order to preserve the physical stability of the shore and to protect the structure from loss to erosion.

### *Vegetative Cover (shoreline buffer)*

Vegetative zone within the riparian area, which provides a “cushion” between the land and water. Vegetation provides erosion protection by stabilizing shorelines and banks and provides habitat for wildlife.

### *Shoreland Septic Systems*

Location of shoreland septic systems is critical as soil and water conditions near the shore may impact the ability of the system to effectively treat effluent causing damage to the environment and posing a health risk to humans.

### *Development of Landscape Plans*

Site plans designed to assist landowner with property development. Plans identify steep slopes, local drainage patterns, existing vegetative cover, locations for development (building footprints, driveway), well sites, natural features, and wildlife habitat.

### *Bluff Stabilization Techniques*

BMP's designed to limit runoff from high bluffs and prevent bluff slumping due to erosion of the underlying soil. These techniques include retaining vegetative cover and limiting the amount of impervious cover (road, driveways, sidewalks). Both practices serve to reduce runoff velocity, thereby limiting soil erosion. Outletting rain gutters and diverting surface runoff away from the bluff will also serve to limit erosion.

### *Lawn Care and Maintenance*

Lawn and gardens within the shoreland zone must be properly planned and maintained in order to prevent contamination of surface waters. Slope problems (sloping to the water), and existing impervious cover at the site should be considered when establishing new lawns and gardens. Also, the use of pesticides and fertilizers should be minimized.

## 8.9 COASTAL RESOURCE PROTECTION GOAL

### *Overall Goal*

“Protect and improve the quality of Bayfield County’s coastal resources which include, coastal tributaries, shorelines, coastal wetlands, estuaries, and islands.”

### Objective 1

Discourage land uses that negatively impact the quality and quantity of coastal waters.

### Objective 2

Discourage land uses that negatively impact the quality and quantity of coastal wetlands.

### Objective 3

Restrict or limit development in areas with sensitive coastal resources.

## 8.10 SUMMARY

Coastal resources of Bayfield County are a significant part of the natural environment. This vast network of tributaries, estuaries, lagoons, coastal and inland wetland communities, and shoreline provides habitat to many unique species of plants and animals, some of which are threatened or endangered. Coastal resources and the quality of coastal environment are intimately linked to land use, and land use decisions directly impact the quality and sustainability of coastal resources. Factors such as shoreline erosion/recession, sedimentation, pollution, and habitat loss jeopardize the health and vitality of coastal resources.