

# ISSUES AND ASSOCIATED RECOMMENDATIONS

This chapter is a condensed summary of the major issues and recommendations that are detailed in Chapter 2. They have been organized into three main categories: Nutrient Management, Sensitive Resources, and Non-Nutrient Contaminants. Within these main categories, specific issues have been grouped into high-, medium-, and low-priority concerns. For each of these concerns there is a brief discussion of the issue followed by the Inland Bays/Atlantic Ocean Basin Team's related recommendations. The recommendations are organized into two groups: Type I – those over which DNREC has direct control; and Type II – those beyond DNREC's jurisdiction. This chapter's structure allows the reader to identify the Inland Bays/Atlantic Ocean Basin's most pressing issues, understand them better, and see what can be done to start addressing them.

## 3.1 NUTRIENT MANAGEMENT ISSUES

According to the *1998 (305[b]) Watershed Assessment Report*, nutrients pose a serious threat to water quality, aquatic life, and human health. The enrichment of lakes, ponds, bays, and estuaries by nitrogen and phosphorus from surface runoff and ground-water discharge is known to be a contributing factor to eutrophication. Agricultural runoff, urban runoff, and municipal and industrial point-source discharges are the primary sources of nutrients. In many watersheds of the Inland Bays/Atlantic Ocean Basin, agriculture is the major land use. Poultry production is a major industry in Delaware. Intense animal livestock production tends to create an imbalance of nutrient input to export resulting in accumulation of nutrients that lead to leaching, erosion, and runoff of excess nutrients to ground and surface waters.

Nitrogen can be transported from organic waste-amended soils into ground waters by leaching and to surface waters by erosion or runoff. Nitrate leaching is a major concern in humid regions with excessively well-drained soils that overlay shallow water tables. These conditions are common throughout Delaware. If nitrate enters ground-water supplies, two major environmental problems can occur. The consumption by humans or animals of drinking water with high nitrate levels has been associated with several health problems, the most serious being methemoglobinemia (O<sub>2</sub> deficiency in blood) in infants. Additionally, ground waters with high nitrate levels that discharge into sensitive surface waters can contribute to the long-term eutrophication of these water bodies. Erosion and surface runoff can transport soluble inorganic nitrogen and organic nitrogen to surface water. Most of

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the nitrogen lost in this manner is sediment-bound organic nitrogen. Although the solubility of nitrate favors its loss in runoff as opposed to sediment transport, total nitrogen losses from most watershed studies are usually several-fold greater than soluble nitrogen.

Phosphorus contributes to eutrophication by its movement into surface waters through erosion, runoff, and subsurface flow in artificial drainage and ground-water discharge. Accumulation of soil phosphorus to excessive levels must be minimized to reduce the transport of soluble or sediment-bound phosphorus to sensitive water bodies. Because crop production systems are forced to

continually use manure as fertilizer, due to the lack of economically viable alternatives for manure disposal, the systems almost always build soil phosphorus levels well beyond the ranges considered optimum for most agronomic crops. The unfavorable N:P ratio in most manures also results in over-application of manure phosphorus relative to crop needs; to meet crop needs for nitrogen, phosphorus must be over-applied.

### 3.1.1 TOTAL MAXIMUM DAILY LOADS AND POLLUTION CONTROL STRATEGIES

A Total Maximum Daily Load (TMDL) sets a limit on the amount of a pollutant that can be discharged into a water body and still protect water quality. The Indian River, Indian River Bay, and Rehoboth Bay have been identified as streams with water-quality concerns. As such, they were targeted for TMDL development by December 1998. The major environmental problems in these waters are nutrient over-enrichment and low dissolved oxygen levels. These problems are caused by both point and nonpoint sources.

By Secretary's Order No. 98-W-0044, the Department has adopted the TMDL Regulations for nitrogen and for phosphorus for the Indian River, Indian River Bay, and Rehoboth Bay. The effective date of the final regulations was December 10, 1998.

The next step is the development and implementation of Pollution Control Strategies to achieve these TMDLs. Pollution Control Strategies for nutrient management can vary from point discharge elimination to Best Management Practices (BMPs) for agriculture. The remainder of this section details the Inland Bays/Atlantic Ocean Basin Team's recommendations that could be used as part of the overall Pollution Control Strategies for the Indian River, Indian River Bay, Rehoboth Bay, and the rest of the Basin.

#### 3.1.1.1 Riparian Areas

The land immediately adjacent to streams, rivers, or other water bodies is referred to as the riparian corridor. These riparian areas are very important for enhancing both ecological and water-quality values because they maintain unbroken wildlife corridors to the floodplain area and reduce sediment and nutrient loading downstream. Riparian areas can act as effective nutrient and sediment buffers for their streams by improving the quality of water moving through these areas. Most of the water entering the streams in the Basin initially passes through these riparian buffers. Therefore, protecting these riparian areas can aid in safeguarding the ecological integrity of the larger downstream floodplain systems.

## Recommendations — Riparian Areas

### High Priority — Riparian Areas:

#### Type I

- ◆ Develop Best Management Practices and an accompanying manual that promotes riparian buffers to help trap nutrients and improve water quality in both channelized and natural streams. (2.4.11 #1, 2.7.4 #1 )

#### Type II

- ◆ Promote the establishment of forested wetlands and upland forest to supplement and/or restore natural riparian buffers. (2.4.11 #19 , 2.9.7 #23 , 2.3.7 #28)

### 3.1.1.2 Channelization

Approximately 2,000 miles of tax ditches have been reconstructed in Delaware since 1951. In general, many of these drainage ditch systems involved channelizing the headwaters of existing natural streams, then constructing ditches out and back from headwater channelization. In past decades, natural streams and wetlands were a lower priority than arable land for farming and development. In addition, water-quality impacts and possible habitat losses associated with the "way" drainage ditches were constructed or maintained were not really considered. Drainage systems were constructed as efficiently as possible.

Drainage construction and maintenance efforts do impact water quality and wildlife habitat. Research indicates that drainage systems play an important role in the release and transport of nutrients and bacteria. They also disrupt habitat. In many areas, natural riparian vegetation is removed, affecting upland and transitional habitat for many animal and bird species. Lack of canopy affects in-stream temperature and dissolved oxygen parameters, which in turn disrupts biological integrity and diversity.

In light of accumulated information, the state's drainage program has developed and is implementing a number of management practices to address these concerns. A need has been expressed to review these existing practices, define a process that allows consistent use, and track implementation.

The Conservation Reserve Enhancement Program (CREP) is providing increased incentives for landowners to implement certain Best Management Practices (BMPs) that improve water quality and enhance wildlife habitat. CREP is focusing efforts on implementing riparian buffers, planting grass filter strips, increasing wildlife habitat acres, and restoring wetlands in targeted water-quality and wildlife-habitat degraded areas. It is expected that implementation of this program will advance Delaware's goal of meeting water-quality standards.

### **Recommendations — Channelization**

#### ***High Priority — Channelization:***

##### **Type I**

- ◆ Educate the agricultural community and other people affected by ditching that drainage and wetlands habitat can coexist if managed properly. (2.4.11 #2)
- ◆ Finalize products of the Department's Comprehensive Tax Ditch Committee. (2.4.11 #3)
- ◆ Implement environmentally friendly ditch construction and maintenance practices. Establish more cost-sharing money in Sussex County to provide incentives for environmentally friendly ditch maintenance (including wiper bar technology). Tie maintenance cost-share money to environmentally friendly maintenance practices. (2.4.11 #4)
- ◆ The tax ditch program should be used for existing land uses, not land conversions. Require the inclusion of a poor drainage disclosure on real estate transactions. (2.4.11 #5)
- ◆ Provide financial incentives for water control structures, and investigate other methods of slowing down water. (2.4.11 #6)
- ◆ Implement demonstration projects to convert marginal agricultural lands to freshwater wetlands. (2.4.11 #7)
- ◆ Develop a manual of environmentally friendly ditch construction and maintenance practices. (2.4.11 #8)
- ◆ Implement a demonstration project on a tax ditch system utilizing riparian buffers. (2.4.11 #9)

#### ***Medium Priority — Channelization:***

##### **Type I**

- ◆ Develop a GIS coverage of ditches utilizing environmentally friendly construction and maintenance practices. (2.4.11 #10)

#### **3.1.1.3 Department Policy and Future Direction**

A reduction in the amount of nitrogen and phosphorus reaching the water bodies of the Inland Bays/Atlantic Ocean Basin is necessary to reverse the undesirable effects. These nutrients enter the water bodies from several sources including point sources, nonpoint sources, and from the atmosphere. Point sources of nutrients are end-of-pipe discharges coming from municipal and industrial wastewater treatment plants and other industrial uses. Nonpoint sources of nutrients include runoff from agricultural and urban areas, seepage from septic drainfields, and ground-

water discharges. Atmospheric deposition comes from both local and regional sources, such as motor vehicle exhaust and emissions from power plants burning fossil fuel.

On December 10, 1998, the Department adopted nutrient Total Maximum Daily Loads (TMDLs) for the Indian River, Indian River Bay, and Rehoboth Bay. These regulations call for a systematic elimination of all point sources discharging to these water bodies. Nonpoint source loads of nitrogen shall be reduced by 85 and phosphorus by 65 percent from tributaries in the upper Indian River. Nonpoint source loads of nitrogen and phosphorus from all remaining tributaries to the Indian River, Indian River Bay, and Rehoboth Bay shall be reduced by 40 percent. The atmospheric nitrogen deposition rate shall be reduced by 20 percent.

The attainment of TMDLs for the Indian River, Indian River Bay, and Rehoboth Bay watersheds within the state will be achieved through development and implementation of Watershed Restoration Action Strategies (WRASs) which will consist of many Pollution Control Strategies (PCSs). The WRASs will be developed by DNREC in concert with the Department's ongoing Whole Basin Management Program, Tributary Action Teams, and the affected public.

The purpose of the WRAS is to initiate actions that will reduce the nutrient loads to impaired water bodies that do not meet Delaware's water-quality standards. The proposed WRAS will be accomplished by optimizing Best Management Practices (BMPs) for nutrient removal at existing to point source facilities and by developing and implementing pollution control strategies for nonpoint sources. To effectively implement the WRAS, there must be extensive effort to educate the citizens of Delaware about the process and impacts of that process on their living, working, and playing. Consequently, there exist a myriad of opportunities to educate both the public and private sector on the effects of PCSs on their daily lives.

TMDLs required for the Inland Bays/Atlantic Ocean Basin are as follows:

Bunting's Branch and Little Assawoman 2003

### **Recommendations — Nutrients**

#### ***High Priority — Nutrients:***

##### **Type I**

- ◆ Systematic elimination of all point sources discharging nitrogen and phosphorus to the water bodies within the Basin. (2.7.4 #2)
- ◆ Implement the Conservation Reserve Enhancement Program (CREP) in the Inland Bays/Atlantic Ocean Basin on 2,000 to 3,000 acres by the year 2002. The following BMPs will be implemented: filter strips,

riparian buffers, wildlife habitat, wetland restoration and hardwood tree planting. (2.7.4 #3)

- ◆ Implement “follow-up” in FY 2002 to track implementation of BMPs on state and federal lands. Plans were written in FY 99. (2.7.4 #4)
- ◆ Provide technical/financial assistance in support of Delaware’s Nutrient Management legislation for implementation of structural and non-structural BMPs such as manure storage, cover crop, etc. (2.7.4 #5)
- ◆ Provide recommendations/support for development and implementation of economically viable alternative uses of manure, including composting and pelli-tizing. (2.7.4 #6)
- ◆ Provide technical/financial support for developing and implementing “pilot projects” such as manure transport, phytase enzyme in feed mills, etc. (2.7.4 #7)
- ◆ Provide technical support for Animal Feeding Operations/Confined Animal Feeding Operations and nutrient management regulations. (2.7.4 #8)
- ◆ Implement a conservation design. If developers could not use this approach, they would need to justify why they could not meet it prior to getting approval for a lesser approach. Zoning impediments to this would need to be identified. (*Work with county planning officials.*) (2.7.4 #9)

#### **Type II**

- ◆ Implement conservation/nutrient management planning/implementation in accordance with Delaware’s nutrient management legislation in the Inland Bays. Tracking of activities can be submitted to the Nutrient Management Commission upon request. *Lead Agency: Nutrient Management Commission* (2.7.4 #10)
- ◆ Finalize and adopt Phosphorus Index and accomplish training for nutrient management planners by FY 2000. *Lead Agency: University of Delaware* (2.7.4 #11)
- ◆ Develop and implement nutrient management plans on golf courses in accordance with nutrient management legislation. *Lead Agencies: Nutrient Management Commission & DNREC* (2.7.4 #12)
- ◆ Widely distribute and encourage the use of Randall Arendt’s *Designing Open Space Developments in Sussex County, Delaware: A Practical Handbook for Those Involved in Land Development*. (2.9.7 #25)

#### **Medium Priority — Nutrients:**

##### **Type I**

- ◆ Currently, the storm-water regulations include a goal of 80 percent reduction in total suspended solids

(TSS). A similar goal should be set for nutrient reduction that is consistent with TMDLs. (2.7.4 #13)

- ◆ Using the Department’s GIS, complete a build-out map to show what the landscape will look like and project water quality using existing population projections, zoning, and subdivision regulations. (2.9.7 #26)

#### **Recommendations — Septic Systems**

##### **High Priority — Septic Systems:**

##### **Type I**

- ◆ Septic regulations should be amended to establish a deadline for the owners of grandfathered lots of less than one-half acre to develop their land or lose their grandfather status. (2.7.4 #14)
- ◆ Septic regulations should require top seamed septic tanks (they are now two-piece tanks, top & bottom), and every tank should be installed with a riser above grade. The riser provides access to the tank and identifies its location. In addition, manufactured seals and sealants now used in the field should be tested for watertightness. Each tank manufacturer should be inspected semi-annually and tanks randomly tested for watertightness. (2.7.4 #15)
- ◆ Begin a program to sample water quality in ditches and on-site wells in areas with small lots and non-conforming systems. It is suspected that in some of the poorly drained subdivisions, the ditching is providing the outlet for the wastewater. This would help prioritize problem areas. (2.7.4 #16)
- ◆ Start a program beginning with the Inland Bays area to replace all non-conforming septic systems. Give homeowners plenty of notice that within so many years, (say 2–4 years) all non-conforming systems have to be upgraded. Older subdivisions served by cesspools will have to address their wastewater needs as a whole. (2.7.4 #17)
- ◆ Start a program to inspect gravity systems every three years and engineered systems annually. Thousands of permits are issued annually, but once the systems are installed there is no follow up. This is a problem especially in Sussex County due to systems installed years before homes are built. Timers, electrical connections, and pressure settings are not correct, which can cause premature failures. Require septic tanks and dosing chambers to be pumped every two years. Licensed waste haulers could provide this service. (2.7.4 #18)
- ◆ Require all homeowners with holding tanks to record on their deed a notice that the property is served by a holding tank. All renewal fees must be paid prior to the transfer of the property. (2.7.4 #19)

- ◆ Before a holding tank can be issued, the entire parcel should be denied a system. If an alternative system can be approved, no holding tank would be approved. (2.7.4 #20)
- ◆ Place a moratorium on permanent holding tanks in subdivisions that are being served by an increasing number of tanks. (2.7.4 #21)
- ◆ Set criteria for ratio of holding tanks to total lots in a subdivision. (2.7.4 #22)
- ◆ Systems washed away during storm events along the beach, should not be replaced. These shoreline communities should have central sewer. (2.7.4 #23)

#### **Type II**

- ◆ Create a law that requires septic certification prior to the sale of any improved property. All non-conforming systems would have to be replaced before any property transfer. *Lead Agency: General Assembly* (2.7.4 #24)
- ◆ Establish a large fee for permanent and temporary holding tanks. *Lead Agency: General Assembly* (2.7.4 #25)

#### **Medium Priority — Septic Systems:**

##### **Type I**

- ◆ Deny the placement of new (non-replacement) alternative septic systems outside of investment areas and restrict their placement in investment areas to reduce impacts to wetlands and important habitats. (2.7.4 #26)
- ◆ Assess septic system failure rate for the Inland Bays/Atlantic Ocean Basin through remote sensing and verification by grounding survey. (2.7.4 #27)

##### **Type II**

- ◆ State Revolving Fund money and support should go to projects with extreme environmental need or economic hardship. *Lead Agency: Wastewater Advisory Council* (2.7.4 #28)

#### **Recommendations — Policy**

##### **High Priority — Policy:**

##### **Type I**

- ◆ Advocate cover crop program. (2.7.4 #29)
- ◆ Support implementation of phytase feed lines by all integrators on the shore by year 2003. (2.7.4 #30)
- ◆ Identify the areas where a significant amount of ground water is being consumed and the Department has little or no water-quality data. (2.7.4 #31)

- ◆ Finalize and implement pollution control strategies to meet established TMDLs for Indian River, Indian River Bay, and Rehoboth Bay. (2.7.4 #32)
- ◆ Develop and implement storm-water-monitoring plan. (2.7.4 #33)
- ◆ Develop depth-to-ground-water maps for the entire state that highlight areas with an extremely shallow water table (2.1.6 #3, 2.2.6 #16)
- ◆ Review irrigation well water-quality for nutrient loading. Incorporate in management plans. (2.2.6 #17)
- ◆ The Department should closely monitor Maryland's *Pfiesteria* Action Plan, as it contains proposed land-based solutions to the overall nutrient-loading problem. (2.7.4 #34)

##### **Type II**

- ◆ The Department should encourage Sussex County to have a (two or three year) sunset time of rezoned and subdivided land in the non-urban growth areas of this Basin. Land in urban growth areas should have a longer time span for initiating new construction on rezoned land. (2.9.7 #1)
- ◆ Focus nutrient management plans for intensive animal-based agriculture on farm-scale nutrient balance rather than exclusively on field-scale crop response to nutrients applied in animal wastes. (2.7.4 #35)

##### **Medium Priority — Policy:**

##### **Type I**

- ◆ Targeted ground-water monitoring should be incorporated more frequently into BMP implementation projects. If possible, monitoring plans should be developed to discern short-term effects and predict long-term trends to provide a better indication of implementation impact. (2.7.4 #36)
- ◆ Determine ground-water system lag time in various sites throughout the state. This could be very helpful in establishing timetables to see results of Pollution Control Strategies. (2.2.6 #1, 2.7.4 #37)
- ◆ Develop a combined strategy to coordinate ground-water sampling and share analytical data. (2.2.6 #2)

##### **Type II**

- ◆ Encourage update of town plans. DNREC, in conjunction with the Office of State Planning Coordination and the Sussex County Planning Department. (2.9.7 #2)
- ◆ When and where construction is needed, encourage infill to existing developed areas rather than develop-

ment of “green” spaces. Continue to work with communities to encourage the protection of stream corridors. (2.9.7 #3)

### **Low Priority — Policy:**

#### **Type I**

- ◆ Obtain grants to repair or replace malfunctioning septic systems in environmentally sensitive areas. Incorporate innovative technologies where appropriate. (2.7.4 #38)
- ◆ Refine regional ground-water flow data with information from all possible sites. (2.2.6 #3)
- ◆ Determine more accurate base-flow loading for impacted streams; compare ground-water and surface-water data for interactions. (2.2.6 #4)
- ◆ Analyze up-gradient well data from monitored sites to see if there are any regional trends in ground-water quality. (2.2.6 #5)

### **3.1.1.4 Implemented Projects and Pollution Control Strategies**

Although action is needed on all of these recommendations to better manage nutrients throughout the Basin and the state, the following recommendations were acted upon and are currently in varying stages of implementation. While the first two recommendations-turned projects were conceptualized, planned, and funded as a direct result of the Chesapeake Basin Assessment effort, they have had a direct impact on the Inland Bays/Atlantic Ocean Basin, as well as the other basins within the state. The atmospheric deposition study was implemented and funded by the Inland Bays/Atlantic Ocean Team and its associates because it provided a vital piece of information for the Basin’s TMDL effort.

- ◆ As the state moves to implement TMDLs and Pollution Control Strategies it is very important that the lands the government owns or controls be managed properly. Therefore, all agricultural lands owned by state and federal governments must be assessed and have comprehensive conservation plans developed for them. These plans should then be incorporated into the land lease agreements and daily management practices. (2.7.4 #39)
- ◆ With the widespread nutrient inputs throughout the Basin, it is important to locate all of the various sources accurately so that local action can be taken. In particular, as population increases in rural areas, septic systems are installed to dispose of the waste. The regional density of these systems and their proximity to sensitive resource are important pieces of the nutrient management puzzle. Therefore, all septic system in basins (state) should be mapped using aerial photography. This information, when placed GIS format, should be used to answer more specific questions about system placement and density. (2.7.4 #40)
- ◆ Atmospheric deposition is proving to be a major contributor to acidification, nitrogen loading, and toxification of waterways. There is currently little or no specific information on the impact of atmospheric deposition to the Inland Bays/Atlantic Ocean and other Delaware basins. It is recommended that options be explored for acquiring the necessary resources to conduct computer modeling and other research to quantify the impact of atmospheric deposition on the Inland Bays/Atlantic Ocean and other basins. (2.7.4 #41)
- ◆ Incorporate septic mapping data in the development of Pollution Control Strategies (2.7.4 #42)

## 3.2 SENSITIVE RESOURCES

The Inland Bays/Atlantic Ocean Basin Team has identified a number of very diverse resources in the Basin as being “sensitive.” These sensitive resources can include living resources such as endangered species or fragile habitat, but also include items as diverse as open space, drinking-water supply areas, or even scenic rivers. The Inland Bays/Atlantic Ocean Basin contains some of the most picturesque areas in the state. Assawoman Wildlife Area, Burton’s Island, and the dunes at Cape Henlopen contain some of the Basin’s natural treasures. However, much of the Basin’s natural beauty has been degraded, as shorelines have become hardened and more areas have become developed. Habitat loss and degradation due to land-use practices are threatening the aesthetic qualities of the Basin and impacting many of its species. Rare and declining species are vulnerable to environmental change and alteration of habitat. Many species exist only in the protected portions of the watershed or rely on certain critical habitats for reproduction. This includes both rare and endangered species as well as those considered to be commercially and recreationally important. The locations of some of these critical habitats have not been identified and may be lost before protective measures can be imposed. Therefore, it is not only important to provide protection to known sensitive areas, but to those areas that have a high potential as well.

### 3.2.1 RESOURCE PROTECTION

Some of the state’s most valuable natural lands are located in this Basin. Many of these are still intact because most growth has occurred in other areas of the state. In a continuing effort to protect these resources, the Department and other non-profit organizations regularly evaluate these areas and rank them for acquisition or protection. In most cases, these rankings are based on existing data and are grouped with those from throughout the state. The Inland Bays/Atlantic Ocean Basin Team feels that this Basin should be evaluated more critically to protect pristine areas before they are lost.

#### 3.2.1.1 Surface Water, Ground Water, and Wetlands

Many of the water bodies in the Basin are considered to be of exceptional recreational and ecological value. These water bodies have a great impact on the character of this Basin. In fact, much of the recreation and almost all of the Basin’s truly natural areas surround these water bodies. Not only should they be protected, but some effort must be made to protect the ground water that provides much of their water. Ground water is the primary source of drinking water in the Basin and can account for

almost 80 percent of the stream flow. Many factors can help improve both surface and ground-water quality, one of which is the preservation of natural wetlands. These wetlands act as buffers and filters for many of the contaminants that would otherwise enter the ground-water/surface-water system. In addition, these wetlands provide vital habitat for many of the Basin’s endangered and threatened species. As one can see, this is a complex system that needs to be addressed comprehensively in order to protect many of the Basin’s sensitive resources.

#### **Recommendations — Surface Water, Ground Water, and Wetlands**

##### ***High Priority — Surface Water, Ground Water, and Wetlands:***

##### **Type I**

- ◆ Promote the acquisition and protection of wetlands and natural heritage sites. (2.3.7 #1 , 2.4.11 #11)
- ◆ Adopt department-wide comprehensive wetland plan. (2.4.11 #12)
- ◆ Delineate all source-water protection areas, such as wellhead areas and excellent recharge potential area. (2.2.6 #6)
- ◆ Restrict placement of docks, piers, and ramps in dead-end canals. (2.4.11 #13, 2.9.7 #4)
- ◆ All efforts should be made to limit further human disturbance of Delaware’s remaining Coastal Plain ponds. Research should be initiated to gain a better understanding of the geological origins and hydrological dynamics of Delaware’s Coastal Plain ponds. Additional inventories are needed to fully assess the presence of rare plant and animal species. (2.3.7 #2, 2.4.11 #14)

##### **Type II**

- ◆ Adopt statewide wetland mitigation policy. Include the concept of “Land Banking.” (2.4.11 #15)
- ◆ Establish wellhead protection ordinances, Best Management Practices, and/or regulations. (2.2.6 #7)
- ◆ Amend subaqueous land statute to go beyond high-water line by 50 feet. *Lead Agency: General Assembly* (2.4.11 #16)
- ◆ Implement the Inland Bays Water Use Plan. *Lead Agency: Center for the Inland Bays* (2.8.4 #1)
- ◆ Develop a series of Best Management Plans (BMPs) for all sources of erosion in order to keep sediment and nutrients out of wetlands, waterways, and the bays in general. Develop management plans to designate and develop riparian buffers and establish habitat criteria for maintaining said buffers. *Lead Agency: Nutrient Management Commission* (2.3.7 #3, 2.7.4 #43)

**Medium Priority — Surface Water, Ground Water, and Wetlands:****Type I**

- ◆ Identify intensive ground-water extractive use in areas that may have water availability issues. (2.2.6 #8)
- ◆ The location of all facilities with water allocations should be updated and a coverage created in the Department GIS similar to that created for public supply wells. (2.2.6 #9)
- ◆ As reservoirs of rare species in Delaware, every effort should be taken to protect the integrity of interdunal swale wetlands. (2.3.7 #4, 2.4.11 #17)
- ◆ Produce a brochure on bioengineering for shoreline stabilization. (2.3.7 #5)

**Low Priority — Surface Water, Ground Water, and Wetlands:****Type I**

- ◆ Accurately define all sub-cropping aquifer areas to help protect the deeper portions of these aquifers. (2.2.6 #10)
- ◆ Pursue better mapping accuracy for surface-water intakes including all irrigational uses. (2.2.6 #11)

**3.2.1.2 Riparian**

Riparian vegetation not only harbors rare species, but also acts as a buffer for adjacent aquatic habitat. Plant roots serve to stabilize banks and impede or filter nutrient laden run-off from entering directly into the surface water. When this habitat is destroyed or altered, there is a loss of plant and animal species and a degradation of water quality. The excess siltation resulting from improper bank management can smother fish egg masses and aquatic vegetation. For some species, this habitat is critical to their continued survival.

Current and existing land developments are often constructed without considering the protection of riparian habitat in the planning process. Many shore residents have installed bulkheads or other hard structures to retard bank erosion, a problem that could have been prevented if riparian buffers hadn't been destroyed. As riparian habitats continue to be destroyed and degraded, responsible management is lacking and protection of this habitat type is inadequate.

**Recommendations — Riparian****High Priority — Riparian Areas:****Type I**

- ◆ Develop model zoning ordinance favoring riparian protection. (2.9.7 #5)

**Type II**

- ◆ Require buffers in urban and agricultural areas to provide habitat, improve the aquatic environment, and filter run off. *Lead Agencies: Sussex County and Municipalities & Nutrient Management Commission.* (2.8.4 #2, 2.9.7 #6)

**Medium Priority — Riparian:****Type I**

- ◆ Encourage waterway management that incorporates wide buffers of natural vegetation, including stands of woody species when possible. (2.9.7 #7)

**Type II**

- ◆ The Department should work with Sussex County and the Basin's municipal governments to develop open-space ordinances that provide for recreation areas and buffer streams and other water bodies. *Lead Agency: Sussex County and Municipalities* (2.3.7 #6, 2.9.7 #8)

**3.2.1.3 Living Resources**

An undeniable fact within the Inland Bays/Atlantic Ocean Basin is that the species composition of the remaining natural areas has permanently changed. The 18th century direct habitat conversion of natural areas to agricultural use has altered a functioning natural landscape into a sprinkling of isolated islands and ribbons of natural areas in a sea of agricultural fields. Add to this the introduction of alien species, pollution, excessive sedimentation, altering of natural waterways, etc., and each natural area is further eroded. Therefore, it is imperative that efforts are made to protect the sensitive resources that *still exist* within this Basin and also throughout the state.

**Recommendations — Living Resources****High Priority — Living Resources:****Type I**

- ◆ The Statewide Wetland Mapping Project data should be compared with the Natural Heritage Inventory to identify areas where additional research and/or protection are needed. (2.3.7 #7, 2.4.11 #18)
- ◆ Restore Atlantic white cedar forests in watersheds where it was historically common and protect what remains. (2.5.9 #1)
- ◆ A policy of no additional loss of hard-clam bed area within the Inland Bays/Atlantic Ocean Basin should be established as a component of any review for marina and other waterfront development. (2.5.9 #2)
- ◆ On the Delmarva Peninsula, maritime forest and coastal scrub-shrub habitats provide critical habitat

for Neotropical migrant songbirds during spring and fall migration. Protection of this critical habitat through purchase and conservation easement should be a priority. (2.5.9 #3)

- ◆ Many species of Neotropical migrant songbirds require large tracts of mature upland forest for successful nesting. Protection of existing large forest stands should be a priority. Reforestation on state-owned lands to connect existing small stands should be undertaken when economically feasible. (2.5.9 #4)
- ◆ Care should be taken when creating habitat to make sure that other valuable habitat is not destroyed in the process. (2.3.7 #8)
- ◆ Promote resource conservation areas for reestablishment and protection of habitat. (2.3.7 #9)

#### **Type II**

- ◆ Identify restoration possibilities to increase connectivity between available habitats (include cooperative opportunities with Maryland). (2.3.7 #10)
- ◆ Discourage the use of invasive plant species as ornamentals. Also ask public land managers to only use native, non-invasive species on public lands. Ask land managers to incorporate the use of native plant species into recommendations given to private landowners. Although the landscaping business will probably continue to use exotic species for landscaping, the Department should advocate the use of native plant species as an educational policy. *Lead Agency: Invasive Species Council, Department of Agriculture* (2.5.9 #5)
- ◆ Support efforts to control noxious weeds while striving to educate the public that not all “weeds” are bad. Many native plant species, which compete with agriculture crops, have high wildlife value. Mowing to control noxious weeds is more disruptive to wildlife habitat, than careful, prudent spraying with herbicides. *Lead Agency: Department of Agriculture* (2.5.9 #6)
- ◆ Sussex County should enact an ordinance, similar to that of New Castle County, that gives Natural Areas special consideration in the land development process. (2.3.7 #29, 2.9.7 #24)

#### **Medium Priority — Living Resources:**

##### **Type I**

- ◆ As reservoirs of rare species in Delaware, every effort should be taken protect the integrity of interdunal swale wetlands (2.3.7 #4, 2.4.11 #17)
- ◆ The Delmarva Fox Squirrel population should be supplemented with additional animals. (2.5.9 #7)

- ◆ Protection of rookery sites within the Basin should be a high priority. Periodic surveys should be continued to monitor existing colonies and seek new ones. All efforts should be made to limit human disturbance of established colonies through education and signage. (2.5.9 #11)

#### **3.2.1.4 Department Policy and Future Direction**

Protecting the sensitive resources in the Inland Bays/ Atlantic Ocean Basin requires a coordinated effort between numerous parties. In some instances, this coordination occurs smoothly, while in other instances there are many obstacles. The Department needs to evaluate many of its policies with regards to protecting these resources and initiate the appropriate actions within and outside the agency.

#### ***Recommendations — Policy***

##### ***High Priority — Policy:***

##### **Type I**

- ◆ The Department needs to assess the cumulative impacts of the development of individual parcels of property. Currently, there is no coordination of the numerous permitting processes for well construction, sewage disposal, storm-water runoff, wetlands construction, subaqueous lands construction, coastal zone consistency, and others. A developer may be able to comply with all of the requirements of these individual programs but when looked at as a whole, the impacts may be unacceptable. (2.3.7 #11, 2.9.7 #9)
- ◆ Open a dialogue with the Office of State Planning Coordination on better definition of “critical area” in the Land-Use Planning Act. Develop a critical areas map that includes vital natural, cultural, and economic resources. This map could include category I wetlands, rare species, riparian corridors, shellfish beds, spawning areas, and other locations with vital natural resources. (2.9.7 #10)
- ◆ Condition Shoreline Protection Permits such that all shoreline protection structures are based on documented and demonstrable need (e.g., evidence of substantial erosion that requires that class/level of erosion control) and that the mitigation measures have the least adverse impact on the shoreline habitat and its living resources. Mitigation measures should consider a tiered approach using innovative accepted biological measures prior to more aggressive mechanical/engineered solutions (riprap, bulkheads, groins, etc.). Promote natural shorelines and buffers around the shorelines of the bays and its tributaries. Develop a set of public brochures illustrating the benefits to both the landowner and the

living resources stressing the enhanced quality of life to all concerned. (2.3.7 #12)

- ◆ Develop a suite of aquatic resource benchmarks that will define living resource habitat/water-quality conditions (both status and trends) of the Inland Bays. These will consist of living resource keystone or resident important species (RIS) In addition, standard water-quality parameters as well as macrobenthic biometrics will be utilized in the overall assessment suite. (Look at what benchmarks are being used elsewhere, such as the Chesapeake Bay.) *Lead: Coastal Management & Center for the Inland Bays* (2.2.6 #12, 2.3.7 #13)
- ◆ Develop and refine a plan to deal with excessive macroalgae. This would consist of early season macroalgae surveillance in order to determine the size and causal mechanisms that will lead to the development of a management plan to control excessive deleterious outbreaks. Harvesting of nuisance macroalgae should minimize by-catch of crabs and fish. (2.2.6 #13, 2.3.7 #14)
- ◆ Recognize the value of relic shoals when looking for borrow sites for beach nourishment projects. (2.3.7 #15, 2.5.9 #15)
- ◆ Minimize dredging activities other than necessary maintenance. (2.3.7 #16)
- ◆ Do not allow overboard disposal of dredge spoils. (2.3.7 #27)
- ◆ Do not allow any new spur channels. (2.3.7 #17)
- ◆ Deep channels should be avoided since increasing the depth of the water, and thus bottom depth, prevents sufficient sunlight from reaching the new bottom depth, taking that portion of the bay's bottom out of primary production. (2.3.7 #18)
- ◆ Encourage re-use of dredge materials and disposal of spoils on uplands. (2.3.7 #19)
- ◆ Develop BMPs for disposal sites. (2.3.7 #20)
- ◆ Where frequent dredging is needed, determine source of sediment and take care of the source. (2.3.7 #21)
- ◆ Every effort should be made to retain the natural state of riparian and shallow-water areas of the Basin. In addition, consideration should be given to restoring degraded shoreline in an attempt to improve the water quality and living resources of the Inland Bays. (2.3.7 #30)
- ◆ Efforts need to be made to limit any further loss of bay shoreline habitat and to retrofit or replace lost habitat with more environmentally appropriate solutions. (2.3.7 #31)
- ◆ All efforts should be made to protect mature hardwood and mixed forest in the Basin. Landowner

involvement in forest/habitat conservation programs available through the Delaware Division of Fish and Wildlife and the Delaware Department of Agriculture should be actively marketed. Acquisition of quality forest tracts by state, federal, and private conservation agencies by conservation easement or outright purchase should be aggressively pursued. (2.3.7 #32, 2.5.9 #16)

### **Type II**

- ◆ The Department should more actively seek agreement with the Office of State Planning Coordination on the definition of what is "more than local concern" and therefore trigger reviews under LUPA to protect open space. (2.9.7 #11)
- ◆ Development of lands within State Resource Areas, Natural Heritage Sites, Natural Areas Inventory, and Old Growth Forests should be discouraged. (2.9.7 #12)
- ◆ Sensitive areas should be accorded special status and given special attention when a development is proposed on or adjacent to such an area. It is recommended that state and local governments care for these areas. Their actions and decisions should reflect a major commitment toward protecting and conserving these resources. (2.3.7 #22, 2.9.7 #13)
- ◆ Implement requirements for buffer zones along streams to protect prehistoric and early historic period archaeological sites. (2.9.7 #14)
- ◆ Develop a program to require offsets for economic development projects that have adverse impacts on the environment. *Lead Agency: Cabinet Committee on State Planning Issues* (2.9.7 #15)
- ◆ Prepare for climate change and sea-level rise by practicing retreat. Setback requirements should be increased along the shoreline. *Lead Agency: Sussex County* (2.1.6 #1, 2.9.7 #16)
- ◆ Require environmental impact statement or LUPA review of new golf courses. *Lead Agency: Office of State Planning Coordination* (2.8.4 #3, 2.9.7 #17)

### **Medium Priority — Policy:**

#### **Type I**

- ◆ Establish historic review boards, such as the one in New Castle County, which will result in proactive measures to preserve historic buildings and efforts to record important features of those that cannot be preserved. (2.5.9 #8, 2.9.7 #18)
- ◆ Increase farmer enrollment in programs to develop bobwhite quail population. (2.5.9 #14)
- ◆ The Department should continue to participate in any sub-regional planning effort to incorporate the big environmental picture. (2.9.7 #19)

- ◆ Promulgate regulations to prohibit new dead-end canals and all other man-made water bodies that do not possess those flushing and circulation characteristics that will maintain optimal water quality and habitat in order to maintain a healthy, functioning aquatic biotic community. (2.2.6 #14, 2.3.7 #23)
- ◆ Delaware should develop an ocean resources plan to facilitate land and water uses of benefit to the state such as preserving the highest-valued fish and shellfish habitat and using offshore sand from designated areas for beach replenishment. (2.6.6 #1)

### Type II

- ◆ A dedicated effort to improve and enforce county comprehensive plans must be made in the future to prevent further degradation of natural resources in the state. (2.9.7 #20)
- ◆ Residents of the Inland Bays/Atlantic Ocean Basin, and throughout Sussex County, are underserved in recreation. Increase Sussex County recreational program infrastructure. *Lead Agency: Sussex County* (2.8.4 #4)
- ◆ The Office of State Planning Coordination and Sussex County, with the towns of the Basin, should develop a “growth issue” database to monitor development issues. A GIS type system should be considered. Such a database could track building permits, zoning changes and other growth issues. *Lead Agency: Office of State Planning Coordination* (2.9.7 #21)

## 3.2.2 RESOURCE CHARACTERIZATION

Although the eastern portion of the Inland Bays/Atlantic Ocean Basin is highly developed, much of this Basin is still relatively rural, agricultural, or undeveloped. As population increases and development pressures expand westward, many sensitive resources may become threatened. This development creates additional pressures on the already impaired bays and their resources. Therefore, it is vital to adequately characterize these resources prior to this development pressure so that well-informed decisions can be made to implement appropriate and comprehensive protection strategies.

### 3.2.2.1 Surface Water, Ground Water, and Wetlands

The Inland Bays/Atlantic Ocean Basin team defines the sensitive resources in this Basin as including not only the traditional endangered species, but also certain natural features and properties. For instance, ground water, which is the Basin’s primary source of water for both drinking and irrigation purposes, is deemed sensitive because of the potential for severe degradation from many human

activities. Additionally, many rivers, streams, and wetlands, which serve as crucial environmental buffers and habitats, are also appreciated for their aesthetic value and are therefore categorized as sensitive resources.

### **Recommendations — Surface Water, Ground Water, and Wetlands**

#### ***High Priority — Surface Water, Ground Water, and Wetlands:***

##### **Type I**

- ◆ Complete recharge-potential mapping for the rest of the state. This mapping shows areas where water and/or contaminants can rapidly enter the ground water. (2.1.6 #2, 2.2.6 #15)
- ◆ Develop depth-to-ground-water maps for the entire state that highlight areas with an extremely shallow water table. (2.1.6 #3, 2.2.6 #16)

#### ***Medium Priority — Surface Water, Ground Water, and Wetlands:***

##### **Type I**

- ◆ Identify intensive ground-water extractive use in areas that may have water availability issues. (2.2.6 #8)
- ◆ The location of all facilities with water allocations should be updated and a coverage created in the Department GIS similar to that created for public supply wells. (2.2.6 #9)

#### ***Low Priority — Surface Water, Ground Water, and Wetlands:***

##### **Type I**

- ◆ Accurately define all sub-cropping aquifer areas to help protect the deeper portions of these aquifers. (2.2.6 #10)
- ◆ Better mapping accuracy for surface water intakes including all irrigational uses. (2.2.6 #11)

### 3.2.2.2 Living Resources

In many ways, our living resources reveal more about the state of our environment than any other factor. Our native species are generally the first indicators of change or disruption. They experience first-hand the direct impact of habitat loss, degraded air and water quality, and competition from exotic species. In particular, studies of rare and declining species can play special roles as environmental indicators. These are often the species most sensitive to environmental change and habitat degradation, and hence can bring the first hints of environmental impact.

With development pressure increasing, it becomes more urgent that these sensitive living resources be accurately characterized throughout the Basin.

### ***Recommendations — Living Resources***

#### ***High Priority — Living Resources:***

##### **Type I**

- ◆ A survey of the Inland Bays/Atlantic Ocean Basin should be conducted as soon as possible to identify remaining upland forests and to evaluate the quality of these areas using such factors as biodiversity, size, age, and exotic infestation. Appropriate actions should then follow, such as natural area designation for qualifying tracts, legal protection, and/or restoration. (2.3.7 #24)
- ◆ A survey of rare habitats should be conducted and summarized. Appropriate actions should be taken to protect these areas, including natural area designation for qualifying tracts, legal protection, and/or restoration. (2.3.7 #25)
- ◆ Incorporate Delaware Natural Heritage Program databases with other planning databases, including those in Maryland, so that rare species are identified prior to development. (2.3.7 #26)
- ◆ Protection of rookery sites within the Basin should be a high priority. Periodic surveys should be continued to monitor existing colonies and seek new

ones. All efforts should be made to limit human disturbance of established colonies through education and signage. (2.5.9 #11)

#### ***Medium Priority — Living Resources:***

##### **Type I**

- ◆ Funding should be sought for increased surveys in potential habitat for tiger beetles. (2.5.9 #9)
- ◆ Increased funding for additional Nongame and Endangered Species Program seasonal biologists to provide better monitoring of beach-nesters as well as increased predator control might result in increased beach-nester productivity. (2.5.9 #10)
- ◆ Freshwater mussels are good indicators of water quality. A survey should be conducted in Inland Bays tributaries. (2.5.9 #12)
- ◆ Continue monitoring existing bald eagle nests and aerial and ground surveys each year for new nest sites. (2.5.9 #13)
- ◆ Initiate an intensive monitoring program at productive amphibian breeding sites within the Basin to determine population trends. (2.3.7 #33, 2.5.9 #17)
- ◆ Monitor range expansion for nutria and develop a strategy for control and containment. Publish literature for landowners with nutria problems. (2.3.7 #34, 2.5.9 #18)

### 3.3 NON-NUTRIENT CONTAMINANTS

Chemical contamination from “classic” industrial sources and the potential threat of this contamination is not widespread in the Inland Bays/Atlantic Ocean Basin. The highest concentration of these sites occurs within, and immediately surrounding, the towns located in Sussex County. Leaking underground storage tanks (LUSTs) make up a majority of the sites with known contamination. Petroleum hydrocarbons are the chemical contaminants that most often are associated with these LUST sites. Contamination of nearby drinking wells is the most common concern regarding this type of contamination. Besides the LUST sites, there are a number of contaminated sites located throughout the Basin that are managed by other programs within the Department. For instance, the Site Investigation and Restoration Branch oversees the abandoned Sussex County landfills, while the Ground Water Discharges Section monitors community septic systems.

Chemical contamination from the use of agricultural pesticides and herbicides has not been fully characterized in the Inland Bays/Atlantic Ocean Basin. Also, there may be some legacy issues surrounding contaminated sediments of the Basin’s waterways; however, these are not adequately characterized either. Dead-end canals are of particular concern for chemical contaminants because they restrict natural flushing of the canal. While chemical contamination is of much less concern than the nutrient contamination that affects the Inland Bays/Atlantic Ocean Basin, existing data gaps inhibit the Department’s ability to definitively characterize the issue of Basin-wide chemical contamination at this time.

#### 3.3.1 RESEARCH AND INVESTIGATION

##### 3.3.1.1 Department Policy and Future Direction

###### Recommendations — Policy

###### **High Priority — Policy:**

###### **Type I**

- ◆ Do not allow overboard disposal of dredge spoils. (2.3.7 #27, 2.7.4 #44)

###### **Medium Priority — Policy:**

###### **Type I**

- ◆ Educate the public regarding the proper disposal of motor oil and household chemicals. Continue to support the efforts of the Delaware Solid Waste Authority in its household hazardous waste collection program. (2.7.4 #45)
- ◆ Adequate information currently exists to evaluate status and trends for the criteria pollutants: volatile

organic compounds, sulfur dioxide, nitrogen dioxide, carbon monoxide, and lead. Data collection and evaluation should continue unchanged. (2.7.4 #46)

- ◆ Due to the proximity of Conectiv’s fly-ash landfill to the Inland Bays, the Department should evaluate the effect of surface- and ground-water discharge from the landfill to Island Creek and Indian River Bay. (2.7.4 #47)

###### **Low Priority — Policy:**

###### **Type I**

- ◆ Evaluate the effect of maintenance dredging dead-end canals and the resulting redeposition of potentially contaminated sediments. (2.7.4 #48)
- ◆ Phase out CCA-treated lumber for shoreline stabilization in aquatic environments. (2.7.4 #49)
- ◆ National studies have shown that high ozone levels cause crop damage and reduce yield, thus adversely impacting our food supply and causing millions of dollars in losses to the agricultural community. Little or no information is available on the level of crop damage and associated impacts on the Inland Bays/Atlantic Ocean and other Delaware basins. It is recommended that options be explored for acquiring the necessary resources to study and quantify the level of crop damage and associated impacts in the Inland Bays/Atlantic Ocean Basin. (2.7.4 #50)

#### 3.3.2 EDUCATION AND PROTECTION

##### 3.3.2.1 Department Policy and Future Direction

###### Recommendations — Policy

###### **Medium Priority — Policy:**

###### **Type I**

- ◆ Aboveground storage tanks are currently unregulated; develop regulations for operation, spill/overflow protection, leak detection, tank testing requirements, and corrosion protection. (2.7.4 #51)
- ◆ Develop education process for owners of exempt Underground Storage Tanks about proper maintenance and leak detection to avoid become a regulated LUST. (2.7.4 #52)

##### 3.3.2.2 Implemented Projects and Pollution Control Strategies

The Inland Bays/Atlantic Ocean Basin Team recognized the need for increased public awareness about Basin-wide environmental issues. The ideas for placing

street signs stating that you are entering the Basin was brought forward along with a Basin-wide storm drain stenciling project. The Inland Bays/Atlantic Ocean Basin Team moved forward on the Basin project with the idea that the other basins will follow.

### ***Recommendations — Implemented Projects***

#### ***High Priority — Implemented Projects:***

##### **Type I**

- ◆ Implement a storm drain stenciling program to raise the awareness of the public concerning the relationship between storm-water runoff and river quality. (2.7.4 #53)
- ◆ Install road signs along major highways announcing that you are entering the Inland Bays Basin. (2.9.7 #22)
- ◆ Due to the nature and scope of the ozone problem it is essential that we continue to participate with other states, regional, and federal agencies on data sharing efforts. Delaware currently works with, and should continue to work with, other states, regional agencies, and EPA to communicate ozone data between the various states and agencies. (2.7.4 #54)
- ◆ Explore options for acquiring the needed support to produce comprehensive periodic inventories of SO<sub>2</sub>, PM<sub>10</sub>, TSP, lead, and toxics. (2.7.4 #55)
- ◆ Explore the options for acquiring the needed support to produce comprehensive periodic inventories of greenhouse gases. (2.7.4 #56)
- ◆ Develop a method to allocate area, mobile, and biogenic emissions to geographic basins, and graphically portray those emissions. (2.7.4#57)
- ◆ Evaluate the effect of maintenance dredging dead end canals and the resulting redeposition of potentially contaminated sediments. (2.7.4 #48)
- ◆ Phase out CCA treated lumber for shoreline stabilization in aquatic environments. (2.7.4 #49)
- ◆ National studies have shown that high ozone levels cause crop damage and reduce yield, thus adversely impacting our food supply and causing millions of dollars in losses to the agricultural community. Little or no information is available on the level of crop damage and associated impacts on the Inland Bays/Atlantic Ocean and other Delaware basins. It is recommended that options be explored for acquiring the necessary resources to study and quantify the level of crop damage and associated impacts in the Inland Bays/Atlantic Ocean Basin. (2.7.4 #50)