COMPREHENSIVE WATER-USE PLAN FOR DELAWARE'S INLAND BAYS

A report prepared for:

THE CENTER FOR THE INLAND BAYS

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EXECUTIVE SUMMARY

INTRODUCTION

Delaware's Inland Bays are faced with a number of problems that affect water quality, the bays' living resources, recreation and human safety, and the economic vitality of the watershed. To begin focusing on these problems in a comprehensive way, the Environmental Protection Agency (EPA) administrator designated Delaware's Inland Bays to the National Estuary Program in 1988. This designation provided a major boost to develop a comprehensive conservation and management plan to address the many concerns related to the degradation of the bays' resources.

In 1995 after many years of dedicated work by a variety individuals, work groups, and committees the Delaware Inland Bays Comprehensive Conservation and Management Plan (CCMP) was signed by the governor and the EPA administrator. With the adoption of this plan, a series of tactics to help restore and maintain the environmental health of the estuary were identified. A clearly identified tactic within the Habitat Protection Action Plan of the CCMP was the development of an Inland Bays Comprehensive Water-Use Plan.

BACKGROUND

Although many laws and regulations are in place to help control users and their activities in the inland bays' watershed, comprehensive water-use planning is often overlooked or not considered until serious problems arise. One way to deal with users and their activities is by developing a water-use plan. A water-use plan is designed to outline acceptable uses of the water to ensure that user conflicts and environmental impacts are minimized. The plan may allow for continued recreational uses of the water body, while attempting to sustain and maintain a biologically diverse aquatic community.

Although this water-use plan has links to many of the other goals listed in the CCMP, its focus is limited. Initially, the plan focuses on the activities currently occurring on the water (recreational boating in particular) and the impacts caused to the bays' natural resources by these activities. In addition, activities occurring on the lands immediately adjacent to the bays' shoreline are also considered.

The plan is designed to be flexible and dynamic to account for future changes in the bays' living resources or changes in human activity and impacts. Once the plan is adopted, periodic reviews will need to take place to determine if modifications or adjustments are needed.

RECREATIONAL USES OF THE INLAND BAYS

A number of studies have provided useful information about use activities of Delaware's Inland Bays. In addition, examining the growth of registered boats in Delaware is another means of estimating the use intensity in the inland bays region. For example, the number of registered boaters increased dramatically between 1965 (10,230 boats) and 1975 (24,557 boats); at a time when concerns began to be voiced about water-use activities in the bays. Significant increases in boat registrations also occurred between 1975 and 1985. There has been modest growth up to 1995 (42,542 boats) and this figure has remained relatively steady for the past few years.

The number of boats docked at marinas and private docks is another indicator of boating activity on the inland bays. In 1986, there were 45 commercial marinas (defined as having 10 or more slips) on the inland bays, offering some 5,384 boat slips. The number of boats kept at private docks remains unknown. However, it was estimated that approximately 1,000 boats were docked or moored around the bays during two overflights in 1986. Thus, the total number of boats kept on the water at either marinas or private docks, with direct access to the inland bays, is at least 7,500 in 1998.

Besides measuring total boating use, previous studies also tried to determine the location of recreation activities on the inland bays. Study approaches ranged from observing actual activity participation at different bay locations; to collecting information from marine patrol officers about preferred locations for various activities; to asking boaters in interviews to identify the locations of their boating activities.

Earlier surveys have consistently shown that there are major differences in the primary activities pursued on Indian River and Rehoboth Bays. Boat fishing, for example, was more popular on Indian River Bay than on Rehoboth Bay in studies conducted in 1989 and 1991.

Fishing from boats was largely absent from the northern half of Rehoboth Bay. This is most likely due to the fact that targeted species are not present in this section of the bay. Sailboarding and sailing were predominant in the northeast section of Rehoboth Bay, and clamming was the most popular activity in southeast Rehoboth Bay.

The makeup of activities within a given geographical area coupled with the physical characteristics of the area, also yields important implications for potential conflicts between activities. For example, the section of Indian River Bay nearest the Indian River Inlet is the most heavily used area on Indian River Bay. On Rehoboth Bay, the northeast quadrant appears to be the most conflict prone area, due to the high intensity and diversity of activity occurring there.

Previous studies have also suggested which activities are most likely to conflict with each other and also the areas of the bays where conflicts are most likely to occur. The Battelle Memorial Institute (1989) study assessed the potential for conflicts between activities. One useful tool, the Inland Bays Activity Area Requirements summarized some spatial requirements of both first-degree and second-degree water contact activities. This tool helps to understand the preferred open-water space needed by different activity groups. Additionally, an activity matrix rated the degree of possible conflicts between all possible combinations of interacting activities.

ENVIRONMENTAL IMPACTS OF WATER-BASED RECREATION

The inland bays are threatened by ever-increasing impacts from anthropogenic sources. Since the late 1950's, multiple-use activities which endanger the ecosystem have emerged. These uses include industrial water supply, wastewater disposal, commercial and residential development, agricultural practices, and various recreational uses and their related support systems. Much of the bays' pollution is attributed to non-point sources, since direct discharges are relatively few and are stringently regulated.

Additional studies and reports about the inland Bays, most notably the Battelle study, mention environmental impacts associated with recreational uses of the bays, in particular those

caused by recreational boating. These impacts can include: increased shoreline erosion and disturbance of bottom sediments leading to increased turbidity, fuel and oil spills, human waste discharges, and excessive noise.

The more serious environmental impacts facing the bays may be linked to high-use areas like marinas. Marinas can impact the environment, beginning with their construction and continuing throughout their operation and use. Construction operations such as dredging, dock installation, and onshore facility development have a wide-range of physical and biological impacts. In addition, valuable wetlands may be destroyed during marina-construction activities.

Dredging disrupts the bottom environment and elevates water-column turbidity by resuspending sediments. Turbidity reduces the penetration of sunlight through the water and can also impair filter-feeding organisms such as clams that rely on clean water. Resuspension of bottom sediment can also redistribute toxic substances into the water column. Disruption of the bottom
during dredging and positioning of pilings forces migrations of mobile species like fish and crabs and localized mortality of less mobile benthic species.

Shoreline-protection structures such as vertical bulkheads deflect incoming waves instead of absorbing them, as the former natural shoreline would have done. This deflection of waves can increase erosion downshore from the bulkhead, frequently creating a serious conflict between landowners. Improperly constructed bulkheads are subject to erosion and scour from the mudline as well as loss of fine material through joints and cracks.

Operations at marinas, after the initial construction phase can also lead to a series of negative environmental impacts. Fuel and oil contamination is common near marinas because of the variety of petroleum products used by boaters and service personnel. Secondary sources of fuel and oil contamination are from storm runoff from parking and boat-maintenance areas. Stormwater runoff from maintenance areas where boats are stripped and repainted is another source of contamination. Detergents used in boat washing can also contribute to environmental degradation.

Sources of fecal coliform bacteria around marinas include faulty septic systems or discharges from boat holding tanks. Although each marina may have a relatively low coliform input, low flush waters like the inland bays are highly susceptible to degradation through cumulative impacts. Several studies have been conducted to assess the effects of recreational boats in concentrated-use areas.

Like marinas, the environmental impacts associated with private dock development are highly correlated with the flushing characteristics of the area in which they are located. Other factors include number of boats and the type of facility. Overall, the environmental impacts of a dock (due to its smaller size) are less than for a marina, but the cumulative impacts of many docks within a given area could be significant.

In summary, recreational uses can cause many environmental impacts to the inland bays and their resources. Many of the above-mentioned impacts are unintended and can be controlled and prevented. However, bay users need to better understand the consequences of their activities since they may not be readily apparent.

THE PROCESS OF INVOLVEMENT

As with any plan that seeks to garner input and support from the affected user community, many stages are necessary to complete the intended task. This water-use plan was no different. The concept of a water-use plan has been discussed and worked on for a number of years. The public and affected users have voiced concerns and provided input through many different channels. The process employed in the development of this plan sought to give all interested parties the opportunity to participate.

Defining the key issues pertinent to the development of this water-use plan involved a number of steps. Initially, issues that had been examined previously, during other water-use planning sessions (such as during the CCMP development process) were considered for their current relevance. Secondly, important issues that had been identified in other water-use planning documents were examined and a determination was made as to whether they applied to Delaware's Inland Bays. If they were deemed appropriate they were considered and discussed along with other concerns. Most importantly, issues were raised by state resource managers, citizens, and other bay stakeholders during a series of meetings held during 1997 and 1998.

Overall, six planning meetings were held with interested stakeholders (open to the general public and public sector officials) to seek their input and solicit ideas on formulating the water-use plan. The meetings were designed to be iterative in nature, so that issues and concerns identified early in the process could be further discussed, clarified, and reviewed at subsequent meetings, and effective, workable solutions could be identified. Other meetings and work group sessions were also conducted during the study period to gain additional input from various groups and individuals. Through this process fifteen issues (or broad problem statements) were identified.

INLAND BAYS' WATER-USE ISSUES

The key issues and concerns that were identified and discussed regarding water-use activities on Delaware's Inland Bays are described below. They are organized into three classifications: Habitat Issues, Uses Issues, and Habitat/Use Issues.

Habitat Issues--Address impacts to the environment of the bays.

Issue #1 Degraded habitat areas (caused by human influences) results in an ecosystem less likely to support living resources.

Issue #2 Boaters cruising in shallow water areas cause bottom scouring, shoreline erosion and turbidity.

Issue #3 Inland bays' users enter resource protection areas and habitat restoration sites and cause damage to experimental test plots.

Issue #4 Marinas, boatyards, and other boating facilities are sites where pollutants are discharged into the bays' waters.

Issue #5 Inland bays' boaters are unfamiliar with the impacts of boat-related pollution on the bays' ecosystem.

Use Issues--Pertain to activities and water user concerns of safety, conflicts, or other human impacts.

Issue #1 PWC's are operated carelessly and safety concerns need to be addressed.

Issue #2 Increased private development (both residential and commercial) diminishes the public's access to the bays.

Issue #3 Boating congestion in certain areas of the bays decreases boater satisfaction and increases the potential for conflicts and accidents.

Issue #4 Existing navigation channels in the bays are not adequately maintained.

Issue #5 Unattended or unmarked recreational crab pots pose hazzards to watercraft and impact living resources.

Habitat/Use Issues--Related to both environmental and user concerns.

Issues #1 There are too few marine enforcement officers to adequately enforce existing laws and regulations in the inland bays watershed.

Issue #2 Buoys and markers for dredged channels are ineffective at directing boaters in the bays.

Issue #3 High speed boats, especially in narrow tributaries, cause shoreline erosion and safety concerns.

Issue #4 Un-restricted development of marinas, docks, and piers in the inland bays watershed causes negative impacts on the environment and may restrict the public s use of certain water areas.

Issue #5 Future increases in boating use on the bays may exceed an identified carrying capacity for the resource.

RECOMMENDATIONS AND ACTIONS

Recommendations and targeted actions are clearly identified that will help minimize environmental impacts, avoid user conflicts, and improve conditions related to water-use activities in Delaware's Inland Bays. The actions are grouped according to specific approaches for organizational purposes. These approaches include: Enforcement, Education/Awareness, Administrative, Regulatory, Waterway Improvement, and Other.

The following recommendations and actions were developed with the input of many individuals. There were strong feelings by many citizens and residents that the actions must be addressed to continue meeting the overall goals outlined in the CCMP. Views were also expressed that some of the actions were unenforceable or that they would be difficult to address due to a variety of reasons. It is anticipated that the proposed water-use plan implementation committee will review these actions and arrive at plausible solutions.

Enforcement Actions -- These actions direct DNREC enforcement personnel to engage in new or stronger enforcement actions relative to water-use activities in the bays. They may also support current enforcement efforts presently underway.

1. Hire additional marine enforcement staff to supplement existing patrols. Additional staff should be assigned to the inland bays to enforce current laws and regulations.

2. Continue presence of marine enforcement staff at potential "trouble spots" on peak weekends during the summer months.

3. Once sensitive aquatic habitats have been identified and marked in the bays and speed limits have been imposed, they should be enforced to protect fragile resources.

4. Increase the presence of marine enforcement staff near habitat restoration sites and resource protection areas to prevent bay users from disturbing them.

5. Continue patrolling areas of high personal watercraft (PWC) use to monitor operators and insure safe operations, as use continues to increase in the bays.

6. Continue enforcing blue crab regulations, especially with regard to crab pot placement and retrieval, to insure the crab resource is protected and boaters can navigate safely in marked and unmarked waterways.

Education/Awareness Actions -- These actions target further education and awareness activities to better inform bay users about certain conditions in the inland bays. They instruct various organizations or agencies to take a proactive approach to educating groups and individuals.

1. Identify sensitive shallow water areas, install signs marking the areas, and propose speed limits to deter boaters from speeding through sites at full speed.

2. Prepare educational materials informing the boating public about preventing negative impacts to shallow water areas in the bays.

3. Improve signage marking resource protections areas and habitat restoration sites and provide explanations for why the areas need to be left undisturbed.

4. Post signage at public access ramps to inform trailerable boaters (many who are non-residents) about resource protection areas and habitat restoration sites and describe ways they can improve the environmental quality of the bays.

5. Prepare and distribute educational materials with information about resource protection areas and habitat restoration sites.

6. Provide outreach services to marina and boatyard operators needing assistance in complying with environmental regulations.

7. Conduct an educational program to help boaters to better understand navigation channel buoy markings on the bays.

8. Develop and distribute general educational materials targeted to boaters and other bay users that addresses any waste, litter, and pollution impacts that they may cause.

9. Disseminate educational messages on water-use activities and habitat issues through various media sources (television, radio, local newspapers, fact sheets, etc.) to reach residents and non-resident audiences during the peak summer months, when activity levels are the greatest.

10. Expand educational materials targeted to PWC operators, since they are often identified as not adhering to the "rules of the road", and require additional education for all operators.

11. Publish a public access guide that highlights access opportunities to the bays for residents and visitors.

12. Educate boaters about boating in crowded waterways. Educational messages should focus on safe speed limits, proper boat handling, and "rules of the road".

13. Develop an educational brochure identifying pumpout/dump stations in the inland bays watershed.

Administrative Actions -- These actions focus on planning, management, or research-related activities that need to be addressed, primarily by DNREC personnel to resolve water-use concerns in the bays.

1. Inventory and map sensitive shallow-water areas in the bays, and other high value resource areas, to identify resources needing protection from human disturbances.

2. Review marina and boatyard operation and maintenance (O&M) plans in a prompt manner when they are submitted.

3. Review all current no-wake areas in the inland bays and develop a policy to address future area designations.

4. Continue to monitor the effectiveness of ongoing regulations and education programs targeted to PWC operators.

5. Complete a public access inventory for the state and the inland bays region, in particular.

6. Acquire available waterfront property to insure public access to the bays is maintained and enhanced.

7. Identify areas around the bays suitable for developing fishing and crabbing piers.

8. Investigate the use of additional Delaware Department of Transportation end-of-road, right of ways for boater access.

9. Expand current state access sites if adjoining properties become available.

10. Monitor special use zones (areas historically used by certain user groups) where concentrations of similar activities are prominent and insure these traditional uses are not displaced.

11. Identify land and water areas in the bays that can be termed Areas of Critical Environmental Concern. These areas would require a higher level of environmental review before allowing any development to occur.

12. Review the current inland bays dredge plan and take steps necessary to address changes to insure safe navigation on the bays.

13. Explore dredging techniques that include new technological approaches for removing nutrients from the bays.

14. Insure that the CCMP tactic related to updating the dredge plan is implemented in a prompt and efficient manner.

15. Continue to monitor the social impacts of increasing bay uses to identify user conflicts, safety concerns, and levels of satisfaction among users.

16. Develop a plan to address the bays' carrying capacity to support various water-use activities as use levels continue to increase.

17. Create a no discharge zone for the inland bays watershed.

Regulatory Actions -- These actions recommend imposing additional regulations or encouraging stronger compliance of existing regulations. Protecting personal property and safeguarding sensitive bay ecosystems are the primary focus of the actions.

1. Impose regulations that restrict the speed of watercraft in sensitive aquatic areas to protect living resources and sensitive habitat.

2. Impose no-wake or minimum-wake zones where impacts to personal property or plant and animal life are identified throughout the bays.

3. Expand no-wake designation in narrow, heavily-traveled tidal creeks and streams to include those areas not already covered by current regulations.

4. Restrict powerboats from those unique areas identified as critical bay ecosystems supporting living resources and serving as spawning, feeding, or nursery areas.

5. To encourage natural shoreline protection methods, amend the state Subaqueous Lands Act regulations to prohibit the construction of vertical bulkheads around the inland bays, except in areas where there are no alternatives. This would also include denying permits for replacement of existing structures when they fail.

6. Develop a policy of "no-net loss" of accessible clam bottom to protect clamming opportunities from shoreline development impacts.

7. Impose regulations that require biodegradable escape panels on crab pots to allow non-targeted species, such as turtles and fish, to escape.

Waterway Improvement Actions -- These actions focus on navigation improvements in the bays to better assist boaters and other users avoid conflict, improve safety, and minimize adverse impacts to the resource.

1. Investigate the need for additional buoys in the bays to properly mark navigation channels and insure boating safety.

2. Determine whether existing channel markers require improved maintenance and whether lighted buoys are desirable to improve nighttime navigation.

Other Actions --These actions are general in nature, yet are still beneficial to address water-use activities and concerns in the bays.

1. Form a bay volunteer program, with volunteers cruising the bays on boats or stationed at access points to educate bay users about inland bays' laws and regulations.

2. Research and draft legislation that more clearly expresses the rights, both traditional and expansive, involved in the Public Trust Doctrine. This should focus on enabling regulatory amendments to existing laws, related to inland bays' uses, to better categorize public trust uses and to prioritize them.

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No doubt there are a number of individuals who have been supportive of this effort over the past two years that we have overlooked in our acknowledgments. To those individuals, we also extend a special thank you. Finally, our hopes are that this water-use plan will provide an initial "blueprint" to help resource managers, elected officials, residents, and visitors safeguard the resource and insure that it remains a healthy and safe environment for all to enjoy for generations to come.

FOREWARD

Delaware's Inland Bays are faced with a number of problems that affect water quality, the bays' living resources, recreation and human safety, and the economic vitality of the watershed. Many of these problems are well-documented. One of the earliest studies in 1969, commissioned by Governor Russell W. Peterson entitled, *Environmental Study of the Rehoboth, Indian River, and Assawoman Bays,* documented some of the environmental degradation that was occurring and proposed a number of recommendations. With the passage of the Federal Water Pollution Control Act Amendments of 1972, additional attention was directed to the water quality issues affecting the bays. In 1983, the University of Delaware Sea Grant report, *Decisions for Delaware: Sea Grant Looks at the Inland Bays,* provided a detailed analysis of five major environmental problems affecting the bays and offered a proposed strategy to overcome them. One of the key recommendations of the report was the establishment of a Governor's task force on the inland bays. This task force was appointed in 1983, and their final report, *Protecting Delaware's Inland Bays: Charting a Course for Change,* further clarified the major issues affecting the bays' environmental quality and identified 46 recommendations that needed to be addressed. As the task force completed its charge, a governor's appointed Inland Bays Monitoring Committee was formed to oversee the implementation of the recommendations.

In 1988, The Environmental Protection Agency (EPA) administrator designated Delaware's Inland Bays to the National Estuary Program. This designation provided a major boost to develop a comprehensive conservation and management plan to address the many concerns related to the degradation of the bays' resources. Another notable effort begun in 1990 that focused on reversing the degradation affecting the bays was the Inland Bays Recovery Initiatives. This results-oriented two year program demonstrated that by employing new management techniques and pollution prevention strategies, partnerships with many individuals could be forged to help solve the problems facing the bays.

Though most of the attention of the early reports and activities focused on water quality and other environmental concerns, considerable attention started being directed towards recreational use concerns in the 1980's. The Greeley-Polhemus Group Inc. completed a report entitled, *Recreation Survey of the Inland Bays* in 1986. In 1989, Hollander, Cohen Associates, Inc. surveyed county residents on a number of issues related to their use of the bays. By 1990, The Battelle Memorial Institute had completed their water-use plan and marina impact assessment study. This study was the first attempt to identify use-conflicts in the bays and environmental impacts caused by users. The University of Delaware Sea Grant Program completed an exhaustive study of boaters using the bays in 1992. This study identified safety and crowding issues facing boaters, as well as environmental issues and management concerns.

Finally, in 1995 after many years of dedicated work by a variety of individuals, work groups, and committees the Delaware Inland Bays Comprehensive Conservation and Management Plan (CCMP) was signed by the governor and the EPA administrator. With the adoption of this plan, a series of tactics to help restore and maintain the environmental health of the estuary were identified. A clearly identified tactic within the Habitat Protection Action Plan of the CCMP was the development of an Inland Bays Comprehensive Water-Use Plan.

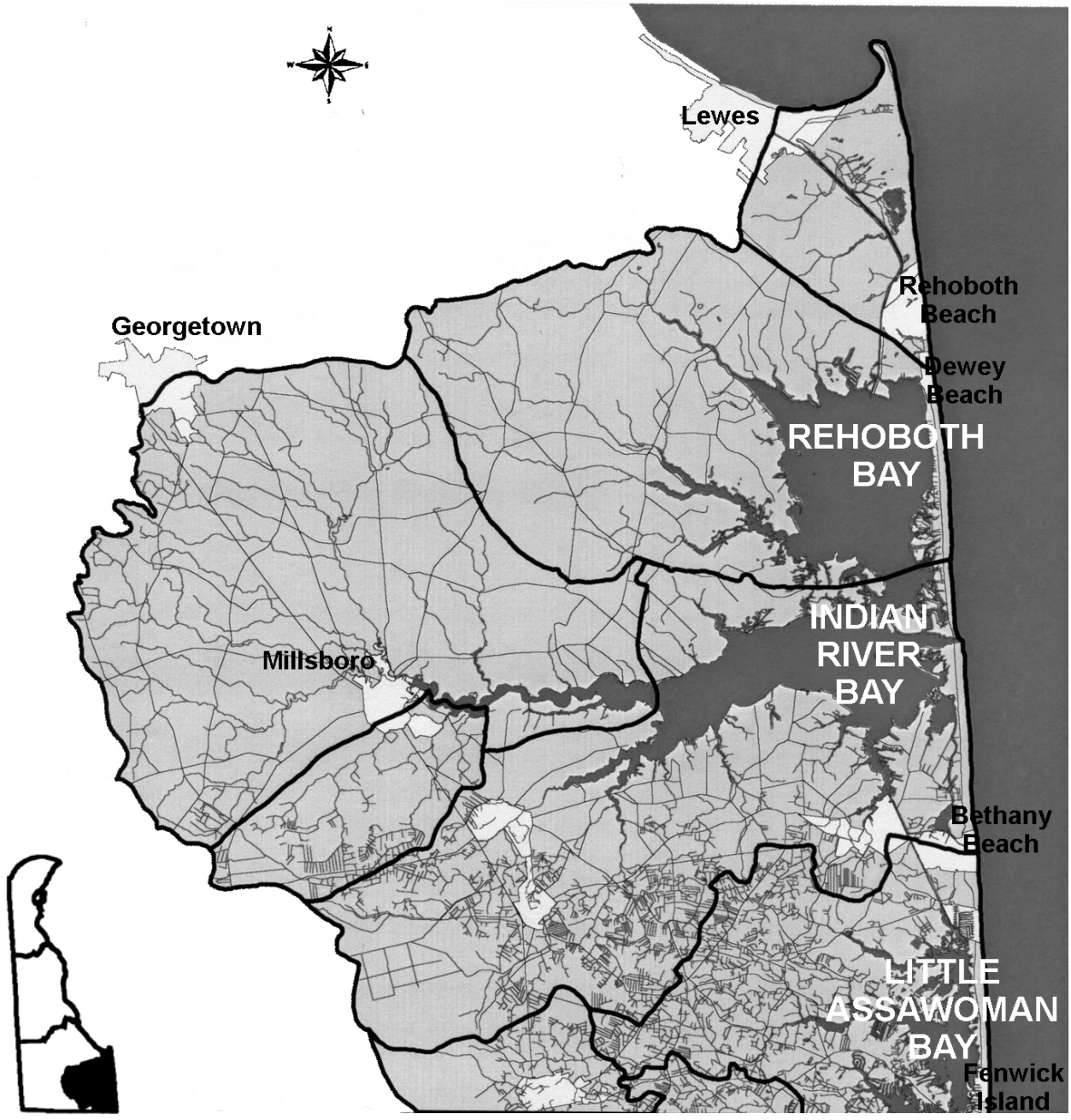


Figure 1. Delaware's Inland Bays Watershed

Section I

BACKGROUND

WHY A WATER-USE PLAN?

The population of Sussex County, Delaware is projected to increase by 35% to 181,197 by the year 2020.

With the population of Sussex County, Delaware projected to increase by 35% to 181,197 (Delaware Population Consortium, 1998) by the year 2020 and tourism growth in the coastal areas of the county also continuing to rise, the demands on the resources of the inland bays will continue to escalate. This increase in growth and resource use requires careful planning to insure that negative environmental impacts are minimized and user safety is insured. Although many laws and regulations are in place to help control users and their activities, comprehensive water-use planning is often overlooked or not considered in many resource management plans until serious problems arise.

The development of a water-use plan was one of the nine key goals addressed in the Delaware Inland Bays CCMP. Other planning elements included establishing and implementing a comprehensive non-point source pollution control plan, a comprehensive wastewater management program, and a shoreline protection program that addresses both natural processes and human activities. This water-use plan tactic is strategically placed under the Habitat Protection Action Plan within the CCMP to ensure the ecosystem's natural resources are given priority status. Valuable aquatic habitats, living resources, and human activities are all to be considered in the plan.

The water-use plan is designed to outline acceptable uses of the water to ensure that user conflicts and environmental impacts are minimized.

The water-use plan is designed to outline acceptable uses of the water to ensure that user conflicts and environmental impacts are minimized. The plan allows for continued recreational uses of the water body, while attempting to sustain and maintain a biologically diverse aquatic community. The planning process has attempted to reach consensus between the public and private sectors to develop action items to achieve the identified goals. In order to ensure that this water-use plan becomes an action plan, all bay stakeholders were invited to become involved. The stakeholders included private citizens, individuals with a business interest in the bays, representatives from state, county, and local governments, and others who were interested in the long-term future of the bays. Fact-finding meetings, public workshops, and other informal gatherings were held to discuss the key issues which were vital to the development of the plan. The recommended actions are based on common sense and practical solutions to resolve identified conflicts.

The Battelle Memorial Institute report entitled, *Delaware's Inland Bays: Water-Use Plan and Assessment of Marina Impacts* was one of the first attempts at reviewing activities and identifying use impacts on the bays. In addition to describing many of the key users and activities in the bay region, the authors also prepared an activity conflict matrix to summarize many of the conflicting interactions between activities. The report did not, however, recommend specific actions or management strategies to resolve the identified conflicts. There is much useful information in the report and it has provided a solid base from which to begin developing this plan.

The plan is designed to be flexible and dynamic to account for future changes in the bays' living resources or changes in human activity and impacts.

Many other study findings have been reviewed and appropriate elements were helpful in developing the plan. Foremost among these studies is the three volume *Florida Keys National Marine Sanctuary: Final Management Plan and Environmental Impact Statement, NOAA (1996).* This comprehensive plan provides a sound basis for managing use activities in a national marine sanctuary.

It was impossible for this water-use plan to address every issue that has an impact on the bays. Although the water-use plan has links to many of the other goals listed in the CCMP, its focus must be limited. Initially, the plan focuses on the activities currently occurring on the water (recreational boating in particular) and the impacts caused to the bays' natural resources by these activities. In addition, activities occurring on the lands immediately adjacent to the bays' shoreline are also considered (e.g. shoreline development activities).

As part of the planning process, many strategies and actions are recommended to help minimize conflicts and protect the bays' resources; regulation of users is only one approach that is considered. Other mechanisms include: stronger education and outreach efforts to encourage voluntary compliance by users, as well as continuing enforcement of current laws and regulations.

The plan is designed to be flexible and dynamic to account for future changes in the bays' living resources or changes in human activity and impacts. The success of any planning process should be evaluated on how the action items are eventually addressed. Where appropriate, various agencies or organizations have been targeted as the lead group to oversee the implementation of identified action items. Once the plan is adopted, periodic reviews will take place to determine if modifications or adjustments are needed.

KEY FACTS ABOUT DELAWARE'S INLAND BAYS

The following facts provide a baseline to begin understanding the multiple characteristics that make-up Delaware's Inland Bays.

Indian River Inlet is the only opening from the

bays to the Atlantic Ocean.

The inland bays are Public Trust waters that the Delaware Department of Natural Resources and Environmental Control is charged with managing and protecting for the citizens of the state.

- ✪ Inland bay waters are considered "ERES" (exceptional recreational and ecological significance) waters. These waters are accorded a level of protection greater than that provided most other state waters.
- ✪ Peak use of the inland bay's water is seasonal (May 15 - September 15) with intense use occurring on weekends and holidays, during the summer months.
- ✪ It is expected that water-use activities on the bays will increase in the future and the conflicting uses, if not addressed, will become more serious.
- ✪ The flushing rate for the bays is low. It takes approximately 90 days for the system to be completely recharged.
- ✪ The bays are relatively shallow and bottom features change periodically due to storms or other weather events.
- ✪ Current boating regulations are primarily designed to protect property and insure personal safety; however, environmental concerns are receiving increased attention.
- ✪ Additional shoreside development of piers, docks, and shoreline stabilization structures will continue to increase.
- ✪ Major tributaries within the inland bays (e.g. Love Creek, Herring Creek, Whites Creek, etc.) provide important habitat for fish and wildlife resources to spawn, nursery, and grow.
- ✪ Public access to bay waters will not keep pace with the increased demand, and may actually decrease as shoreline development continues.

- The use of 4-cycle outboard engines, which cause less pollution than 2-cycle engines, will continue to increase in the inland bays.

- Use activities will change in the future based on changing technology, new and different types of equipment, or changes in the resource base.

- As Delaware's Clean Vessel Act Program matures and marinas provide additional dump stations and pumpouts, concerns about boater wastes impacting the bay waters will be minimized.

Section II

INTRODUCTION

WATER-USE PLANNING

Carrying capacity is the level of recreational use an area can withstand while providing a sustained quality of recreation.

A number of water-use planning efforts have been developed for other water bodies around the country. A myriad of approaches have attempted to deal with human population increases and their resulting impact on natural resources and on each other. The overall goal in most of these plans is to protect the environment, improve water safety and user satisfaction (including increased access), and maintain and improve water quality. Nearly all of the plans are developed by public sector agencies or authorities, but all require maximum public input in the planning process.

One important concept, relative to water-use planning, that has been studied for a number of years is *carrying capacity*. There are many different ways to define this concept. But a general definition proposed by Wagar (1964) is the "level of recreational use an area can withstand while providing a sustained quality of recreation." Implicit in this definition, as well as other writings of the time, was recognition of at least two components of carrying capacity--a quality natural environment and a quality recreation experience. Although carrying capacity has traditionally been applied to land-based recreational activities, more recently attention has focused on a better understanding of water-based recreation. Most recent research emphasizes that carrying capacity is not an absolute number, but rather represents a range of values that must be related to the specific management objectives for a given area.

Although the issue of carrying capacity has been discussed for controlling activities on Delaware's Inland Bays it is not the focus of this plan. However, the plan does strive to insure environmental quality is maintained and positive recreational experiences are enjoyed by all users.

WATER-USE PLANNING IN DELAWARE: A CHRONOLOGY

To set the stage and better understand the bays and the uses that have historically occurred, a brief overview of previous studies and their findings is beneficial. As previously noted, several studies have been conducted in the inland bays region to examine individuals and groups who recreate on the bays' waters. Many of these efforts provide an excellent starting point to begin assessing what is known about inland bay users.

A 1986 study estimated that about 125,000 boat trips occurred on the bays during a 22-week season from May to October.

The 1969 environmental study of the Rehoboth, Indian River, and Little Assawoman Bays recognized that the waters were good fishing and shellfishing areas. The report further noted that the calm waters were ideal for pleasure boating and waterskiing. The report was critical of the changes taking place with regard to the quantity and quality of the bays' resources, as dredging was occurring to support the increasing number of recreational watercraft appearing on the waters of the bays (Delaware State Game and Fish Commission, et al. 1969).

Jensen and Weeks (1975) examined boating activity in the bays and estimated that more than 11,000 Delaware-registered boats were active in the inland bays. They also observed only about 200 boats actually underway or anchored on the bays daily (150 on Rehoboth Bay and 50 on Indian River Bay).

During the summer of 1986, The Greely-Polhemus Group interviewed 423 individuals engaged in various recreational activities on Delaware's Inland Bays. Approximately one-half of those interviewed participated in recreational boating during the season. About 74% of those interviewed said that they spent time fishing or crabbing in the inland bays during the season. The Indian River Inlet area was mentioned as a very popular fishing spot.

The Greely-Polhemus study observed nearly 400 boats on the inland bays on a warm, sunny holiday (Saturday, July 5, 1986) but also estimated that an average day may have 150 - 200 boats in use on the bays at any one time. The study also estimated that about 125,000 boat trips occurred on the bays during a 22-week season from May to October.

Hollender, Cohen Associates, Inc. (1989) conducted a telephone survey of 301 Sussex County residents and found that enjoying the scenery was the most popular recreational use of the inland bays (reportedly particpated in by 74% of those interviewed). The activities that followed included: swimming/sunbathing (44%), picnicking (41%), shore/dock fishing (39%), boat fishing (38%), other boating (28%), shore crabbing (36%), boat crabbing (25%), clamming (12%), waterskiing (11%), sailing (11%), windsurfing (5%) and jetskiing (1%). When residents were asked if any bay uses interfered with their enjoyment of the inland waters, 8% indicated motorboating, 5% mentioned jetskiing and 2% stated waterskiing. In contrast, 51% of these same respondents reported that they or members of their household were restricted in the uses they would make of the inland bays because of crowds and traffic congestion and 30% due to a concern for personal safety.

The Battelle Memorial Institute (1989) characterized use activities on the inland bays by identifying uses occurring, their impacts on the environment, and potential conflicts between uses. Though little primary data was generated,

the findings provided a thorough examination of water-use activity in the bays. A conflict matrix prepared by the authors provided an initial view of potential water safety concerns and conflict scenarios between various user groups.

A Delaware Sea Grant study in 1992 indicated that boaters overall had very satisfactory boating experiences in the bays and considered crowding to be moderate.

Falk, et al (1992) provided the most comprehensive view of boaters using the inland bays and the impacts they face, both environmentally and socially. More than 450 field interviews were conducted to gather data on boaters using the bays. In addition, 290 shoreline residents provided additional information through a mail survey. Overall, boaters indicated that they had very satisfactory boating experiences and considered the crowding to be moderate. However, crowding ratings did vary depending on the use levels for a particular day. More than three-quarters of all boaters agreed that boating conditions, the day they boated, were safe. Permanent residents, however, voiced greater concerns about safety than non-residents. When asked to rate their support for various management options that might be proposed, the majority of all user groups tended to support items such as, establishing off-limit zones to protect sensitive resources, and restricting shoreline development. The least favored options included limiting the size and power of boats, restricting the number of boat ramps, and limiting the number of boats using the bays.

SUPPORT FOR THE DEVELOPMENT OF A WATER-USE PLAN FOR DELAWARE'S INLAND BAYS

Many of the previously cited studies also explored the attitudes and opinions of individuals who live around or visit the bays and how these people felt about issues related to water-use activities and the bays. Of notable interest is the fact that 76% of bay users interviewed in 1986 said that they would favor area use restrictions on boating, and another 85% mentioned that they would support policies to impose speed limits on boats using the inland bays. Only 38%, however, felt that they could support limiting the use of fuel-powered boats in the bay system (Greeley-Polhemus Group, 1986).

76% of bay users in a 1986 study said they would favor area use restrictions on boating; 85% mentioned they would support policies to impose speed limits on boats in the bays.

The Hollender, Cohen Associates, Inc. (1989) study, as well as the University of Delaware Sea Grant (Falk, et al. 1992) study asked various bay constituencies whether they would support or oppose certain restrictions or controls for the inland bays. In general, nearly everyone supported certain types of restrictions, such as prohibiting discharges of pollutants and restrictions on building and development. Opinions about other options were more evenly divided based on the user group or population that was solicited. Generally, public input collected by MDR Associates, Inc. (1990) showed support for all types of restrictions. This input was generated through a survey of Sussex County residents and data collected at public meetings that were part of the Inland Bays Estuary Program CCMP planning process. Those attending the public meetings tended to support the various restrictions more than the residents who were surveyed by mail.

89% of respondents to a 1990 survey indicated they would support a water-use plan to protect or limit certain uses of the bays.

The groups surveyed by Falk, et al. (1992) included bay users sampled at various access points surrounding the bays and shoreline residents living adjacent to the bays. It is not surprising that these groups were less likely to favor restrictions on boating activity and access. The permanent residents of the bay area were more supportive of boating restrictions than the seasonal residents or visitors, but less supportive than the county-wide population surveyed by MDR Associates (Table 1).

MDR Associates Inc. (1990) also asked citizens whether they supported a proposal to develop a water-use plan to protect or limit certain uses of the bays at specific times or places. Eighty-nine percent of respondents supported this proposed suggestion. Citizens were also asked whether they supported strengthening or developing limitations or whether they favored imposing controls on certain activities. There was general support for protecting environmentally sensitive areas from motorized watercraft, for protecting people from contact with polluted water, and for banning the taking of shellfish from polluted areas. Both the survey efforts and public meetings found strong support for enforcement of existing laws and for public education. Outright banning of any kind of watercraft was not supported. In sum, previous public opinion surveys about the inland bays suggest that, while certain regulatory controls are necessary and appropriate, the key to compliance is adequate enforcement coupled with an effective public information and education campaign.

Table 1. Percent of People Favoring Potential Restrictions on Delaware's Inland Bays.

	Source of Public Input				
	MDR Associates, Inc. (1990)*		Falk, et al. (1992) **		
	Sussex County Residents (n=301)	Public Meeting Attendees (n=85)	Permanent Residents (n=312)	Seasonal Residents (n=277)	Seasonal Visitors (n=105)
Prohibiting all discharges of pollutants into the water	97	89	96	97	99
Restrictions on building and development	83	87	78	75	87
Stricter limits on the size and/or number of fish, crabs, clams, and waterfowl that can be taken	77	84	70	70	55
Zoning the waters to provide for specific uses at specific places	68	N.A.	54	53	62
Limiting the size and power of boats using these waters	67	64	50	35	35
Restricting the number of marinas	58	78	70	49	39
Restricting the number of boat ramps	50	65	39	34	23
Limiting the number of boats using the bays, tributaries, and canals	48	58	25	16	14

* Source: MDR Associates, Inc. 1990. Citizen Input to the Draft Water Use Plan for Delaware's Inland Bays. Report to the Inland Bays Estuary Program, EPA Contract No. 68-C8-0105, Work Assignment No. 42, Subcontract with Battelle Ocean Sciences, March 15, 1990.

** Source: Falk, James, Alan Graefe, Ellen Drogin, John Confer, and LeeAnne Chandler. 1992. Recreational Boating on Delaware's Inland Bays: Implications for Social and Environmental Carrying Capacity. Report to the Inland Bays Estuary Program, University of Delaware Sea Grant College Program, DEL-SG-19-92, December 1992.

Section III

RECREATIONAL USES OF THE INLAND BAYS

INTENSITY/GROWTH OF RECREATION ON THE INLAND BAYS

The best sources of information about use activities of the inland bays include a survey of recreation uses conducted in the summer of 1986 (Greeley-Polhemus Group, Inc. 1986), the Battelle water-use plan study (1989), and the University of Delaware Sea Grant social and environmental carrying capacity study (Falk, et al. 1992). The Greeley-Polhemus report used aerial surveys on two summer days along with field interviews with 423 bay users during a one week period in August, 1986 to determine who was using the bays and their accompanying views. Battelle's analysis was based on secondary data sources coupled with aerial surveys made over the Fourth of July and Labor Day holiday weekends of 1989. The Falk, et al study used a combination of on-water boat counts and surveys of bay users and shoreline residents to measure bay uses and user perceptions.

Examining the growth of registered boats in Delaware is one means of estimating the use intensity in the inland bays region (Table 2). For example, the number of registered boaters increased dramatically between 1965 and 1975; at the time concerns began to be voiced about water-use activities in the bays. Significant increases in boat registrations also occurred between 1975 and 1985. There has been modest growth up to 1995 and this figure has remained relatively steady for the past few years. Information collected on Delaware-registered boaters in 1985 (Falk, et al. 1987), indicated that 55% of all respondents from a random survey boated in the inland bays at various times. In 1995, 52% of Delaware-registered boaters surveyed indicated that they boated in the inland bays (Falk, 1996). This information reveals that the inland bays are a popular site for Delaware-registered boaters and various reports suggest the bays also attract many non-resident boaters.

Delaware boat registrations increased more than 200% between 1965 and 1985.

Table 2. Growth of Delaware-Registered Boaters for Select Years (Source: DNREC, Division of Fish and Wildlife).

Year	# of DE-Registered Boats	% Increase
1965	10,230	--
1975	24,557	140%
1985	37,402	52%
1995	42,452	14%

It is estimated at least 7,500 boats are kept in Inland Bays' waters at marinas or private docks.

The number of boats docked at marinas and private docks is another indicator of boating activity on the inland bays. In 1986, there were 45 commercial marinas (defined as having 10 or more slips) on the inland bays, offering some 5,384 boat slips (Battelle 1989). Demand exceeded the supply and a moratorium on marina construction was in effect while the Department of Natural Resources and Environmental Control evaluated the environmental impacts of marinas. Subsequently, new regulations governing marina construction and operations were implemented and the number of marina slips had increased to 6,607 by 1996. The number of boats kept at private docks remains unknown. However, the Greeley-Polhemus Group counted approximately 1,000 boats docked or moored around the inland bays during two overflights in 1986. Thus, the total number of boats kept on the water at either marinas or private docks, with direct access to the bays, is at least 7,500 at present (in 1998).

Compared to the large numbers of boats with access to inland bays waters, the actual number of boats using the bays at any one time is relatively small. Jensen and Weeks (1975) observed only about 200 boats actually underway or anchored on the bays daily (150 on Rehoboth and 50 on Indian River Bay) in 1974. The Greeley-Polhemus Group reported "somewhat more than 200 boats" using the bays on Saturday during the Labor Day weekend in 1985. Two follow-up overflights in 1986 revealed a total of 225 boats using the bays on a non-holiday weekend and 393 boats on the bays during the Fourth of July weekend. Falk, et al (1992) measured peak use from on-the-water observations on six weekend days during the summer of 1991, and found totals ranging from 251 to 848 boats at one time on Rehoboth and Indian River Bays.

ACTIVITY PARTICIPATION - BAYWIDE

Besides measuring total boating use, previous studies have also tried to determine the locations of recreation activities on the inland bays. Study approaches have

ranged from observing actual activity participation at different bay locations (Greeley-Polhemus Group 1986; Falk, et al. 1992) to collecting information from marine enforcement officers about preferred locations for various activities (Battelle 1989), to asking boaters in interviews to identify the locations of their boating activities (Falk, et al. 1992). Fishing and crabbing (35%) were the dominant activities in the 1986 study followed by sunbathing and sightseeing (27%) and boating or cruising (14%). This distribution reflects the fact that sampling in this study emphasized shore locations where people could easily be contacted and interviewed.

There are major differences observed between activities occurring on Indian River and Rehoboth Bays.

While boaters were under-represented in the Greeley-Polhemus (1986) study (only 61 persons or 14% of respondents were boating at the time they were interviewed), the majority of respondents (54%) overall reported engaging in boating at some time during the year. Most of these boaters (71%) owned their own boats and nearly all of the boating engaged in by respondents (83%) was on the inland bays, with only 17% indicating the ocean or elsewhere.

Earlier surveys have consistently shown that there are major differences in the primary activities pursued on Indian River and Rehoboth Bays (Table 3). Boat fishing, for example, was more popular on Indian River Bay than on Rehoboth Bay in both 1989 and 1991. Between two-thirds and three-fourths of all activity observed on Indian River Bay by both Battelle (1989) and Falk, et al (1992) was either fishing or cruising whereas these same two activities constituted less than one-half of the observed activity on Rehoboth Bay for both years.

Fishing from boats was dominant in many sections of Indian River and Rehoboth Bays, but was largely absent from the northern half of Rehoboth Bay.

Further analysis of recreation uses within certain sections of the inland bays was conducted by Battelle (1989) and Falk, et al (1992). The distribution of shore and water-based activities across 12 "sub-territories" was provided by Battelle. Results showed that fishing from boats was dominant in many sections of Indian River and Rehoboth Bays, but was largely absent from the northern half of Rehoboth Bay. This is most likely due to the fact that targeted species are not present in this section of the bay. Sailboarding and sailing were predominant in the northeast section of Rehoboth Bay, and clamming was the most popular activity in southeast Rehoboth Bay (Figure 2 and Table 4).

Similarly, Falk, et al (1992) found that different parts of the bays are used to varying degrees for different purposes. Again, a multitude of activities occur in many of the zones, with cruising, sportfishing, and crabbing being prominent in Indian River Bay. Northern Rehoboth Bay remained a popular sailing and sailboarding area, and the southern portion was supported by fishermen and clammers (Figure 3 and Table 5). This analysis reveals important details to better understand use activities in the bays and can also lead to improved management of users.

Table 3. Percent of Water-Use Activity Sitings in Rehoboth and Indian River Bays from Battelle (1989) and Falk, et al (1992).

	Rehoboth Bay		Indian River Bay	
Activity	Battelle* (n = 323)	Falk, et al** (n = 1,171)	Battelle* (n = 337)	Falk, et al** (n = 1,882)
Fishing	24	20	41	40
Cruising	24	21	28	34
Crabbing	7	1	4	10
Clamming	13	11	12	6
Beaching	0	5	0	4
Sailing	9	18	3	2
Jetskiing	2	8	1	2
Waterskiing	2	2	1	1
Sailboarding	15	13	1	1
Swimming	4	1	9	<1

* Source: Battelle Memorial Institute (1989). Based on 4 aerial surveys conducted in July and September 1989.

**Source: Falk, et al (1992). Based on 6 on-water surveys conducted in August 1991

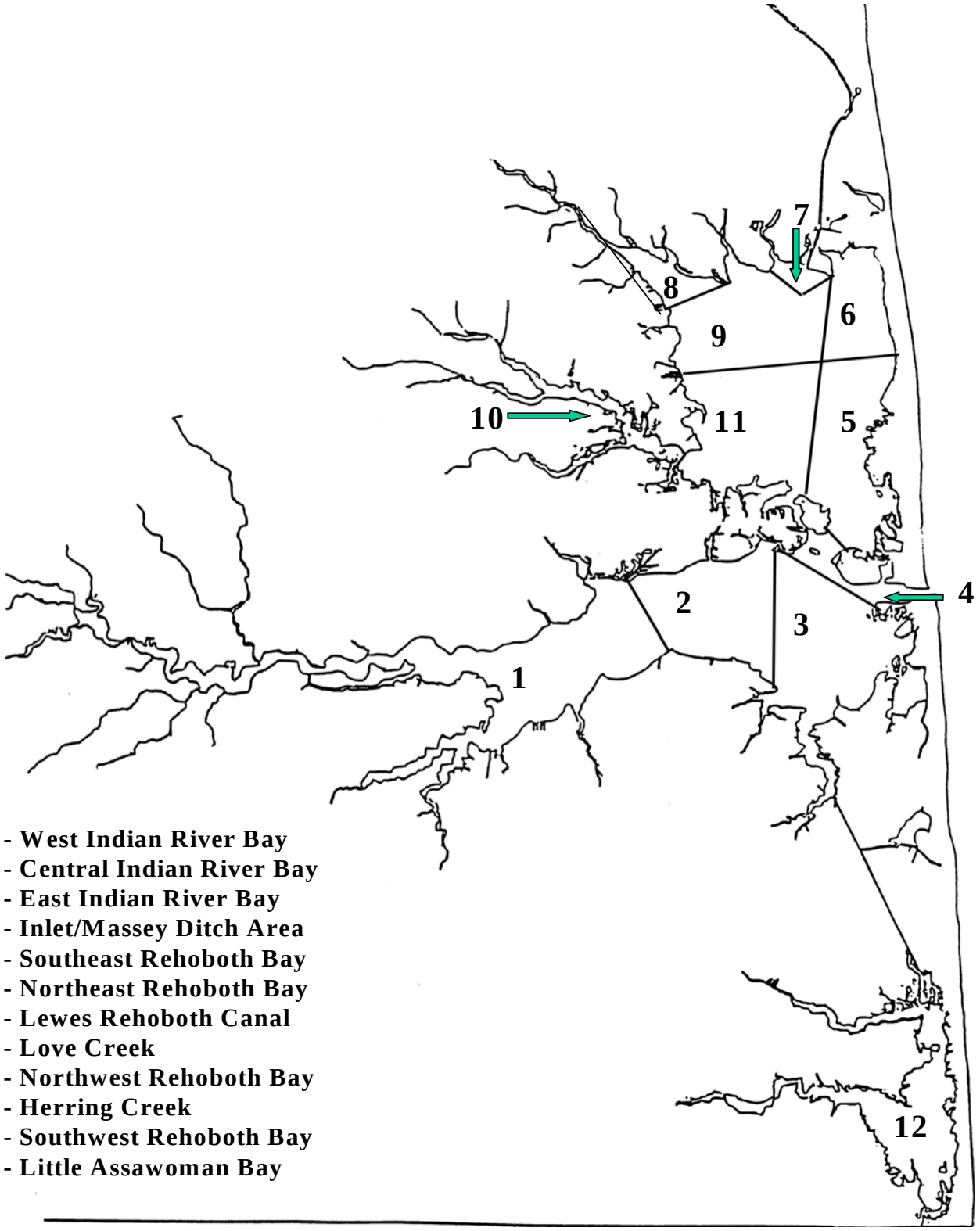


Figure 2. Geographic Areas Identified by Battelle Memorial Institute (1989)

Table 4. Activity Estimates by Geographic Area Based on 4 Aerial Flights Conducted in 1989 (Source: Battelle Memorial Institute, 1989)

AREA	PRIMARY ACTIVITIES (%)					
West Indian River Bay	Boat Fishing	42	Sailing	4	Waterskiing	2
	Motorboating	34	Swimming	4	Jetskiing	2
	Crabbing	11	Clamming	3	Sailboarding	1
Central Indian River Bay	Boat Fishing	36	Clamming	18	Waterskiing	1
	Swimming	21	Sailboarding	3		
	Motorboating	20	Sailing	3		
East Indian River Bay	Boat Fishing	36	Swimming	9	Jetskiing	1
	Motorboating	31	Sailing	2	Waterskiing	1
	Clamming	20	Sailboarding	1		
Inlet/Massey Ditch Area	Boat Fishing	44	Clamming	6	Crabbing	1
	Shore Fishing	23	Swimming	4	Sailboarding	1
	Motorboating	17	Jetskiing	3		
Southeast Rehoboth Bay	Clamming	41	Sailboarding	8		
	Boat Fishing	32	Crabbing	4		
	Motorboating	12	Sailing	3		
Northeast Rehoboth Bay	Sailboarding	62	Motorboating	5	Clamming	2
	Sailing	19	Waterskiing	3	Crabbing	2
	Jetskiing	6	Swimming	2		
Lewes Rehoboth Canal	Boat Fishing	43	Jetskiing	14		
	Crabbing	29	Motorboating	14		
Love Creek	Motorboating	35	Boat Fishing	18	Waterskiing	6
	Crabbing	29	Swimming	6	Sailing	6
Northwest Rehoboth Bay	Motorboating	25	Swimming	10	Jetskiing	5
	Boat Fishing	23	Crabbing	8	Clamming	4
	Sailing	20	Sailboarding	5	Waterskiing	4
Herring Creek	Motorboating	37	Crabbing	20	Jetskiing	2
	Boat Fishing	33	Waterskiing	7	Sailing	2
Southwest Rehoboth Bay	Motorboating	39	Swimming	7	Sailboarding	1
	Boat Fishing	31	Sailing	6	Crabbing	1
	Clamming	13	Waterskiing	1		
Little Assawoman Bay	Boat Fishing	42	Waterskiing	5	Crabbing	2
	Motorboating	27	Sailboarding	3		
	Sailing	19	Jetskiing	3		

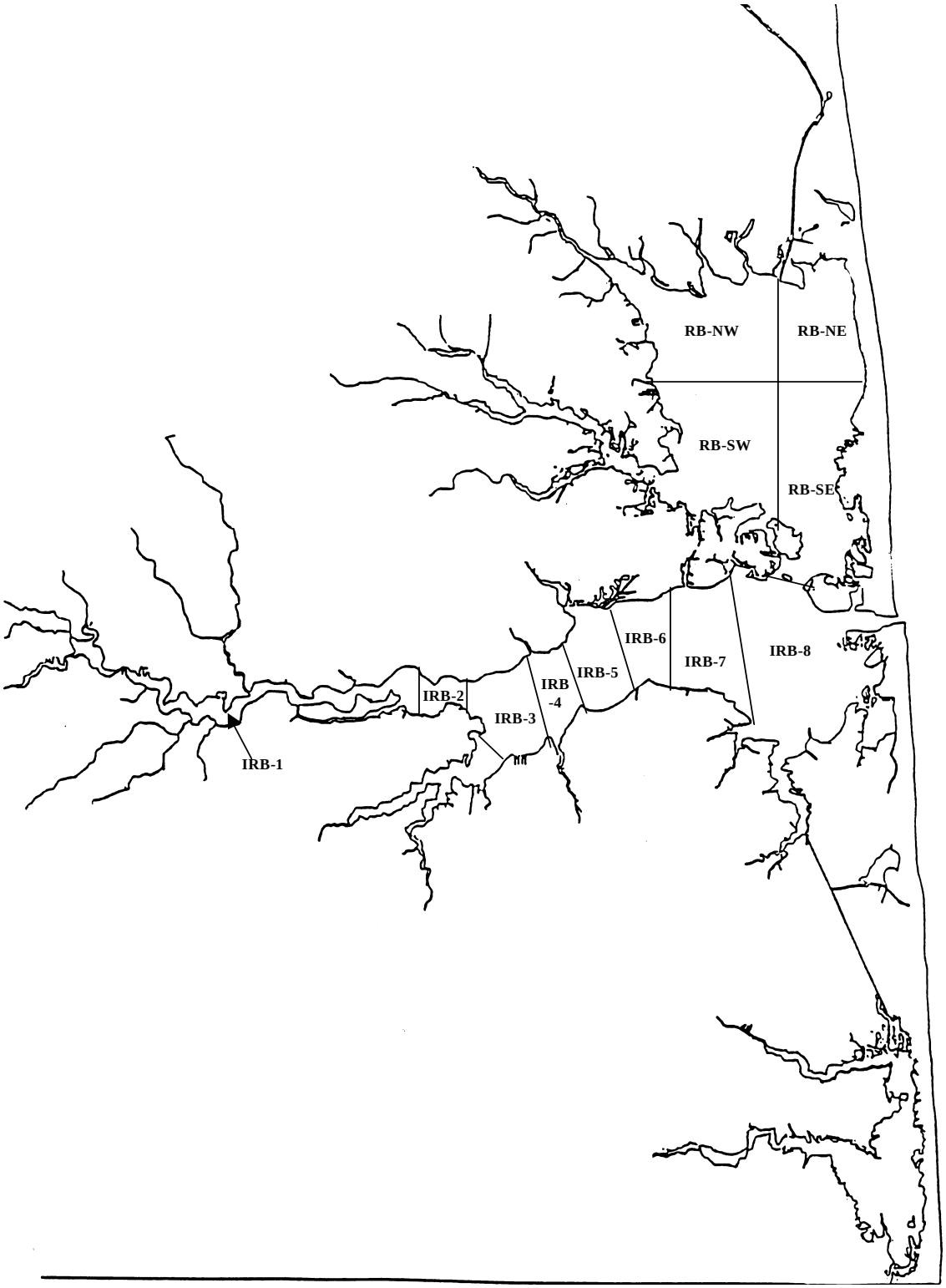


Figure 3. Geographic Areas Identified by Falk, et al (1992)

Table 5. Activity Estimates by Geographic Area Based on 6 On-Water Counts Conducted in 1991 (Source: Falk, et al. 1992)

AREA	PRIMARY ACTIVITIES (%)					
IRB-1	Crabbing	58	Fishing	6	Sailing	1
	Cruising	30	Jetskiing	1		
	Waterskiing	6	Swimming	1		
IRB-2	Cruising	45	Waterskiing	12	Fishing	3
	Crabbing	36	Jetskiing	3		
IRB-3	Cruising	57	Sailing	6	Waterskiing	1
	Crabbing	30	Jetskiing	4	Fishing	1
IRB-4	Cruising	51	Jetskiing	3	Fishing	1
	Crabbing	31	Waterskiing	3	Swimming	1
	Beaching	7	Sailing	2		
IRB-5	Cruising	55	Jetskiing	5	Sailing	2
	Crabbing	23	Beaching	3	Clamming	2
	Fishing	5	Waterskiing	3	Swimming	2
IRB-6	Cruising	45	Fishing	22	Jetskiing	3
	Clamming	14	Sailboarding	6	Beaching	2
	Crabbing	11	Sailing	5	Waterskiing	2
IRB-7	Cruising	37	Clamming	13	Jetskiing	1
	Fishing	27	Crabbing	4		
	Beaching	16	Sailing	3		
IRB-8	Fishing	61	Beaching	2	Crabbing	1
	Cruising	27	Sailing	1	Jetskiing	1
	Clamming	5	Sailboarding	1	Waterskiing	<1
RB-SE	Fishing	55	Sailing	3	Beaching	<1
	Clamming	25	Jetskiing	2		
	Cruising	16	Swimming	<1		
RB-NE	Sailboarding	41	Cruising	11	Clamming	2
	Sailing	26	Waterskiing	2	Swimming	<1
	Jetskiing	16	Crabbing	2	Beaching	<1
RB-NW	Cruising	46	Waterskiing	5	Swimming	1
	Sailing	29	Clamming	4	Jetskiing	1
	Fishing	11	Sailboarding	2		
RB-SW	Fishing	29	Beaching	15	Swimming	1
	Cruising	28	Sailing	3	Waterskiing	1
	Clamming	20	Jetskiing	2		

CONFLICTS BETWEEN ACTIVITIES

The makeup of activities within a given geographic zone, coupled with the physical characteristics of the area, can yield important implications for potential conflict between activities. For example, the section of Indian River Bay nearest the Indian River Inlet is the most heavily used area on the bay. On average, about 186 vessels were observed in this zone on weekends in 1991. Although the acres/boat ratio is relatively high (due to the relatively large size of the zone), this area was considered a "hot spot" because most of the activity takes place within a very tight area in or near the navigation channel, where drifting and anchored fishing boats and cruising powerboats compete for the same water area. On Rehoboth Bay, the northeast quadrant appears to be the most conflict prone area, due to the high intensity and diversity of activity occurring there.

The northeast quadrant of Rehoboth Bay appears to be a conflict prone area, due to the high intensity and diversity of activity occurring there.

The Battelle (1989) report identified preferred use areas for selected activities and assessed the potential for growth as well as conflicts between activities. Their analysis suggests that boat fishing and powerboating, the two most popular and economically important activities on the bays, may be near capacity because of their intensity and the fact that they compete with each other for the same preferred areas of the bays (Figure 4). Conversely, other activities including water-skiing, sailboarding, and sailing showed much room for growth as they represented a small segment of total use and tended to be concentrated in a few areas.

As previously noted, certain activities occur in selected areas because of their dependence on living resources as a basis for the activity. Fishing, clamming, and crabbing are limited to areas where there are sufficient stocks to be harvested and water quality is high enough to support the resource. Hunting is limited to near shore areas where the potential for conflict is reduced due to the temporal separation of activities (hunting occurs during a different season than many other water uses).

Previous studies have also suggested which activities are most likely to conflict with each other and also the areas of the bays where conflicts are most likely to occur. Battelle's assessment included some helpful tools for assessing the potential for conflicts between activities. One useful tool, the Inland Bays Activity Area Requirements summarized some spatial requirements of both first-degree and second-degree water contact activities. This analysis helps to understand the preferred open-water space needed by different activity groups (Appendix A). Additionally, the Inland Bays Activity Conflict Matrix (Appendix B) was created to rate the degree of possible conflicts between all possible combinations of interacting activities. These information sources coupled with existing data on water use activities on the bays can be used to evaluate the need for management actions to resolve user conflicts on the inland bays.

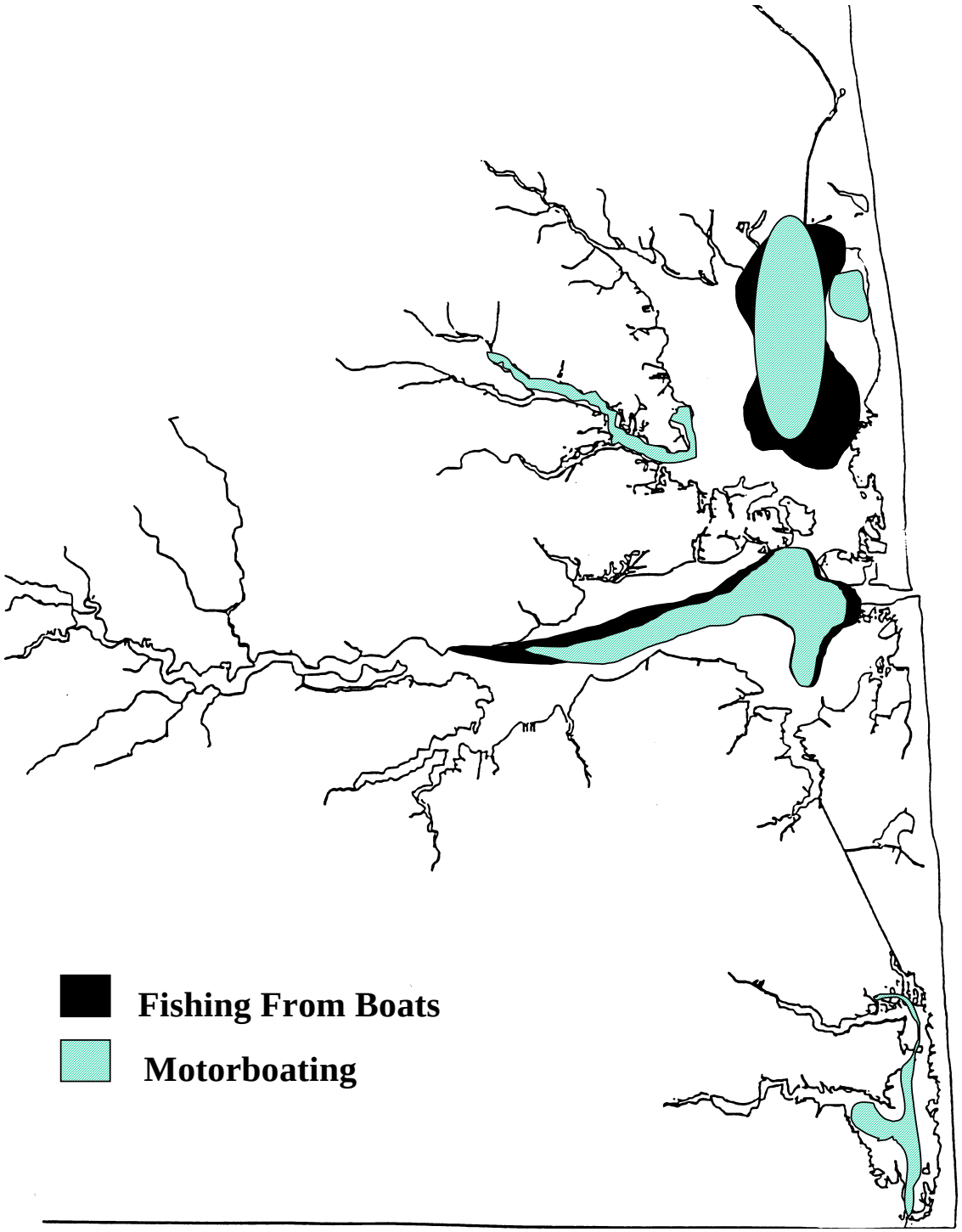


Figure 4. Boat Fishing and Motorboating Locations (Battelle Memorial Institute, 1989)

Section IV

ENVIRONMENTAL IMPACTS OF WATER-BASED RECREATION

CONCERNS ABOUT ENVIRONMENTAL QUALITY

Much of the bays' pollution is attributed to nonpoint sources; direct discharges are relatively few and are stringently regulated.

The inland bays are threatened by ever-increasing impacts from anthropogenic sources. Since the late 1950's, multiple-use activities which endanger the ecosystem have emerged. These uses include industrial water supply, wastewater disposal, commercial and residential development, agricultural practices, and various recreational uses and their related support systems. Much of the bays' pollution is attributed to non-point sources, since direct discharges are relatively few and are stringently regulated.

The public's perception of environmental impacts on the inland bays further amplifies the need to be concerned. Various user groups surveyed during the 1980's contributed their opinions about the environment. About one-third of the respondents interviewed by the Greeley Polhemus Group (1986) said they had perceived a deterioration in the environmental quality of the bays over the previous six years. Over one-half of the property owners surveyed by Hastings and Kuennen (1984) reported that water quality in the inland bays area had declined over the previous five years. Over 80 percent of the property owners considered litter a problem, while 69 and 70 percent viewed contamination of shellfish beds and boat discharges as problems, respectively. Finally, one-fourth of Sussex County residents surveyed by Hollender, Cohen Associates, Inc. (1989) felt that motorboating was harming the environment. Additional studies and reports about the inland bays, most notably the Battelle study, mention environmental impacts associated with recreational uses of the bays, in particular those caused by recreational boating. These impacts can include:

Turbidity decreases light penetration, which affects primary productivity and ultimately results in decreased estuarine production.

Increased shoreline erosion and disturbance of bottom sediments leading to increased turbidity: Increased erosion results when boat wakes hit natural shorelines, especially in marshes. Impacts are especially significant when boats speed close to shore. Wakes and propeller wash cause resuspension of bottom sediment in shallow water. This turbidity decreases light penetration, lowers dissolved oxygen levels, and ultimately results in decreased estuarine production. The effects of prop wash (e.g., destruction of bottom vegetation and benthic habitat) are most significant in areas less than five feet deep. This five-foot depth constitutes approximately 3,603 surface acres, or 75% of the preferred motorboating activity acres in the inland bays.

Fuel and oil spills: Oil introduced from fuel-oil spills may bind to bottom sediments and be taken up by aquatic vegetation. Organisms feeding on plant material can absorb the hydrocarbons into their systems; toxins may become progressively concentrated as they are passed up the food chain. Fuel-oil spills can also destroy the habitat of crabs.

The more serious environmental impacts facing the bays may be caused by high-use areas like marinas.

Human waste discharges: The potential discharge of human wastes into the bays may result in exceeding the assimilative capacity of the estuary. The result can be an increase in water-borne pathogens that are human and animal health hazards. Unlike other large estuaries, which may have higher flushing rates, pollutants are not effectively diluted or flushed out of the inland bays region because of the shallow depths and the fact that it has only one small outlet to the Atlantic Ocean.

Excessive noise: Equipment noise from powerboats and personal watercraft (PWC) can affect fishery resources and disrupt nesting of shore birds and waterfowl in shallow areas or close to shore. Excessive noise may also result in abandonment of nests as wildlife retreat in search of a stable environment.

The more serious environmental impacts facing the bays may be caused by high-use areas like marinas. Marinas can impact the environment, beginning with their construction and continuing throughout their operation and use. Construction operations such as dredging, dock installation, and onshore facility development have a wide-range of physical and biological impacts. In addition, valuable wetlands may be destroyed during marina-construction activities. In general, the severity of impacts that affect water quality are related to the flushing characteristics of the area in which the marina is located.

Dredging disrupts the bottom environment and elevates water-column turbidity by resuspending sediments. Turbidity reduces the penetration of sunlight through the water and can also impair filter-feeding organisms such as clams that rely on clean water. Resuspension of bottom sediment can also redistribute toxic substances into the water column. Disruption of the bottom during dredging and positioning of pilings forces migrations of mobile species like fish and crabs and localized mortality of less mobile benthic species. By removing benthic vegetation and altering the contours of the shoreline, dredging can create small, poorly oxygenated pockets that discourage favorable biological growth.

Shoreline-protection structures such as vertical bulkheads deflect incoming waves instead of absorbing them, as the former natural shoreline would have done. This deflection of waves can increase erosion downshore from the bulkhead, frequently creating a serious conflict between landowners. Improperly constructed bulkheads are subject to erosion and scour from the mudline as well as loss of fine material through joints and cracks.

Operations at marinas, after the initial construction phase can also lead to a series of negative environmental impacts. Fuel and oil contamination is common near marinas because of the variety of petroleum products used by boaters and service personnel. Secondary sources of fuel and oil contamination are from storm runoff from parking and boat-maintenance areas. Stormwater runoff from maintenance areas where boats are stripped and repainted is another source of contamination. Detergents used in boat washing can also degrade the environment.

Low flush waters like the inland bays are highly susceptible to degradation through cumulative impacts.

Sources of fecal coliform bacteria around marinas include faulty septic systems or discharges from boat holding tanks. Although each marina may have a relatively low coliform input, low flush waters like the inland bays are highly susceptible to degradation through cumulative impacts. Several studies have been conducted to assess the effects of recreational boats in concentrated-use areas. Delaware's Division of Public Health has surveyed boaters to provide a basis for policies to determine shellfish harvest closure areas near marinas. In 1992, approximately 1,043 acres of Rehoboth Bay shellfish growing areas and 1,495 acres of Indian River Bay areas were classified as "conditionally approved" or "prohibited" for harvesting by the Division of Public Health, due to the presence of marinas (Pingree 1992).

Like marinas, the environmental impacts associated with private dock development are highly correlated with the flushing characteristics of the area in which they are located. Other factors include number of boats and the type of facility. Overall, the environmental impacts of a dock (due to smaller size) are less than for a marina, but the cumulative impacts of many docks within a given area could be significant. They are likely to have less severe operational impacts than marinas since they probably do not have fueling facilities and other services. On the contrary, some smaller docks are not subject to the same regulations as commercial marinas and some improper practices (pumping bilges, over-the-water washing with detergent and solvents, or sanitary-waste disposal) may be more common. Accidents such as minor fuel spills may also occur, with no provision for cleanup or containment of a larger spill.

The environmental impacts of a dock are less than for a marina, but the cumulative impacts of many docks within a given area could be significant.

Sportfishing, especially of very popular species, carries the risk of overharvesting the resources, even though most popular species are heavily regulated. Significant declines of a preferred species can result in proliferation of a less desirable species. The disposal of fish-cleaning wastes in the nearshore environment is also an often overlooked impact, because it is assumed that these are natural products that can be easily degraded by the estuary. If fish viscera are not readily scavenged by animals, they are decomposed by benthic fauna and bacteria, creating a localized increase in biological oxygen demand and anoxic conditions in poorly flushed areas (such as in marina basins).

Many environmental problems could be minimized with additional education and enforcement.

In summary, recreational uses can cause many environmental impacts to the inland bays and their resources. Many of the above-mentioned impacts are unintended and can be controlled and prevented. However, bay users need to better understand the consequences of their activities since they may not be readily apparent. For the most part, many of the impacts could be minimized with additional education and enforcement. Potential solutions for many of these environmental problems will be discussed in the following section.

Section V

THE PROCESS OF INVOLVEMENT

SOLICITING INPUT FROM STAKEHOLDERS

The public and affected users have varied concerns and provided input through many different channels.

As with any plan that seeks to garner input and support from the affected user community, many stages are necessary to complete the intended task. This water-use plan was no different. As previously noted, the concept of a water-use plan has been discussed and worked on for over a number of years. The public and affected users have voiced concerns and provided input through many different channels. The process employed in the development of this plan sought to give all interested parties the opportunity to participate. Public meetings and workshops were announced in advance and open for all to participate. In addition to individual mailings inviting key stakeholders to attend, state and local newspapers were sent press notices announcing the dates and times of each meeting.

Defining the key issues pertinent to the development of this water-use plan involved a number of steps. Initially, issues that had been examined previously, during other water-use planning sessions (such as during the CCMP development process) were considered for their current relevance. Secondly, important issues that were included in other water-use planning documents were examined and a determination was made as to whether they applied to Delaware's Inland Bays. If they were deemed appropriate they were considered and discussed along with any other concerns. Most importantly, issues were raised by state resource managers, citizens, and other bay stakeholders during a series of meetings during 1997 and 1998. Issues identified by citizens were closely examined and discussed at meetings so that the full intent of the concerns were clear and concise. Through this process fifteen issues (or broad problem statements) were identified.

Once key issues (problems) were discussed and clarified, options or solutions for resolving the issues needed to be identified. The process of identifying solutions also involved a series of steps. As solutions were suggested for each of the fifteen issues, they were discussed during working group meetings with citizens and stakeholders, and through consultation with technical experts and resource managers. These groups were asked whether the proposed solutions were viable and could be effective at resolving or minimizing the identified problem. This input was considered along with other supporting information and the targeted recommendations and actions were ultimately identified.

Overall, six planning meetings were held with interested stakeholders (open to the general public and public sector officials) to seek their input and solicit ideas on formulating the water-use plan. The meetings were designed to be iterative in nature, so that issues and concerns identified early in the process could be further discussed, clarified, and reviewed at subsequent meetings, and effective, workable solutions could be identified. Other meetings and work group sessions were also conducted during the study period to gain additional input from various groups and individuals. Many of these sessions were less formal than the organized public meetings, but they also were important to gain insight and direction in completing the process. A brief summary of the planning meetings and other sessions follows to provide documentation on the process of soliciting stakeholder input.

February 20, 1997 - Planning Session, Center for the Inland Bays Staff - The Executive Director, and other key members of the Center for the Inland Bays, were invited to discuss their ideas and concerns about the water-use plan. Special needs were identified and a tighter focus on developing the plan was discussed.

March 13, 1997 - Technical Planning Meeting, DNREC, Division of Water Resources Staff - Since the Division of Water Resources staff coordinated the development of the CCMP, their views and comments were important to help focus the direction of the water-use plan. Goals and objectives were articulated and division staff agreed to support the planning effort.

March 20, 1997 - Presentation, Inland Bays Citizens Advisory Committee - Members of the Inland Bays CAC were considered to be important stakeholders in the process of developing the water-use plan. The members represent a number of different interest groups involved in bay-related activities. An introductory presentation was made to explain how the planning process was to be carried out and to invite their participation in future meetings.

Members of the Inland Bays CAC were considered to be important stakeholders in the process of developing the water-use plan.

June 10, 1997 - Technical Planning Session, DNREC Staff - This session sought to gain ideas and suggestions from DNREC resource managers and technical experts to gain their views on key issues and concerns that face both inland bays' resources and users. The participants represented each division within DNREC and provided information on how the water-use plan could be effective in focusing attention on their division's mandate to protect and manage the resources of the watershed. Many of the ideas presented focused on the use of existing legal regulations as a means to control or minimize user impacts on the bays.

Stakeholder meetings sought to identify key water-use concerns and issues.

June 19, 1997 - Planning Meeting #1, Interested Stakeholders - The first stakeholder meeting was held to "set the stage" for developing the water-use plan for Delaware's Inland Bays. As noted, the CCMP signed in 1995 provided the authority to develop the plan. The original intent was to develop a plan to be a vision document with specific charges directed at certain agencies or organizations to implement. The document would be a "living" document in that it needs to be reviewed periodically to see if any water-use changes in the inland bays warrant modifications to the overall plan. It was noted that many of the issues that were to be discussed would focus on minimizing impacts to the environment. The first meeting was primarily a brainstorming session with participants asked to identify any water-use concerns, issues, or problems they were aware of in the bays.

August 21, 1997 - Planning Meeting #2, Interested Stakeholders - At this meeting, documents were distributed that explained some of the issues and existing regulations that had been discussed at the initial meeting. Additionally, topics that were identified at the first meeting were discussed. The initial set of broad topics included: (1) Habitat and Environmental Concerns, (2) Regulations and Enforcement, (3) Land-use Planning and Development, (4) Recreational Boating and Marinas, and (5) Education. From this list of broad topics more detailed concerns and issues were identified and discussed.

October 9, 1997 - Planning Meeting #3, Interested Stakeholders - This meeting focused on a discussion of the major issues that were developed from the broad topics that had been previously identified. In addition, some potential solutions were drafted from information discussed at previous meetings as well as information obtained from other sources. An in-depth discussion of the major issues and potential solutions began to clarify concerns and further solicit input and opinions from stakeholders. An attempt was also made to rank some important criteria by which to measure the success of the proposed solutions. As expected, the most important criterion was how the solutions would have a positive effect on improving habitat or water quality in the bays.

Improving habitat and water quality were identified as the most important criterion by which to measure the success of the plan's proposed solutions.

November 10, 1997 - Presentation, Inland Bays Citizens Advisory Committee - A follow-up presentation was made to CAC members to update them on the progress in the development of the water-use plan. The discussion highlighted the identification of issues and preliminary focus on potential strategies and action tactics. Members were again invited to participate in the process to insure all stakeholders would be represented.

January 22, 1998 - Planning Meeting #4, Interested Stakeholders - At this meeting the discussion focused on identifying potential conflicting use areas in the bays. This involved identifying locations of current water-use activities occurring on the inland bays. In addition, any environmental impacts caused by users were

noted as were any conflicting uses that could be identified. After this discussion was complete, an assignment was given to participants to complete and return. Individuals were requested to provide more in-depth feedback on the proposed solutions identified to date, and to better focus on those that could be selected as targeted recommendations.

Identifying potential conflicting use areas in the bays was an important part of the planning process.

April 3, 1998 - Presentation, Center for the Inland Bays Board of Directors - The presentation to the Center's Board of Directors was the first time, other than newspaper coverage, that the entire board was provided with an update on the water-use plan development. This was an important step since the board approved the project and needed to be assured that progress was moving forward. Board members were provided with an opportunity to comment on the plan, and suggest additional ideas and concerns that should also be considered.

April 30, 1998 - Planning Meeting #5, Interested Stakeholders - Results of the stakeholder's input and feedback on more than 50 proposed solutions were distributed at this meeting. The information that was collected showed which solutions the group thought would be most effective at resolving the problem issues identified. Respondents also provided many open-ended comments and reactions to the proposed solutions. A lengthy discussion about dredging in the inland bays and some of the impacts that it causes also ensued. It was noted that dredging can be a very controversial issue and that the water-use plan should address it to some degree. It was also noted that another planning group would probably be convened in the near future to address dredging more completely. Finally, a discussion of the impacts caused by personal watercraft (PWC) took place. Information that described how each of the states deal with PWC regulations was distributed. The information included PWC accident reports from each state.

A number of approaches are suggested to address water-use problems including: enforcement, regulatory, education, waterway improvement, and administrative.

June 10, 1998 - Planning Meeting #6, Interested Stakeholders - The group was asked at this meeting to comment on a newly revised list of issues and proposed action items. The issues and actions were similar to those the group had discussed at previous meetings, but they were organized in a different fashion. The potential solutions were organized by the following approaches: Enforcement, Regulatory, Education, Waterway Improvement, Administrative, and Other. A matrix was developed to display these approaches with the potential solutions that had been identified and discussed. This format made it clearer to visualize which methods were being proposed to help resolve water-use issues in the bays. After participants had the opportunity to review the matrix and discuss it, they were requested to participate in a process of prioritizing the action items. This added some sense as to the importance of the actions and which ones should be assigned priority status, compared to those that might have a longer time period to implement.

DNREC's Inland Bay's Whole Basin Management Team provided technical and scientific input.

June 18, 1998 - Presentation, DNREC Inland Bays' Whole Basin Management Team - In an effort to gain additional input and suggestions from resource managers and technical scientists, representing all DNREC divisions, a presentation was made to the Inland Bays' Whole Basin Management Team. This group of resource professionals is charged with characterizing the inland bays watershed and planning ways to better manage and protect the resources of the ecosystem. The group was asked to provide their agency's views on the issues and problems that had been identified in the bays from a water-use standpoint. Their input has provided important information that represents additional public sector agency interest in the bays.

October, 1998 - March, 1999 - Review Draft Comment Period - An initial draft of the water-use plan was prepared and delivered to the Center for the Inland Bays Board of Directors in October, 1998 for their comments. Once the board had a chance to review the document a second draft was prepared in January, 1999 and widely distributed for interested stakeholders (general public and technical experts) to review and provide comment. The many comments and suggestions received back during this phase were beneficial in helping to edit and modify the contents of the draft plan. A meeting was held February 4, 1999 to discuss the draft and provide an opportunity to ask additional questions or propose any final solutions. Finally, on March 3, 1999 a workshop was held for the CIB Board of Directors to discuss the draft plan and pose any questions they might have, prior to adopting plan and moving ahead with an implementation scheme.

The collective input from each of these varied sessions provides the foundation for developing actions to address the major water-use concerns facing the inland bays. An important element to understand about the process of involvement, was that there were a multitude of ideas and suggestions from a variety of interest groups as how to best reach the desired goals. Many of the ideas, were supported by a majority of the stakeholders. However, there was disagreement on certain issues. For instance, some of the recommendations and actions supported by the general public were not as well-endorsed by public sector officials. Public sector comments focused on budgetary concerns, lack of personnel to achieve certain recommendations, or a failure to completely understand some of the more complex issues.

The following section attempts to synthesize, at times, conflicting comments and ideas and tries to put forth a sound rationale on the type of action or recommendation that should be supported. Many of the ideas need to be discussed further so that a mutually agreed-upon results can be achieved. If other options are available that have not been explored, opportunities for individuals to bring new ideas to the forefront for debate and discussion will be available.

Section VI

WATER-USE ISSUES AND PROPOSED STRATEGIES

DESCRIBING THE MAJOR ISSUES

The key issues and concerns that have been identified and discussed regarding water-use activities on Delaware's Inland Bays are described below. They are organized by three classifications: Habitat Issues, Uses Issues and Habitat/Use Issues. Habitat issues are those that address impacts to the environment of the bays. Use issues pertain to activities and water user concerns of safety, conflicts, or other human impacts. Habitat/Use issues relate to both environmental and user concerns. In addition to describing the issues, and to help further clarify and define them, the existing situation is presented along with stakeholder concerns. Finally, strategies or options that could resolve or minimize the issues are discussed. The fifteen issues are identified below:

HABITAT ISSUES

Habitat Issue # 1. Degraded habitat areas (caused by human influences) result in an ecosystem less likely to support living resources.

Habitat concerns focus on negative impacts to the bays' environment.

Habitat Issue # 2. Boaters cruising in shallow water areas cause bottom scouring, shoreline erosion, and turbidity.

Habitat Issue # 3. Inland bays' users enter resource protection areas and habitat restoration sites and cause damage to experimental test plots.

Habitat Issue # 4. Marinas, boatyards, and other boating facilities are sites where pollutants are discharged into the bays waters.

Habitat Issue # 5. Inland bays' boaters are unfamiliar with the impacts of boat-related pollution on the bays' ecosystem.

Use issues pertain to activities and water user concerns of safety, conflict, or other human impacts.

USE ISSUES

Use Issue # 1. PWC's are operated carelessly and safety concerns need to be addressed.

Use Issue # 2. Increased private development (both residential and commercial) diminishes the public's access to the bays.

Use Issue #3. Boating congestion in certain areas of the bays decreases boater satisfaction and increases the potential for conflicts and accidents.

Use Issue #4. Existing navigation channels in the bays are not adequately maintained.

Use Issue # 5. Unattended or unmarked recreational crab pots pose hazzards to water craft and impact living resources.

Habitat and use issues relate to both environmental impacts and user concerns.

HABITAT/USE ISSUES

Habitat/Use Issue #1. There are too few marine enforcement officers to adequately enforce existing laws and regulations in the inland bays watershed.

Habitat/Use Issue #2. Buoys and markers for dredged channels are ineffective at directing boaters in the bays.

Habitat/Use Issue #3. High speed boats, especially in narrow tributaries, cause shoreline erosion and safety concerns.

Habitat/Use Issue #4. Un-restricted development of marinas, docks and piers in the inland bays watershed causes negative impacts on the environment and may restrict the public's use of certain water areas.

Habitat/Use Issue #5. Future Increases in boating use on the bays may exceed an identified carrying capacity for the resource.

HABITAT ISSUES

Habitat Issue #1. Degraded habitat areas (caused by human influences) result in an ecosystem less likely to support living resources.

Description of Issue:

It is difficult to fully comprehend and address all of the environmental impacts that may be caused by anthropogenic sources.

This broad issue identifies key concerns about the environmental impacts caused by inland bay's users. As different habitats are impacted by humans, they are less likely to support the living resources that have been a part of the bays' ecosystem for many generations. It is difficult to fully comprehend and address all of the environmental impacts that may be caused by anthropogenic sources. To this end, a more complete assessment by technical experts that can relate cause and effect, may be the best solution offered to this issue.

Existing Situation:

♦ The state of Delaware has enacted several laws and regulations that are designed to minimize degradation of waters in the inland bays watershed.

♦ Resource protection areas and aquatic habitat restoration sites are being created to test whether habitat and living resources can be re-established in certain areas of the bays. The areas are experimental in nature and are designed to provide essential habitat for fish and shellfish.

Stakeholder Input:

Current information may document areas in the inland bays that are necessary to support various species of living resources (fish, birds, mammals, etc.). These areas may be important to sustain living resources throughout their spawning periods, serve as nursery areas, and even places for these animals to feed and grow. These areas need to be identified and measures should be taken by DNREC to help minimize or prevent any human impacts from occurring in these areas.

The impacts caused by humans on fish and wildlife resources range from habitat destruction to noise impacts.

The negative impacts caused by humans on the fish and wildlife resources of the inland bays are numerous, and range from habitat destruction to noise impacts. A careful review and documentation of the more serious impacts and suggested measures to reduce such impacts is needed. Educational strategies may be the most effective at achieving the desired results.

Aquatic habitat restoration sites have been created in the inland bays, as experimental sites where Submerged Aquatic Vegetation (SAV) and shellfish beds are being planted to see if they can be re-established in the bays. As additional areas are created, educational information will have to be developed to keep users informed of their location. Support for these sites is encouraged and area zoning may be required to prevent bay users from disturbing them.

Habitat restoration sites are experimental in nature and designed to test whether SAV grasses and shellfish beds can be re-established.

Periodically, new dredging (not maintenance dredging on existing waterways) may be required to gain water access to a needed public facility in a sensitive area. If this is required, such dredging must be off-set by a mitigation project to be agreed on by the appropriate parties. Any new private sector dredging that may impact sensitive shallow water areas should not be permitted.

Boating facilities should be prohibited on lands near sensitive aquatic habitat if water depth is inadequate to handle boating traffic of certain sizes. It is unacceptable to develop shoreside facilities and then expect dredging to occur to accommodate access to the facilities. Once sensitive aquatic habitats have been identified and documented, boating facility developers must be informed of such areas before they are given any permits to develop their sites.

Strategies and Options for Consideration:

✓ Identify high value resource areas, mark them, and protect them from human disturbances.
✓ Educate boaters about areas identified as high value resource areas supporting living resources as spawning, feeding, or nursery areas.

Habitat Issue # 2. Boaters cruising in shallow water areas cause bottom scouring, shoreline erosion, and turbidity.

Description of Issue:

Boating facilities should not be located on lands near sensitive aquatic habitat.

Boating on the bays may cause a number of environmental impacts, including increasing the amount of turbidity (suspension of bottom sediments) in the bays. Major turbidity problems begin around Memorial Day (late May) and start to subside after Labor Day (early September). Turbidity can impact the bays negatively in that it prevents light from reaching bottom sediment and assisting in plant growth (e.g. SAV grasses). Bottom scouring (or prop scouring) of sediment can also occur if boats or personal watercraft get too close to shore, or run aground in shallow areas in the bays. These impacts, though not often visible, can impact bottom-dwelling plant and animal communities.

Major turbidity problems begin around Memorial Day and begin to subside after Labor Day.

Existing Situation:

♦ Existing boating regulations in Delaware include restricting boat speed in designated areas (no-wake zones), which include some shoreline shallow water areas. However, many shallow water sensitive areas remain unmarked and susceptible to impacts of watercraft.

♦ Educational materials are available which inform the public about shallow water impacts, but they may not be reaching all pertinent boaters.

Stakeholder Input:

Shorelines can be areas where seagrasses and other aquatic habitat and resources can grow. They are also important bird and turtle nesting areas. Preventing damage to these locations may be necessary to allow them to serve their vital functions. To minimize damage and destruction, keeping motorized craft away from shorelines may be a necessity. This could be difficult to enforce and it would also prevent boats from docking on beach areas in the bays, which currently occurs. Some would argue that this option may be unnecessary, that it is a common-sense type of action, since most owners of motorized craft already stay away from shallow areas to avoid running aground and possibly damaging their vessels.

A more extreme idea would be to mandate that only manually-powered craft (e.g. kayaks, canoes, etc.) be allowed to navigate certain distances from shorelines. This would insure that propellers would not be damaging any sensitive habitat near shorelines. This would still be an enforcement problem and educational efforts would be needed for this option to be effective.

Strategies and Options for Consideration:

✓ Inventory and map sensitive shallow water areas in the bays.
✓ Better marking of sensitive shallow water areas (e.g. resource protection areas or habitat restoration sites).
✓ Restrict speed of craft in sensitive areas, not just for safety or property concerns, but to protect living resources.
✓ Prepare better educational materials informing the public about shallow water impacts.

Habitat Issue # 3. Inland bays' users enter resource protection areas and habitat restoration sites and cause damage to experimental test plots.

Description of Issue:

Resource protection areas are valuable research and monitoring sites and should be protected from human intruders.

DNREC officials are identifying areas in the bays to evaluate as resource protection areas or habitat restoration sites (initially as demonstration projects) and attempting to restore submerged grasses and shellfish in hopes that they will eventually begin re-generating themselves. These areas are valuable research and monitoring sites and should be protected from human impacts. It is difficult to adequately deal with the natural predators and environmental conditions that exist, but bay users are also entering these areas to clam or engage in other activities. This human activity can disrupt and destroy valuable work that has taken place.

Existing Situation:

♦ To date (summer 1998), three areas have been evaluated to support SAV and shellfish growth, and other areas are planned in the future.

♦ Signs are currently in place to deter bay users from entering and disturbing resource protection areas and habitat restoration sites.

♦ The Delaware Fishing Guide contains an educational message informing people about resource protection areas and identifies on a map where the first site is located.

Stakeholder Input:

There is a strong likelihood that additional sites will be identified in the inland bays as areas to evaluate the possibility of restoring habitat and living resources. Signage explaining why these areas are important and should not be disturbed can be effective at restricting people from these areas. It may also encourage them to support efforts to help restore and enhance the bay's resources. If signage is not effective at keeping people from disturbing the protected areas, it may be necessary to have enforcement officers present to keep people away. Periodic patrols may be enough to send the signal to bay users.

The restoration site near Delaware Seashore State Park is close enough to park property that staff of the park (enforcement or management) could take some responsibilities to see that the areas are not disturbed by bay users. Park personnel may also take some additional responsibility to help educate the public (through signage or displays) about the areas near their park.

Strategies and Options for Consideration:

✓ Improve signage marking resource protection areas and habitat restoration sites; include rationale for staying out of areas.
✓ Post signage at boat access ramps to inform trailerable boaters about resource protection and habitat restoration sites in the bays.
✓ Increase enforcement presence near the identified sites.
✓ Expand educational materials with information about resource protection areas and habitat restoration sites.

Signage explaining the purpose of resource protection areas and habitat restoration sites should limit intrusion to the areas by bay users.

Habitat Issue # 4. Marinas, boatyards, and other boating facilities are sites where pollutants are discharged into the bays' waters.

Description of Issue:

Boating facilities, such as marinas and boatyards concentrate boating activity and may cause some major impacts to the bays' waters and associated environments. Fuel spills, runoff from parking areas, and runoff from boatyard work areas can all cause negative impacts to the bays. Additionally, clamming grounds near boating facilities are often closed by the DNREC Division of Water Resources due to the contamination of clam beds from these sites. The loss of accessible clam bottoms due to high bacteria levels is a serious concern that should be addressed. It is important that marina and boatyard operators take strong actions to minimize any negative impacts from their facilities.

Existing Situation:

♦ Marinas are required by law to have up-to-date operations and maintenance (O&M) plans to address minimizing pollution of land and water.

Boating facilities concentrate boating activity and may cause some major impacts to the bay waters and associated environments.

♦ *Best Management Practices for Delaware Boat Maintenance Facilities* was developed in 1997 by the DNREC Pollution Prevention Program to educate boating facility owners and managers about ways to minimize pollution from their properties.

♦ The Delaware Clean Vessel Act Program also addresses issues related to boater-generated waste and how to adequately deal with it. The plan and associated educational materials should help marinas address this concern in the future.

Stakeholder Input:

Marinas and boatyards can be a major source of pollution into the inland bays. All marinas throughout the state are required to have operation and maintenance plans to address how they deal with preventing or minimizing environmental impacts. There is a concern that these plans are not being updated and that DNREC is lax in requiring marina operators to comply with the marina regulations due to lack of personnel. These plans need to be enforced and violators should be held accountable for any negative environmental impacts they cause.

DNREC's, Pollution Prevention Program should consider developing an outreach effort to inspect marinas and boatyards and identify areas where improvements need to be made. This would not involve fining or citing violators, but would be proactive and encourage environmental compliance. This service should be of an outreach nature to work with the operator of a facility to assist in remedying any deficiencies and curbing any undesirable practices that may have adverse impacts.

The need for marinas to have pumpout or dump stations for human waste is identified in the state's marina regulations. In addition, the DNREC, Division of Fish and Wildlife is also responsible for implementing the Clean Vessel Act Program for the state to insure marinas and other boating facilities provide adequate pumpout or dump stations for boaters. Implementation is ongoing through DNREC. Nearly every marina or public boating access site in the inland bays region provides shoreside restrooms. State and privately-operated boating facilities should continue to provide these facilities as the minimum required to help address marine sanitation issues throughout the bays. Another action to consider may include designating the inland bays a no discharge zone.

Boaters generate a vast amount of waste material (i.e. garbage, aluminum cans, glass, plastics, etc.). Marinas and other boating facilities should provide adequate trash receptacles as well as containers for source separation of recyclable materials. Marinas that have attempted these efforts have had tremendous success. Boaters can and should set a positive example to keep boating waters clean and promote conservation of resources.

Boaters can and should set a positive example to keep boating waters clean and promote resource conservation.

Strategies and Options for Consideration:

✓ Many of the actions needed to insure this issue is implemented are already in place and compliance and enforcement need to be ensured.
✓ Insure DNREC reviews marina O&M plans as required by law.
✓ DNREC should provide outreach services to those facilities needing assistance in complying with state regulations.
✓ Create a no discharge zone in the inland bays.

✓ Develop a no-net loss of accessible clam bottom policy to protect clamming opportunities from shoreside impacts.
✓ Develop an educational brochure identifying pumpout/dump stations in the inland bays.

Habitat Issue # 5. Inland bays' boaters are unfamiliar with the impacts of boat-related pollution on the bays' ecosystem.

Boaters, especially visitors and non-residents, are unaware of the negative environmental impacts they may cause.

Description of Issue:

This issue focuses on bay users (primarily boaters) and their unfamiliarity with the environmental impacts they cause, either knowingly or unknowingly, through their boating actions. Reaching boaters, through traditional and non-traditional means, becomes the focus of this issue. There is a need to characterize boaters on their familiarity with the bay's ecosystem and how often they boat on the bays. Literature suggests that if boaters are educated about the impacts they cause and the eventual effects on the bay's system, they may take more precautions when boating.

Existing Situation:

♦ There are numerous sources of information that address the negative impacts caused by boaters. Additional educational materials describe how boaters can be more "environmentally-friendly".

Stakeholder Input:

Encouraging non-polluting activities and allowing living resources to thrive and flourish are both important goals of the Center for the Inland Bays.

Boaters, especially visitors and non-residents, may think any negative environmental impacts that they knowingly or unknowingly cause do not have long-term effects on the bay's ecosystem. Many boaters may think that the bays are so massive that tidal flushing helps keep the system clean. This is a myth that needs to be presented and clarified to boaters. Many groups and organizations already develop educational messages with environmental themes targeted to boaters. Better and stronger educational messages need to be directed to these individuals so that they will be aware of the negative impacts boating can have on the bays' ecosystem. A simple, concise brochure or colorful decal is needed to inform boaters about things they can do to be more "environmentally-friendly" towards the bays.

Signs, with an inland bays logo, placed at boating access points (both marinas and launch ramps) can help users better understand the bays are part of a fragile marine ecosystem. Encouraging non-polluting activities and allowing living

resources to thrive and flourish are both important goals of the Center for the Inland Bays (CIB) and must be balanced. This message needs to be directed at bay users on a regular basis to keep them informed, hoping they will help protect the resource.

Strategies and Options for Consideration:

✓ Develop additional educational materials targeted to the inland bays that address the waste and pollution impacts caused by boaters.
✓ Disseminate messages through as many means as possible to reach various audiences (signs, brochures, newspaper columns, etc.).
✓ Place signs at boat access sites that highlight negative impacts to the environment and the bays' living resources caused by boater pollution.

USE ISSUES

Use Issue # 1. PWC's are operated carelessly and safety concerns need to be addressed.

Description of Issue:

Personal watercraft are popular in the bays because of their shallow draft and ability to navigate throughout nearly the entire bay system.

Personal watercraft (PWC), commonly referred to as jetskis, are a fast-growing segment of vessels being operated on the inland bays. They are popular in the bays because they are shallow-draft and can navigate throughout nearly the entire bay system. The potential for them to be involved in accidents and annoying to shoreline residents is high. There are three distinct segments of PWC operators to be concerned about in the bays: (1) resident property owners who keep the vessels at their docks or residences; (2) PWC owners who trailer their vessels to the bays and launch at area launch ramps; (3) individuals who rent personal watercraft from the various watersport rental businesses in the bay area for a short-term activity. Each group probably has a different level of expertise and knowledge about the safe operation of these vessels on the water.

Existing Situation:

♦ A PWC law was passed in Delaware in 1991 with a detailed set of regulations that operators and PWC rental operations must comply with.

♦ The DNREC, Office of Boating Safety is addressing the issue of PWC safety in a very proactive way by conducting education classes for PWC owners and operators.

♦ The DNREC, Office of Boating Safety is working with PWC rental operations to encourage stronger initiatives to promote safety among the renters. The safety messages and information they provide have been instrumental in helping to keep PWC accidents to a minimum in Delaware's Inland Bays.

Stakeholder Input:

There is still a perception that PWC operators in the bays are causing unsafe conditions and possible conflicts between different user groups. There are some known areas in the bays of high PWC use (e.g northern end of Rehoboth Bay and in Little Assawoman Bay). Marine enforcement patrols continually enforce PWC laws and they focus attention on violations as needed. The presence of marine enforcement officers helps to keep PWC operators aware that patrols are

monitoring their activity. The Division of Fish and Wildlife annually reviews its education and enforcement efforts with regard to PWC's and modifies these plans if warranted. However, additional education directed at PWC operators is always encouraged.

Strategies and Options for Consideration:

✓ DNREC needs to continue monitoring the effectiveness of regulations and education programs targeted to PWC operators.
✓ Continue to have DNREC, marine enforcement patrols in areas of high PWC use to monitor and insure safe operations.
✓ Increase enforcement of existing PWC regulations.
✓ Expand educational materials and require more education of all PWC operators.

Use Issue # 2. Increased private development (both residential and commercial) diminishes the public's access to the bays.

Description of Issue:

The issue of access is a fundamental goal that has been identified in the water-use plan. Access can be defined as insuring that all individuals have the opportunity to visit the bays and enjoy their amenities, not just a select few who can afford to own property or pay slip fees to dock their boats at private marinas. Providing adequate public access is the primary responsibility of government agencies (e.g. federal, state, county, or town). As the resident population increases, this becomes an even stronger issue to consider.

Access can be defined as insuring that all individuals have the opportunity to visit the bays and enjoy their amenities.

Existing Situation:

♦ DNREC's Division of Parks and Recreation provides access to the public through its state parks on the bays (Delaware Seashore, Holts Landing, and Fenwick Island).

♦ DNREC's Division of Fish and Wildlife provides access to the public through its launch ramps on the bays (Massey's Landing, Rosedale Beach, and Lewes) and at Assawoman Wildlife Area.

♦ The City of Millsboro offers access to Indian River through its town park, Cupola Park.

♦ Information about access to the bays is provided through the Delaware State Map, produced by the Division of Economic Development and through the Delaware Fishing Guide produced by the DNREC, Division of Fish and Wildlife. The Division of Parks and Recreation has information guides for each of its state parks in the inland bays region.

Stakeholder Input:

Gaining access to the bays through public property is becoming extremely difficult. The state has the primary agencies (especially DNREC, Division of Parks and Recreation and Division of Fish and Wildlife) who purchase available property to maintain for public use. Additionally, some private conservation organizations may also be in a position to purchase available land and allow public use to occur.

The Division of Parks and Recreation initiated the development of a statewide public access plan (including the inland bays) a few years ago, but never completed the exercise. Since there is not a county recreation department or open space program, there is limited support at the county level for such a plan to be initiated. If such a plan is worthwhile, the CIB should take the necessary steps, working with county and local tourism groups and make linkages with emerging nature-based tourism activities throughout the county.

A property inventory of land adjacent to the bays would be desirable to determine if any undeveloped properties exist that may be available in the future for public access. The Division of Parks and Recreation, or state environmental organizations may maintain records of such properties.

Public sector agencies must insure that access to the bays is not lost.

Numerous maps and guides produced by different state agencies identify public access areas around the inland bays. These may be adequate to meet the needs of visitors and residents. The CIB could also develop information of this nature to highlight and focus attention on the available public access sites in the bays' watershed, including the James Farm property.

Strategies and Options for Consideration:

✓ DNREC should complete a public access plan for the state and inland bays region, in particular**.**

Boaters in a 1992 Delaware Sea Grant study did not feel congestion was a serious concern and indicated the bays were a safe place to boat.

✓ State, county, and municipal agencies should be prepared to purchase waterfront property to insure public access to the bays is maintained.

✓ A public access guide to the bays should be published for widespread distribution.

✓ Current state access sites should be expanded as adjoining properties become available.

✓ Identify areas around the bays suitable for the development of fishing and crabbing piers.

✓ Investigate the use of additional DelDOT end-of-road right of ways for boating access.

Use Issue #3. Boating congestion in certain areas of the bays decreases boater satisfaction and increases the potential for conflicts and accidents.

Description of Issue:

This issue begins to examine social carrying capacity and its ramifications. Understanding boaters' needs is the underlying theme to comprehending boater satisfaction. However, there are other variables that need to be considered that may also affect boating satisfaction.

Overall most boaters interviewed in 1991 (Falk, et al. 1992) did not feel that congestion was a serious concern and they indicated the bays were a safe place to boat. Boating congestion is caused by many factors. The availability and location of sport fish and weather conditions are factors that contribute to congestion. Problems are not always obvious unless user conflicts and accidents increase. However, situations do change and there is always a need to monitor this concern to see if people's opinions and perceptions change over time. This may be a good indicator to determine if certain actions may need to take place in the future in response to peoples' changing satisfaction levels.

If boating congestion leads to safety problems due to accidents or other confrontations between users, the situation needs to be corrected.

Boating congestion, by itself, also needs to be examined, but not simply from a numerical carrying capacity standpoint. If boating congestion overall in the bays, or in specific areas, is considered a safety problem due to accidents or other confrontations between users, the situation needs to be corrected.

Existing Situation:

♦ The University of Delaware Sea Grant study, *Recreational Boating on Delaware's Inland Bays: Implications for Social and Environmental Carrying Capacity* conducted in 1991 was the first study that attempted to address this concern in the bays.

Common sense dictates that when boating in heavy use areas speeds should be curtailed and caution should be used.

♦ Boating accident records maintained by the Division of Fish and Wildlife provides data to determine whether crowded conditions are leading to unsafe conditions on the bays.

Stakeholder Input:

There are known areas in the bays where use activity can be heavy, such as near Massey's Landing, Indian River Inlet, and the northern and eastern sides of Rehoboth Bay. Common sense dictates that when boating in heavy use areas speeds should be curtailed and caution should be used. Advisories to boaters, in certain locations, can be issued if needed through media outlets (radio, television, newspapers), shoreside signage at marinas and launch sites, and through informational fact sheets. Education and public awareness are the keys to gaining user compliance with speed restrictions and safe operating regulations.

Certain areas of the bays have traditionally been used by certain types of users. For instance, sailboarders typically use the state park beach on the eastern shore of Rehoboth Bay. Directly north of this beach is the Rehoboth Bay Sailing Association. Sailboats of all sizes operate out of this facility. This area extends into the middle of Rehoboth Bay and can be characterized as a sailing/sailboarding area, and because of this historical use it should be allowed to continue in this fashion. Areas that have historically been reserved for clamming, can also receive this "historic-use" designation. These designated areas can be identified and information dispersed to bay users.

DNREC should monitor any changes in boating activity and act accordingly if safety or environmental concerns are identified.

Boating activity in the bays may change over time because of new types of equipment being used or by other factors. DNREC should monitor changes in boating activity or use of new equipment and be prepared to promulgate new regulations if the new uses affect personal safety or negatively impact the environment. If subtle changes are perceived, University of Delaware Sea Grant personnel could be available to assist in monitoring and documenting changing boat-use patterns.

Strategies and Options for Consideration:

✓ Continue monitoring boat use at heavily-used boating areas with marine enforcement patrols during peak weekend times.

✓ Continue education/awareness targeted to boaters about boating in crowded waterways (e.g. speed limits and boater etiquette).
✓ Identify special use areas (zones) where concentrations of similar activities are prominent, giving priority to traditional uses.
✓ Boating advisories can alert boaters about heavy-use areas in the bays.

There is a concern that storm events along with naturally-occurring wave action may accelerate shoaling in the bays' marked boating channels.

Use Issue #4. Existing navigation channels in the bays are not adequately maintained.

Description of Issue:

Dredged navigation channels exist throughout the bays to assist boaters in their cruising pursuits. When properly maintained, the channels provide deep water for most boats using the bays to navigate safely. However, storms, other weather occurrences, and naturally-occurring wave action can accelerate the shoaling process and cause the channels to fill in. As shoaling persists, the safety of boaters becomes an important concern.

Existing Situation:

♦ Tactic G in the Inland Bays Comprehensive Conservation and Management Plan (CCMP) recommends that the inland bays dredge plan should be *"...reviewed, updated and codified. Where appropriate, the plan will be updated to protect important habitats by applying the most current aquatic habitat and living resources impact assessment methods and by ensuring that dredge projects reflect the best dredging technologies and methods to minimize adverse impacts"*.

Stakeholder Input:

The Inland Bays Comprehensive Conservation and Management Plan recommends that the inland bays dredge plan should be reviewed, updated, and modified.

Most people agree that existing navigation channels in the inland bays system should be routinely dredged to insure safe navigation by boaters. Since any dredging activity can cause serious impacts to the bays' ecosystem, it should occur only during times when impacts to aquatic resources can be minimized. If a navigation channel is located near spawning or nursery areas for fish, dredging must be avoided during the time when this activity is occurring.

The inland bays dredge plan should be updated and include information on all dredging activity, privately as well as publicly-funded projects. The new dredge plan should identify areas in the bays that are appropriate or inappropriate for dredging. The planning effort should rely on public input as well as technical input from resource managers and technical scientists.

Existing boating facilities may need periodic dredging to insure safe passage by boaters. If previous authorization for dredging has been approved, it would be difficult to deny future requests. Maintenance dredging of existing sites should be permitted if impacts to sensitive habitat are minimized and mitigation efforts are considered.

Strategies and Options for Consideration:

✓ Encourage DNREC to review the current dredge plan and take steps necessary to address changes to insure safe navigation in the inland bays.
✓ Charge the Center for the Inland Bays with overseeing that the CCMP tactic related to the Dredge Plan is implemented.
✓ Dredging techniques that include new technological approaches to removing nutrients from the bays should be explored.

Use Issue # 5. Unattended or unmarked recreational crab pots pose hazzards to watercraft and impact living resources.

Description of Issue:

Although covered by current regulations, many people are concerned that crab pot regulations need stronger enforcement. There is a concern that recreational crabbers still place crab pots near navigational channels or other heavily used waterways with improper or inadequate markings. Cruising boats may get their props caught in crab pot lines. In addition, fast moving boats or PWC's may hit crab pot buoys and dislodge the marking floats. Additional education is still needed to target all crabbers using crab pots.

Crab pots are placed near navigational channels with improper or inadequate markings.

Existing Situation:

♦ Current boating regulations state that, "*No person shall place any item or equipment in a navigable channel so as to obstruct or otherwise impede or interfere with the passage of a vessel*".

♦ Current regulations state that crab pots must be marked with the owners name and address. Owners are required to check their pots and remove crabs within 72 hours of placing them in the water.

Marine enforcement patrols should have adequate staffing to insure crab pot regulations and other laws are enforced.

♦ DNREC, marine enforcement routinely check pots for markings, as well as tagging them to insure they are being checked within the 72 hour time frame. Those that are not checked within this time frame are confiscated by marine enforcement patrols.

♦ The University of Delaware Sea Grant Program has produced an educational bulletin instructing crabbers on how to adequately secure marking floats to their crab pots.

Stakeholder Input:

Prohibiting the placement of crab pots to within 200 feet of the centerline of marked navigation channels; and in the main channel of tributaries in such a way as to impede safe navigation was suggested. This should include crab pots or any other nets or equipment that could restrict navigation in a maintained channel. This may not adequately cover narrow tributaries which also handle substantial boating traffic and may also be locations where crab pots are placed. This may be more of an enforcement issue than a regulatory one, since regulations do exist to cover this particular issue.

The law states that improperly marked crab pots will be confiscated by marine enforcement patrols and it is designed to protect crabs or other non-targeted species from dying in pots. Marine Enforcement patrols should have adequate staffing to insure this practice continues.

Strategies and Options for Consideration:

✓ Stronger enforcement of crab pot regulations need to be carried out by DNREC marine enforcement to insure the crab resource is protected and boaters can navigate safely.

✓ Impose regulations that require biodegradable escape panels on crab pots to allow non-targeted species to escape.

HABITAT/USE ISSUES

Habitat/Use Issue #1. There are too few marine enforcement officers to adequately enforce existing laws and regulations in the inland bays watershed.

Enforcement pertaining to fisheries regulations and monitoring boating laws were the most often discussed concerns of stakeholders.

Description of Issue:

There is a continuing sense and perception, by the general public, that DNREC's marine enforcement staff do not have adequate personnel to enforce all of the laws and regulations pertaining to water-use activities in the inland bays. Enforcement pertaining to fisheries regulations (i.e. harvest of fish, crabs, and shellfish) and monitoring boating laws were the most often discussed concerns pertinent to this issue. This perception is usually offered by individuals who do not see enforcement patrols cruising in their boats, on a regular basis, on the bays. All agree that the marine police staff are dedicated and do an excellent job with the resources they have, but that many problems could be solved or reduced if a stronger presence was noted.

Existing Situation:

♦ Marine enforcement staff enforce numerous laws and regulations applying to water-use activities in the inland bays (Appendix C).

All agreed that the marine enforcement staff are dedicated and do an excellent job with the resources they have, but many problems could be solved or reduced if there was a stronger enforcement presence on the bays.

♦ Currently, Division of Fish and Wildlife marine enforcement agents oversee fish and wildlife laws and enforce boating regulations while Division of Water Resources environmental protection officers are responsible for monitoring environmental quality, especially water quality concerns in the bays.

Stakeholder Input:

Many argued that a strong and consistent presence of marine enforcement officers on the bays is needed during the summer to deter violators, help prevent violations, and control user activities. One possible suggestion was to hire additional marine enforcement officers during the summer months. There is a concern about whether seasonal officers could be adequately trained and have full authority to enforce regulations. Also, due to agency certification requirements, this idea may be difficult to support. Funding to support this suggestion was also noted as a concern that would need to be addressed.

Combining current marine enforcement patrols and environmental protection officers to perform similar inland bays' functions was discussed. Currently, marine enforcement patrols oversee fish and wildlife laws and enforce boating regulations, whereas environmental protection officers are responsible for monitoring environmental quality, especially inland bays water quality concerns. A joint patrol could provide a staff that would enforce all regulations and laws pertaining to the bays, both on water and landside.

Seeking additional funding to hire more marine enforcement patrols for the inland bays was an important concern to stakeholders.

A more radical idea proposed forming a new inland bays enforcement patrol to be a full-time presence on the bays. This idea is idealistic, but does present a thought-provoking suggestion. Concerns about funding these officers and the overall authority to manage and administer a newly created entity would need to be discussed and agreed upon. This idea would need to be fully explored by DNREC administration and possibly the Delaware General Assembly to determine its viability.

Strategies and Options for Consideration:

✓ Hire additional marine enforcement staff to supplement existing DNREC, Division of Fish and Wildlife staff during peak summer months.
✓ Continue placing marine enforcement staff at potential "trouble-spots" during peek weekend times to deter violators.
✓ Consider having bay volunteers on boats or at access points educating bay users about laws and regulations to safeguard bay resources and create awareness about personnel safety, thereby augmenting certain functions provided by marine enforcement personnel.

Habitat/Use Issue #2. Buoys and markers for dredged channels are ineffective at directing boaters in the bays.

Description of Issue:

Boaters would like to see better navigation markers in the bays since the bays are relatively shallow.

There is a consensus by the general public that buoy markers in the bays, especially on dredged channels, are not properly maintained or positioned to adequately direct boaters in the bays. As a general rule, boaters would like to see better markers to help them navigate, especially since the bays are relatively shallow throughout. A variety of problems related to navigation may exist: (1) boaters (especially novice boaters) may not be aware of how to read markers; (2) channel markers are not consistent with the navigational charts that boaters are using; (3) markers and buoys are not being maintained properly by the responsible agency; and (4) maintenance dredging is not occurring to keep channels open and navigable.

Existing Situation:

♦ Navigation buoys currently mark only the existing channels in Rehoboth and Indian River Bays.

♦ There are limited lighted buoys to assist boaters navigate at night.

Better education needs to be targeted to boaters about navigating in the bays.

Stakeholder Input:

There is concern voiced by boaters that navigation buoys and markers in the bays are difficult to follow. Many boaters, especially non-residents and visitors are unfamiliar with the bays and the shallow areas (or sandbars) that change constantly after storms and other natural occurrences. New or additional buoys that are more prominent should be placed in navigation channels, along with better education targeted to boaters to help them navigate within maintained channels.

Certain channel markers are not lighted and thus boaters boating after sunset and before sunrise may have a difficult time traversing the bays. Nighttime boating can be especially difficult for novice boaters and lighted buoys become an attractive amenity. Concerns have been raised about the cost of such amenities, as well as who would operate and maintain the buoys.

Strategies and Options for Consideration:

✓ An educational effort is needed to help bay boaters to better understand buoy markings on the bays; decals could be developed depicting navigational markers that instruct boaters how to follow channel markers.

Nighttime boating can be especially difficult for novice boaters and lighted buoys could be beneficial.

✓ Investigate whether more buoys are needed in the bays, and whether current markers require better maintenance; lighted buoys may be beneficial to improve nighttime navigation.

Habitat/Use Issue #3. High speed boats, especially in narrow tributaries, cause shoreline erosion and safety concerns.

Description of Issue:

Throughout Delaware's Inland Bays, there are a series of narrow tributaries that are rapidly becoming developed with residential property, as well as marinas, and other boating facilities. These areas can also be popular areas for boaters and personal watercraft. As previously mentioned, erosion by boats can be a problem and is a major concern to property owners residing along these narrow

There are numerous causes of shoreline erosion, and the severity can depend on many factors.

tributaries. There are numerous causes of shoreline erosion, and the severity can depend on many factors. A Maryland DNR study, *The Role of Boat Wakes in Shore Erosion in Anne Arundel County, Maryland,* completed in 1981 describes the impact of shoreline erosion caused by boats. Boats traveling at certain speeds and close to shorelines can cause shorelines to erode if the shoreline in question is susceptible. According to the study, the type of shoreline most susceptible to erosion would have a combination of conditions: (1) an exposed point of land in a narrow creek or cove, (2) fastland consisting of easily-eroded material such as sand or gravel, (3) a steep nearshore gradient on the shoreline profile, and (4) a location adjacent to a high rate of boating with boats passing relatively close to the shoreline. This study also found that boats towing a water-skier created higher boat wakes than those without a skier in tow, which has implications for inland bays tributaries since water-skiing does take place in certain areas of the bays.

As an example, the Maryland DNR enforces the following boating regulations in certain areas to protect boaters and living resources: impose speed limits on weekends and holidays; maintain minimum-wake zones (in addition to no-wake zones); and prohibit boating in certain areas to protect threatened and endangered species.

Existing Situation:

♦ No-wake zones are currently established for certain areas in the inland bays to insure personal safety and protect property.

Stakeholder Input:

Most no-wake areas in the bays have been so designated for safety reasons and to protect property and land from the effects of boat-induced waves. No-wake typically means operating a vessel at speeds of six mph or less. There is a concern that additional no-wake areas should be designated in the bays, especially in narrow tributaries. It might be difficult to determine which tributaries are considered *narrow* and there may be other criteria (e.g., erosion, noise, wildlife impacts, or safety) that can be used for no-wake or minimum-wake designation in inland bays tributaries. Proposing such designations may lead to opposition from waterskiers, PWC operators, and others. The need for additional enforcement also poses a concern. A thorough review of current no-wake areas should be undertaken as a basis to recommend adding additional no-wake zones.

Strategies and Options for Consideration:

✓ Impose no-wake or minimum-wake zones where impacts to personal property or plant and animal life are identified.
✓ DNREC must review all current no-wake areas in the inland bays and develop a policy to address future area designations.
✓ Expand no-wake designation to include various tributaries not already covered.

No-wake speed typically means operating a vessel at speeds of six mph or less.

Habitat/Use Issue #4. Un-restricted development of marinas, docks and piers in the inland bays watershed causes negative impacts on the environment and may restrict the public s use of certain water areas.

Description of Issue:

There is considerable concern from many groups and individuals that development of marine-related facilities (marinas, private docks, piers/boardwalks) in the bays is growing and leading to many environmental problems, both real and perceived. Many of these facilities continue to be developed and they consume a portion of the public trust waters that are protected for the rights of everyone to use.

Subaqueous land lease fees that used to be paid by anyone who built a dock or pier over public lands were eliminated a few years ago and DNREC lost a source of revenue and control over the development of these structures. Building and development activity, including obtaining permits for water-related facilities around the bays seems to move forward at a steady pace.

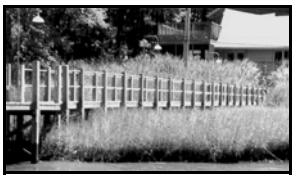
There is considerable concern that development of marine-related facilities (marinas, private docks, piers/boardwalks) in the bays is growing and leading to many environmental problems.

Existing Situation:

♦ State and/or federal permits are required prior to any development depending on the nature of the facility or structure and the impacts on the environment.

♦ State marina regulations set existing standards for the development of marinas.

Stakeholder Input:



It has been proposed that new or expanded marinas or launch ramps should only be developed in areas that require minimal (or no) dredging to insure boats have access to navigable waterways. This also applies to private docks and piers which are built for individual homeowners. Oftentimes water depth is not sufficient at the end of a dock or pier and dredging is needed to reach deep water. This activity should be severely curtailed. Identifying "deep water" will become the responsibility of the private individual in each case prior to developing any structure.

Once areas deemed "sensitive habitat" have been identified throughout the inland bays, any development that may cause impacts to these areas should be closely monitored. All negative impacts to the sensitive habitat should be avoided. DNREC should identify no development zones because of the sensitive nature of wetlands or other aquatic habitat. If developers obtain permits for development, and carefully plan developments to avoid negative impacts, mitigation measures must also be identified to offset any potential negative impacts.

If it is determined that additional marinas are needed in the inland bays region, DNREC should develop a base map identifying areas that meet the desired marina siting criteria. If such criteria are not already established, DNREC should take the lead to do so. Key variables such as: (1) no impact on wetlands; (2) minimal dredging; (3) avoiding sensitive habitat; and (4) access to deep water are all desirable criteria to examine in determining where marinas and boating facilities could be developed.

"No development zones" should be identified because of the sensitive nature of wetlands and other aquatic habitat.

Strategies and Options for Consideration:

✓ The Center for the Inland Bays, DNREC, and private citizens should identify land and water areas in the bays that can be termed Areas of Critical Environmental Concern. These areas would require a higher level of environmental review before allowing any development to occur.
✓ Identify sensitive habitat areas that would be off-limits to developers.
✓ Prohibit the use of vertical-walled structures (e.g., bulkheads) as a way to stabilize shorelines.
✓ Any vertical-walled structure needing to be replaced, must be replaced using natural methods, such as rip-rap or vegetation.

Habitat/Use Issue #5. Future Increases in boating use on the bays may exceed an identified carrying capacity for the resource.

Description of Issue:

Examining boater satisfaction over time can be an effective way to monitor activity levels and assess whether carrying capacity limits may be reaching their maximum.

There are people who would like threshold limits set for the number of boats that can safely operate on the bays at any one time (from both an environmental and social level). This would be difficult to achieve for the bays because access to the resource is open, and not controlled like in certain lakes, reservoirs, or parks. As mentioned earlier, examining boater satisfaction over time can be an effective way to monitor activity levels and assess whether carrying capacity limits may be reaching their maximum.

Existing Situation:

♦ The University of Delaware Sea Grant Report published in 1992, *Recreational Boating on Delaware's Inland Bays: Implications for Social and Environmental Carrying Capacity* began to explore this issue, however, no conclusions were reached at the time that warranted establishing specific boating carrying capacity limits for the bays.

♦ Carrying capacity standards for the inland bays were suggested by The Battelle Memorial Institute in 1989 for a variety of activities (Appendix A).

♦ Carrying capacities for boats have been determined for other water bodies where there is controlled access to the resource, such as inland lakes and reservoirs.

Stakeholder Input:

If resource managers determine that recreational boating is growing and creating serious environmental problems or creating unsafe conditions for users, a methodology may need to be identified that will determine the impacts and help prevent these serious conditions from occurring.

If monitoring and research indicate that carrying capacity problems exist, a mechanism for limiting boating activity on the bays may be needed. This is a policy or management concern that should be addressed to insure boaters have a safe environment to recreate. Some mechanisms that might be considered include: (1) assessing user fees; (2) odd/even number use days; (3) restricting activities to certain areas or at certain times; or (4) restricting certain uses. This is an extremely difficult process to manage and one that causes a great deal of concern and conflict among users. It requires constant monitoring and assessment to insure people's safety and the ecosystem is protected. Since access to the bays waters is from many different locations, managing such a plan would be difficult.

If research indicates that carrying capacity problems exist, a mechanism for limiting boating activity on the bays may be needed.

Strategies and Options for Consideration:

✓ Continue to monitor environmental and social impacts of increasing use.
✓ Develop a methodology to determine if the bays' capacity to support boating has been exceeded and identify a mechanism to limit boating, in certain areas, if carrying capacity research indicates such a need.

Section VII

RECOMMENDATIONS AND ACTIONS

Recommendations and targeted actions are clearly identified in this section that will help minimize environmental impacts, avoid user conflicts, and improve conditions related to water-use activities in Delaware's Inland Bays. The actions are grouped according to specific approaches for organizational purposes. These approaches include: Enforcement, Regulatory, Education/Awareness, Waterway Improvement, Administrative, and Other. In addition, the issue from which the action is derived is noted in an abbreviated form at the beginning of each action.

In many instances, implementing actions will require a partnership with other interested parties.

Where appropriate, responsible agencies or organizations are identified as the lead group to insure that the actions are carried out. In many instances, implementing the actions will require a partnership among other interested parties. The lead agency or organization can decide on the best method of accomplishing the intended goal.

In addition, it was difficult to assign time-frame priorities for completing the identified actions in the plan. From the standpoint of interested stakeholders, they are all important actions deserving high priority status. One suggestion to aid in prioritizing the actions would be for the proposed water-use plan review committee to work closely with the Center for the Inland Bays and affected management agencies to set priorities. Criteria have been identified with stakeholder assistance that can be useful in evaluating short and long term priorities.

Actions should be reviewed annually by a water-use plan review committee.

In order for this plan to be evaluated as to its success, two actions need to be implemented immediately. First, a commitment needs to be made to review the actions periodically to note their progress or completion. Secondly, a water-use plan implementation committee, representing various stakeholders, should be appointed to act as the responsible review group. In addition to documenting progress, this group should also address any new activities or occurrences related to the bays' water-uses that may be relevant to the actions identified in this plan. If recommended actions need to be modified, this committee can discuss the necessary changes.

The following recommendations and actions were developed with the input of many individuals. There were strong feelings by many citizens and residents that the actions must be addressed to continue meeting the overall goals outlined in the CCMP. Views were also expressed that some of the actions were unenforceable

or that they would be difficult to address due to a variety of reasons. It is anticipated that the proposed water-use plan implementation committee will review these actions and arrive at plausible solutions.

Marine enforcement personnel should have greater presence at potential "trouble spots" during peak summer weekends.

Enforcement Actions: These actions direct DNREC enforcement personnel to engage in new or stronger enforcement actions relative to water-use activities in the bays. They may also support current enforcement efforts presently underway.

1. (H/U Issue #1) Hire additional marine enforcement staff to supplement existing patrols. Additional staff should be assigned to the inland bays to enforce current laws and regulations (DNREC, Division of Fish and Wildlife).

2. (H/U Issue #1) Continue presence of marine enforcement staff at potential "trouble spots" on peak weekends during the summer months. These are areas where serious accidents have occurred in the past, where large numbers of boats are concentrated in relatively small areas, or where multiple activities occur simultaneously (DNREC, Division of Fish and Wildlife).

3. (H Issue #2) Once sensitive aquatic habitats have been identified and marked in the bays and speed limits have been imposed, they should be enforced to protect fragile resources (DNREC, Division of Fish and Wildlife).

4. (H Issue #3) Increase the presence of marine enforcement staff near habitat restoration sites and resource protection areas to prevent bay users from disturbing them (Appropriate DNREC Divisions).

Marine enforcement personnel should patrol areas of high PWC use to monitor operators and insure safety.

5. (U Issue #1) Continue patrolling areas of high personal watercraft (PWC) use to monitor operators and insure safe operations as use continues to increase in the bays (DNREC, Division of Fish and Wildlife).

6. (U Issue #5) Continue enforcing blue crab regulations, especially with regard to crab pot placement and retrieval, to insure the crab resource is protected and boaters can navigate safely in marked and unmarked waterways (DNREC, Division of Fish and Wildlife).

Education/Awareness Actions: These actions target further education and awareness activities to better inform bay users about certain conditions in the inland bays. They instruct various organizations or agencies to take a proactive approach to educating groups and individuals.

The CIB, DNREC, and Delaware Sea Grant should prepare educational materials informing the boating public of how to be more "environmentally-friendly".

1. (H Issue #2) Identify sensitive shallow water areas, install signs marking the areas, and propose speed limits to deter boaters from speeding through sites at top speed (DNREC, Division of Water Resources).

2. (H Issue #2) Prepare educational materials informing the boating public about preventing negative impacts to shallow water areas in the bays (CIB, Appropriate DNREC Divisions, University of Delaware Sea Grant).

3. (H Issue #3) Improve in-water signage marking resource protection areas and habitat restoration sites and provide descriptive narratives for why the areas need to be left undisturbed (DNREC, Division of Water Resources).

4. (H Issue #3) Post signage at public access ramps to inform trailerable boaters (many who are non-residents) about resource protection areas and habitat restoration sites and describe ways they can improve the environmental quality of the bays (CIB, DNREC Division of Water Resources).

5. (H Issue #3) Prepare and distribute educational materials with information about resource protection areas and habitat restoration sites. The materials should be produced in a way that they can be updated on a regular basis as new sites and programs are created (DNREC, Division of Water Resources, CIB).

The CIB should help educate bay boaters to better understand navigation channel buoy markers on the bays.

6. (H Issue #4) Provide outreach services to marina and boatyard operators needing assistance in complying with environmental regulations. Services may include individual consultations, workshops, or other programs to insure facility owners and managers comply with state marina regulations and employ "best management practices" at their facilities (DNREC, Pollution Prevention Program and Division of Water Resources).

7. (H/U Issue #2) Conduct an educational effort to help bay boaters to better understand navigation channel markers on the bays. One approach could be to design and distribute decals to identify navigational markers used in the bays and instruct boaters how to read and properly follow the navigational aids (CIB).

8. (H Issue #5) Develop and distribute general educational materials targeted to boaters and other bay users that addresses any waste, litter, and pollution impacts that they may cause (Appropriate DNREC Divisions and CIB).

DNREC should produce a public access guide that highlights opportunities for residents and visitors.

9. (H Issue #5 and U Issue #3) Disseminate educational messages on water-use activities and habitat issues through various media sources (television, radio, local newspapers, fact sheets, etc.) to reach residents and non-resident audiences during the peak summer months when activity levels are the greatest. Messages should be disseminated on a weekly basis during the summer (Appropriate DNREC Divisions, CIB, University of Delaware Sea Grant).

10. (U Issue #1) Expand educational materials targeted to PWC operators, since they are often identified as not adhering to the "rules of the road", and require additional education for all operators (DNREC, Division of Fish and Wildlife).

11. (U Issue #2) Produce a public access guide that highlights access opportunities to the bays for residents and visitors (Appropriate DNREC Divisions).

12. (U Issue #3) Educate boaters about boating in crowded waterways. Congested and crowded waterways are often locations where boating accidents occur. Educational messages should focus on safe speed limits, proper boat handling, and "rules of the road" (DNREC Division of Fish and Wildlife, CIB).

DNREC should inventory and map sensitive shallow water areas in the bays, and other high value resource areas and insure they are protected from human disturbances.

13. (H Issue #4) Develop an educational brochure identifying pumpout/dump stations in the inland bays watershed (Appropriate DNREC Divisions, CIB).

<u>Administrative Actions</u>: These actions focus on planning, management, or research-related activities that need to be addressed, primarily by DNREC personnel, to resolve water-use concerns in the bays.

1. (H Issue #1) Inventory and map sensitive shallow water areas in the bays, and other high value resource areas, to identify resources needing protection from human disturbances (Appropriate DNREC Divisions).

2. (H Issue #4) Review marina and boatyard operation and maintenance (O&M) plans in a prompt manner when they are submitted. These plans insure how the facilities are addressing environmental concerns (DNREC, Division of Water Resources).

3. (H/U Issues #3) Review all current no-wake areas in the inland bays and develop a policy to address future area designations. This will insure that private property and natural resources are protected from the damage caused by heavy boat wake (Appropriate DNREC Divisions).

Public sector agencies should acquire waterfront property to insure public access to the bays is maintained and enhanced.

4. (U Issue #1) Continue to monitor the effectiveness of ongoing regulations and education program targeted to PWC operators (DNREC, Division of Fish and Wildlife).

5. (U Issue #2) Complete a public access inventory for the state and the inland bays region, in particular. Current access sites should be identified, as well as future sites that might be available (DNREC, Division of Parks and Recreation).

6. (U Issue #2) Acquire available waterfront property to insure public access to the bays is maintained and enhanced (Appropriate State, County, or Municipal Government Agencies).

7. (U Issue #2) Identify areas around the bays suitable for developing fishing and crabbing piers (DNREC, Division of Fish and Wildlife).

8. (U Issue #2) Investigate the use of additional Delaware Department of Transportation end-of-road, right of ways for boater access (CIB).

9. (U Issue #2) Expand current state-owned access sites (e.g., parks, boat ramps, etc.) if adjoining properties become available (Appropriate DNREC Divisions).

Current no-wake areas in the inland bays should be reviewed and a policy developed to address future designations.

10. (U Issues #3) Monitor special use zones (areas historically used by certain user groups) where concentrations of similar activities are prominent and insure these traditional uses are not displaced (Appropriate DNREC Divisions).

The CIB and DNREC should identify land and water areas in the bays that can be termed Areas of Critical Environmental Concern.

11. (H/U Issue #4) Identify land and water areas in the bays that can be termed Areas of Critical Environmental Concern. These areas would require a higher level of environmental review before allowing any development to occur (Appropriate DNREC Divisions and CIB).

12. (H Issue #1 and U Issue #4) Review the current dredge plan and take steps necessary to address changes to insure safe navigation on the bays (DNREC, Division of Soil and Water Conservation).

13. (U Issue #4) Explore dredging techniques that include new technological approaches for removing nutrients from the bays (DNREC, Division of Soil and Water Conservation).

14. (U Issue #4) Insure that the CCMP tactic related to updating the dredge plan is implemented in a prompt and efficient manner (CIB).

15. (H/U Issue #5) Continue to monitor the social impacts of increasing bay uses. This may involve establishing monitoring procedures to identify user conflicts, safety concerns, and levels of satisfaction among users (Appropriate DNREC Divisions and CIB).

16. (H/U Issue #5) Develop a plan to address the bays' carrying capacity to support various water-use activities as use levels continue to increase (Appropriate DNREC Divisions).

17. (H Issue #4) Create a no discharge zone in the inland bays watershed (Appropriate DNREC Divisions and CIB).

The CIB should oversee that the CCMP tactic related to the updating of the dredge plan is implemented in a prompt and efficient fashion.

Regulatory Actions: These actions recommend imposing additional regulations or encouraging stronger compliance of existing regulations. Protecting personal property and safeguarding sensitive bay ecosystems are the primary focus of the actions.

1. (H Issue #2) Impose regulations to restrict the speed of watercraft in sensitive aquatic areas to protect living resources and important habitat (DNREC, Division of Fish and Wildlife).

2. (H/U Issue #3) Impose no-wake or minimum-wake zones where impacts to personal property or plant and animal life are identified throughout the bays (DNREC, Division of Fish and Wildlife).

3. (H/U Issue #3) Expand no-wake designation in narrow, heavily-traveled tidal creeks and streams to include those areas not already covered by current regulations (DNREC. Division of Fish and Wildlife).

DNREC should consider restricting power boats from areas identified as important bay ecosystems.

4. (H Issue #1) Restrict powerboats from those unique areas identified as critical bay ecosystems supporting living resources and serving as spawning, feeding, or nursery areas (Appropriate DNREC Divisions).

5. (H/U Issues #4) Amend state Subaqueous Lands Act regulations to prohibit the construction of vertical bulkheads around the inland bays, except in areas where there are no alternatives. This would also include denying permits for replacement of existing structures when they fail. This would encourage more natural shoreline protection methods (DNREC, Division of Water Resources).

6. (H Issue #4) Develop a policy of "no-net loss" of accessible clam bottom to protect clamming opportunities from shoreline development impacts (Appropriate DNREC Divisions).

7. (U Issue #5) Impose regulations that require biodegradable escape panels on crab pots to allow non-targeted species, such as turtles and fish, to escape (DNREC, Division of Fish and Wildlife).

Accessible clam bottom areas should be protected from shoreline development impacts.

Waterway Improvement Actions: These actions focus on navigation improvements in the bays to better assist boaters and other users avoid conflict, improve safety, and minimize adverse impacts to the resource.

1. (H/U Issue #2) Investigate the need for additional buoys in the bays to properly mark navigation channels and insure boating safety (Appropriate DNREC Divisions and U.S. Coast Guard).

2. (H/U Issue #2) Determine whether existing channel markers require improved maintenance and whether lighted buoys are desirable to improve nighttime navigation (Appropriate DNREC Divisions and U.S. Coast Guard).

Additional buoys are needed to properly mark navigation channels and insure boating safety.

Other Actions: These actions are general in nature, yet are still beneficial to address water-use activities and concerns in the bays.

1. (H/U Issue #1) Form a bay volunteer program, with volunteers cruising the bays on boats or stationed at access points to educate bay users about inland bays' laws and regulations. This effort can help to safeguard bay resources and improve user safety, thereby augmenting the role undertaken by current marine enforcement personnel (CIB).

Public Trust Doctrine issues related to the bays should be researched and clearly expressed.

2. Research and draft legislation that more clearly expresses the rights, both traditional and expansive, involved in the Public Trust Doctrine. This should focus on enabling regulatory amendments to existing laws, related to inland bays' uses, to better categorize public trust uses and to prioritize them. Permitting procedures should address public trust rights and uses expressly, and appropriate planning should occur to ensure their implementation (Appropriate DNREC Divisions and Department of Justice, Environmental Unit).

Section VIII

CONCLUSIONS

Short term results can have long term benefits if users' attitudes and behaviors are modified to insure environmental impacts are minimized and conflicts between users are averted.

This water-use plan has attempted to develop a framework for addressing human impacts on Delaware's Inland Bays. The framework was not intended to be exhaustive, but rather selective in focusing on solutions to key issues that could produce tangible short-term results. However, even short-term results can have long-term benefits if users' attitudes and behaviors are modified to insure environmental impacts are minimized and conflicts between users are averted. The strong focus on education and awareness actions is intended to influence these changes.

There are more complex and controversial methods to manage and control the multiple uses occurring in the bays that may need to be explored in the future. For instance, zoning specific uses to defined areas and prohibiting certain uses altogether are being attempted in water bodies at various locations nationally. These types of actions were discussed for different water-use activities occurring in Delaware's Inland Bays, but were dismissed in favor of other education or enforcement tactics. However, as previously noted, the increase or change in water-use activities in the future may dictate the need for stronger actions to achieve the desired results.

This water-use plan was not completed to stand alone. As other Comprehensive Conservation and Management Plan (CCMP) tactics are reviewed and implemented, this plan can gain strength and develop new partnerships. A number of habitat protection tactics identified in the CCMP can be directly related to the actions identified in this plan. For instance, developing county habitat protection ordinances and creating a Resource Protection Area Management Plan can further direct attention for the need to preserve the bays' vital resources. Establishing shoreline building-setback lines and updating the inland bays dredge plan can also further benefit the resource and re-enforce some of the targeted actions proposed in this water-use plan.

Additionally, Inland Bays' Tributary Action Teams being coordinated through the Center for the Inland Bays are addressing nutrient enrichment and habitat loss issues. Each sub-watershed in the system (Rehoboth, Indian River, and Little Assawoman Bays) is being examined by residents and other stakeholders independently to highlight unique water quality problems and concerns.

This plan was not completed to "stand alone". As other CCMP tactics are implemented this plan can gain strength and develop new partnerships.

Other related items that also affect water quality and management of the bays include DNREC's Total Maximum Daily Load (TMDL) process and the planning actions of the Inland Bays' Whole Basin Management Team. Both of these efforts are closely associated with the Tributary Action Teams to focus attention on improving the overall health of the ecosystem. The actions identified in the water-use plan, through stakeholder involvement, may be helpful in defining and characterizing key water-use concerns that may also contribute to the Tributary Action Team process.

Since activity uses in the bays can change periodically, this plan cannot remain static. It must be reviewed periodically and modifications made, if needed. Currently, DNREC scientists and others, monitor important environmental parameters in the bays. It would also be beneficial to monitor activity patterns baywide, as well as in specific geographic zones, to determine changes or emerging trends. Three conditions that should be monitored include: user impacts on the environment, problems related to crowding and user satisfaction, and safety concerns. Each of these issues is vital to providing a quality recreational experience for bay users. Additionally, the major tributaries in the bays' ecosystem (e.g., Herring Creek, Love Creek, Whites Creek, Pepper Creek, and Upper Indian River) deserve special attention. These areas are subject to intense recreational uses and potential user conflicts, but can also provide valuable habitat to many of the bays' living resources.

This water-use plan invites all stakeholders to become trustees of the resource and do their share to enhance the quality of the bays.

With the completion of this plan, the work related to improving and enhancing the bays assets has not come to an end; some would suggest, it is just beginning. The plan describes an action agenda that many groups, organizations, and individuals can become involved. The primary impetus lies with the state agency responsible for managing the resource for the citizens of the state; the various division and sections within the Department of Natural Resources and Environmental Control (DNREC). The Center for the Inland Bays is also charged with the responsibility of overseeing implementation of the actions.

Managing multiple-use waterbodies, like Delaware's Inland Bays can be a complex task, especially considering all of the stakeholders who have an interest. This water-use plan invites all stakeholders to become trustees of the resource and to do their share to maintain and enhance the bays so that the quality of life that attracts them continues for years to come.

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APPENDIX A

INLAND BAYS ACTIVITY AREA REQUIREMENTS (BATTELLE MEMORIAL INSTITUTE, 1989)

Activity	Class	Shoreline Consumption	Open-Water Consumption	Unit of Space Measurement	Environmental Quality Requirements
First-Degree Water Contact					
Swimming	R	High	Low	1:10 lin ft shoreline; 1:150 sq ft beach	High water quality, no debris
Windsurfing	R	Low	High	1:5 acres	High water quality
Jet skiing	R	Low	High	1:2 acres	High water quality
Waterskiing	R	Medium	High	1:10-20 acres	High water quality
SCUBA Diving	R	Low	Low	1:5 acres	High water quality
Second-Degree Water Contact					
Motorboating	R	Medium	High	1:20 acres	Deep water, no debris
Sailboating	R	Medium	Medium	1:2.25-3.5 acres	Deep water, no debris
Rowing	R	Low	Low	1:0.3-1 acre	Weather protected areas
Hunting	R	High	Low	1:8 acres	High-quality waterfowl habitat, low development
Boat Fishing	R,C	Medium	Medium	1:3-10 acres	High-quality fish habitat
Shore Fishing	R	Low	Low	1:50 lin ft shore; 1:25 lin ft pier	High-quality fish habitat
Crabbing	R,C	Low	Medium	varies	High-quality shellfish habitat
Clamming	R,C	Low	Medium	1:1-5 acres	High quality shellfish habitat
Mariculture	C	Medium	Medium	varies	High water quality
Nature Study	SP	High	Low	varies	Low/no development
Third-Degree Water Contact					
Sunbathing	R	High	Low	1:50 sq ft beach	No debris
Sightseeing	R	High	Low	varies	No debris, moderate development
Marina Operations	C	High	High	varies	Good flushing, low impact
Private Dock Operations	R	High	Medium	varies	Good flushing, low impact
Industrial Discharge	I	Low	High	varies	Good flushing, low impact
Industrial Intake	I	Low	High	varies	High water quality, no debris
Municipal Discharge	M	Low	High	varies	Good flushing, low impact
Stormwater Runoff	M	Low	High	varies	Good flushing, low impact

KEY TO HEADINGS

Class
R Recreational: Private individuals and groups exercising their rights to enjoy the inland bays
C Commercial: Individuals and businesses that derive all or part of their livelihood directly from the bays, including selling goods and services to recreational users
M Municipal: Municipalities and authorities that discharge wastewater into the bays
I Industrial: Businesses that intake of discharge bay water
SP Special Programs: Academic Institutions, nature centers, etc. that use the bays for instruction and research

Shoreline: Open-Water Consumption
Relative special demands of the entire activity group, including any infrastructure. Swimming, for example, requires a relatively large shoreline beach area with restrooms, parking facilities, etc. nearby, but the actual open-water space consumed is only the near-shore, ~ 50 foot fringe area.

Unit of Measurement
Area required for a single member (e.g., 1 swimmer, 1 sailboat, 1 marina) of the activity.

Environmental Requirements
Minimum environmental quality parameters necessary for the activity to comfortably exist.

APPENDIX B

INLAND BAYS CONFLICT MATRIX
(BATTELLE MEMORIAL INSTITUTE, 1989)

Activities	SW	WS	JS	SK	SD	MB	SB	RW	HT	FB	FS	CB	CL	MC	NS	SU	SS	MA	PD	ID	II	MD	SR
First- Degree Water Contact																							
Swimming	-	3	3	2	2	3	2	1	2	2	3	2	2	3	2	0	0	3	3	3	3	3	3
Windsurfing	3	-	3	3	2	3	2	1	2	2	1	1	1	1	1	0	0	3	2	3	3	3	3
Jet Skiing	3	3	-	3	3	3	3	3	2	3	3	3	3	2	3	1	2	2	2	3	3	3	3
Waterskiing	2	3	3	-	3	3	3	3	2	3	3	3	3	2	3	1	1	2	2	3	3	3	3
SCUBA Diving	2	2	3	3	-	3	3	1	2	3	1	2	2	2	1	1	1	3	2	3	3	3	3
Second Degree Water Contact																							
Motorboating	3	3	3	3	3	-	3	3	3	3	2	3	3	3	3	1	1	2	2	2	2	2	2
Sailboating	2	2	3	3	3	3	-	1	2	2	1	1	1	1	1	1	0	2	1	2	2	2	2
Rowing	1	1	3	3	1	3	1	-	1	1	1	1	1	1	1	1	0	2	1	2	2	2	2
Hunting	2	2	2	2	2	3	2	1	-	1	1	1	2	3	3	2	2	3	3	3	2	3	3
Boat Fishing	2	2	3	3	3	3	2	1	1	-	0	1	1	2	1	0	0	2	2	3	2	3	3
Shore Fishing	3	1	3	3	1	2	1	1	1	0	-	1	1	2	1	2	1	3	3	3	3	3	3
Crabbing	2	1	3	3	2	3	1	1	1	1	1	-	1	1	1	0	0	3	3	3	2	3	3
Clamming	2	1	3	3	1	3	1	1	2	1	1	1	-	2	1	0	0	3	3	3	2	3	3
Mariculture	3	1	2	2	2	3	1	1	3	2	2	1	2	-	2	2	2	3	3	3	3	3	3
Nature Study	2	1	3	3	1	3	1	1	3	1	1	1	1	2	-	2	1	3	3	3	3	3	3
Third-Degree Water Contact																							
Sunbathing	0	0	1	1	1	1	1	1	2	0	2	0	0	2	2	-	0	2	2	2	2	2	2
Sightseeing	0	0	2	1	1	1	0	0	2	0	1	0	0	2	1	0	-	2	2	3	3	3	3
Marina Operations	3	3	2	2	3	2	2	2	3	2	3	3	3	3	3	2	2	-	2	3	3	3	3
Private Docks	3	2	2	2	2	2	1	1	3	2	3	3	3	3	3	2	2	2	-	3	3	3	3
Ind-Discharge	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	2	3	3	3	-	3	3	3
Ind-Intake	3	3	3	3	3	2	2	2	2	2	3	2	2	3	3	2	3	3	3	3	-	3	3
Mun-Discharge	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	2	3	3	3	3	3	-	3
Storm Runoff	3	3	3	3	3	2	2	2	3	3	3	3	3	3	3	2	3	3	3	3	3	3	-
Conflict Rating	2.2	1.9	2.6	2.5	2.1	2.4	1.7	1.4	2.1	1.7	1.8	1.7	1.8	2.1	2.0	1.1	1.2	2.5	2.3	2.7	2.5	2.7	2.7

0 No water-use activity conflicts; no competition for space or resource utilization; may exist together.

1 Low conflict; probable small competition for space or resources.

2 Medium conflict; definite competition for space or resources; but activities usually not overlapping.

3 High conflict; direct competition for space and/or resources; activities cannot coexist without substantial space between participants.

APPENDIX C

SUMMARY OF LAWS AND REGULATIONS AFFECTING WATER-USE ACTIVITIES IN DELAWARE'S INLAND BAYS

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LAWS AND REGULATIONS AFFECTING WATER-USE ACTIVITIES
IN DELAWARE'S INLAND BAYS

Recreational Boating Regulations:

-all motorized vessels must be registered
-boating safety course (anyone born after 1/1/78)
-PFD's available on boats for all riders
-PFD's worn by anyone 12 years of age and under
-no operating boats under the influence of drugs or alcohol
-speed must be slow enough to prevent wakes when vessels are within 100 feet of:
    -any shoreline where "slow no-wake" signs have been erected by DNREC;
    -floats;
    -docks;
    -launching ramps;
    -marked swimming areas and swimmers;
    -anchored, moored, or drifting vessels.
-vessel operators are prohibited from discharging untreated sewage onto state waters

Anchoring/Obstructing Navigation Regulations:

-no anchoring of vessels/objects in navagable channels or equipment from vessels to interfere with passage of vessels, or obstruct or obscure navigational aids
-no anchoring vessels or allow equipment to obstruct/interfere with vessel passage near:
    -boat launching facility;
    -marina entrance;
    -entrance to any canal/waterway;
    -permanent mooring facility.
-no placing equipment or items in navigable channels as to obstruct or impede or interfere with passage of a vessel.

Waterskiing Regulations:

-prohibited waterskiing areas:
    -Lewes-Rehoboth Canal, entirety;
    -channel through Massey's Landing (from buoy #12 to buoy 19A);
    -Assawoman Canal, entirety;
    -Indian River Inlet (between buoy #1 and coast guard station);
    -Roosevelt Inlet (from 100 yards off jetty entrance to canal);
    -White's Creek (south of marker #9A);
    -any marked swimming areas, unless authorized by a special permit issued by DNREC.

Personal Watercraft (PWC) Regulations:

-age to operate PWC (16 years; 14 years under supervision of parent/guardian)
-no operating from ½ hour after sunset to ½ hour before sunrise, unless equipped with lights
-all operators/riders must wear approved PFD's
-owner of PWC shall oversee safe use of PWC by another person operating vessel
-speed of PWC's:
    -PWC shall not be operated at any speed greater than headway speed while within, or at entrance to a marina or other place used as an anchorage;
    -within DE Atlantic Ocean waters, PWC's shall not be operated at any speed greater than headway speed, unless vessel is at least 300 feet from all fixed structures, vessels, people in the water, or shorelines;
    -on DE waters, other than the Atlantic Ocean, no person shall operate a PWC at any speed greater than headway speed unless vessel is at least 100 feet from all fixed structures, vessels and shorelines, and at least 300 feet from all people in the water; this provision shall not apply to the waters of the Nanticoke River.
-PWC's are not allowed in areas where motorized vessels are prohibited.
-no towing skiers behind PWC, unless designed to carry at least 2 people (with observer)
-all PWC's must have a self-circling device or lanyard-type engine cut-off switch; lanyard switch must be attached to operator.
-no person shall alter or tamper with any part of PWC throttle (or cut-off switch) mechanism on a PWC which returns engine to idle speed upon release of hand from throttle.
-PWC shall always be operated in a reasonable and prudent manner. Unreasonable maneuvers include:
    -weaving through congested vessel traffic;
    -jumping or attempting to jump wakes of another vessel within 100 feet of such other vessel, or when visibility around such other vessels is obstructed;
    -following within 100 feet of a water-skier;
    -speeding in restricted speed areas.
    -No person shall rent a PWC to any person who does not hold a valid automobile driver's license.
-no person shall rent a PWC unless it is marked with the word "RENTAL".
-no person shall rent a PWC without explaining to the operator the areas where the vessel is and is not allowed to be operated.
-no person shall rent a PWC without providing, at the rental site, a vessel equipped to render assistance, guidance and policing of rented PWC's.

Personal Watercraft (PWC) Regulations (continued):

-no person shall rent a PWC without providing the following information to the person and obtaining a written acknowledgment that the operator has read and understands the following:

-a printed map/chart of the area where the person is permitted to operate the PWC;

-a booklet/manual relating to PWC safety which is accepted or recognized by the DNREC;

-a summary of the provisions of the PWC law.

-the DNREC is directed to establish an educational safety program for the operation of PWC's; operators under 18 years of age are required to participate in any safety program established by the department.

-the state, each county and each municipality shall have concurrent authority to enforce the provision of this PWC law.

Tidal Water Fishing Regulations:

-recreational gillnet permits (allowable sizes and seasons)
-commercial licenses/permits
-minimum size limits on various species
-creel limits (per day) on various species
-seasonal closures for various species
-areas closed to netting
-seasonal net closures
-prohibited fishing gear
-disposing of fish wastes

Crabbing Regulations:

-minimum size limits (peelers-3", soft shell-3.5", hard shell-5")
-no sponge-bearing females may be harvested
-equipment requirements and tending equipment (every 72 hours)
-markings
-harvest limits
-strictly prohibited to lift or tend anyone else's crab pots

Clamming Regulations:

-clamming permitted only in approved areas
-recreational harvest limits (with permit and without permit)
-minimum size limits
-equipment (hand rakes only)
-commercial clamming seasons, times, and harvest limits

Marina Regulations:

-marina owners/operators shall provide access to pumpout/dump stations
-marinas must submit siting designs and address water quality and other environmental concerns
-marinas must not impact:
    -wetlands;
    -shellfish resources;
    -submerged aquatic vegetation;
    -benthic resources;
    -critical habitats;
    -recreational water use areas
-marinas designs must address stormwater and solid waste management
-marinas must address vessel maintenance and prevent wastes from being disposed of in ground or surface water
-marinas must provide an operation and maintenance (O&M) plan and update as required
-O&M Plans must include information on the following:
    -water quality management;
    -storage and handling of all materials used in maintenance;
    -storage, handling, and disposal of wastes;
    -shoreline structures maintenance;
    -emergency operations;
    -rules and regulations for marina users.