

Indian River Inlet Valued Environmental Representation
(Indian RIVER)

Group 5

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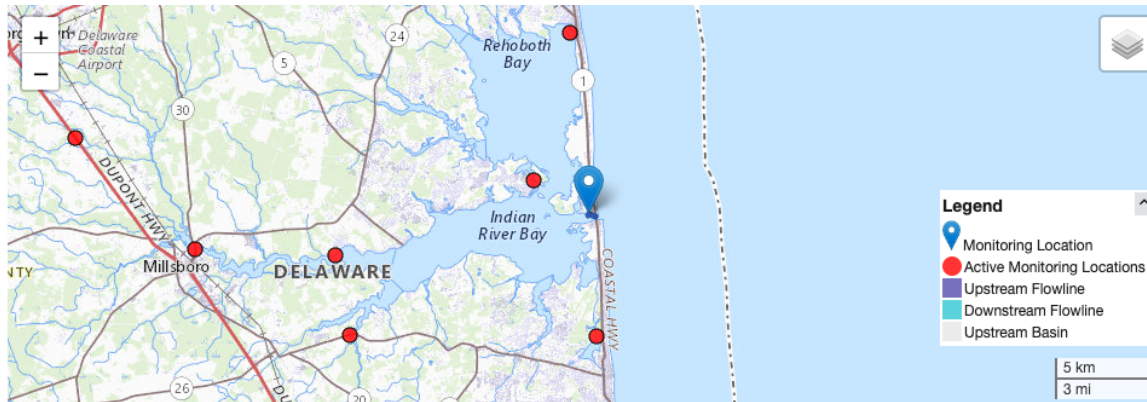
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Mission Statement

Indian RIVER's mission is to secure the attainment of fishable, boatable, and swimmable water quality standards in the Indian River Inlet and Bay of southeastern Delaware by the year 2030.

Map



The above map is of the Rehoboth Bay and Indian River Bay, with the monitoring location indicated at the Indian River Inlet. The legend also describes the active monitoring locations, upstream and downstream flowlines, and upstream basin.

Background

The Indian River Inlet is located in Delaware Seashore State Park and it connects the 15 mile long Indian River Bay to the Atlantic Ocean. The Indian River Bay watershed has an average freshwater flow of around 5 cubic meters per second. This connection between Delaware's inland bays and the Atlantic Ocean not only allows boats through, but also marine life, such as crabs, oysters, horseshoe crabs and other fish, into the Indian River Bay and Rehoboth Bay. The Indian River has an area of 86 square miles and Rehoboth Bay has an area of 72 square miles. The Indian River Inlet has beaches on either side and it can be crossed using the

Charles W. Cullen Memorial Bridge. This bridge spans 950 feet, is supported by cables that light up blue at night and accommodates both cars and pedestrians. This bridge is the sixth to reach across the Indian River Inlet, as the previous bridges collapsed or were unstable. The Indian River itself is named after the Nanticoke Indian Tribe whose reservation used to be located at the upper reaches of the river, near the headwaters. Nanticoke translates to the tidewater people.

History

The Indian River Inlet has played a major role in the development of the Delaware Coast, and provides a connection to the Atlantic Ocean. Over time, the Indian River Inlet has gradually shifted North, as it began to shoal. In 1880, the Inlet developed a large shoal that proved to be hazardous for navigation of the bay. This proved to be a great challenge, and the inlet struggled to remain open over the years, with the inlet opening and closing cyclically as the shoal shifted, and the water became more shallow. In 1929, after decades of dredging and digging out the inlet, the Army dredged a channel for a new inlet in its modern day location. The last 100 feet were removed with dynamite. A week later, a storm blew through and closed the new inlet once again. In April 1929, a volunteer group assembled to dig out the inlet by hand, this time permanently.

In the following years, the inlet was constantly dredged to remain open and operational. This proved to be costly and unsustainable. In 1936, the management of the inlet was passed to the State Highway Commission, who decided to add jetties in order to fix the inlet in place. Additionally, a swing bridge was constructed in order to facilitate ship traffic, and connect the beach towns of Rehoboth and Bethany. These jetties remain in operation today.

Economics and Funding

Delaware's inland bays provide economic value worth \$4.5 billion and 35,000 jobs through tourism, recreational activities and real estate. The Indian River Inlet provides a channel for the entrance of aquatic life into the Indian River Bay and Rehoboth Bay. This provides economic support through jobs and recreational activities such as fishing and crabbing. This results in many businesses such as restaurants, boat rentals, tackle stores and hotels, to accommodate visitors. Additionally, homes on the water have increased value, especially with good water quality. Good water quality is a key component for economics, as it affects the fish, oyster and crab production, as well as tourism. This is even more reason that the Delaware inland bays should be protected and preserved.

The Indian River Bay, as well as other Delaware water ways, receive government funding. Last year, the Indian River Inlet received over \$43 million dollars to repair a scour hole to increase the inlet's accessibility. This year, over a million dollars has been put towards the Indian River's operations, maintenance and rehabilitation projects. Over 10 millions dollars in the last two years has been put towards operations and maintenance in the intercoastal waterway from Rehoboth Bay to Delaware Bay.

Policies and Mandates

Federal and State regulations have been enacted over the years in order to ensure the safety of the Inlet. A few of the primary legislative activities are listed below.

Coastal Zone Management Act (CZMA): The Coastal Zone Management Act was signed in 1972, and has since been amended. NOAA is the responsible authority for this act. In response to this policy, Delaware prepared a coastal program, which was established as the Delaware

Coastal Management Program. This serves as the governing body for policy of Delaware coastal waterways.

Delaware Coastal Zone Act: The Delaware Coastal Zone Act was passed in the early 1970's, and allowed DNREC to regulate industry on the Coastal Strip of Delaware. This is a quintessential policy for the Indian River Inlet, as DNREC remains the governing body of natural resource and watershed management.

Delaware House Bill 160: This bill permits shellfish aquaculture in the Delaware Inland Bays, which was deemed to be a beneficial economic opportunity for the state. Additionally, the addition of oyster aquaculture aids in daily water filtration, and removal of excess nutrients.

Additionally, recreational activities are strictly monitored on the Inlet through DNREC. This includes fishing and boating activities, both of which require permitting. DNREC limits the number of fishing permits with a sales cap in order to protect the bays. Additionally, DNREC is responsible for ensuring that aquaculture activities do not conflict with recreational practices.

Problems/Issues

Indian RIVER highlights and focuses on the primary problems faced when working to achieve fishable, boatable, and swimmable water quality standards within the Indian River Inlet and Bay. The main problems that diminish the water quality in the Indian River Inlet include eutrophication, habitat loss, and turbidity. These are not the only problems within the bay, but they can serve as a starting point to direct attention to other issues within the bay.

Problem 1: Eutrophication

The first issue that will be discussed is eutrophication. This occurs when excess nutrients, like nitrogen and phosphorus, are present in bodies of water. Some of the main ways that excess

nutrients are ending up in the Indian River Inlet include agricultural runoff and increased urbanization. About 40% of the land in Delaware is used for farming(Delaware.gov). Farming practices introduce nutrients like nitrogen and phosphorus to crops to fertilize them in order to promote growth. However, when it rains, there is runoff of the nutrients, and many of them end up in the inland bays of Delaware. The nutrients promote the growth of algae, however, when the algae die, oxygen is consumed by the bacteria that decompose it, and this depletes the dissolved oxygen in the water. This creates an environment that is difficult for fish and other aquatic organisms to live because they do not have sufficient oxygen needed to live. Another common cause of eutrophication includes wastewater being discharged into bodies of water, which contains nitrogen and phosphorus as well and promotes algal blooms.

Goal 1: Reduce Nutrients

Significantly reduce nutrient input to the Indian River Bay and Inlet to achieve Delaware standards for aquatic life.

Problem 2: Habitat Loss

Habitat loss is another concern for the Indian River Inlet. With urbanization and construction in areas surrounding the Indian River Inlet continues, along with the rise of sea levels, the ecosystems that support life are being taken away and damaged. Areas surrounding the bay continue to be developed and built on, and the construction can cause contamination of the water around it. A construction site can introduce chemicals into the soil, which can runoff into the bay. Toxic chemicals are potentially being released into the water, and this can cause ecosystems to suffer or die. Without essential parts of the ecosystem, aquatic life cannot be supported. Habitat loss due to construction and urbanization is a major issue for Delaware's inland bays because of the continued construction and urbanization. With sea level rise, it could

potentially cause issues as well for habitat loss because the increases in the depth of water could make it more difficult for sunlight to reach plants, which need sunlight for photosynthesis. It could also increase erosion on the coast, which can diminish the water quality(Cowan et. al.). All of these factors can make it difficult for the habitat to continue to sustain life.

Goal 2: Protect In Stream Habitat

Preserve existing stream habitat and restore degraded habitats.

Problem 3: Turbidity

Turbidity is the cloudiness and color of water caused by particles in it. The particles can be from sediment, like clay, microorganisms, and algae, among other sources. Turbidity is a problem in water because it can harm fish by depleting oxygen levels in the water. If there are a lot of particles in the water, it can affect the ability of sunlight to reach plants that need sunlight for photosynthesis. If plants are not able to do photosynthesis, then less oxygen is being released into the water. Oxygen is needed by fish and aquatic organisms to survive, so this can be an issue for the ecosystem's survival. High levels of turbidity can also affect gill functions in fish. Particles can get stuck in the gills of fish, and make it difficult for them to breathe. Another issue with turbidity is that it can contribute to the growth of bacteria, which affects the quality and safety of the water. High turbidity can also cause issues with the appearance and aesthetics of the water. Overall, high turbidity is bad for the ecosystem because it can deplete oxygen as well as harm fish and other organisms, and it can cause the growth of different bacteria, which can affect the swimmability of the water. It is also important for swimming water to look clean, and turbidity can negatively impact this as well.

Goal 3: Reduce Turbidity

Significantly reduce turbidity input to the Indian River Bay and Inlet to achieve Delaware standards for aquatic life.

Summary of Goals

In order to improve the overall quality of Indian River Bay and Inlet, it's imperative to understand all the factors relating to one another that would lead to progress in achieving the defined goals. This pertains to not only identifying the problems at hand but also using data to identify the root of the issues that the goals were created to respond to. In order to ensure action and follow through, one needs to understand the policy impacting the issues pertaining to the Indian River Bay and Inlet. Policies ensure that there is a collaborative effort working towards the common goals of restoring the bay. Indian RIVER identifies three main goals as reducing nutrients, protecting stream habitats, and reducing turbidity. Indian RIVER believes that these goals are important and applicable because they will contribute to the overall improvement the health of the bay and inlet, as well as improving the bay habitat for indigenous organisms.

Recommendations

To reduce the nutrient concentration, Indian RIVER recommends:

- Educate the nearby agricultural communities on the importance of using the proper amount of fertilizer
- Keeping animals and their waste out of streams and nearby waterways
 - Fencing out
- Plant field buffers along the edges of agricultural fields
 - Help prevent nutrient pollution by absorbing nutrients before they reach the waterways
 - Can be grassed or forested buffer strips

To protect instream habitats, Indian RIVER recommends:

- Enhancing riparian buffers to reduce erosion
 - Planting more native trees and other plants
- Utilize open space/conservation design techniques in the surrounding area
 - Reduces the amount of site area devoted to residential areas and lawns and more to open natural space
 - Design sites to include more habitat area
- Use conservation easements to make land protection permanent

To reduce turbidity, Indian RIVER recommends:

- Disinfect and filter the body of water
- Explore of the option semipermeable filtration system
 - Before the river flows into ocean
 - Or downstream of agricultural and industrial communities

Conclusion

The Indian River Inlet and Bay serve a great purpose to the communities surrounding southeastern Delaware. Whether the inlet is being used by boaters, people are out fishing in the bay, or there is a thriving marine and coastal ecosystem, the watershed's protection is important. The three problems we introduced and discussed above are all interconnected. The watershed is used by various life forms and for different purposes, so its maintenance is crucial for the bay's future. The watershed needs to be analyzed and monitored to understand the extent of the problems it faces. This will allow for effective solutions to be developed and for steps towards better boatable, fishable, and swimmable water quality are ensured.

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