

CHAPTER 7: ~~Sensitive Areas and~~ ~~Environmental~~ ~~Protection~~Environment

(text only)

Ocean City ~~is~~ a ten-mile-long barrier island ~~is~~ bounded on the east ~~and west~~ by the Atlantic Ocean and on the west by the Isle of Wight and Assawoman coastal bays, ~~respectively~~. Since its beginnings, Ocean City has depended on the surrounding environment. Its vegetation provided convenient pastures for Worcester County's earliest farms. Tourism began in the early 1900s by touting the restful and hygienic benefits of sea air and the Atlantic's medicinal waters. Later, the "pound fisherman" harvested the bounty of the sea.

The Town's connection and inter-dependence with the natural environment is underscored by ~~its history~~significant storm events. In August, 1933, a major northeast storm, not a hurricane, cut the present inlet between Ocean City and Assateague Island. The storm destroyed fishing camps, but provided access from Sinepuxent Bay to the Atlantic, thereby helping create a new industry - sportfishing.

Today, Ocean City depends even more on a clean environment to sustain it. The high quality of adjacent bays and ocean and clean air continue to make Ocean City a desirable place to live and visit. The town's economic future in recreational tourism is directly linked to the quality of its environment. As a model of 'smart growth', the concentration of development within City limits has allowed for other areas nearby to remain undeveloped.

~~The~~For the purpose of this chapter, the environment is comprised of the natural elements of land, sea, air, ~~and as well as~~ the products of manbuilt environment. The following sections establish the goal and objectives for protection and management of sensitive areas and environmental features and inventory existing conditions and trends concerning various attributes of the environment. Finally, recommendations for maintaining and improving the quality of the Town environment are provided.

Goal:

To protect the quality of the air, water and land from the adverse effects of development and growth and, where feasible, to enhance the quality of the natural environment and sensitive areas. New priorities include adaptation to climate change and mitigation of hazards for a more resilient community.

Objectives:

In order to achieve this goal, the following objectives are adopted:

- 7.1 Continue to inventory and evaluate the town's natural and cultural resource base and establish policies to protect and preserve resources.
- 7.2 Continue to preserve and enhance the PublicTown Beach and maintain the Beach Replenishment Program.
- 7.3 Continue to monitor and maintain air quality at its present high level.
- 7.4 Monitor the Town's energy consumption patterns and identify opportunities for instituting energy conservation measures when appropriate.
- 7.5 Continue to enhance the Town recycling-waste-to-energy program where possible to increase the amount and types of materials captured in the recycling stream-reduce litter through the Adopt-a-beach, Adopt-a-street and Downtown Clean-up programs as well as other initiatives.
- 7.6 Encourage use of water conservation measures to reduce draw-down of the groundwater supplies and to prevent salt water intrusion.
- 7.7 Maintain and enhance the quality of the Coastal bays and the ocean. Continue to actively participate in and support the Maryland Coastal Bays Program.
- 7.8 Utilize development standards for the location and construction of structures to minimize the impacts of flooding and to mitigate major flood hazards.
- 7.9 Protect and preserve coastal marsh and wetlands as valuable spawning areas and to maintain the benefits they provide to water quality, shoreline stabilization, and wildlife habitat.
- 7.10 Utilize best management practices, low impact development techniques, flexible development regulations and innovative site design and mitigation measures to protect and improve environmental quality. Continue to implement locally determined Critical Area standards for setbacks and water quality measures.

7.11 Continue to participate in the Community Rating System (CRS), which provides reduced flood insurance premiums to reward stringent flood hazard protection regulations.

7.12 Require all forms of development and re-development to avoid sensitive areas or mitigate for impacts whenever possible.

7.13 Flexible development standards should be utilized to protect sensitive areas when they can be demonstrated to better protect sensitive environmental resources than would result from applying standard restrictions/regulations.

7.14 Investigate the benefits of natural and nature based management actions for storm protection.

Sensitive Areas

One of the visions of the Maryland Economic Growth, Resource Protection and Planning Act of 1992 requires the Town's Comprehensive Plan to include a "Sensitive Areas element that contains goals, objectives, principles, policies and standards designed to protect, from the adverse effects of development, sensitive areas, including the following: 1) streams and their buffers; 2) 100-year floodplains; 3) habitats of threatened and endangered species; and 4) steep slopes.

Ocean City does not contain any streams. Steep slopes are generally defined as slopes greater than 25 percent, and development is usually prohibited or strictly regulated in these areas. There are no steep slopes in the Town.

Virtually all of Ocean City's land area is within the 100-year floodplain at risk from the effects of coastal flooding, storm surge and high winds. Based on a new FEMA coastal RiskMAP analysis, new flood insurance rate maps were adopted on July 16, 2015, which reduce the portion of Ocean City located within the special flood hazard area or 1% chance floodplain. Approximately 40% of the land area and 40% of the structures remain in the moderate or high risk flood hazard zones.

As a growth area which is already 97.5 percent developed, development in the 100-year floodplains special flood hazard area cannot be avoided. Ocean City's flood protection and stormwater management regulations take into account the problems inherent in developing in the floodplain, and enforcement of these regulations should continue to be stringent.

Habitats of threatened and endangered species. An inventory of threatened and endangered

~~species is provided in a later section of this Chapter of the plan.~~ Habitats of threatened and endangered species should be protected and State and Federal guidelines for their protection should continue to be adhered to. Ocean City's location adjacent to Assateague Island National Seashore and the Maryland Coastal Bays national estuary place high density urban built form in close proximity with natural habitats. Several habitat management projects over the years have provided beneficial use for both conditions and help to manage any conflicts through partnerships with the Maryland Coastal Bays Program, Department of Natural Resources, Department of the Environment, and the National Park Service.

The Town of Ocean City will continue to monitor the work of the Mid Atlantic Regional Council on the Ocean (MARCO) in developing an Ocean Action Plan for the Mid-Atlantic region. Issues related to ocean water quality, offshore energy development, management and management areas which may restrict the sport fishing industry, and federal control and allocation of sand resources are critical to local resource management.

Geology and Land Form

Ocean City is located in the Coastal Plain, and occupies the southern end of a barrier island called Fenwick Island. Such land forms are dynamic in their development and continue to be active. Fenwick Island, like most barrier islands, was formed through wave, wind, and tidal action.

Due to its location on a barrier island, Ocean City is subject to some specialized forces of nature. A barrier island, in its natural state, is a constantly changing land form. Barrier islands serve two main functions. First, they protect the coastlines from severe storm damage. Second, they harbor several habitats that are refuges for wildlife. In fact, the salt marsh ecosystems of the islands and the coast help to purify stormwater runoffs from mainland streams and rivers. Figure 7-1 illustrates the features and structure of a typical natural barrier island.

Figure 7-1

The structure of a typical barrier island consists of the following zones from the ocean side toward the bay:

- * Beach - consists of sand deposited by the actions of waves
- * Dunes - formed from sand carried and deposited by winds. Dunes are stabilized naturally by plants (sea oats, bitter panicum) and artificially by fences. The primary dune faces the ocean and may be followed by secondary and tertiary dunes inland.
- * Barrier flat - (also called backdune, overwash or mud flat) formed by sediments that

_____ get pushed through the dune system by storms, such as hurricanes. Grasses grow and stabilize these areas. This is the primary area in Ocean City which has developed over the last 100 years and by its natural form drains to the bayside marsh areas.

* _____ Salt marsh - a low-lying area on the sound-side of a barrier island. Salt marshes are _____ generally divided into high and low marsh areas. High marsh areas may typically be _____ flooded twice each month with the spring tides, while low marsh areas can be flooded _____ twice daily with the high tides. Cord grasses stabilize the salt marsh area, which are _____ one of the most ecologically productive areas (amount of vegetation per acre) on _____ Earth.

Factors causing constant changes to Ocean City's land form include:

- * _____ Waves which deposit and remove sediments from the ocean side of the island
- * _____ Currents including long-shore currents that are caused by waves hitting the island at an angle which move the sand from one end of the island to another. The offshore currents along Ocean City's coastline tend to remove sand from the northern ends of the island and deposit it at the southern ends.
- * _____ Tides which move sediments into the salt marshes and eventually fill them in. Thus, the bay sides of barrier islands tend to build up as the ocean sides erode.
- * _____ Winds which blow sediments from the beaches to help form dunes and into the marshes, which contributes to their build-up.
- * _____ Sea level change: rising sea levels tend to push barrier islands toward the mainland.
- * _____ Storms which may have the most dramatic effects on barrier islands by creating overwash areas and eroding beaches as well as other portions of barrier islands.

The impact of these changes can be significant. Perhaps the best illustration of how substantial natural changes can be as a result of a single event is the major storm that opened the Ocean City Inlet in 1933 and now separates Fenwick Island from Assateague Island to the south. To keep the channel navigable to the mainland, the U.S. Army Corps of Engineers constructed two rock jetties. Although the jetties stabilized the inlet, they altered the normal north-to-south sand transport by the longshore currents. The result is that sand built up behind the north jetty and the sand below the south jetty was quickly eroded. In a very short time, natural forces combined with human intervention have permanently altered the barrier island profile.

Figure 7-2 illustrates changes to Assateague Island as a result of the accelerated erosion caused by the man-made rock jetties of Ocean City Inlet. The figure shows the configuration

of Assateague Island in 1980 and an outline of the position of the Island in 1849. ~~The accelerated erosion has shifted Assateague Island almost one half mile (.8 km) inland. Active management by the U.S. Army Corps of Engineers and the National Park Service has slowed and stabilized this process through inlet dredging and sand bypass to restore the natural long shore sediment movement that continues to nourish Assateague Island.~~

Figure 7-2

~~Much of the early development of Ocean City took little account of the natural processes and constraints of its location on a barrier island. This approach entailed obvious risks, and in hindsight early development could have been more environmentally sensitive. However, on the positive side, by developing Ocean City intensely the demand for development in other coastal areas was diminished. In fact, 75 percent of Maryland's coast has been preserved nearly in its natural state through establishment of the Assateague Island State and Natural Seashores.~~

Threats to Beach Stability

The three major natural forces affecting the coastal shoreline are erosion, sea—level rise and storms. Each of these presents different but related threats to the beach and property in Ocean City.

Beach Erosion

Historical shoreline changes along Ocean City area prior to the Beach Replenishment Project are shown in Figure 7-3. The average rate of oceanside erosion over the 130 years of record has been 1.9 feet per year; some areas have shown accretion over various time periods.

Figure 7-3

Although the average rate of erosion of the beach during the past 130 years (1850-1980) has been 1.9 feet per year, inspection of shoreline movement over this period shows that the recession is not constant through time or space. Indeed, there were periods of very rapid shoreline retreat, which probably corresponded to the major storms of record -- 1902, 1933, ~~and~~ 1962 and more recently in 1998 and 1999. In addition, the erosional trend at any one point along the shore has tended to fluctuate through time.

While the historical trend of recession has been set at 1.9 feet per year, changes in shoreline position since 1961/62 have been less appreciable due to a decrease in hurricane activity. In other words, the historical rate of erosion has not been realized in the last several decades. This marked departure from the trend may be due to ~~human modifications of the shore~~ management strategies, notably groins, sand scraping, and ~~some beach fill~~ the USACE shore stabilization project since 1986. ~~However it is more likely that a lull in hurricane activity since 1960 is also a key factor.~~

Assateague Island to the south is one of the longest ‘natural shorelines’ on the East Coast and as such has become intensively studied, measured and observed. Many federal agencies have overlapping responsibilities for shoreline management including the Update with USACE report, USGS sediment management study, NPS, NASA and USFWS. It should be noted that long range plans have recently been prepared for Assateague Island by Department of Interior agencies which promote a new management strategy for the next 30 to 50 years to allow natural forces and sea level rise to create rapid environmental change and unstable barrier island conditions. report on Assateague

Sea Level Rise

Ocean City, MD is vulnerable to elevated water levels from flooding, storm surge, and high tides due to its location on a developed barrier island along the mid-Atlantic coast. This sea level rise policy recognizes the importance of planning and preparing for the historic and future effect of changing sea level and how it may increase hazard risks to the community. Estimates of future conditions vary greatly depending on the source, the specific location and the period of time being examined. Ocean City relies primarily on the expertise of the U.S. Army Corps of Engineers (USACE) to identify the risk and adaptation measures necessary for this hazard mitigation element.

Figure 7-2 (www.corpsclimate.us/ccaceslcurves.cfm)

The USACE establishes three projections for future sea level change beginning with an extension of historic sea-level rise rates. The USACE Low Curve is based on a 24-year regional rate of 0.01453 feet per year (1 foot in 69 years) for Ocean City, Maryland. Based on tide gauge data from the Ocean City Inlet (#8570283), the USACE Sea Level Change Curve Calculator also estimates an intermediate rate scenario of 0.0267 feet per year (1 foot in 37 years), and a high rate scenario of 0.0658 feet per year (1 foot in 15 years) that may be used for planning and project design.

The Atlantic Coast of Ocean City, Maryland at Ocean City, is also undergoing subject to the same long term shoreline erosion/retreat forces as a result of sea level rise. Sea level rise, theoretically caused by long term global warming, has an effect on all coastal areas. During the period 1940-1980 data from the National Oceanic and Atmospheric Administration (NOAA) has documented the sea level rise at the following stations near Ocean City:

| | | |
|--|-----------------|--------------------|
| * Atlantic City, New Jersey | .013 | ft./yr. |
| * Lewes, Delaware | .006 | ft./yr. |
| — Norfolk, Virginia | .012 | ft./yr. |
| * Ocean City Inlet | .014 | ft./yr. |

From this data, it is estimated that the rate of historical sea level rise at Ocean City has been on the order of .010 feet per year | 1 foot per 100 years.

Conclusions drawn from a study conducted by EPA in 1985 indicate sea level rise could double the rate of erosion at Ocean City in the next forty years. If no additional erosion control measures are taken, the shore could erode 85-153 feet by 2025 assuming current sea level trends. An 11-inch global rise in sea level would increase expected erosion to between 180 and 238 feet, if no additional measures are taken; a 15-inch rise would increase expected erosion to between 216 and 273 feet. The study also offered the following summary conclusions:

- The projected rise in sea level would increase the quantity of sand necessary to maintain the current shoreline for the next forty years from 5-10 million cubic yards if current trends continue, to 11-15 million cubic yards for the two scenarios of accelerated sea level rise.
- Projected sea level rise would increase the priority of erosion control-measures under current policies of the Corps of Engineers. Current policies place a greater emphasis on flood protection than recreational benefits provided by proposed projects. Because of the substantial erosion that could occur from a rise in sea level, the need for flood protection will be greater if sea level rises.
- A significant rise in sea level would require the continuation of the beach replenishment program to offset the erosion.
- The cost of controlling erosion caused by sea level rise does not threaten the economic viability of Ocean City in the next forty years. Even the most pessimistic estimate of future erosion control implies a cost of less than fifty cents for every visitor that comes to Ocean City each year. Protecting the shore at Ocean City will continue to be economically justified.
- Understanding the likely impact of sea level rise on Ocean City in the next century will require identification of the most cost-effective and environmentally acceptable sources for up to fifty million cubic yards of sand to be placed on the beach.
- Better estimates of future sea level rise would enable decision makers to more adequately determine the most prudent strategy for controlling erosion at Ocean City.
- Although improved procedures for estimating erosion are desirable, current methods are sufficient to yield first-order estimates for use in long-term planning.

Existing barrier island profiles and the Ocean City Inlet have the effect of reducing storm surge and flooding impacts to the bayside shorelines of the community as evidenced by the Flood Insurance Rate Map (FIRM) mapping of 1% chance flood zones. Base flood elevations quickly change from 11 feet at the ocean beach to 5 feet near the US Coast Guard Station in downtown Ocean City.

Figure 7-3

Relative SLR rates also appear to be lower at Ocean City's mid-point location between the Delaware Bay and Chesapeake Bay estuaries, with less effect from land subsidence and upstream watershed impacts (FEMA Region III Coastal Storm Surge Study 2013). Tide gauge readings, storm surge studies and sea level rise projections from Lewes, DE and Norfolk, VA are not an acceptable substitute for location specific data from the Ocean City Inlet or other coastal barrier island measurements.

To the extent that there is a local delay in observable SLR impacts in Ocean City, it will allow for the study of best practices in other communities, preparation of action plans tied to measured changes, and implementation of resiliency strategies for significant climate related events.

An updated sea level rise policy was adopted in 2016 and incorporated into the Town of Ocean City Hazard Mitigation Plan. This policy incorporates USACE estimates of future sea level rise that are specific to the Ocean City Inlet tidal data and describes current adaptation actions.

Storms

Ocean City is subject to hurricanes and northeasters, which can cause severe damage to the beaches and property. These storms are different, and pose different threats to the town.

Hurricanes, which originate principally during August, September and October, are tropical cyclones with surface wind velocities of 75 miles per hour or more. ("Tropical storm" is the term used to describe such storms with winds less than 75 mph). Hurricanes are extremely violent, short-lived events. They pummel barrier islands with severe winds, heavy rains, and a storm surge, all of which can result in massive property damage and loss of life.

The U.S. Office of Coastal Zone Management estimates that in any year Ocean City has a one percent chance of being struck by a hurricane and less than a one percent chance of being struck by a Category 4 or 5 hurricane. This is one of the lowest probabilities on the East Coast, and is due to Ocean City being somewhat protected. Many hurricanes are deflected eastward by the projection of the Carolina capes. While this is fortunate, preparations must still be made for an evacuation.

Northeasters are typically; large in scope and long in duration, and can be a major threat to property while a moderate threat to life. These storms are large low pressure systems which linger for three or more days, occurring most often in the cooler half of the year. Northeasters bring heavy rains, gale force winds, and a steady pounding of mid to large size waves. They usually cause mild and temporary beach erosion. However, given the right combination of climatic and tidal factors, northeasters can deliver major flooding including over-washing the

island and major beach erosion.

Beach Stabilization and Protection Efforts.

Over the years, a variety of beach stabilization efforts have been tried. Wood, stone and macadam groins have been constructed. Following the devastating storm of 1962, the beaches were replenished with sand. A program in which stone groins were constructed at prescribed intervals along the beach was abandoned due to its high cost relative to its effectiveness.

In 1991, the Atlantic Coast of Maryland Shoreline Protection Project was completed at a total cost of about \$45,000,000, which was shared by the federal government, the State of Maryland, Worcester County and the Town of Ocean City. The project consisted of a steel sheetpile seawall in front of the boardwalk from 4th Street to 27th Street, the construction of a wider (220 feet) beach, and the establishment of a protective dune which is 25 feet wide at its crest, and 85 feet wide at its base and vegetated with 65 acres of dune grass. It was designed to prevent damages associated with waves and erosion resulting from a 100-year storm event.

In the two months immediately following completion of the project, four powerful storms hit the Ocean City area. The project proved its value by absorbing the ocean's impact and protecting buildings and the boardwalk. The U.S. Army Corp of Engineers estimated the project prevented up to \$160 million in damages in the two month period, more than justifying its cost.

The project also provides for periodic beach renourishment and monitoring over the 50-year project life (until 2044). Renourishment and monitoring costs are shared by the Army Corps of Engineers (53 percent) and the state of Maryland (47 percent). On average, 800,000 cubic yards of sand is required to renourish the beach every four years. The last regularly occurring renourishment was completed in 2011. A state maintenance fund has been established which pays for periodic renourishment and repairs to the beach, dune and seawall. Thus, a long-term commitment has been made to this promising-successful solution to the beach erosion problem.

Water Quality / Coastal Bays

Ocean City is located in the Coastal Bays Watershed. This 175 square mile basin includes all of Maryland's barrier islands and the portion of Worcester County draining to the coastal bays. The main surface water bodies are the salt bays and the Atlantic Ocean. The limited freshwater system is predominately local drainage or small creeks draining to the bay. No natural body of fresh water exists in Ocean City.

Atlantic Ocean

In the Mid-Atlantic region, a Regional Planning Body (RPB) has been meeting since 2013 in order to design and carry out a regional ocean planning process in collaboration with the general public, stakeholders, and partners such as the Mid-Atlantic Regional Council on the Ocean (MARCO). The main product of this collaborative effort is the Mid-Atlantic Regional Ocean Action Plan (boem.gov/Ocean-Action-Plan).

The Mid Atlantic Regional Ocean Action Plan includes a description of the special relationship of the Mid-Atlantic region to the ocean waters off of its shores, the history and collaborative process of Mid-Atlantic regional ocean planning, further detail about the RPB and its membership and a summary of certain foundational documents developed with public input.

These foundational documents include the Mid-Atlantic Regional Ocean Planning Framework that established eleven overarching principles to guide ocean planning, two goals for the regional ocean planning process, and a series of objectives related to each goal. The goals are:

Healthy Ocean Ecosystems. “Promote ocean ecosystem health, functionality, and integrity through conservation, protection, enhancement, and restoration.”

Sustainable Ocean Uses. “Plan and provide for existing and emerging ocean uses in a sustainable manner that minimizes conflicts, improves effectiveness, increases regulatory predictability, and supports economic growth.”

The Plan also describes nine objectives and 33 inter-jurisdictional coordination actions that address the Sustainable Ocean Uses goal. These objectives address: National security, Ocean energy, Commercial and recreational fishing, Ocean aquaculture, Maritime commerce and navigation, Offshore sand management, Non-consumptive recreation, Tribal uses, and Critical undersea infrastructure.

Surface Water and Coastal Bays

Surface waters in Ocean City are of two very different types. The Atlantic Ocean exhibits a hardiness and resistance to pollutants due to its currents, tides, and wind driven flushing. The Coastal Bays, on the other hand, have a modest flushing capability. This, combined with their shallowness and proximity to developed land areas, makes them very vulnerable to environmental stress. For this reason, the coastal bays require special care to preserve their viability. Figure 7-4 shows the extent of the Coastal Bays Watershed and its many creeks and bays.

The Maryland Coastal Bays Program exists under the umbrella of the EPA’s National Estuary Program, designed to protect the most economically and environmentally significant estuaries in the United States. The Coastal Bays behind Assateague Island and Ocean City make up one of only 29 estuaries nationwide that has received this special attention. In these regions,

the health of the economy is closely linked to the health of the environment. The Coastal Bays Program is a cooperative effort between Ocean City, Berlin, Worcester County, the state of Maryland, the United States Environmental Protection Agency (EPA), and a host of state and federal agencies which have brought together scientists and diverse groups, including the agriculture, golf, tourism, fishing and development industries, to produce a Comprehensive Conservation and Management Plan (CCMP) for the Coastal Bays.

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Embarked upon in 1996 and completed in 1999, the MCB Program has recently developed a report in 2004 updated a Comprehensive Conservation Management Plan in 2015 that provides the most recent indications regarding water quality, fish and wildlife habitat condition within the Coastal Bay and describes proposed management actions for the next 10 years. The entitled, An annual report card on the health of the bays called "The State of Maryland's Coastal Bays", also summarizes the environmental status of the bays and indicates the following:

Water Quality

Water quality shows many warning signs of ecosystem change, even though some areas currently still have good water quality. In general, water quality is degraded within and close to the tributary streams and much better in the more highly flushed regions of Assawoman, Isle of Wight, and Sinepuxent Bays. Excess nutrients (nitrogen and phosphorus) typically are the primary causes of degraded water conditions. Variation in water quality between regions is reflecting variation in nutrient concentrations. Excessive nutrients lead to hypoxia (low oxygen levels), limited fish survival, and phytoplankton (single-celled algae) blooms which limit sea grass growth in portions of the watershed including Newport Bay, St. Martin River, and the northern portions of Assawoman Bay.

The presence of sea grasses is an indicator of good water quality. Excess nutrients cause algal blooms which block sufficient sunlight from reaching grasses. Eelgrass and widgeon grass are the two species that occur in the Coastal Bays. Although almost 85 percent of the sea grasses within the watershed occur along the Assateague Island shoreline, sea grasses are also evident along the Ocean City Bay-front, with beds extending from 40th street to 85th street. The area extent of sea grasses has been increasing in recent years. The 2002 acreage in the Coastal Bay represents a 320 percent increase since annual data began to be collected in 1986. has varied over the years as a result of environmental conditions and management actions. Based on a current evaluation through the 2015 Maryland Coastal Bays 'report card', sea grasses are in a period of decline in the bays near Ocean City.

Finfish and Shellfish

Finfish in the Coastal Bays are diverse. The shallow waters are ideal nursery and forage habitat for over 140 species of finfish. Most of the regions' most valuable commercial finfish are composed of estuarine dependent types like summer flounder, bluefish, weakfish, spot, tautog, and black sea bass among others. Since interstate management of summer flounder began in 1989, the stock has recently recovered to the level where no longer considered over fished.

The blue crab continues to be a valuable resource in the Coastal Bays, supporting a steady commercial and recreational fishery. Surveys suggest that abundance fluctuates without an apparent trend, yet there is still a successful annual harvest that even attracts crabbers from the Chesapeake Bay. Hard clams have declined over the past three decades compared to historical abundances, but have been relatively stable for the past 10 years.

Presently there are no viable natural oyster populations inhabiting the subtidal bars of the Coastal Bays. Episodic natural events, in particular the opening and stabilization of the Inlet, fundamentally changed the ecosystem, creating higher salinities in which oyster populations could no longer flourish. Small, relict populations still exist intertidally at a few locations with occasional spatfall on structures such as riprap, pilings and bridge supports. Bay scallops have also been found in most bay segments but are in low numbers.

Groundwater

~~Four groundwater aquifers underlie Ocean City. The upper two, the Pleistocene and Pocomoke, suffer from vulnerability to salt intrusion. The lower aquifers, Ocean City and the Manokin, are used for water supply, although portions of the Manokin, between 28th Street and about 80th Street, contain brackish water.~~

~~The Ocean City and Manokin aquifers provide good quality water, but could be threatened by salt water intrusion. Intrusion can occur either vertically or horizontally. Vertically, brine could move from leaks in the upper aquifers or be drawn up from the salty St. Mary's aquifer. Studies performed in the past by the U.S. Geological Survey indicates that vertical intrusion will not be a problem. Above the water supply aquifers lies a confining layer which prevents inter-aquifer leakage. The St. Mary's formation below is very dense and requires a high pressure differential for leakage to occur which is not considered likely.~~

~~However, horizontal intrusion could come from the salt water being drawn in from the ocean. The probability of this occurring has not been scientifically determined, but if Ocean City is similar to other Atlantic Coast situations there is no imminent danger. In any case, the location of the offshore "salt wedge" should be determined so an accurate picture can be drawn for future policy decisions.~~

~~The water supply aquifers are recharged in the Manokin subcrop. This subcrop is a seven mile~~

~~wide band beginning northwest of Salisbury in the Hebron area and spreading northeast through Laurel, Georgetown, and ending at the coast at Broadkill Beach in Delaware.~~

Stormwater and Flooding

Ocean City's annual rainfall averages forty nine inches, which translates to approximately 200,000 gallons per acre or 23,000 gallons on a 5,000 square foot lot. Depending on the land cover, it either percolates into the soil or becomes runoff. The more land covered by impervious surface, the more runoff results.

Stormwater is both a water quality and a flooding problem. In terms of water quality, stormwater washes pollutants from roofs, parking lots and streets, carrying the un-treated oil, grease, animal waste, heavy metals, and other assorted pollutants to the bays. Stormwater pollution has a potentially major impact on the ecology of the coastal bays. This is due to the bays' shallow depths and limited flushing capabilities. Also, pollutants in general tend to settle out and concentrate in embayments and canals.

Development can greatly affect the amount and quality of stormwater. Management measures during construction and site planning can reduce its adverse impacts. During heavy rain events, runoff causes localized flooding. Generalized flooding results from rain, winds and tides associated with major storm events. The state passed the 1982 Stormwater Management Act which requires municipalities to adopt stormwater regulations, and Ocean City has adopted and is enforcing appropriate measures. [See Chapter 11 Water Resources Element for more information.](#)

For several reasons it is desirable to maximize infiltration of rainwater. This water serves to replenish the groundwater, thereby helping to hold back the salt water wedge. Also, less runoff reduces nuisance flooding and the adverse impacts of stormwater on water quality. The original sandy soils of Ocean City can absorb about eight times as much water as normal Eastern Shore soils. Such soils lend themselves to the use of infiltration practices for stormwater management.

~~Ocean City is subject to two types of flooding, localized and general. All of Ocean City is located in the 100 year flood zone. The V (velocity) zone on the oceanfront is subject to wave action in addition to flooding. Since avoiding developing in the floodplain is not an option, elevated construction, floodproofing, and special construction methods are required to protect property from flooding.~~

Wildlife

Although Ocean City is a thoroughly urbanized barrier island, it still provides important habitat for many wildlife species. Dune systems established in the 1990's re-established a habitat that had previously been lost [for migratory butterflies, birds and small mammals.](#)

Wetlands protection regulations along with water quality standards should ensure the continuation of ~~these~~ rich ecological areas in the coastal bays. Conscious planting of food and shelter can also increase urban wildlife populations.

The Maryland Department of Natural Resources has compiled a “Summary of Current and Historical Rare, Threatened and Endangered Species of Ocean City, Maryland”. The summary identifies 9 animal species and 36 plant species that are either rare, threatened or endangered. Appendix A identifies these species by Scientific and Common names and establishes State and Federal rankings based primarily on known occurrences. An explanation of rankings is included as part of Appendix A. The Maryland Department of Natural Resources “Heritage Program” should continue to assist the Town in assessing ~~any~~ possible impacts a development project may have on the habitats of such species to afford them protection.

Climate and Air Quality

Ocean City’s climate is greatly influenced by its proximity to the Atlantic Ocean. Average annual rainfall is forty-nine inches, and snowfall averages ten inches per year.

Violent weather comes in several forms. Thunderstorms occur about thirty times a year, bringing heavy short-term rains and high winds. Although rare, tornadoes and water spouts do occur. Hurricanes can make landfall, and northeasters occur regularly. Snowfall is generally light, but occasionally heavy snows occur.

In general, the air quality of Ocean City is good and likely to remain so. The northwest winds during the cooler months are brisk and help to reduce pollutant concentrations. During the summer, Maryland is often under the influence of a Bermuda High (a high pressure system) centered over the Atlantic Ocean. Air movement is slowed, resulting in a higher concentration of some pollutants. Air pollution is more likely during the summer months in the immediate vicinity of sources such as traffic congestion and construction sites. However, consistent onshore breezes along the coast help to disperse the pollutants.

Other pollution problems persist such as ozone, carbon monoxide, and particulate matter. Emerging problems such as acid precipitation will need to be ~~brought under control~~managed at a regional and national level. Acid rain is a result of ~~fossil-carbon~~ fuel combustion, such as motor vehicles, which adds nitrogen oxides to the air. In ~~the past general~~, the rainfall in Maryland ~~has been~~is ten times more acidic than natural levels. In areas where soils and ~~rocks~~ geologic formations are thin, acid rain may cause the waters to become very acidic resulting in the decline of fish populations.

Solid Waste and Recycling

Proper and timely disposal of solid waste is a key to a healthy environment. In addition to health, odor and aesthetic considerations are important. Substantial amounts of seafood are consumed in Ocean City, so in summer, collection is required on a nearly daily basis.

Over 30,000 tons of refuse are processed annually; peak volumes reach over 350 tons per day or 20 pounds per household.

Ocean City began developing its recycling program in 1989. Aluminum, plastic, cardboard, newspaper, office paper, metal, ~~waste oil~~ and glass are now recycled through regular refuse collection and transport of all waste materials to an energy production recycling facility. ~~Several recycling drop-off sites are located throughout the town (see community facilities chapter), and a limited collection system is operated in some residential neighborhoods.~~

~~An ordinance passed in 1992 requires all holders of alcoholic beverage licenses to separate glass and aluminum, which is collected by the town. This effort has been quite successful. The town now recycles over 2,800 tons of material per year, or almost 10% of the total solid waste collected. Efforts to improve this performance are continuing.~~

The ocean has received a variety of ~~man's~~ waste products over the years. Sewage sludge, radioactive materials, dredge spoil, industrial by-products, and military ordnance have all been disposed of at sea. ~~These items contain varying amounts of pollutants including highly radioactive materials, toxic substances, heavy metals, carcinogens, silt, and oxygen consuming materials.~~ The Ocean Dumping Act of 1972 curtailed many past abuses and funded research to further the understanding of the potential hazards and safety issues. The two major dump sites off the East Coast were brought under new regulations. The 12 Mile Site is located 10 nautical miles off Long Island and the 106 Mile deep-water dump site is located 115 nautical miles east of Atlantic City, NJ. Predominately used for sewerage sludge and industrial waste, the 106 Mile Site could affect the water quality of the coast of Ocean City. Currents and Gulf Stream eddies could transport pollutants along the Maryland and Virginia coasts. For this reason Ocean City should continue to support restrictions on ocean dumping and monitor annual water quality testing.

Recent report on top ten cleanest beaches: Today, Ocean City, MD is rated as one of the cleanest beaches in the nation by the Natural Resources Defense Council based on regular state and county water quality testing at 8 different locations along the beach. The beach is cleaned each night by the Department of Public Works Department, and numerous volunteers help to adopt a sections of town beach and collect litter from the dunes and beach.

~~A recent addition to the waste reduction arsenal, seaborne toxic waste incineration, has caused a great deal of public concern. The major issues surround leaks or spills during transportation, effectiveness of incineration in destroying the waste, and the danger of collision of the incinerator ship. The progress of this method should be closely monitored.~~

Visual-Built Environment

The Town of Ocean City has many characteristics of an urban area and as such is responsible for managing its surrounding environment in unique ways. For human habitat, the importance of buildings and infrastructure to support activities, enclose and organize outdoor spaces, and accommodate natural environmental features is an essential element of the Comprehensive Plan.

Historic Resources are also managed in a way that recognizes the importance of cultural traditions at the beach, while recognizing the need to reinvent and rebuild the built environment.

Past comprehensive plans have described several offenses to the visual built environment, most of which continue to exist~~detract from the visitor experience~~. The most negative aesthetic ~~factors~~ include overhead utility wires and poles, the proliferation of signs, the lack of landscaping, ~~architecture and~~ qualities of building design, and the proliferation outdoor displays of merchandise or signage by retail establishments.

Regarding overhead wires and poles, the 1969 Comprehensive Plan made a statement that is still valid today: “The greatest offense to view is the maze of poles and wires which seems to intrude everywhere but on the beach itself... No single accomplishment would more improve the appearance of the town than removal of overhead poles and wires.” Utilities have been placed underground in recently developed areas and in some downtown areas. Ocean City’s concerted effort to continue placing utilities underground would be the single most effective improvement to the visual environment.

An effective landscaping ordinance adopted in 1984 has added much greenery and greatly enhanced recent development. As parking lots are resurfaced landscaping should be added; . The landscaped medians installed along Coastal Highway in the 1990's show the major aesthetic benefit to be gained by added greenscape. The use of bermed landscaping along Coastal Highway would also improve its aesthetics greatly, as berms are effective at disguising parking lots. Combined with shrubs and trees they can create the illusion of a green space rather than a parking lot. Opportunities to create smaller vest pocket parks or green spaces that provide respite from hardscapes in the Town should be explored-encouraged as development and re-development occur over time.

For many years, Ocean City has been the recipient of the National Arbor Day Foundation’s Tree City USA Award and the MD P.L.A.N.T. Award administered by the Maryland Community Forest Committee. The Town of Ocean City Beautification Committee is appointed and commissioned by the Mayor and City Council to help determine the needs of the town for the planting, maintenance, and protection of all trees on the streets and in the

parcs of Ocean City and to make referrals for the enforcement of the landscape code. They are, also, the appeals board for city landscape code violations.

The Beautification Committee works in partnership with the Department of Recreation and Parks to bring the beauty of the trees and color to our barrier island town. Each year the Ocean City Beautification Committee searches for properties which are attractive, well maintained and pleasing to the eye. To show appreciation for this effort in civic pride, the Committee and the Mayor and City Council present Beauty Spot Awards in eight categories.

A concern for improved building design has been voiced by the town's citizens and officials, and much of the development community has responded with more imaginative design in recent years using variations in bulk, roof lines, and attention to fenestration and color. A noteworthy achievement toward improved design is the Downtown Design Guidelines, developed by the Ocean City Development Corporation in 2002~~3~~ followed by the Upper Downtown Design Guidelines in 2006. The guidelines are now being successfully applied to all structures in the Downtown area located between the Inlet and ~~3rd~~-17th street. The guidelines cover a number of aspects of design including site design, bulk, scale, signage, architectural design and landscaping. Recommended treatment of both private and public improvements is provided. Recommendations for public improvements extend to include treatment of the design in investments in public improvements, including sidewalks, street furnishings, landscaping, public spaces, public parking, Town gateways and waterfront vistas and public art.

This recent accomplishment has provided momentum toward a more pleasing visual environment. ~~Design guidelines are now being considered for additional areas of Town, in particular areas of the extended Downtown located between 3rd and 18th street. Development of design guidelines that encourage protection of the distinct character of this area would clearly continue the progress that has been made.~~ The keys to the success of the design review process to date include:

- A clearly written and illustrated design guide which presents standards and examples of what is desired, and which permits design flexibility.
- A partnership process of administering the Downtown and Upper Downtown design guidelines between the Town and the Ocean City Development Corporation (OCDC).
- Incorporation of advisory design guidelines that apply to the entire town into the Site Plan review process and approval by the Planning and Zoning Commission.
- Political and popular support of the objectives of the process.

The proliferation of signs made possible by the town's ~~overly~~-permissive sign regulations has caused a general degradation of Ocean City's appearance in past years. While signs are

important to the success of business, the excess permitted became a blight on the environment, a hazard to vehicular traffic, and a detriment to effective advertising because one sign cannot be seen among the many.

The sign regulations have since been reviewed and amended to reduce the number of signs, better regulate their location, and eliminate more obtrusive signs. The Downtown Design Guidelines establish provisions for better management of signage in the Downtown area. These provisions also recommend treatment for lighting, parking, fencing and screening which are important elements of the ~~visual~~built environment.

~~Visually,~~ Ocean City has made substantial progress in the quality and variety of both ~~in~~ public and private developments. In many cases, the quality of the natural environment enhances the visitor experience and success of individual businesses. The design review process and continued landscaping will ensure further progress. A more restrictive sign ordinance and control of outdoor displays will also contribute to a successful formula for the continued improvement of its visual image. See Chapter 8 Downtown / Redevelopment for additional strategies for the built environment.

Energy Conservation

While much progress with energy conservation measures has been made in the areas of housing, transportation, and production of goods and services, nationally the need for energy conservation ~~has been progressively de-emphasized~~continues to be emphasized along with utilization of green energy sources. ~~This trend should be reversed;~~Conservation efforts should be supported and energy efficiency should be factored into all public construction and purchases including consideration of energy saving vehicle purchases.

In 2015, Ocean City was successful in bidding a 3 year contract for electricity supply and saved money while achieving a goal of 25% energy from sustainable or renewable sources. Three electric vehicle charging stations have been approved in recognition of the increasing number of EV visitors, and in response to a grant to install a TESLA compatible station.

Maryland is currently reviewing two applications for an off-shore 120 MW wind energy facility. This offshore wind farm is to be located more than 17 nautical miles off the coast of Maryland and interconnecting with the existing Delmarva Power 138-kV transmission system in Ocean City, Md. The Wind Farm will be located in the offshore wind energy area designated by the Department of Interior as block OCS-A 0482 and could be in-service by the end of 2022.

Night lighting in the resort has been affected by the recent shift to LED light fixtures. While potentially an energy and cost saving measure, it has generated increasing numbers of complaints regarding the glare and intensity of the LED light with impacts to residential properties. Additional study and installation standards may be required to manage this change in the future.

Environmental Threats

Table 7-1 displays major environmental threats to Ocean City and nearby waters. Along with each potential threat are listed potential impacts and a qualitative assessment of each item's

severity and scope. Definitions for key terms used in the table including “Potential Severity”, “Scope”, and “Managed/Regulated” are as follows:

Potential Severity

- ~~* Low Poses low probability of immediate threat, but should be monitored for long-term consequences.~~
- ~~* Moderate Direct environmental effects have been detected. Generally requires mitigation effort to prevent further decline.~~
- ~~* Major When it occurs, a severe disruption of habitat or environmental quality can be expected.~~

Scope

- ~~* Local Effects are generally proximate to occurrence or site of activity.~~
- ~~* Widespread Effects disburse or activity is pervasive.~~

Managed/Regulated

- ~~* Yes Activity is regulated and/or examined for its environmental impact.~~
- ~~* No Not monitored for environmental impact.~~

The items in the environmental threat table can be classified in three groups. One group are threats which have occurred or are on-going sources of environmental degradation which have control measures in place. These items require continued enforcement and monitoring of compliance. Examples of this class include sewage treatment plants, dredging, land alteration, industrial waste treatment, and automobile exhaust.

~~The second group is comprised of potential problems resulting from accidents or other specific events. Items in this category include chemical, toxic and radioactive material spills, oil tanker spills, tanker truck spills, natural gas leaks, nuclear war.~~

~~The third group includes those threats which are on-going but do not have an effective system of control mechanisms or rely on voluntary compliance. Some examples are agricultural runoff, development in aquifer recharge areas, boating, and climatic warming.~~

Summary

Overall, Ocean City's environment is of high quality for an urbanized area. Air quality is excellent. The beaches are cleansed by the tides and by the City. Although some degradation has occurred, the bays and ocean retain much of their original quality. It appears the major challenge confronting Ocean City's environment centers on maintaining the quality and resilience of beaches, waters, and ~~remaining~~ wetlands that sustain the tourism economy and add value to the built environment.

Future coastal bays quality will depend on close cooperation among all levels of government. The Maryland Coastal Bays Program is a joint effort involving Ocean City, Worcester County, the State of Maryland, and the Federal government. It was initiated in 1996 to develop a plan for the protection and preservation of the Coastal Bays. The Town should continue to actively participate in the Program, and implement the recommendations of the Program as they are developed over time.

Beach, Inlet and barrier island preservation will require cooperation among property owners, Ocean City, Worcester County, the State and the Federal government. The USACE projects including Beach Replenishment, Inlet Management, and Sand Bypass Project ~~is~~ are a long-term commitment to maintaining Ocean City's Maryland's most valued coastal resort assets.

Recommendations

Air Quality

- ❑ State and Federal monitoring of air quality should continue to ensure its quality remains high.
- ❑ Town officials should stay informed of the acid rain issue and lobby state and federal agencies for appropriate actions to ensure acid rain does not disrupt the ocean and bays' ecology.

Water (Off-shore)

Ocean City's wastewater system should continue to provide sufficient capacity and _____ treatment so the ocean outfall does not degrade ocean waters.

~~■ _____~~

~~✘ _____ Off-shore disposal of dangerous and toxic chemicals should be tightly regulated to _____ prevent damage to Ocean City's waters and shores.~~

~~✘ _____ Off-shore dumping of waste should be prohibited.~~

■ _____ Off-shore drilling for oil and gas should be ~~tightly regulated~~opposed to prevent environmental _____ damage and impact to the coastal resort economy.

~~✘ _____ Ocean City should actively participate with MARCO and the Regional Planning Body to implement the Mid Atlantic Ocean Action Plan.~~

Coastal Management

■ _____ Threats to beach stability include major storm events, long term coastal erosion and potential changes in federal coastal management on Assateague Island. New adaptation —measures will be required to maintain the Ocean City Inlet and protect downtown —areas from storm surge and tidal flooding. The Ocean City Municipal Airport will be ———increasingly at risk from unmanaged overwash conditions on Assateague Island —similar to those experienced during the 1998 nor'easter storms.

■ _____ Continued management of the Ocean City Inlet is critical to maintaining water quality in the coastal bays, controlling the effects of storm surge, maintaining navigable channels and sediment flow to the ocean shoreline.

Water (Coastal Bays)

~~✘ _____ Disposal of sewage treatment plant effluent should be limited by the capacity of the _____ bays to receive the nutrients and process them without reduction of water quality.~~

~~✘ _____ Existing emergency sewage treatment plant discharge or overflow to the bays should be closely monitored to _____ determine compliance with discharge standards and permit requirements. These _____ standards should be strictly enforced.~~

~~✘ _____ Stormwater should be controlled on-site to reduce negative water quality and flooding _____ impacts. Returning stormwater to the soil should be a priority. Requirements for _____ infiltration should be included in repaving requirements. The use of pervious pavers _____ should be studied and, if found to be advantageous, permitted where appropriate.~~

~~✘ _____ The Maryland Coastal Bays Program should be supported in its efforts to study the _____ bays and recommend management options to maintain and improve their quality. As _____ the program continues to evolve the Town should implement program~~

_____ recommendations that benefit water quality, ~~and~~ wildlife habitat and water based recreation.

Groundwater

✘ _____ Well drawdown and recovery levels should continue to be monitored to determine if _____ pumpage levels are appropriate in specific aquifers.

✘ _____ The State and surrounding counties should adopt controls to ensure that no _____ inappropriate development occurs in aquifer recharge areas to protect the integrity and quantity of Ocean City's water supply.

✘ _____ Every effort should be made to monitor groundwater quality and to minimize the _____ threat of saltwater intrusion to potable water supplies.

Land

✘ _____ Wetlands should be preserved, as they are critical to water quality, provide valuable _____ wildlife habitat, provide flood protection, and serve as nursery for virtually all _____ important finfish and shellfish. The federal, state, and local governments should _____ continue to protect them.

✘ _____ The Beach Replenishment Program, Navigation channel dredging, and Inlet sand bypass projects should be maintained to provide storm protection and recreational use.

✘ _____ No construction or structures should be permitted on the reestablished primary dune _____ and beach.

✘ _____ Controlled pedestrian access over the reestablished dune should be strictly enforced.

✘ _____ Private seawalls should be generally discouraged as they can accelerate beach erosion.

✘ _____ The beaches should always remain accessible to the public, and more public access to _____ the bays should be provided.

Fish and Wildlife

✘ _____ The town should encourage landscaping for wildlife and provide resource materials _____ and staff assistance. This effort should be integrated into the town's beautification _____ efforts.

✘ _____ The public should be educated as to the harmful environmental effects of plastic litter.

Restrictions on the use of plastic in items that prove to be eventually detrimental to the environment may be necessary.

Habitat enrichment programs, such as planting submerged vegetation, should be investigated for their potential for improving the productivity of the bays.

Appropriate measures should be used to protect rare, threatened and endangered species.

Solid Waste

The recycling program should be expanded whenever possible to reduce the waste stream.

Compaction of trash by the public and private sectors should be encouraged to reduce volume and prolong the lifespan of the landfill.

Energy Conservation

The town's energy consumption patterns should be monitored and cost effective opportunities should be identified to institute public and private conservation measures.

The town should cooperate with the state and other agencies in disseminating energy conservation information.

The energy efficiency implications of the town's purchases and operations should always be considered.

Visual-Built Environment

A town-wide urban design, beautification, and landscaping plan should be developed.

The Town should continue to administer and enforce The Downtown Development Guidelines in cooperation with the Ocean City Development Corporation (OCDC). These guidelines cover a number of aspects of design including site design, bulk, scale, signage, architectural design and landscaping.

Design standards appropriate to other specific town neighborhoods should be developed and an appropriate design review processes for development of all types should be instituted.

Recommendations provided by the Ocean City Development Corporation for public

_____ improvements should be implemented to the extent practicable. These include
_____ consideration of the design treatment future investments in public improvements,
_____ including sidewalks, street furnishings, landscaping, use of public spaces, public
_____ parking, and public art as well as protection or enhancement of waterfront vistas and
_____ town gateways.

✘ _____ A landscaping program for existing development should be developed. Repaving of
_____ existing parking lots is an excellent opportunity to achieve this and improve on-site
_____ stormwater management.

✘ _____ Sign controls should be strengthened to better regulate the proliferation and
_____ appearance of signs.

✘ _____ A systematic program to bury utility wires should be developed and implemented.