

The Starvation of Southold's Beaches

The Conservation Advisory Council has become concerned about a series of waterfront applications in which some property owners along Southold Town's north shore are asking the Town Trustees for permission to harden unvegetated bluffs to limit the loss of bluff sediment due to erosion. The property owners' concern is that this erosion causes landward retreat of the bluff line that may endanger structures on the property. The fact that such bluffs are unvegetated is clear evidence that natural storm events are actively mining these bluffs for sediment and will continue to do so as the sea level continues to rise. The CAC's concern is focused on the fact that natural excavation of sediment from such bluffs is vitally important as the major source of sediment that nourishes and maintains the beaches from Mattituck to Orient Point.



Figure 1. Unhardened but eroding bluffs such as those here between Town Beach and Horton Point supply sediment to support a natural, wide beach. 12/01/2014.

An introductory course in coastal geology teaches that beaches are created by the movement and deposition of sediment along the shore, following a natural and predictable process. This process, commonly termed the longshore or littoral drift, is a mechanism that forms, maintains, and destroys beaches. The longshore drift has three dynamic zones: excavation and sediment-loading, where wave action mines sediment from a source; transportation, where longshore currents carry sediment suspended in the water column downstream; and finally deposition, wherever this longshore

current slows down, causing the suspended sediment to drop out. Manmade interference with the function of any of these zones will result in often unwanted changes to the shoreline downstream.

The most important of these zones is the source, where wave action excavates sediment, which becomes the sediment load carried in the water column by the longshore current. If this sediment mining is prevented, the beaches downcurrent will be starved. Shutting off this sand train profoundly changes the profile of these downcurrent beaches. Failure of sediment replenishment causes the beach profile to become lower and if hardened by unnatural structures to become narrower or to vanish, and the sediment texture changes from fine sand to pebbles and cobbles. The lowering of the beach level, as well as the beach narrowing, allows storm waves to release erosive energy higher up on the shoreline, which in turn allows the scouring action of waves to be more effective, particularly as sea level rises.

The north shore beach profile changes seasonally, principally during the colder months when strong prevailing winds roar down the length of Long Island Sound from the northwest, driving a strong longshore current, capable of carrying heavy loads of suspended sediment, eastward. In summer months, with prevailing southwest winds, the longshore currents are weakest and minimal longshore drift occurs. This weaker drift may actually allow a slight accretion of sand onto the beaches in summer but not enough to make up for the sediment losses of winter.

Second homes not occupied during the colder months make up a large percentage of Southold's waterfront homes. Owners of these properties, less likely to witness strong winter storms, have their perspective shaped by the gentle southwest winds of summer. These pleasant summer conditions nurture a mindset among property owners that simply hardening their property would be a reasonable solution to their erosion problem. They are unaware of the predictable consequences awaiting their neighbors downstream if the nourishing sand train is slowly choked off bit by bit.

One practice the Trustees currently follow to address bluff erosion is to approve applications for toe armoring, by which boulders are placed at the foot of bluffs in an attempt to impede the scouring actions of storm waves. Evidence does not support that this is an effective solution in all situations (Figure 6.).

Applications are separately submitted by property owners and separately considered by the Trustees at different times. The result of this piecemeal practice is that some properties are being hardened while adjacent properties for which no applications were submitted remain unprotected. This begins a downward spiral of bluff change by putting the shoreline out of alignment, with unprotected bluffs being selectively and aggressively eroded while armored bluffs are less affected. The shoreline assumes a crenulated pattern of hardened, micro-peninsulas of rock armor jutting seaward. Interspersed between these armored projections are deeply indented bluff faces where waves have carved out the unprotected bluffs. As the eroded indentation deepens over time, the sediment is mined at the side walls, undercutting the sediment behind these hardening structures of the adjacent protected property (Figure 4). This mining and undercutting will trigger a response from the owner of protected property to construct a return wall of bulkheading or toe armor to prevent the bluff from being eroded from behind the armor. The cycle of erosion and response will continue as long as the sea level continues to rise. As more and more bulkheads, seawalls, revetments and toe armor are installed and less sediment becomes available for transport by the longshore drift, the beaches downcurrent starve, causing drastic changes in shore profiles.

The damaging effect of this excessive shoreline hardening is already evident in erosive hotspots from Mattituck to Orient. A short walk west from Town Beach provides a good example of these shoreline dynamics in action and with them the future of Southold Town's coastline under present management practices. Here, encapsulated in just 1/2 of a mile, are revealed the geophysical and legal problems the Town Trustees confront now and will face in the future.

On this walk, one first encounters a row of houses set low on a beach that already suffer the ravages of storm surges, as evident by wood boards and boulders assembled for protection from flooding (Figure 2.). This flooding is the result of the beach being lowered over the past few decades because of insufficient sediment replenishment. The lowering of these beaches is not unknown to Southold Town, which regularly renourishes Town Beach with sediment to protect the beach and adjoining parking lot from storm washouts.



Figure 2. Soundview Avenue, Southold, west of town beach. Groins and bulkheads to the west inhibit the supply of sand with the result that the beach is lowered, allowing storm surges to attack residences.
11/12/2014

Proceeding west, one encounters a town-built revetment on private property (Figure 3), paid for by town taxpayers, to prevent Soundview Avenue from being washed away. The property owner thanks the taxpayers by posting “Private No Trespassing” signs. This town-built revetment has facilitated a serious blowout of the unprotected bluff immediately to the east with the result that the bluff line has retreated 10 to 12 feet landward from the revetment toe since the revetment was built in 2012.



Figure 3. Soundview Avenue. An unprotected bluff blowout occurs at the east edge of a town-built revetment because the revetment is more resistant to erosion but is subject to being outflanked by erosion from the side.
12/26/2012 []

On reaching the west end of this revetment, one comes again upon another unprotected, seriously eroded bluff, above which is perched a residence in danger of being undermined where erosion has moved the bluff back by 20+ ft. Thus, at both ends of this town-built revetment unprotected bluffs have been seriously compromised.

As shown in Figure 4, we have a sharp right angle boundary between an unprotected bluff and a 9+ ft. high vertical concrete, return seawall which extends seaward perpendicular to the beach. At the right angle corner where the bluff and seawall connect, erosion is intensified and is now cutting back behind the seawall to threaten the integrity not only of the seawall but also of the foundation of the seawalled residence it was built to protect.



Figure 4. 21815 Soundview Avenue. Bluff blowout adjacent to a seawalled property that itself is threatened as erosion cuts back to outflank the seawalled property's foundation and also undermine a neighbor's unprotected residence. Notice the wired gabion placed to protect the bluff has been tossed aside by wave action. 11/12/2014

One next encounters two boulder groins, the second of which is unsafe for normal foot passage.



Figure 5. 21815 Soundview Avenue. Boulder groin blocks safe public passage along the beach, which is a violation of the public's right of lateral access. 12/26/2012

If one manages to safely negotiate this boulder groin, one encounters a formidable wall of bulkheads that stretch uninterrupted into the distance (Figure 6).

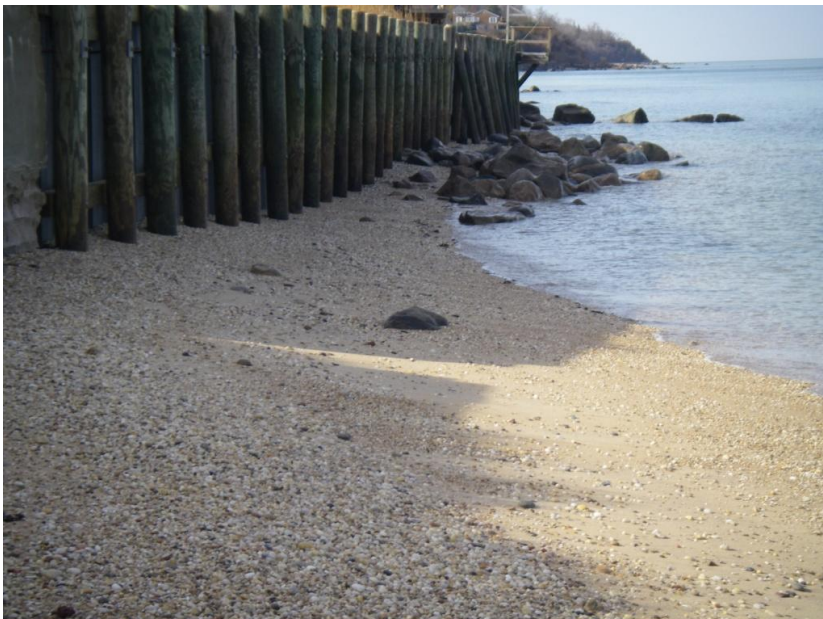


Figure 6. Soundview Avenue. Low Tide. Wave scour against bulkheads causes the beach to disappear, along with public access, because sediment is removed and not replenished. Notice toe armor has been scattered by wave action offering little protection for bulkheads, which calls into question the effectiveness of toe armor in all situations. 11/12/2014

Such a long continuum of vertical bulkheads presents an unnatural face to confront the fury of gale-driven storm surges with wave energy reflected rather than absorbed as it would be on a gently sloping natural beach. Wave turbulence intensifies at the foot of the bulkhead, picking up loads of sediment to be carried away by the longshore current, which itself is now speeded up by absorbing the reflected wave energy. The power of the wave turbulence is more than enough to scatter poorly designed toe armour emplacements. Dramatically, the reflected waves mesh into the incoming storm waves to explode as vertical masses of sea spray that impact and erode the unprotected bluff above the bulkhead (figure 7.).



Figure 7. 21815 Soundview Avenue. Storm waves strike vertical bulkheads with explosive force jetting up massive and repetitive sea sprays that can be over 20 ft. in height and capable of attacking and eroding bluffs above bulkheads. 10/29/2012

The sediment-depleted beaches fronting the bulkheads thin and gradually vanish. As beaches shrink bit by bit, these permanent bulkheads, toe armor, groins, and revetments are increasingly awash at low tide, drowning the public's right to walk the beach.

The boundary of town- and state-titled public land supposedly begins at mean high water, with private title extending landward. This poses an important question: With a landward-moving shoreline, does the state or town title move landward with it, or does the property owner retain title to the underwater portion of the property? Various decisions of the U.S. Supreme Court — such as *Illinois Central R.R. v. Illinois*, 146 U.S. 387

(1892) or New York State Supreme Court *Tiffany v. Oyster Bay*, 234 N.Y. 15,20 (1922) — seem to lean toward the shoreline's being “in trust for the public good,” where public good supersedes private interest. The answer to the question of who owns land reclaimed by the sea will have a vital bearing on what legal, cost-effective, and engineered tools can be applied for rational coastal management.

The Trustees have little control over the submission of applications for shoreline modification, which come trickling in separated in time and location. The Trustees are compelled to make rapid decisions on each individual application that, if approved, may establish precedence for the future approval of similar applications. Later, such approvals, some of which require variances, may have unintended and detrimental consequences. It becomes difficult to revoke a precedent as it opens the avenue for the property owner to sue. The lurking threat of such lawsuits can cripple rational coastal management.

The CAC would respectfully like to propose to the Southold Town Board and the Town Trustees a management plan for maintaining the natural ribbon of beaches from Mattituck to Orient Point. The unvegetated bluffs on the north shore of Southold Town facing Long Island Sound should be declared **sensitive areas**. On bluffs so designated, the degree of hardening permitted would be severely limited, and special scrutiny of any proposed hardening project's short- and long-term impacts on adjacent properties would be required. Designation as a **sensitive area** would alert the present or potential property owner to the special nature of the property. By being alerted to the natural environmental impacts acting on the property, the potential or existing property owner would be able to wisely shape his/her financial investment and expectations for the property with the knowledge that the bluff line will advance landward at a roughly predictable rate. The Town Code should be modified to extend the setback of property structures related to the degree of bluff landward advancement at the site. The building code should encourage designs of property structures that incorporate features allowing structures to be moved landward as the bluff line advances. The properties should be configured to allow sufficient setback retreat. The Southold Town Code should adopt The N.Y. State Sea Level Task Force planning standard for future coastal management development, based on the prediction that the sea will rise 3½ feet by 2100.

The Town Code appears to be based on the belief that sea level is unchanging and deeded property rights do not change whether or not a property is flooded by tide water. The Trustees apply this code despite clear tenets of the Public Trust Doctrine and U.S. Supreme Court decisions that the private property line ends at mean high water. Sadly, the common enemy, a rising sea, is creeping landward and has no respect for property rights. The best military response to an overwhelming force is retreat. When that force is a rising sea, all plan Bs, whether bulkheads, toe armoring, groins or beach nourishment that attempt to oppose such an enemy are merely delaying actions and will eventually fail. The price of this failure will be high, whether the cost is swallowed by the property owner or the taxpayer.

It is appropriate here to put in perspective the magnitude of geologically recent sea level changes, from the prehistory of early humans to the present time. Starting 135,000 years ago at the end of the last inter-glacial period, just before the most recent glacial period began, the sea level was 20 to 30 feet higher than it is today. At the end of this past glacial period, just 12,000 years ago, sea level was roughly 400 feet lower than it is today. In just 12,000 years, sea level has risen 400 feet as the ice sheets have melted due to the climate warming we are experiencing today. A significant difference between present humans and our prehistoric ancestors is that they were nomadic and could retreat as the coastline flooded. Today, we have cemented ourselves permanently to the edge of the seashore, unable or reluctant to retreat. There will only be one winner.

Southold Town officials must publically accept the fact that the rising sea level constitutes a threat to public safety and property. The Town Board and Town Trustees must stress that most attempts to stabilize or defend public or private waterfront property will at best be mere delaying actions. Acceptance of these facts should compel a revision of some coastal management practices by the Town Trustees and a revision of applicable town codes by the Town Board. The present practice of hardening the shoreline with an uncoordinated and piecemeal style of management is guaranteed to fail as the rising sea continues to nibble its way into the land.