What is the Salt Pond?

The Salt Pond is an inland, estuarine waterbody located west of Route 1 and immediately north of the Town of Bethany Beach, DE. The Salt Pond drains into a loop canal that was constructed along its southern border (northern border of Bethany Beach), trending southeast to a “loop” near Pennsylvania Avenue and 1st Street. To the west, the canal drains into the Assawoman Canal. To the North, the Assawoman Canal connects to White Creek, then Indian River Lagoon and Indian River, which flows east to the ocean. To the South, the Assawoman canal connects to Little Bay, and then Little Assawoman Bay, which extends south - parallel to Route 1 and along the entire western border of Fenwick Island. The Assawoman Canal ultimately meanders through a series of drainages and canals terminating and emptying into the ocean at the southern terminus of Ocean City, MD.

Salt ponds (full explanation of the terminology is below) have been used by humans for many thousands of years, starting with indigenous people who occupied this region, most recently the Nanticoke and Choptank tribes and the Lenape Indian Tribe of Delaware. Europeans learned to harvest fish and shellfish, hunt waterfowl, and hunt or trap a variety of mammal species including deer, rabbits, racoons, squirrels, and muskrats.

Both the size and the location of the Salt Pond have varied over time due to climatic conditions, storms, and natural coastal zone process where shorelines and beaches periodically moved inland and back again. A United States Geological Service (USGS) 7.5 Quadrangle map from 1949 displays the Salt Pond as a kidney bean shaped waterbody approximately a mile long from NE to SW, and at its narrowest about 1/3 of a mile NW to SE. What is most interesting, for the purposes of this article, is that other than a U.S. Army Camp, no development is shown around the Salt Pond, the closest being ~10 structures (houses?) along Route 26 between Route 1 to the east and the Assawoman Canal to the west. Wetlands/marshes surround the pond, with extensive wetlands/marshes on the north and east sides. A large patch of wetlands/marsh occurred at the SW end of the pond. The west side of the pond is shown as forested, most likely with the tree and shrub species still observable today. A copy of the 1949 map is provided at the end of this article.

USGS maps from 1956, 1981, 1994, and 2015 document development trends. While the Salt Pond itself has not changed that much in terms of its general size and configuration, surrounding wetlands/marsh have shrunk dramatically and housing and business development have closed in the surrounding area of the Salt Pond. The effects of what can be seen today in the Bethany Beach area results in the diminishment of the natural functioning of the Salt Pond, and an elimination of much of its former ability to hold flood water from both rainfall and the "backwater effect."

Today, the boundary of the Salt Pond is relatively stable, artificially confined by roads, housing developments, ditches, and the loop canal. During heavy rains and/or storms from the northeast strong winds and the resulting waves push ocean water into Indian River Bay and down into the Salt Pond. The elevation of the Salt Pond can quickly rise a foot or two and begin to overflow Fred Hudson Road to the north, and Bethany Beach streets in a number of locations north of Garfield Parkway/Route 26. A number of residents in flood prone areas are very aware of the "*backwater effect*" where flood water from the ocean and rainwater combine to cause the nuisance and sometimes very damaging flooding. Depth measurements were taken by the author while kayaking. Several locations in the Bethany Loop Canal were 6 ½ feet deep, although depths were half that where some shoaling was observed. Interestingly, random depth measurements taken in the Salt Pond itself ranged from 1 to perhaps 3 feet, although there may be deeper areas that were not located.

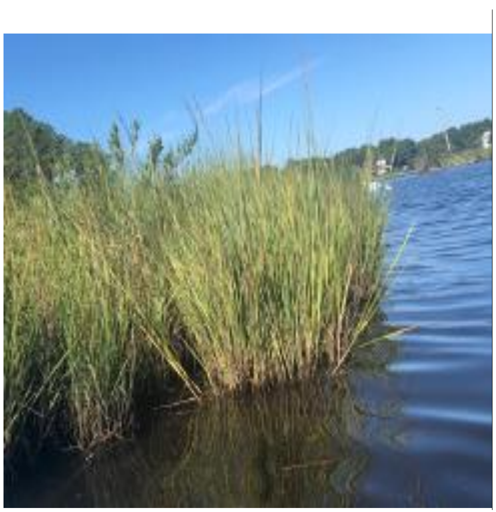
Prior to development that began to occur ca.1901, the Salt Pond could ebb and flow naturally, without being constricted by artificial barriers. As noted above, USGS maps show that in just the past 80 years, the pond migrated in some areas over the landscape until development activities confined the salt pond artificially. The natural movement of sand both created and removed natural inland sand barriers. Sometimes rain and/or ocean storm water would pond in various areas across the landscape for periods of time, creating pockets of open water habitat distributed across the landscape. This can no longer occur because the Salt Pond is almost entirely constrained and bordered by development, canals, roads, and ditches. There is an area of undeveloped marsh remaining in the northeast corner of the Salt Pond, the area just north of the National Guard site and west of the Blue Coast restaurant. This marsh area functions to store rain and flood waters. Still, construction of Route 1 isolated this marsh area from wetlands to the east and the coastline.

The regional geology underlying the formation of the coastal salt ponds reflects glacial activity in our area that reached its peak about 21,000 years ago. The Laurentide ice sheet began to retreat between about 11-18,000 years ago as worldwide climatic conditions became warmer. Melt waters, rich in sediment, flowed out of the melting glacier and down from the moraine in braided streams. The sediments deposited from these braiding melt water streams created a southward dipping outwash plain composed of discontinuous lenses of sand and gravel that are elongated in the direction of stream flow. Coastal salt ponds were subsequently created as sea levels rose and barrier beaches were formed.

Coastal salt ponds are unique and interesting habitats. Salt pond ecology results from physical processes that occurred over thousands of years, and many of these dynamic processes are still occurring today, as sea levels rise, the climate changes, and land-use patterns in the Bethany Beach ecoregion change through natural succession processes, and escalating development. Fortunately, Bethany Beach and nearby coastal communities are working to preserve natural areas and, in some cases, restore or enhance their natural functions. Coastal salt ponds have a continuous freshwater source, through rainfall, stream flow, and surface/groundwater flow.


Salinities range from fresh to brackish, and vary depending upon the nature and scope of human activities, the frequency of storms, and/or the size of the watershed. Rainfall provides fresh water. Nor'easters push saltwater into the system and create more brackish water. Salt ponds, in their natural state are very dynamic, but this former natural dynamism has been greatly reduced by the effects of human activity, and concomitant changes in hydrological patterns across the landscape (both surface water and ground water). Frequently, salt ponds have two major zones of vegetation: 1) the regularly flooded low marsh zone; and, 2) the irregularly flooded high marsh zone. While these vegetation zones are observable around the Salt Pond along the northern border of Bethany Beach, they do not manifest in quite the same way as they would have pre-development.




The Salt Pond bottom sediments vary, with sands, gravels, clayish muck, silts, and other materials, creating microhabitats for plants and animals. Layers of organic matter are common. All together, the Salt Pond provides rich and varied geomorphic and hydrologic conditions, with concomitant variety in vegetation communities, typically occurring in zones of elevation surrounding the pond.

The health of the pond is threatened by air pollution, exotic species, pathogens, jetty construction, excessive pond user, and excess nitrogen from road runoff, fertilizers, and other sources. Excess nitrogen can lead to algal blooms and low dissolved oxygen levels killing fish, shellfish, and other aquatic species. Non-native species have been introduced to local coastal waters from other continents for centuries, often transported on the outer hulls of ships or as larvae in ballast waters taken on in foreign ports and then released into the east coast via our harbors. Non-native species (also called exotic or alien species) have disrupted the delicate balance of the local ecosystem, changing physical and chemical properties, thereby stimulating changes in fish, wildlife, and plant populations. Non-native plant species may also respond differently than native species to nutrient enrichment and pollution in the coastal environment. Non-point source pollution from development within the coastal salt pond watershed may increase nutrient levels and contamination within the ponds.

Unnatural nutrient loading caused by agriculture, yard fertilizer, or road run-off have produced an explosive growth in cattail and Common Reed (*Phragmites australis*) populations, species which crowd-out, shade, and out compete naturally occurring species. Common Reed has a deep, extensive, tubular root system which pulls a great deal of water out of the immediate area, sometimes lowering the water table to the point where the shallower roots of natural species are left high and dry. As natural species disappear or are diminished in abundance, the fish and wildlife species that depended upon these naturally occurring species suffer adverse effects, or can be forced to move out of an area. With biodiversity decreases, the overall health of the ecosystem also decreases, making it harder for nature to survive natural disasters or the onslaught of human activity.

In addition, exotic invertebrates or fish often have few or no natural predators in their new location, allowing the new species to multiply unchecked. This can cause a decline in local food resources for local, native species, crowd sessile animals and plants from their usual spaces, and even be a vector for the spread of diseases.

Below is an excerpt from the publication ***NATIONAL WETLANDS INVENTORY, Wetlands of Delaware*** (September 1985, DOI/USFWS) by Ralph W. Tiner, Jr., which describes Estuarine Wetlands, in general, and salt marshes. The excerpt is provided to summarize this topic and help explain the hydrology and vegetation of the Estuarine Wetlands and the salt pond near Bethany Beach.

Excerpts:

Estuarine Wetlands (Tiner, pp. 35-38): The Estuarine System consists of tidal brackish waters and contiguous wetlands where ocean water is at least occasionally diluted by freshwater runoff from the land. It extends upstream in coastal rivers to freshwater where no measurable ocean-derived salts (less than 0.5 parts per thousand) can be detected. From a salinity standpoint, Delaware estuaries can be divided into three distinct reaches: (1) polyhaline - strongly saline areas (18-30 parts per thousand), (2) mesohaline (5-18 ppt), and (3) oligohaline - slightly brackish areas (0.5-5 ppt). Delaware Bay and large coastal rivers, such as the Indian and Leipsic Rivers, become increasingly fresher upstream from their mouths as saltwater becomes more diluted by freshwater runoff. A variety of wetland types develop in estuaries largely because of differences iu salinity and duration and frequency of flooding. Major wetland types include: (1) intertidal flats, (2) emergent wetlands and (3) scrub-shrub wetlands. Estuarine wetlands are most extensive along Delaware Bay.

Estuarine Intertidal Flats: Intertidal flats of mud and/or sand are extremely common in estuaries, particularly between salt marshes and coastal bays. They are typically flooded by tides and exposed to air twice daily. These flats are generally devoid of macrophytes, although smooth cordgrass (Spartina alterniflora) may occur in isolated clumps. Microscopic plants, especially diatoms, euglenoids, dinoflagellates and blue green algae, are often extremely abundant, yet inconspicuous (Whitlatch 1982).

Estuarine Emergent Wetlands: Differences in salinity and tidal flooding within estuaries have a profound and visible effect on the distribution of emergent vegetation. Plant composition markedly changes from the more saline portions to the slightly brackish upstream areas. Even within areas of similar salinity, vegetation differs largely due to the frequency and duration of tidal flooding and locally to freshwater runoff. Examples of estuarine wetland plant communities are presented in Table 14 and shown on Plate II.

Salt Marshes: The more saline (polyhaline and mesohaline) reaches of estuaries are dominated by salt marshes (plate II.a.). These estuarine wetlands are most widespread along Delaware Bay, south of the Chesapeake and Delaware Canal to Lewes. A broad zonal pattern exists due to tidal flooding and two general zones are identified: (1) regularly flooded low marsh and (2) irregularly flooded high marsh (Figure 13).

The low marsh is flooded at least once daily by the tides. A tall form of smooth cordgrass (Spartina alterniflora) dominates this zone from approximately mean sea level to the mean high water mark. This zone is generally limited to creekbanks and upper borders or tidal flats. A recent study in Connecticut found that the tall form of smooth cordgrass was an accurate indicator of the landward extent of mean high tide (Kennard, et at. 1983). According to state wildlife biologists, common reed (Phragmites australis) has displaced the tall form of smooth cordgrass from the low marsh in many locations. Above this level is the high marsh which is flooded less often and is exposed to air for much greater periods. Vegetation here often forms a complex mosaic rather than a distinct zone. Plant diversity increases with several being abundant, including a short form of smooth cordgrass, salt hay grass (Spartina patens), spike grass (Distichlis spicata), glassworts (Salicornia spp.), marsh orach (Atriplex patula), sea lavender (Limonium carolinianum), salt marsh aster (Aster 38 tennifolius), black grass (Juncus gerardi,), and common reed. Common reed and the short form of smooth cordgrass are particularly widespread high marsh plants. Pools and tidal creeks within the salt marshes may be vegetated with widgeon grass, sea lettuce, or other algae.

The short form of smooth cordgrass forms extensive stands just above the low marsh. Within these and higher areas, shallow depressions called pannes can be found. These pannes are subjected to extreme temperatures and salinity. Summer salinities may exceed 40 parts per thousand (Martin 1959). Although they may be devoid of plants, many pannes are colonized by a short form of smooth cordgrass and glassworts, while blue-green algae may form a dense surface mat.

Above the short cordgrass marsh, three grasses predominate: common reed, salt hay grass, and spike grass. Common reed forms either pure or mixed stands in the high marsh. Salt hay grass often forms nearly pure stands and is probably the more abundant of the latter two species, while spike grass is commonly intermixed. Spike grass commonly forms pure or nearly pure stands in the more poorly drained high marsh areas where standing water is present for extended periods. The short form of smooth cordgrass also frequently occurs in this zone. Black grass, which is actually a rush, is found at slightly higher levels often with high-tide bush (Iva frutescens). In the Little Assawoman Bay estuary, black needlerush (Juncus roemerianus) is locally common. This area represents the northern range limit of this species which is a dominant high marsh plant in Maryland, Virginia and further south. Ditches throughout the high marsh are immediately bordered by a tall or intermediate form of smooth cordgrass, while old spoil mounds adjacent to these mosquito ditches are vegetated by high-tide bush.

At the upland edge of salt marshes, switchgrass (Panicum virgatum), common reed, sea myrtle (Baccharis halimifolia), high-tide bush, wax myrtle (Myrica cerifera), and red cedar (Juniperus virginiana) may form the salt marsh border. Extensive fields of switchgrass frequently form the transition zone between upland and coastal wetland. Other plants present in border areas include bayberry (Myrica pensylvanica), poison ivy (Toxicodendron radicans), goldenrods (Solidago sempervirens and Euthamia graminifolia), foxtail grass (Setaria geniculata), and marsh pink (Sabatia stellans). Where freshwater influence from the upland is strong, narrow-leaved cattail (Typha angustifolia), big cordgrass (Spartina cynosuroides), bulrushes (Scirpus american us and S. pungens), marsh fern (Thelypteris thelypteroides), rose mallow (Hibiscus moscheutos), and other brackish species may occur. Common three-square (Scirpus pungens) may form a border around forested and shrub hanunocks within salt marshes. In many areas, salt marshes grade directly into fringing freshwater forested wetlands. Exposed and heavily weathered stumps of white cedars in salt marshes provide evidence of recent submergence of freshwater swamps by salt water.

Author’s Notes:

Numerous scientific studies have been undertaken in Delaware's salt marshes. These studies are largely referenced by Daiber and others (1976). More recent studies have been completed by Dr. Franklin Daiber's students at the University of Delaware including Parker (1976), Tyrawski (1977), Clarke (1978), Phillips (1978), Jones (1978), Rennis (1978), Pennock (1981), Roman (1981), Simek (1981), Van House (1981), Watrud (1981), and Winkler (1981). In addition, Roman and Daiber (1984) have examined primary production dynamics in two Delaware tidal marshes. A detailed Fish and Wildlife Service report on New England high salt marshes (Nixon 1982) serves as a useful reference on the ecology of salt marshes.

Images taken while kayaking the Salt Pond on August 30, 2020 - showing developed and undeveloped areas, the loop canal, typical vegetation, and several birds observed
Included for more information are three USGS maps and a list of additional references.

Additional Resources:

Lake Link Delaware: At this link there is a map of the Salt Pond and Bethany Beach and the surrounding area. Zoom in and out to see different views of the landscape.

Delaware Watersheds - Indian River Bay

Delaware’s Shellfish Program

Shellfish Aquaculture in Delaware’s Inland Bays: