

Inland Bays/Atlantic Ocean Environmental Profile

Introduction

“Quote from Charles Clark IV”

This report is the Department of Natural Resources and Environmental Control's environmental profile of the Inland Bays/Atlantic Ocean Basin in Delaware. It provides a summary assessment of environmental information and highlights some of the numerous treasures and challenges of the Inland Bays. The information is being used by the Department to establish environmental priorities and to educate other governmental agencies and the citizens of Delaware about significant issues of concern in the Inland Bays/Atlantic Ocean Basin.

The basis for developing this report comes from the Department's realization that virtually every activity that takes place in the environment impacts multiple resources. For example, improper disposal of hazardous substances, or excessive application of fertilizers on land, can result in the leaching of these pollutants into the ground water. Pollutants like these may also enter streams and other surface waters during storm events. The consequences can be widespread, causing potential impacts to public drinking water supplies, habitat, aquatic life, and recreational fishing.

Managing the complex and dynamic natural world we call “the environment” requires examination of the many resources that compose it. Understanding and respecting the relationships that exist in nature among the air, land, water, and living-resources has prompted the Department to focus on looking at the environment from multiple perspectives in an integrated fashion. This effort, which we refer to as “Whole Basin Management,” involves monitoring, assessing, and managing all of Delaware's biological, chemical, and physical environments on the basis of drainage patterns.

Four major drainage basins encompass Delaware: the Piedmont, Chesapeake Bay, Inland Bays/Atlantic Ocean, and Delaware Bay and Estuary. Each basin consists of smaller management units, or watersheds, which represent the area drained by a river, stream, or creek. Delaware has 45 sub-basins, or watersheds. The Delaware portion of the Inland Bays Basin/Atlantic Ocean Basin is located in southeastern Sussex County. The basin is named for the area which it drains to, the Inland Bays and Atlantic Ocean. In Delaware, this basin drains approximately 200,702 acres, or 314 square miles.

The Inland Bays/Atlantic Ocean Basin is the third basin being assessed by the Department's Whole Basin Management program which involves a phased process to effectively assess the health of a targeted basin and develop an implementation plan to address environmental problems. The paramount objectives of the process are to protect the environment, improve community outreach, maximize wise resource use, and promote environmental education and stewardship. As part of this process, we will be asking you and your neighbors to express your ideas, concerns, and opinions about the region in which you reside.

This publication is a summary of the Preliminary Assessment report for the eight watersheds that make up the Inland Bays/Atlantic Ocean Basin. The pages that follow contain information on these topics:

- Watershed Hydrology
- Land Use & Population
- Contaminants
- Water Quality
- Living Resources
- Recreation

As you read this environmental profile, you are encouraged to think about the problems or issues that concern you in your region and the actions we can all take to protect and improve Delaware's environment. Some suggestions for what we can all do every day are listed on the pages at the back of this environmental assessment.

Let us continue to be responsible stewards of the environment and create an environmental legacy that we can be proud to pass on to future generations. We must remember that we are simply borrowing the natural treasures of the Inland Bays from our children. Our goal is to leave them with the same treasures our ancestors left us to experience and enjoy in the Inland Bays!

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Delaware's Good Nature Depends on You!

Graphics:

Map showing 4 basins - "Delaware's Major Drainage Basins" (same map as in the Piedmont Environmental Profile revised to show 4 rather than 5 basins)

Enlarged map of the Inland Bays with all watersheds labeled - "Inland Bays Basin Watersheds"

Inland Bays Basin Watersheds: Lewes Rehoboth Canal, Rehoboth Bay, Indian River, Iron Branch, Indian River Bay, Buntings Branch, Assawoman Bay, Little Assawoman Bay

Watershed Hydrology

Water is Delaware's most valuable natural resource. It is critical to our existence, provides habitat for wildlife and allows for excellent recreational opportunities in the Inland Bays/Atlantic Ocean Basin. Water is constantly recycling and changing its state through the processes of evaporation, condensation and precipitation, commonly referred to as the *water cycle*.

The water in our streams and ponds is warmed by the sun's rays, causing it to evaporate and enter the atmosphere as a gas. As these water molecules collect in the atmosphere, the humidity increases until the air mass can no longer hold any more moisture. At this point, the water vapor condenses and falls back to the Earth in the form of snow, rain, sleet or hail. Some of this precipitation is filtered through the soil and ends up as ground water. If more precipitation falls than the soil can absorb, it becomes runoff. Both runoff and ground water eventually reach a stream, bay or other water body, and the water cycle begins all over again.

Surface water bodies, like rivers, lakes, bays and oceans, are the most visible expressions of water in the water cycle. These reservoirs act as "thermometers" for measuring the health of the waters in the water cycle. For

example, diverse aquatic habitats and fish populations are representative of a healthy water body. An excess of nutrients can lead to a reduction in the diversity and populations of these living resources.

The Rehoboth Bay, Indian River Bay and Little Assawoman Bay are the major surface water bodies in the Inland Bays/Atlantic Ocean Basin. These estuaries provide important habitat for migrating birds, finfish and shellfish and are becoming increasingly urbanized with encroaching development.

The Inland Bays have several shallow aquifers, or water-bearing zones, in the underlying sediments which inexpensively provide 100 percent of the region's drinking and irrigation water supplies. These aquifers also feed the streams, rivers and the bays themselves. The basin's ground water, generally available within 10 feet below the surface, is an invaluable asset to development and commerce. But this very availability of ground water and its continual movement through the dynamic water cycle make these water resources extremely vulnerable to contamination.

Shoreline

More than 11 miles of Delaware's ocean coast are developed with homes and businesses, the majority of them located on the barrier island, the thin strip of land separating the ocean from the Inland Bays. Sea level rise, storms and other natural coastal transport processes are causing the barrier island system to migrate in a landward direction. The current rate of sea level rise is one foot per century; at this rate, we can expect about 300 feet of shoreline retreat, or about 15 feet every 20 years.

The rising waters and storm consequences require continual vigilance and management decisions. Efforts by the state to maintain public beaches and dunes include planting beach grass, erecting sand fence, and repairing damage to the beaches and dunes following storms. Beach nourishment projects restore wider beaches for recreation and protection of inland areas by replacing sand lost during storms.

Some communities have chosen to harden the shoreline by constructing bulkheads and other structures that provide localized wave protection; however, they do not replace eroded sand. Strategic retreat, the relocation of waterfront structures inland, is practiced on a limited basis today to protect the structures and help preserve the beach. The option best suited to treat erosion of any particular beach or land area can depend upon the primary goal – preservation of the beach or property protection.

Dredging

As development continues to flourish around the Inland Bays, requests for new dredging projects increase along with the population. Dredging is the process of removing bottom sediments to create or maintain safe navigable channels for recreational or commercial boating purposes. In Delaware, dredging is also used for obtaining sand for beach restoration activities, for removing unwanted sediments and aquatic vegetation from state-owned ponds and lakes, and for controlling sediment deposits in inland waters.

Dredging physically alters the bottom and temporarily causes water turbidity or cloudiness, and damage to plants and animals. Dredging of dead-end canal systems with little or no freshwater inflow for flushing to allow access of pleasure boats to new developments results in stagnant water in the canals, and dredging the upper portions of tidal tributaries allows the extended upstream progression of saltwater from the Inland Bays into the upper tributaries. On the other hand, removing bottom sediments from main navigational channels and existing marinas can be beneficial if the dredging helps to improve circulation patterns.

Two initiatives are underway in the Department to ensure that the most current aquatic habitat and living resource impact assessment methods will be used, and that dredging projects reflect the best technologies and methods to minimize adverse impacts: the “Statewide Dredging Activity Analysis and Management Project” and a review and update of the Department’s “Inland Bays Dredging Study.”

Land Use and Population

Sussex is Delaware’s fastest growing county. Most of the development pressure centers on the Inland Bays/Atlantic Ocean Basin. Two very different land use activities, poultry farming and second home recreational, thrive in the basin. Since the 1960s, a massive influx of people from neighboring states has continued to swell the basin’s seasonal and permanent populations. At the same time, the poultry industry has experienced enormous growth. Some perceive the two as incompatible land uses; ironically, the rapid growth of both activities has contributed to dramatic changes in land use and degradation of the basin’s land and water resources.

The basin’s population is approximately 120,000. More important is the apparent rate of growth: between 1990 and 1999, Sussex County experienced a 23 percent population increase; between 1990 and 2020, it’s anticipated that the county will experience a 55 percent population increase. The rapid growth and

the seasonal population swing – which can swell by more than 200 percent on summer weekends – make it difficult to maintain or expand the infrastructure at an affordable level to the permanent population. Controversy, including court action over sewer rates, reflect this difficulty. In addition, as the population and tourist industry grow, so does the number of automobiles. Highways in parts of the basin are so clogged at times, that emergency vehicles have trouble maneuvering.

Urban land use now covers about 17 percent of the basin. From 1992 to 1997, residential and general commercial urban land use expanded by three percent. If this rate of urban growth continues to 2020, approximately 29 percent of the basin, excluding open water, will be in urban land uses. During the same 5-year period, agricultural land decreased by about 2,327 acres and forest cover by about 3,200 acres. Most of the new urban growth has been along Route 1 near Rehoboth Beach and Lewes and in the Long Neck area.

Land use planning and zoning authority rests with the municipalities and Sussex County government. The Coastal Zone Act prohibits new heavy industry and offshore bulk product transfer facilities and requires state permits for new manufacturing plants in the basin prior to construction.

Sussex County has developed a comprehensive land use plan for the non-incorporated portion of the basin, which addresses conservation, transportation and economic issues. The plan also includes a growth management strategy that encourages new development in designated growth areas, most of them concentrated in the eastern portion of the basin. In the past few years, some land along Route 113 has been downzoned from commercial to agriculture. The state comments on proposed new facilities and most developments in the basin through the Land Use Planning Act (LUPA).

Shaping Delaware's Future

In response to growing concerns about the viability of comprehensive planning to direct and manage new development and make land-use decisions, the Delaware General Assembly enacted Senate Bill 116 in June 1995. The Act, known as "Shaping Delaware's Future," sets forth 10 goals to improve the effectiveness of land use decisions. Recently, the goals were modified and there are currently 11. Those most applicable to the Inland Bays/Atlantic Ocean Basin include:

- Direct investment and future development to existing communities, urban concentrations, and designated growth areas.
- Protect important farmlands and critical natural resource areas.
- Encourage redevelopment and improve the livability of existing communities and

urban areas, and guide new employment into underused commercial and industrial sites.

In December 1999, the Governor's Cabinet Committee on State Planning Issues adopted the report, "Shaping Delaware's Future: Managing Growth in 21st Century Delaware, Strategies for State Policies and Spending." This report notes that lands near the Inland Bays, "an area of unique and sensitive resources, are experiencing a variety of environmental problems because of significant development pressure." Three of the five management strategies listed below are prefaced in the report as follows:

"In these coastal areas, the state, county and local governments will work to cooperatively pursue creation of land use techniques and development and infrastructure investment phasing agreements that:

- Meet the need to provide necessary sewer and transportation improvements to achieve water quality objectives and provide safe, efficient transportation while ensuring the protection and enhancement of the Bay's fragile resources and retaining the character and integrity of the area. Implement ordinances, as recommended in the Comprehensive Conservation and Management Plan for the inland Bays, that: promote environmentally sensitive development; include design, density or process incentives for such development; and incorporate zoning classifications and development standards (setbacks, buffers, tree protection, impervious cover limitations, etc.) to ensure environmentally sound land use.
- Further the protection of important agricultural lands in the Inland Bays Watershed outside of the designated developing area through Transfer of Development Rights programs, Purchase of Development Rights programs, zoning, or other methods.
- Protect areas designated as particularly critical or valuable natural resources or habitats."

On Jan. 1, 2000, Governor Thomas R. Caper signed a letter endorsing "Shaping Delaware's Future: Managing Growth in 21st Century Delaware." The Cabinet Committee on State Planning Issues has requested state agencies review their regulations and policies to bring them into compliance with the management initiative.

Contaminants

The waters of the Inland Bays are highly enriched with the nutrients nitrogen and phosphorous, the contaminants having the greatest impact on the

surface and ground waters of the Inland Bays/Atlantic Ocean Basin. While nitrogen and phosphorus are essential for plant and animal growth, when excess amounts enter the bays, water quality can deteriorate as aquatic plant growth accelerates and the level of oxygen is reduced. This process of overenrichment is called eutrophication. The primary activities accelerating eutrophication in the Inland Bays are urbanization and agricultural activities. Contamination of the basin's ground water by excess nitrogen is critically important because ground water supplies 100 percent of the basin's drinking water.

Nitrogen and Phosphorus

Phosphorus enters the bays primarily through soil erosion and runoff. Nitrogen enters through a variety of pathways such as point source discharges, atmospheric deposition, erosion, runoff and ground-water discharge. As much as 25 percent of the total nitrogen entering the bays is estimated to be deposited from the atmosphere, while point sources such as wastewater treatment facilities with discharge pipes to surface waters account for less than four percent. The remaining nutrient loading comes from land use activities and is transported by erosion, runoff and ground-water discharge.

The drinking water standard for nitrate (as nitrogen) is 10 milligrams per liter (mg/l). In the Inland Bays, nitrate concentrations in the ground water vary from less than 0.5 mg/l in wooded or natural areas to greater than 100 mg/l in areas with historically intensive poultry production. More than 23 percent of all wells in the basin have nitrate levels that exceed the drinking water standards.

Urban Nutrient Sources

Numerous urban sources of nutrients are transported to the Inland Bays through erosion, stormwater runoff and leaching from soils to the ground water. The sources include discharges from on-site septic systems and domestic sewage treatment plants as well as fertilizers applied to private and commercial landscapes, nutrient rich sediments from construction activities, exhaust emissions and open burning.

Discharges from septic systems contribute the greatest urban loading of nutrients to the bays. More than 18,000 septic systems are permitted in the Inland Bays/Atlantic Ocean Basin, discharging as much as 480,000 pounds of nitrogen and 250,000 pounds of phosphorus to the soils annually. Most of the nitrogen from septic tanks is converted to nitrate-nitrogen, which easily enters the ground water and ultimately, the bays or their tributaries. Many older homes near the bays are on small lots with sandy soils, and some still have substandard on-site wastewater disposal systems like cesspools or seepage pits. As much as 50 percent of the septic systems in the Inland Bays/Atlantic Ocean Basin would not

meet current regulations for on-site wastewater disposal systems for a variety of reasons including inadequate lot sizes and system capacities.

Sussex County has created three regional sewer districts that apply wastewater onto agricultural lands through spray irrigation, which utilizes the nutrients in wastewater as fertilizer to grow crops. This has eliminated more than 14,000 septic systems within the basin.

Agricultural Nutrient Sources

Agricultural settings contribute significant amounts of nitrogen and phosphorous via field applications of manure, litter and chemical fertilizers that are ultimately transported to the water. Agriculture is the largest land use in the basin, accounting for 32 percent of the land. In 1997, more than 70 million chickens – 25 percent of the total raised annually in Delaware – were raised in the basin, generating more than 90,000 tons of manure and litter that are typically applied to the land. Most of the croplands are devoted to growing corn and soybeans. If nutrients are over-applied to agricultural sites, the excess may be transported to surface waters.

Implementation of comprehensive nutrient management plans can significantly reduce nutrient losses from agricultural activities. Delaware lawmakers, working with farmers, drafted and passed legislation in June 1999 requiring farmers to develop nutrient management plans to prevent nutrient loss from agricultural sites. Of the 241 poultry operations in the basin, over half now have manure storage facilities. State and federal cost share funds, as well as low-interest loans are available to farmers who wish to install manure storage sheds and dead bird composters. Research is underway to reduce phosphorous levels in manure through modifications in poultry feed.

Non-nutrient Sources of Contaminants

Non-nutrient sources include hazardous waste facilities, state and federal superfund sites, air emissions and solid waste landfills. The Department's Division of Air and Waste Management has programs that actively monitor these emissions and facilities.

Water Quality

The Inland Bays/Atlantic Ocean Basin's many streams, wetlands, and tidal rivers and bays support uniquely diverse fish and wildlife populations and provide abundant recreational opportunities. Delaware's Inland Bays are the crown jewel

of an exceptional beach recreational industry that draws thousands of visitors to enjoy the sun, sand, water and natural resources of Rehoboth, Indian River and Little Assawoman Bays.

As recently as 1975, Delaware routinely experienced serious water pollution and public health problems as a result of the discharge of untreated sewage. Since then, localized improvements in water quality have been achieved through voluntary efforts, regulatory actions and significant private and public investments in wastewater treatment facilities. However, the need for additional cleanup and pollution prevention continues.

The focus of water-quality management has expanded from point source discharges to decreased stream flows and nonpoint source problems such as urban and agricultural runoff, erosion, and sedimentation. Unaddressed, these problems lead to poor habitat conditions for fish and other aquatic life, diminished enjoyment of our surface waters for recreation, and unhealthy conditions.

Water Resources Issues

A number of water resource issues have arisen in the Inland Bays/Atlantic Ocean Basin over the past several years, from how to address habitat loss to concerns of *Pfiesteria* outbreaks.

The Inland Bays are suffering from excessive nutrients (eutrophication) that cause unwanted algal blooms, including *Pfiesteria* and red and brown tides. The algal blooms block sunlight from reaching the bottom of the bays and cause the level of dissolved oxygen to decrease. These changes in environmental quality have led to fish kills, loss of desirable submerged aquatic vegetation (SAV) or sea grasses, and declines in desirable finfish and shellfish habitat.

In the past two decades, a marked resurgence of seagrass has occurred in Delmarva's coastal bays with the exception of Delaware's Inland Bays. Recent attempts to reestablish eelgrass in the Inland Bays have been plagued by excessive algal growth, hurricanes and human impacts. However, a recent success in reproduction and establishment of viable beds has occurred in the vicinity of the Indian River Inlet where ocean influenced water quality is sufficient to support growth.

A preliminary assessment of water-quality data, completed in 1999 for the Inland Bays Basin, confirmed a decline in water quality. The study characterized the existing water quality conditions of the basin and identified potential problems. These problems include the excessive nutrient levels, declining trends of some pertinent water quality indicators such as dissolved oxygen, and frequent violations of water quality standards.

Delaware will continue to focus on point source and nonpoint source pollution problems such as urban and agricultural runoff, erosion and sedimentation, and ground-water contamination. The Department has adopted Total Maximum Daily Load (TMDL) regulations for nitrogen and phosphorous for Indian River, Indian River Bay, and Rehoboth Bay which set watershed-wide pollution reduction targets. Pollution control strategies are being developed to help reach these targets. Additional research and assessment efforts will be necessary to better understand how this complex aquatic system responds to certain pollutants.

Living Resources

The Inland Bays/Atlantic Ocean Basin is home to the diamondback terrapin and seasonal stopover for neotropical songbirds. Its living resources are diverse and exceptional – rare wetlands and rare species of the tiger beetle – and habitat is dwindling as human activity increases. Its very diversity makes the living resources of the Inland Bays/Atlantic Ocean both exceptionally valuable and exceptionally vulnerable.

Priority Communities

Mature **forests** provide diverse habitat for many species of native mammals, invertebrates, amphibians, reptiles, and birds, including migratory songbirds. Of the less than 60,000 acres of forests remaining, most are privately owned.

Forests of the basin include coniferous, hardwood and mixed woodlands with a variety of woody and grassy understory plants. Though longevity is desirable in forests – with minimal human disturbance favoring these natural communities – virtually all basin forests have been harvested at least twice since the arrival of European settlers. With most of the basin's land area cleared and drained for agriculture and increasingly subject to residential development, human impact on basin plants and animals has been profound.

Wetlands serve a variety of ecological functions: They filter nutrients, sediments and toxic chemicals from water; they minimize storm and tidal flooding; and they slow erosion by providing a buffer against tides and waves. Wetlands also serve as habitat for a variety of animal and plant species.

Constituting over 39 percent of the basin, wetlands support Delaware's most diverse freshwater, brackish, and saltwater ecological communities. Although saline and brackish marshes may be most recognizable to the beach-goer, boater, or casual observer, this basin includes significantly more nontidal,

freshwater wetlands. Arguably the rarest and most diverse freshwater wetlands in the state, acidic sea-level fen wetlands and interdunal swale wetlands are only found in Delaware in this basin.

Historically, the Inland Bays portion of the basin has lost substantial wetland acreage due to development and/or agricultural land conversion. Although the rate of wetland destruction in the basin and statewide has slowed in recent years, an estimated 54 percent of Delaware wetlands has been lost since 1780.

Priority Species

Neotropical migrant songbirds breed in North America and migrate to the tropics each autumn. The coastal maritime forests and scrub shrub communities in the basin provide important habitat for migrating birds.

The beach and dunes along Delaware's Atlantic Coast provide critical habitat for **beachnesting birds**, including the piping plover, least tern, common tern, black skimmer, and American oystercatcher, which are ranked as rare by the Delaware Natural Heritage Program. The piping plover is also federally listed as threatened. While these birds resided in healthy numbers in the 1960s, their numbers have declined in recent years. The Division of Parks and Recreation closes nesting beaches seasonally to reduce human disturbance.

The **diamondback terrapin** is a small to medium sized turtle that lives in estuarine marshes and bays. Though still common in the basin, potential human impacts deserve attention. Bulkheading and rip rap make it difficult for females to find nesting sites. Often, terrapins attempting to cross Route 1 in search of nesting habitat, are killed by automobiles. Commercial crab traps also pose a threat to terrapins.

The Inland Bays/Atlantic Ocean Basin has a history of robust **osprey** populations. However, several factors have lowered their productivity, including: lack of safe nesting sites, changes in local fish populations, and human disturbance.

Two rare species of **tiger beetle** are found in the basin. These species, the beach dune tiger beetle and the little white tiger beetle, inhabit open dune habitats, and have only been found in Cape Henlopen State Park. They are good indicators of the ecological integrity of beach and dune communities.

The **Delmarva fox squirrel** is found in mature hardwood and loblolly pine forests along streams and bays. Population declines due to loss of habitat caused the Delmarva fox squirrel to be placed on the Federal Endangered

Species list in 1967. The species was reintroduced to the Inland Bays/Atlantic Ocean Basin, but their numbers remain low.

Freshwater mussels live in the bottom sediments of freshwater streams, rivers and ponds. They are the most endangered family of animals in the United States. Of the 13 species that occur in Delaware, 11 are rare or extremely rare. Freshwater mussels are important monitors of water quality.

Surf clams are commercially important clams that are found in the ocean surf to a depth of about 140 feet. Overharvesting led to a decline of this species along the Delaware coast and there are concerns about recovery of surf clam populations. The sandy ridges that surf clams prefer are used as borrow sites for beach nourishment activities.

Recreation

The Inland Bays and their watershed are a major provider of tourist-based income and recreation. Many thousands of visitors enjoy going to the beach, fishing, pleasure boating, shellfishing, crabbing, hunting and other recreational pursuits. The adjacent public lands are used for hiking, hunting, wildlife watching and other outdoor activities as well as a means of gaining access to the bays themselves. The Inland Bays/Atlantic Ocean Basin contains four state parks, two state wildlife areas, two state fishing areas, eight public boat launches, and one publicly-owned marina.

Studies have shown that the beach and outdoor recreation are the primary reasons tourists visit coastal Sussex County. The four state parks in the area – Delaware Seashore, Fenwick Island, Holts Landing and Cape Henlopen – comprise about 8,100 acres. This is approximately 43 percent of the acreage in Delaware's state park system, taking in more than 14 miles of Delaware's Atlantic Coast. Cape Henlopen and Delaware Seashore are the two most visited parks in the state park system and most visitors in this basin come from Maryland, Pennsylvania and New Castle County.

The recreation and tourism that surround Delaware's Inland Bays account for more than \$250 million annually. Decline in water quality can threaten the area's tourism industry, as fish stocks become depleted, odors from decaying macroalgae fill the air, and threats of *Pfiesteria* loom. Improving the water quality of the Inland Bays is vital to maintaining the booming tourism and recreation of Delaware's beaches.

Community-Based Recreation

In addition to the state recreation areas and beaches that draw tourists to the Inland Bays/Atlantic Ocean Basin, the basin's year-round residents have a need for close-to-home recreational opportunities. While Sussex County government provides no recreation services or facilities for its residents, several municipalities within the basin operate parks that help to meet the recreation needs of their residents.

Within the Inland Bays/Atlantic Ocean Basin are more than 100 acres of municipal park land, providing playgrounds, picnic areas, ball fields and other recreational amenities to residents. These parks provide recreation opportunities for residents, but do not meet all of the basin's community recreation needs.

In Delaware's 1996 Statewide Comprehensive Outdoor Recreation Plan (SCORP), several needs were consistently reflected throughout the state. These include: historic and nature education; programs for people with disabilities, teens and seniors; public swimming pools; playgrounds and tot lots; trails and pathways; and camping areas. In addition to these statewide needs, residents of the Inland Bays/Atlantic Ocean Basin expressed a need for ballfields, fishing and boating access, and organized sports leagues.

The SCORP research showed that Sussex County residents have the greatest need for outdoor recreation facilities and programs in the state. One of the issues identified in the 1996 SCORP is the lack of recreation facilities available to Sussex County residents. At this time, Sussex County government has no plans to begin providing recreation services for its residents.

Efforts Underway

Center for the Inland Bays

The Center for the Inland Bays, the smallest of the 28 National Estuary Programs, was established in 1994 by the Delaware legislature. The Center's mission is "to oversee the implementation of the Inland Bays Comprehensive Conservation and Management Plan and to facilitate a long-term approach for the wise use and enhancement of the Inland Bays watershed by conducting public outreach and education, developing and implementing conservation projects, and establishing a long-term process for the preservation of the Inland Bays Watershed."

Tributary Teams

A Tributary Strategy Program was initiated during autumn 1998 by the Center for the Inland Bays. Local stakeholders from each of the Inland Bays sub-watersheds were organized into three Tributary Actions Teams, which provide guidance and direction to the Center in its mission to reduce nutrient contributions and restore habitat in the Inland Bays.

Since January 1999, the teams have been involved in a coordinated effort with the Department of Natural Resources and Environmental Control to develop pollution control strategies (PCS) to meet the required total maximum daily loads (TMDLs) for nitrogen and phosphorous in the Inland Bays.

The teams developed an issue brief and began public deliberations on pollution strategies in February 2000. Deliberations will continue throughout the spring, 2000.

House Resolution 32

In June 1999, the Delaware House of Representatives passed House Resolution 32, establishing a working committee comprised of Sussex County Council, the Department of Natural Resources and Environmental Control, the Office of State Planning Coordination, the Department of Agriculture, the Sussex County Association of Towns and the Center for the Inland Bays.

The committee is assessing progress toward implementation of the Land Use Action Plan of the Inland Bays Comprehensive Coastal Management Plan (CCMP) and identifying areas where successful implementation has not been achieved. The committee's role is also to recommend changes to Sussex County's Comprehensive Plan and implement ordinances such as zoning and subdivision, which will lead to water quality improvements through achieving TMDLs for the Inland Bays and their tributaries.

Issues under consideration, which may ultimately result in recommendations from the committee, include: regulation of septic systems and holding tanks within the Inland Bays watershed, requiring environmental impact assessments for land use projects above certain thresholds, for example, acreage, number of units, square footage, intensity of use, and buffers on developable lands.

Nutrient Management Commission

The Delaware Nutrient Management Commission was established in June 1999 after passage of the Delaware Nutrient Management Law. The Commission is tackling the problem of nutrients entering the Inland Bays with a comprehensive program addressing not just agricultural sources, but the whole spectrum of nutrient contributions, including golf course landscape operations, residential inputs and residential and commercial fertilizers.

What Can We Do?

Volunteer, Get Involved

Beach Grass Planting

Since 1990, dedicated volunteers have stabilized Delaware's sand dunes by planting more than 3,000,000 stems of Cape American beachgrass on Delaware's ocean and bay beaches. The beachgrass is planted annually in March and the program is coordinated by the Division of Soil and Water Conservation, Department of Natural Resources and Environmental Control. Call 302-739-4411 for information.

Coastal Cleanup

An annual cleanup of Delaware's coast has been underway for 13 years as part of the Delmarva Coastal Cleanup. Volunteers join in a cooperative effort with other groups on the Delmarva Peninsula to pick up debris along the coast as well as collect data for the Center for Marine Conservation. Call the Department of Natural Resources and Environmental Control for information, 302-739-6324.

Inland Bays Citizen Monitoring Program

Volunteers have been taking water samples on a regular basis along the Inland Bays since 1991 to measure important water-quality characteristics, from dissolved oxygen levels to water clarity. Training is provided by the University of Delaware Sea Grant College Program, which manages the Inland Bays Citizen Monitoring Program with support from the Division of Water Resources, Department of Natural Resources and Environmental Control. For more information, call the University of Delaware Sea Grant College Program in Lewes, 302-645-4250.

James Farm

Volunteers are always needed and welcome at the James Farm Ecological Preserve. The Preserve, located on Cedar Neck Road in Ocean View, is managed by the Center for the Inland Bays. If you are interested in volunteering for projects such as trail maintenance, tree planting or mowing and other activities please call the Center for information, 302-645-7325.

State Park Volunteers

Volunteer in a State Park! Delaware's State Parks offer a variety of opportunities to get involved with projects ranging from trail construction and maintenance to helping out with special programs. For information on volunteer opportunities within state parks, call the Division of Parks & Recreation, 302-739-3197.

Be an Environmental Steward Every Day

Our everyday activities and disposal habits collectively contribute significant levels of pollution to our waterways. Nonpoint sources of pollution such as chemical fertilizers that are transported through erosion, runoff and other mechanisms, must be reduced if we are to make real progress in the cleanup of our waters. We must also be mindful not to add hazardous, toxic or unnecessary materials to increase the burden of wastewater systems. Below are a variety of recommendations and helpful information for environmentally responsible decisions:

Household Hazardous Waste

Hidden in our kitchen cupboards and garbage cans are substances like pesticides, cleaners, drain openers, solvents, and paints that are potentially hazardous wastes. Household hazardous waste is considered to be any material discarded from the home that may pose a threat to human or environmental health if handled improperly.

- ✓ Use non-phosphate laundry detergents. Phosphates may overstimulate plant growth in streams and lakes and deplete oxygen levels needed by fish.
- ✓ Purchase non-toxic household cleaning products when possible.
- ✓ Read and follow the directions on labels carefully.
- ✓ Use latex paint instead of oil-based paint when possible.
- ✓ Use fabric softener sheets rather than liquids (they have a lower metals content) or add one cup vinegar or a quarter cup of baking soda to final rinse.
- ✓ Use stains and finishes derived from natural sources such as shellac, tung oil and linseed oil.
- ✓ Know how to identify a hazardous product. Federal law requires that hazardous products be labeled: DANGER, WARNING, or CAUTION.

Household Hazardous Waste Collection

Dispose of your hazardous substances safely and properly at the Delaware Solid Waste Authority Sussex County facility the first Saturday in February, June and October at the Southern Solid Waste Management Center, Route 20, Jones Crossroads. Hours are 8 a.m. to 3 p.m. You can drop off product containers marked, "Warning: Hazardous," "Flammable," "Corrosive" or "Explosive." The following items are accepted:

Household – full aerosol cans; bleach; chemistry kits; nail polish, polish removers, perfumes; disinfectants; drain cleaners; floor wax; mercury thermometers; moth balls; oven cleaner; smoke detectors; spot remover; toilet cleaner.

Home Health Care – prescription medications; used syringes.

Explosives – ammunition; firecrackers; gunpowder.

Workshop – corrosives; paints (other than latex); small compressed-gas cylinders; solvents; stains; strippers; thinners; varnish; wood preservatives; florescent bulbs.

Garden/Yard – fungicides; herbicides; pesticides; pool chemicals.

Automotive – antifreeze; auto batteries; degreasers; waste fuels-gasoline, kerosene; used motor oil mixed with other fuels.

What will not be accepted:

Friable asbestos – accepted by appointment at Cherry Island Landfill for a fee. Call 764-2732.

Non-friable asbestos – accepted by appointment at all Delaware Solid Waste Authority landfills for a fee.

Unknown substances – greater than 1 gallon or 8 pounds.

Radioactive waste.

Materials with other disposal methods:

Latex paint – water-soluble, not hazardous. Can be taken to landfill.

Containers with less than 1-inch of material – can go in regular trash.

Used motor oil – oil that has not been mixed with other fuels is accepted at specific "Recycle Delaware" locations.

Lawn and Garden

Establishing and maintaining a healthy lawn and garden makes a home more attractive and is also environmentally beneficial. Healthy lawns and gardens,

coupled with trees and shrubs, can help prevent erosion. Local streams will benefit from reduced runoff provided by your lawn and landscaping. However, lawns can be a source of pollution if proper lawn care techniques are not followed.

- ✓ Perform soil tests every 3-4 years to determine the amount of nutrients necessary for a healthy lawn. Contact your local soil conservation district for more information and test kits.
- ✓ Use fertilizers only as needed. Do not heavily water lawn after application because it may lead to excessive aquatic algae growth.
- ✓ Don't give your lawn a crew cut. Lawns should be 2-4 inches in height. Cutting too short or too frequently weakens the grass and allows weeds to grow faster.
- ✓ Leave grass clippings on the lawn to serve as a natural fertilizer or compost them along with other yard wastes.
- ✓ Use pesticides sparingly. If pesticides are used, read and follow directions carefully. Try to use natural (non-toxic) alternatives to pesticides, such as insecticidal soap. Never use pesticides if rain is in the forecast because the chemicals will run off into a local stream or storm drain.
- ✓ Consult your local nursery for advice on selecting plants suited for the site characteristics. Use mulch to reduce weed growth and evaporation.
- ✓ Do not overwater your lawn or garden. Excessive watering can cause chemicals to leach into ground water and can make plants more prone to disease.

Build a Compost Pile

1. Select a flat, well-drained spot that gets full sunlight. Try to build your pile in the middle of your garden.
2. Construct a compost bin out of scrap lumber, bricks, concrete blocks or wire. Make sure the bin has openings to let air penetrate pile.
3. Feed the pile, mixing coarse and fine materials in 6 to 8 inch layers. The bottom layer should consist of twigs, wood chips, chopped corn stalks, or other coarse material. Next, add a layer of material high in nitrogen such as grass clippings or manure. Top with a layer of soil and repeat the process. Sprinkle the pile with water.
4. Mix the layers well and shape so the center is lower than the sides to help water flow into the pile. Turn the pile once a month and remoisten the material as you turn it.

The plant materials should decompose into compost within five months in warm weather, longer under cool or dry conditions. Spread compost in the garden and till it under to offer your soil and plants renewed vigor.

Septic Systems

Septic systems require periodic check-ups and proper care to remain healthy and function properly. They must have a healthy diet to prevent groundwater and soil contamination as well as costly repair bills.

- ✓ Keep all toxic and hazardous chemicals out of your septic systems. Even small amounts of these chemicals can destroy your system's biological digestion.
- ✓ Avoid dumping grease or fats down your kitchen drains. They can accumulate and cause blockages in your system. Collect grease in a container near the sink.
- ✓ Have your septic tank pumped by a certified contractor every three years to ensure proper operation. Failure to pump periodically can cause clogging and result in costly repairs.
- ✓ Don't drive over absorption fields. This can cause compacting which can result in clogging. Do not plant trees over the absorption system and do not construct walkways, patios, swimming pools or other permanent structures over or within the leachline area.
- ✓ Minimize the solids load. Minimize or avoid using a garbage disposal unit. Remove scraps with the garbage or compost them.
- ✓ Minimize the liquid load. The less wastewater you produce, the less the soil has to absorb. Practice water conservation by repairing leaky fixtures, washing clothes only with a full load and using water-saving devices. Do not let water run while brushing teeth, washing vegetables and dishes.

Boating

Waste Disposal

Sewage: Avoid discharging sewage directly into the water. Sewage contains disease-carrying organisms and nutrients that are harmful to humans, plants and wildlife. Boaters should have some type of sanitation device on board, such as a portable toilet, holding tank, or other device, to treat the sewage. Boaters should dispose of this waste at proper dump stations or pumpout facilities. The dumping of sewage directly into the water is illegal. Take the time to find the proper disposal area near your boating area and, whenever possible, use onshore restrooms.

Trash: Don't litter. Collect all trash and dispose of it in proper containers once onshore. Secure items so they don't fall overboard. Recycle appropriate materials whenever possible.

Fish: Clean fish at designated areas and dispose of waste in appropriate containers. Do not throw fish waste into surface waters at marinas; the waste can cause water quality problems within the marinas.

Liquid Waste: Dispose of or store liquid waste (e.g., oil, grease, detergents, paint) in the proper containers.

Fuel Spillage

One quart of engine oil spilled in one million quarts of seawater will kill half of the exposed crab larvae. Avoid over-fueling. Do not top-off tanks at the fuel docks. Purchase vents that act as fuel/air separators so that fuel does not enter the bilge. Use oil-absorbing pads in the bilge and dispose of properly.

Boat Maintenance

Perform boat maintenance in locations away from surface waters. Use designated areas where provided. Recycle boat engine oil and other fluids.

Boat Cleaning

While keeping boat hulls clean is important for maintaining speed and efficient operation, use detergents and antifouling treatments that do not contain phosphate and are biodegradable to minimize impacts on the environment. Antifouling paints work by releasing chemicals that are toxic to unwanted organic growth that attaches itself to boat surfaces. Unfortunately, high concentrations of chemicals such as copper and tin can be extremely harmful to other aquatic organisms in enclosed marine environments such as bays, harbors and marinas.

Choose the most environmentally friendly technique to prevent fouling of boat hulls. Keep all paints and related products away from the water and dispose of them properly. Perform boat maintenance out of the water, if possible. Use areas specifically designated for dust and scraping control, where wash water is effectively treated. Treat paint dust and scrapings as hazardous waste and dispose of them properly.

Erosion and Habitat Degradation

Obey speed limits and no-wake zones. Slow your boat down before coming to the speed limit marker. Wakes produced by boats contribute to shoreline erosion. Be careful in shallow areas; do not disturb the sediment or uproot vegetation with the boat propeller.

Recycle

The 'RECYCLE DELAWARE' program is a voluntary source-separate recycling program. Most centers are located within a five-mile radius of most households so residents can easily drop off recyclables on the way to work or shopping. For

the center nearest you, call the The Delaware Solid Waste Authority Citizens' Response Line, 1-800-404-7080.

Items accepted through 'RECYCLE DELAWARE'

Paper – newspapers, magazines, phone books, newspaper inserts and paperback books.

Plastic – narrow-neck plastic bottles only (milk jugs, soda bottles, laundry detergent, salad dressing, cooking oil, shampoo, cleaning bottles. rinse lightly. Remove lids and crush. Labels and rings can stay on.

Cans – aluminum, steel and empty aerosol cans (drink and food cans, pet food, hair and bug spray). Rinse lightly. Crush if possible. Labels can stay on. Remove plastic spray knob from aerosols.

Glass – food and beverage containers, jars. Rinse lightly. Remove lids. Label and ring can stay on.

Cardboard – (specified locations only, call 1-800-404-7080 for locations) corrugated cardboard only. Fold down to fit in 60-inch x 5-inch opening.

Motor oil – (specified locations only, call 1-800-404-7080 for locations) used motor oil, hydraulic or diesel oil.

Oil filters – (same locations as motor oil) used car and truck oil filters.

Batteries – small household batteries and button type (A's, C's, D's, watch, hearing aide and camera).

Buy Recycled Products

We can all be more environmentally conscious when making purchases. Consider buying recycled products. Ask your local suppliers about the following recycled products:

Household Items – carpet and backing, kitchen containers, wall panels, roof materials, tissues, toilet paper, paper towels, gift wrap, trash bags, plastic lumber, floor tile, steel and aluminum containers, benches and picnic tables, flower pots, mail boxes.

Office Items - computer paper, stationery, envelopes, file folders, copier paper, notepads, printer and laser cartridges, rulers, wastepaper baskets, pens and pencils, binders.

Auto Parts - re-treaded tires, oil filters, license plate frames, batteries, rubber accessories, rebuilt auto parts, oil.

Home*A*Syst for Risk Assessment

Home*A*Syst, a companion program of the Farm Assessment System, takes you step-by-step through a series of worksheets that help you understand potential hazards in and around your home. Topics and potential problems affecting them include: drinking water; fuel storage; septic systems; fertilizers, herbicides and insecticides; hazardous waste; indoor air; and lead. Call the University of Delaware Cooperative Extension Office for more information, 302-856-7303.

Glossary

AQUIFER: a water-bearing geological formation that will yield water to a well or spring. Aquifers can be classified as confined or unconfined.

ATMOSPHERIC DEPOSITION: the occurrence of pollutants from the air falling on the land or water, sometimes at great distances from their original sources. Can be an important contributor to declining water quality.

BASIN: the surface area that drains into a surface water system.

CONTAMINANT: Any element, substance, compound, mixture, or agent, other than a hazardous substance, which, after release from a facility and upon exposure of, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction) or physical deformations in the organism or their offspring.

EROSION: Wearing away of soil by running water, wind or ice; erosion is the process by which the earth's surface is shaped and occurs even in remote, uninhabited areas at a slow rate (geologic erosion); of more concern is accelerated erosion caused by human activities.

EUTROPHICATION: The enrichment of natural waters with inorganic material, especially nitrogen and phosphorus, such that they support excessive growth of plants and algae.

GROUND WATER: Water beneath the earth's surface at varying depths; in reservoirs called aquifers.

HAZARDOUS WASTE: Any waste material that is potentially dangerous, including explosives, radioactive materials, and chemicals.

NONPOINT SOURCE POLLUTION: Pollution of surface or ground-water supplies originating from land use activities and/or the atmosphere, having no well-defined point of entry.

POINT SOURCE POLLUTION: Pollution of surface or ground-water supplies at well-defined, usually manufactured points or locations; discharges of treated wastewater from municipal and industrial treatment plants are common point sources of pollution.

RECHARGE AREA: Land area over which precipitation infiltrates into the soil and percolates downward to replenish an aquifer.

SALINITY: The quality of water based in its salt content; seawater contains approximately 18,000 of salt in each million parts of water.

SEPTIC SYSTEM: An onsite system designed to treat and dispose of domestic sewage; a typical sewage system consists of a tank that receives wastes from a residence or business and a system of tile lines or a pit for disposal of the liquid effluent remains after decomposition of the solids by bacterial in the tank.

SURFACE WATER: Lakes, ponds, streams, rivers and other water bodies, which lie on the surface of the land; may be partially or fully supplied by ground water.

TMDL OR TOTAL MAXIMUM DAILY LOAD: a calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

TURBIDITY: A measure of the amount of fine particles of solid matter suspended in water.

WATERSHED: An area of land that contributes runoff to one specific delivery point; large watersheds may be composed of several smaller "subsheds," each of which contributes runoff to different locations that ultimately combine at a common delivery point.

WATER TABLE: The upper level of a saturated zone below the soil surface, often the upper boundary of a water table aquifer.