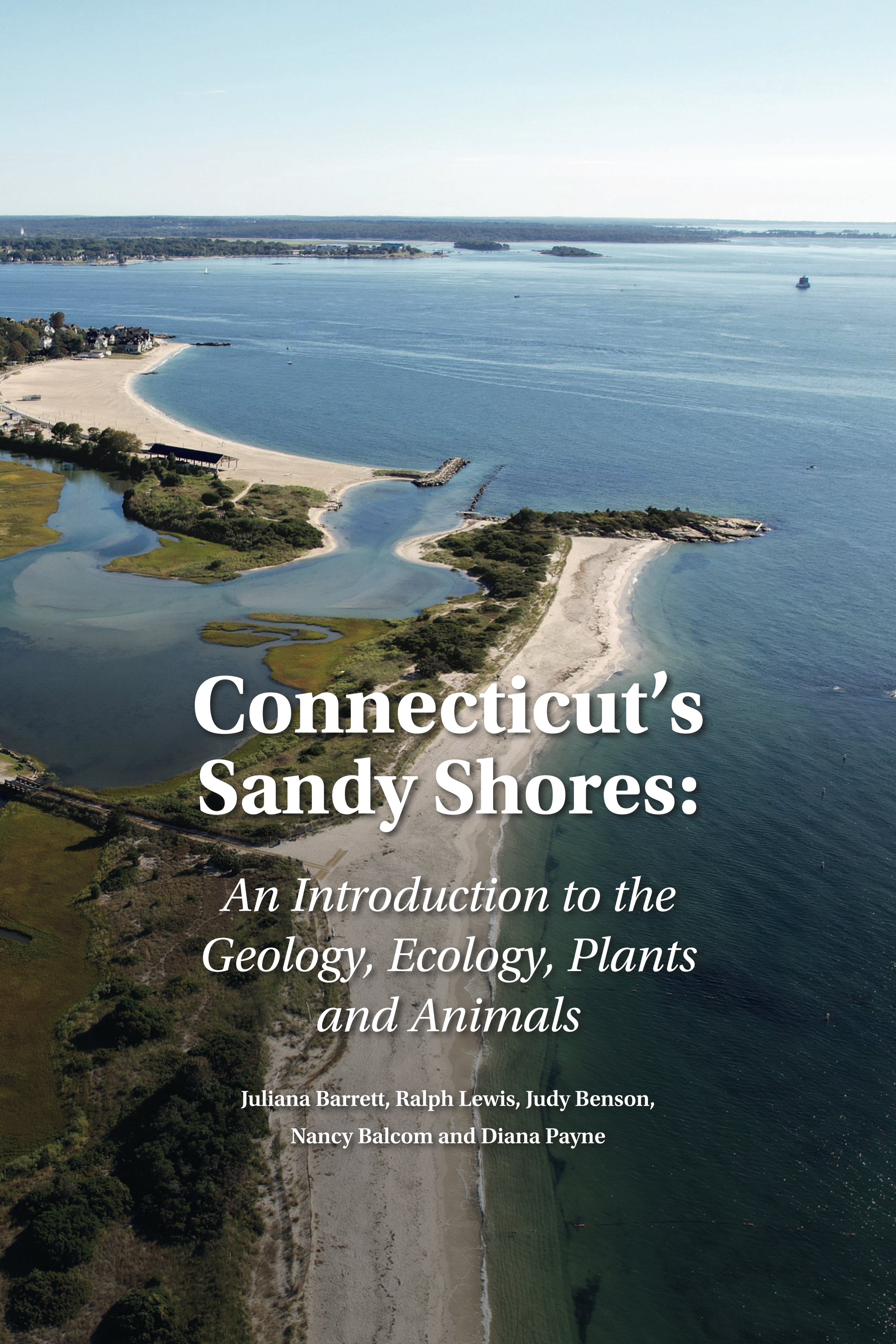

Connecticut's Sandy Shores:

An Introduction to the Geology, Ecology, Plants and Animals

Juliana Barrett, Ralph Lewis, Judy Benson, Nancy Balcom and Diana Payne

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Connecticut's Sandy Shores:

An Introduction to the Geology, Ecology, Plants and Animals

By Juliana Barrett, Ralph Lewis, Judy Benson,

Nancy Balcom and Diana Payne

Connecticut Sea Grant College Program

CTSG-23-01

Connecticut College Arboretum Bulletin #45

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Foreword

The beach is often a place to relax and unwind, but it can also be a place to learn and explore. This booklet is intended to inspire and excite students, teachers and beachgoers in their exploration of the beach/dune environment. As the interface between land and water along much of the Connecticut coastline, this dynamic and ever-changing environment is home to a myriad of species and ecosystems. This guide highlights the different ecosystems and associated species that may be found along the beach/dune interface. In addition, the geology of this system and why the Connecticut shoreline is different from shorelines in other states is explored. While a dynamic system, intense land use has historically changed the coastal environment, and now climate change is impacting and reshaping Connecticut's beaches and dunes with sea level rise and more intense coastal storm events. This guide also offers information on beach access and how to tread lightly when visiting. The better we understand and learn about Connecticut's beaches and dunes, the better we can act to protect and conserve them.

This guide is a companion to the *Salt Marsh Plants of Long Island Sound*, and is produced by the Connecticut Sea Grant Program, University of Connecticut, in cooperation with the Connecticut College Arboretum. Ralph Lewis, Professor in Residence, UCONN-Avery Point and Retired State Geologist of Connecticut (CT DEEP), generously contributed his time and expertise in writing the geology section and graciously answered a myriad of questions; Joel Stocker,

University of Connecticut retired, contributed stunning aerial photography along with his knowledge and love of the coast; Annalee Mears assisted with the invertebrate species descriptions; reviewers Robert Askins, the Katharine Blunt Professor Emeritus of Biology at Connecticut College; Nels Barrett, Regional Ecologist at USDA Natural Resources Conservation Service; Maggie Redfern, Interim Director of the Connecticut College Arboretum; Jessica LeClair, formerly at Connecticut Sea Grant; and Douglas Thompson, the Rosemary Park Professor of Geoscience and Environmental Studies at Connecticut College provided edits and invaluable feedback on the text. Photographs were generously contributed by Robert Bachand, Nancy Balcom, Juliana Barrett, Judy Benson, Jenna Castle, Tessa Getchis, Aaron Hunt, Lisa Jarosik, Ralph Lewis, Thomas Morris, Diana Payne, Beth Sullivan, Joel Stocker and Mark Szantyr. Many illustrative images for the geology section were created by Wendolyn Hill. Karen Ward did the graphic design for this booklet. CT DEEP gave permission for the use of numerous maps, images and photographs. Krista Romero, CT DEEP, was invaluable in assisting with the necessary permits and permissions to fly a drone over Connecticut State Parks. John Sargent contributed his skill, knowledge and artistic talents to provide the centerfold illustration of the entire beach/dune system—something that is hard to see from any one vantage point.

Enjoy the coast - ***Juliana Barrett***

Photo by Judy Benson

Public Rights to the Connecticut Shore

Judy Benson

Everyone owns the beach. Everyone can enjoy the beach. That's a simplified way of understanding the public's rights to walk, swim, fish or collect seaweed on Connecticut's sandy and rocky shores.

This isn't true just for the state and town beaches. It's true for all the coastline below the mean high tide line. Basically, that means that any area that gets wet with the daily tides is part of the public domain. Access is the only limiting factor.

In Connecticut, many private beaches can be accessed from land only through privately owned roads. But a kayaker is within his or her rights to pull up to any beach and picnic within the area claimed by the high tides. Anyone can walk along the water's edge from the town beach onto an adjacent private beach, provided they stay below the highwater mark.

That mark is often defined by a prominent line of whole or shards of shells, pieces of seaweed or plants and other debris called the wrack line. This line also marks the upland limit of the public trust area, described in the **Connecticut Coastal Management Act**. The size of these areas varies across the Connecticut coast, from narrow bands to wide stretches. For more information: **https://portal.ct.gov/DEEP/Coastal-Resources/Public-Trust-Fact-Sheet**

Photo by Judy Benson

Photo by Judy Benson

> "To stand at the edge of the sea, to sense the ebb and the flow of the tides, to feel the breath of a mist moving over a great salt marsh, to watch the flight of shore birds that have swept up and down the surf lines of the continents for untold thousands of years, to see the running of the old eels and the young shad to the sea, is to have knowledge of things that are as nearly eternal as any earthly life can be."

— Rachel Carson

Go Lightly to the Sea

Judy Benson

Next time you walk the beach, breathing salty air, swaying to the rhythms of crashing waves and cawing gulls, pay attention to footprints. The fleeting impressions of your feet in the sand can be a guide for how we interact with this vital but vulnerable environment.

Just as your physical footprints disappear with the tides, strive for metaphoric footprints of your visit that are just as gentle. The primeval urge that draws us to the sea need not degrade the very things that nourish us. With mindful intention, you can enjoy beaches and dunes with all your senses while respecting their fragility.

Here are a few suggestions:

- Walk only on designated paths through the dunes. Beach grass is very sensitive to trampling and is critical to trapping and holding sand. Also, during storms, pathways provide opportunities for floodwaters to flow inland, reducing the protective value of dunes.
- If you pick up live animals to take a closer look, handle them with great care and return them to where you found them quickly so they do not dry out.
- Don't feed wildlife. Human food is not healthy for wild animals and can degrade their habitat.
- If fishing or shellfishing, learn the rules for which species you can catch, and where, and purchase relevant licenses or permits.
- Don't disturb fencing around shorebird nesting areas.
- Keep dogs leashed and always pick up after them.
- Take photos of interesting rocks, shells and other natural objects instead of taking them with you.
- Use sunscreen marked "reef safe" or "reef friendly" that doesn't harm the ocean and corals.

- Minimize use of plastic and other throwaway items; make sure all trash is disposed of properly.
- To reduce carbon emissions, enjoy beaches close to home, or travel by bicycle or public transportation.
- If you dig holes and build sandcastles, fill and topple them before you leave. These can create obstacles for other beachgoers and animals.

This all boils down to a simple question: when you leave, will there be any evidence you were there? If the answer is no, you've done a great service to the plants and animals that call the beaches and dunes home and set a great example for the next person. Thank you for going lightly to the sea!

Geology of Connecticut's Beaches and Dunes

Ralph Lewis

Images by Wendolyn Hill, unless otherwise noted

Introduction to coastlines and how shorelines are shaped

Coastlines are, and have always been, dynamic by nature. Agents of change such as wind, waves, tides and storms constantly work to rearrange the coastal landscape. The composition and character of the coastal segment interacting with these agents of change largely determines how resistant that landscape is to change. The major natural factors at play in shaping shorelines are their primary geologic composition (e.g., rock-dominated, sediment-rich, sediment-poor or mixed) and the characteristics of the forces that constantly work to modify coastal features to fit their physical setting (Figure 1). These forces include wind, waves, tides, storm surge and sea level.

The frequency and intensity of the natural forces assailing a particular coastal segment may vary from season to season and most

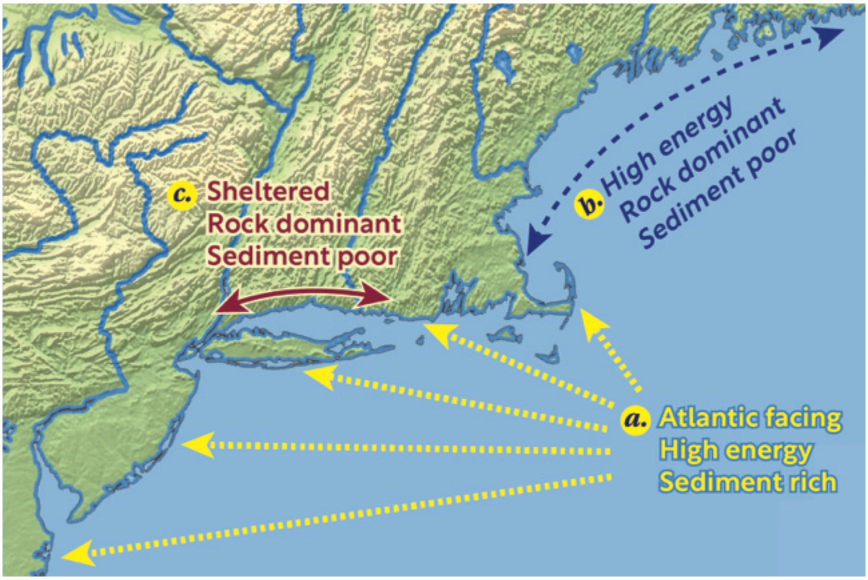
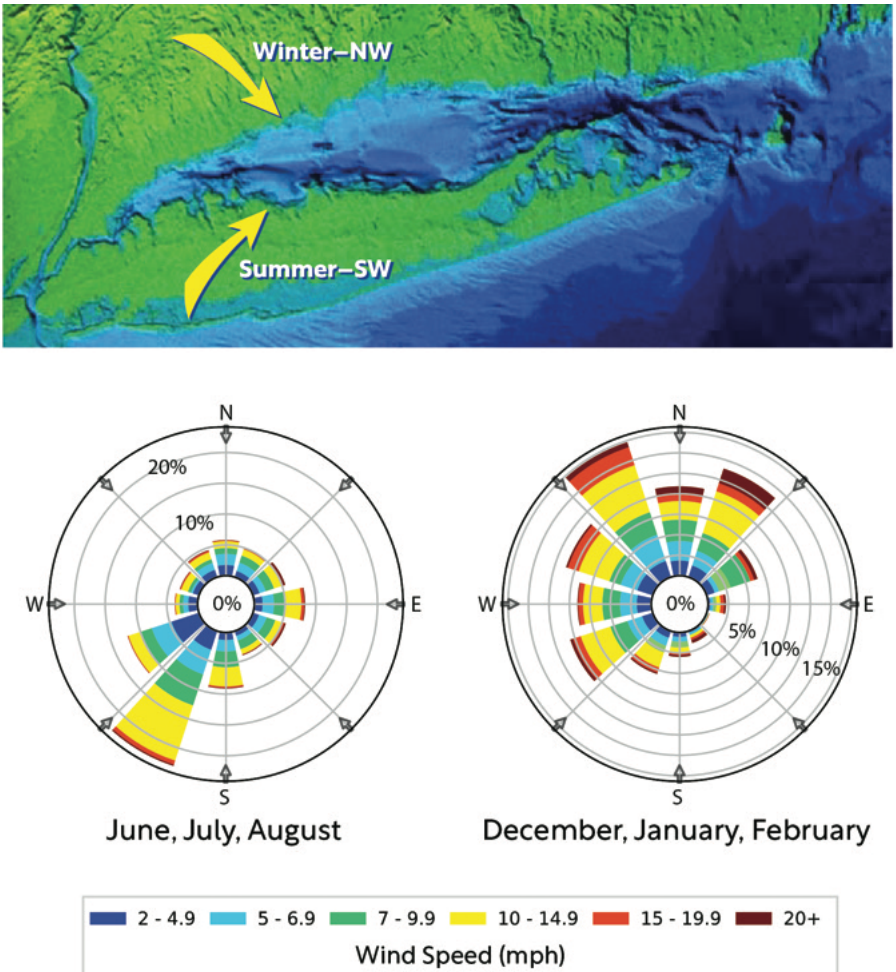


Figure 1. *This image shows the regional distribution of three types of coastlines: a) Atlantic-facing, high-energy, highly-modified, sediment-rich coastline; b) high-energy, less-modified, irregular, rock-dominated, sediment-poor Gulf of Maine coast; and c) sheltered, very slightly modified, irregular, rock dominated,sediment-poor north shores of Long Island Sound and Buzzards Bay.*

beaches gradually adjust to this as the seasons change. In the Long Island Sound area, these gradual, cyclical adjustments can be related to the aspect of the coast (the direction it is facing) and seasonal prevailing wind direction (Figure 2). When the prevailing, day-to-day, winter winds blow from the northwest, the New York/Connecticut coast is "protected" in the lee (the side away from the wind), while the north coast of Long Island faces into the wind which averages about 15 mph. The opposite is true for the slightly lighter, prevailing, southwest winds of summer.

Although seasonal changes in beach width and slope can be expected throughout the year, unless a stormy season is involved, they generally keep beaches in tune with changes in prevailing conditions and often go unnoticed by the casual observer. The most obvious rapid coastal change occurs episodically during storms because



From the Iowa Environmental Mesonet of Iowa State University

Figure 2. *A wind rose plot of seasonal prevailing winds at Bridgeport Airport. Yellow arrows show the prevailing NW and SW wind directions in relationship to the coasts of Long Island Sound. Map image courtesy of CT DEEP.*

storms bring increased wind, wave and tidal energy as well as storm surge. As the number of named storms steadily increases with climate change, the frequency and severity of storm-induced coastal modifications are also increasing.

One characteristic that all shorelines share is that they move landward (become transgressive) in the face of a rising sea. The rate and manner in which they do this depends on the physical character of the retreating coastal segment. Under similar conditions, bedrock cliffs and steep resilient slopes would be more resistant to coastal change than an adjacent low, mobile sandy beach. Part of this difference relates to how specific coastal types retreat. Waves attacking the base of steep slopes and cliffs act to undercut them, causing instabilities that lead to slope/cliff collapse and landward retreat. Rollover is a common process by which low, gently-sloping beaches composed of non-cohesive sediments such as sand, move landward (transgress).

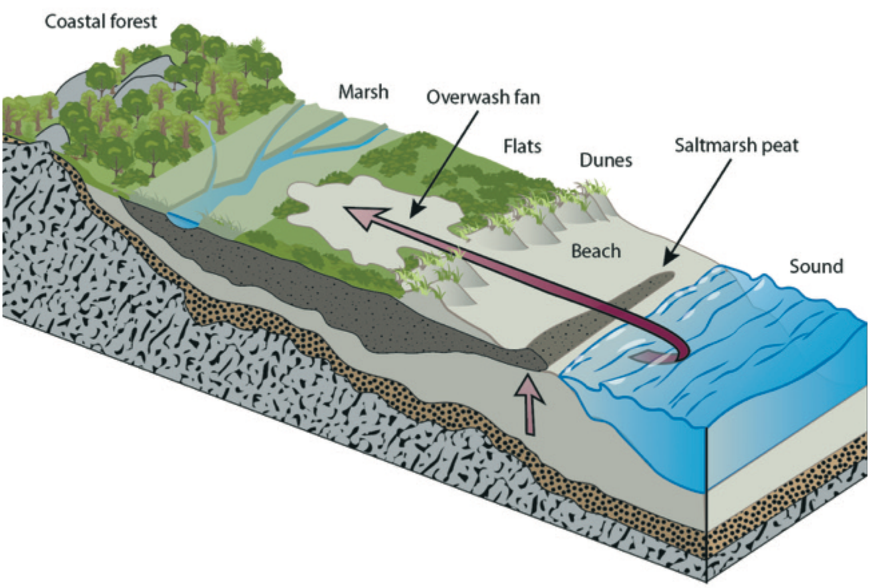


Figure 3. *Low-lying, sandy beaches can move landward through a process called rollover. Strong storm events and storm surge can move sand landward, creating overwash fans. The vertical purple arrow points to once-buried salt marsh peat that is being exposed as the beach retreats landward.*

Factors that typically drive beaches landward through rollover are sea-level rise, storm runup/overwash and a dynamic shoreface. When conditions are suitable, storm-generated wave runup (swash) and storm surge can overtop dunes and other beach features and move sediment landward through a process called overwash or washover. As shown in Figure 3, the rollover process removes sediment from beach fronts and deposits it, in the form of overwash fans, in backshore areas. Saltmarsh peat that was previously rolled over is

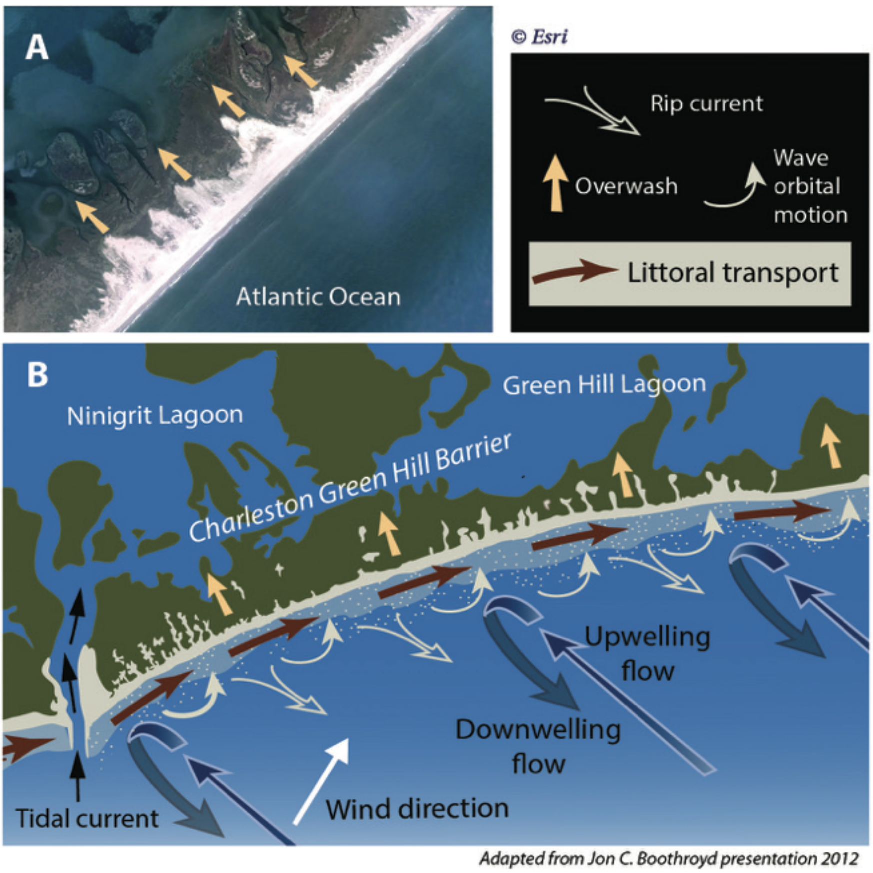


Figure 4A-B. *(A) The yellow arrows indicate overwash fans along the ocean-facing front of Rhode Island's coastline, typical of the beach/dune rollover process. (B) Schematic diagram of the overwash fans and littoral transport which replenishes the sand along the beachfront in Rhode Island.*

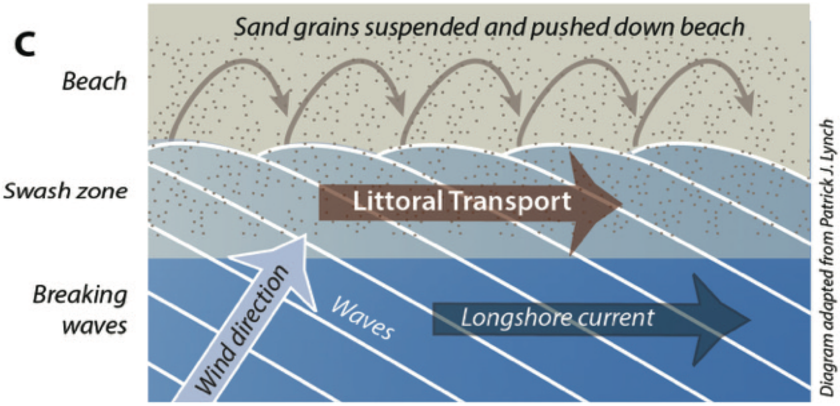


Figure 4C. *Beach sand movement by littoral transport along a typical sandy shoreline.*

commonly exposed along transgressive beach fronts as overlying beachfront sediment is transported landward.

The presence of overwash fans along its backshore is a good indication that a beach is migrating landward during storms. Figure 4A shows coalesced overwash fans along the sediment rich, Atlantic-facing coast of western Rhode Island. The glacial outwash deposits of this coastline are similar in composition; they are being reworked to form low-lying, gently sloping transgressive beaches that tend to rollover in similar ways and at similar rates. This similar, coastwide, landward movement (Figure 4B), combined with active littoral transport of replenishing sediment (insert, Figure 4C), produces and maintains the straight, transgressive coastline of western Rhode Island. Littoral transport refers to the movement of sediment (mainly sand) along the shoreface due to breaking waves and longshore currents.

The Connecticut coastline is different from coastlines directly on the Atlantic Ocean

Sheltered from the high-energy waves of the Atlantic Ocean, the less powerful wave environment and the compositional diversity of the north shore of Long Island Sound have combined to produce a coastline that is markedly different from the surrounding Atlantic-facing shorelines of Long Island and western Rhode Island. Arthur Bloom (1967) divided this coastline into seven coastal segments based on surficial deposits and bedrock exposure (Figure 5). He reported that only three of these areas show meaningful barrier beach development, and, where the shape of Connecticut's irregular coastline is strongly controlled by the north-south fabric of exposed bedrock, there is a paucity of sediment, particularly when compared to surrounding Atlantic-facing coastlines (Figure 1).

As noted by Bloom (1967), the north shore of Long Island Sound is composed of whatever materials waves have to work with (Figures 5, 6 and 7). The irregularities that typify this shoreline result from the fact that each major shoreline component reacts to the rising waters of Long Island Sound differently (Figure 7).

The major players in this discordant scenario, ranging from most resilient to least resilient, are as follows: Numerous, persistent, bedrock outcrops, points and necks act as bulwarks (a defensive wall) maintaining the irregular character of this coastline (e.g., Byram Point, Greenwich; Long Neck, Darien; Wilson Point, Norwalk; Hoadley Point/Sachem Head, Guilford; Millstone Point and Great Neck, Waterford; Avery Point, Bluff Point, Groton Long Point and Morgan Point, Groton; and Wamphassuc Point and Stonington Point, Stonington). Although they are all quite resilient, they do not all share the same characteristics. Exposed bedrock that is fairly solid and relatively free of weakness (e.g., layering and fracturing) is not easily exploited by wave action or other weathering agents like freeze-thaw and salt spray. Outcrops, necks and points composed of this type of bedrock are highly resilient in the low wave energy environment of Long Island Sound. Their glacially-smoothed surfaces

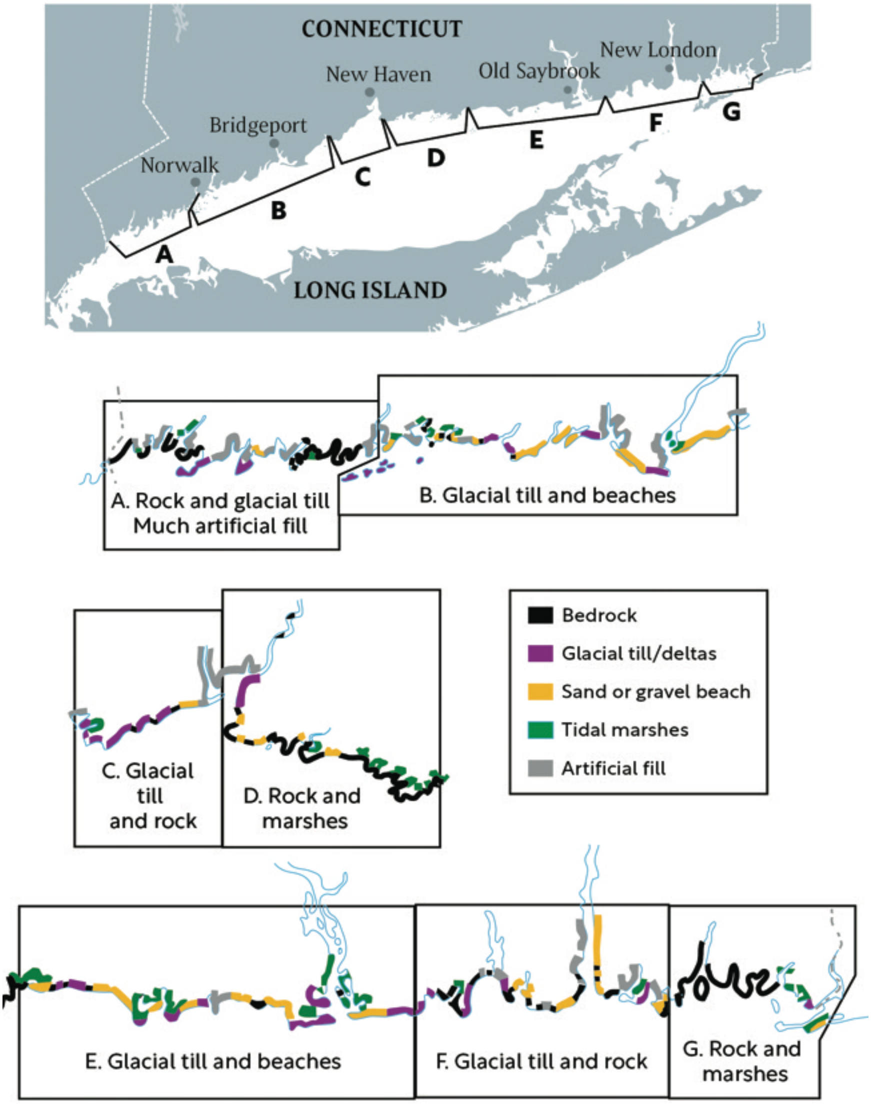


***Figure 5A-G**. Connecticut's coastal types as adapted from Bloom (1967). Of the seven mapped areas, only segments (B) and (E) were categorized by Bloom as being composed primarily of glacial delta deposits with associated sand/gravel beaches and tidal marshes. The remaining segments are composed of bedrock and some combination of glacial sediment/marshes and artificial fill.*

typically slope seaward and they are largely unaltered as the rising sea submerges them in place (Figure 8). Aside from the blanket of glacial till that is largely removed by the winnowing action of encroaching waves, this type of exposed, solid bedrock yields precious little sediment for beach nourishment.

Bedrock outcrops that are highly fractured, layered and compositionally prone to being broken down chemically tend to be a bit less resilient than their more solid counterparts. Rather than being submerged in place, these features tend to retreat landward as a fairly steep, seaward-facing, bedrock face that is attacked by wave energy focused at its base. The aptly named west side of Bluff Point, Groton is

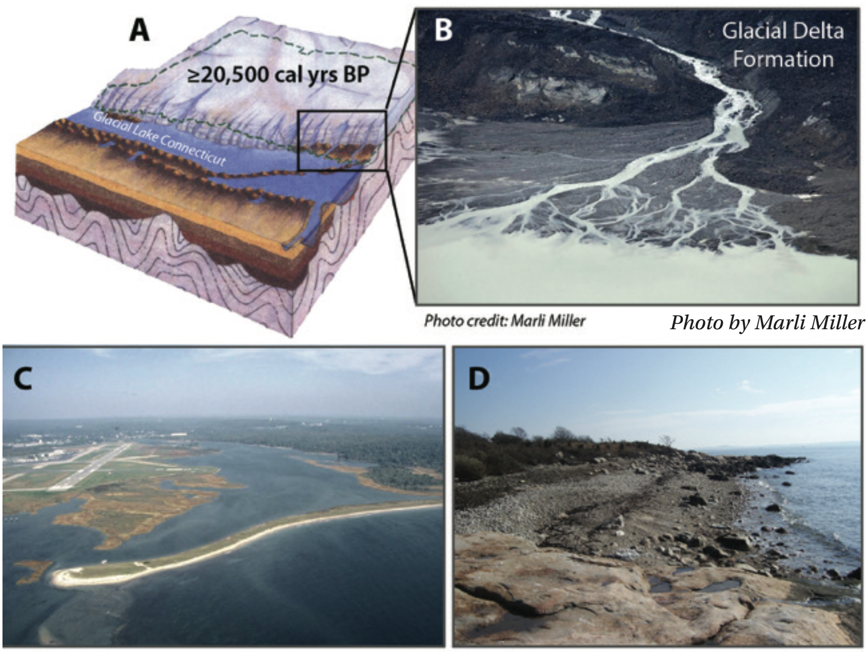


Photo by Marli Miller

Artwork by Tom Ouellette, figure and lower two photos courtesy of CT DEEP

Figure 6A-D. *(A) and (B) show glacial delta formation at the mouths of bedrock valleys, as the Wisconsinan glacier melted out of Glacial Lake Connecticut approximately 20,500 years ago. (B, C and D) illustrate the fact that shorelines are composed of whatever material waves have to work with. Along the Connecticut shoreline, low sandy beaches (C) are typically confined between points/necks and develop as waves chew into glacial delta deposits. Adjacent beach compositions (D) can range from outcropping bedrock to boulder/cobble beaches derived from glacial till/moraines (See Figure 22).*

Photos by Joel Stocker

Figure 7A-D. *Along the north shore of Long Island Sound, localized beach retreat proceeds in different ways, depending on the composition and slope of a particular shoreline segment. On gently-sloping, glacial delta surfaces (A) Griswold Point, Old Lyme and (B) Camp Harkness, Waterford, overwash fans indicate that sediment is being removed from the beach front and deposited on marshes or upland in backshore areas (beach rollover). At Harkness Memorial State Park, Waterford (C) old dunes are being eroded and previously deposited marsh deposits exposed (see Figure 3). At Rocky Neck State Park, East Lyme (D) bedrock of the Lands End peninsula is submerged in place as Long Island Sound waters rise. The islands in the distance were highpoints on the peninsula that have yet to be totally submerged in place.*

a good example of this process. Its bedrock is highly fractured and susceptible to being broken into chunks, as water filling its numerous fractures (Figure 9A) expands on freezing.

A variety of glacial deposits, ranging from the layered silts, sands and gravels of deltas built into Glacial Lake Connecticut to the unsorted, boulder-laden tills of coastal moraines/drumlins, are the main (and often only) source of natural material supporting natural beach formation along the north shore of Long Island Sound. East and west of New Haven Harbor, most of this material was derived from glacial scour of metamorphic bedrock which is typically rich in garnets and magnetite. That is why these minerals are commonly found in the glacially-derived, natural sands of local beaches (Figure 10). There is a garnet beach sand trail at Hammonasset State Park with information found at this link: **https://portal.ct.gov/-/media/DEEP/geology/GarnetTrail/Hammonasset_2022.pdf**

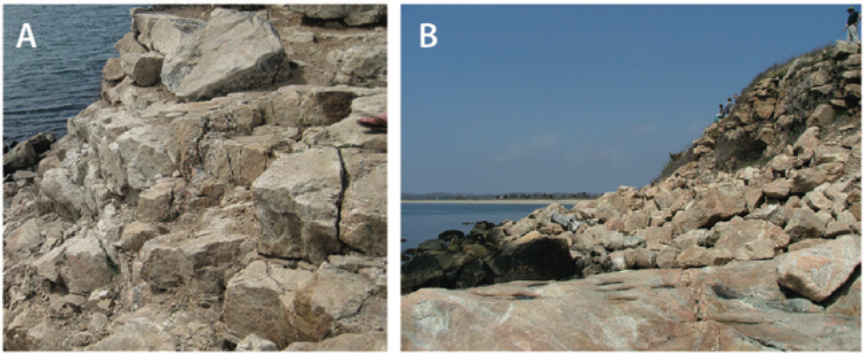
Photo by Ralph Lewis

Photo by Joel Stocker

Photo by Ralph Lewis

Photo by Ralph Lewis

Figure 8A-D. *Photos of bedrock outcrops at Waterford Beach, Waterford (A and B), Bluff Point, Groton, east side (C), and Rocky Neck, East Lyme (D). At these locations, the bedrock is glacially smoothed (C), slopes to Long Island Sound and is relatively free of fracturing or layering. As a result, these bedrock points/necks are little changed by wave action, and they do not move landward, but remain in place as the rising waters of Long Island Sound advance over them. (B) shows islands offshore of Waterford Beach that are yet-to-be submerged highpoints on the seaward extension of the point shown in (A). (C) and D) show boulders left sitting on bedrock as wave action has winnowed away finer components of overlying till. This type of boulder lag often armors bedrock and morainal shores. These bedrock points and necks typically yield too little sediment to adequately replenish surrounding beaches (see Figure 23 - Wave Refraction).*



Photos by Ralph Lewis

Figure 9A-B. *The bedrock of the west side of Bluff Point, Groton, is easily broken into blocks as water filling its numerous fractures (A) expands on freezing. Over time, wave action focused at the base of the bluff undermines it and the bluff retreats landward as unstable bedrock blocks tumble down its face. These blocks land on the wave-cut, bedrock bench at the base of the bluff and serve to armor this section of shoreline (B). Here again, this type of bedrock bluff retreat typically yields too little sediment to adequately replenish surrounding beaches (see Figure 23 - Wave Refraction).*

Photo by Juliana Barrett

Figure 10. *Garnet sand on beach, Waterford, CT.*

Slightly less persistent coastal moraines (red rectangles, Figure 11) also form points (e.g., Greenwich Point, Greenwich; Jeffery Point, Branford; Hammonasset and Meigs Points, Madison; Kelsey Point, Clinton; Cornfield Point, Old Saybrook); or islands (Captain Islands, Greenwich; Norwalk Islands, Norwalk; Pine Island, Groton). As wave action winnows out their finer material, leaving behind a resilient boulder cobble armor, they may yield a small amount of sediment to surrounding local beaches. These morainal points (e.g. Hammonasset and Meigs Points, Kelsey Point, Cornfield Point; Figure 11E) are more resilient than the glacial deltas (dark green and yellow shading) they armor so they have not eroded landward as much as the less resilient glacial sand and gravel deposits that border them. From a standpoint of littoral transport, the morainal points act just as their bedrock counterparts in that they also partition the coastline and compartmentalize intervening sandy beaches.

Promontories composed of thick till deposits such as Stratford Point, Stratford (black diamonds, Figure 11 A-B) and Griswold Point, Old Lyme (Figure 12), and drumlins, (purple ovals, Figure 11, e.g. Shippan Point, Stamford; Hatchett Point, Old Lyme; Black Point, East Lyme) are moderately resilient. Escarpments (steep, erodible slopes over three feet high), like the one at Griswold Point, usually front thick till deposits as they are eroded back by wave action. These deposits can supply sediment to replenish local features like the small barrier spit just west of the scarp shown on Figure 12. Locals and birders may know this barrier spit as the Griswold Point Preserve. Drumlins, like those circled in purple on Figure 11 (e.g., Black Point, East Lyme), are resilient enough to form points which can erode landward, supplying adjacent beaches with some sediment, but they can also locally disrupt beach replenishment by littoral transport.

As the Wisconsinan glacier melted northward exposing the bedrock-controlled topography of the Glacial Lake Connecticut shoreline, wide, shallow, braided meltwater streams flowed down emerging, glacially modified valleys building deltas of various sizes into the Lake (Figure 6). Deposition of the larger glacial deltas (e.g., Bloom's Segment E, Figure 11) required efficient delivery of substantial amounts of

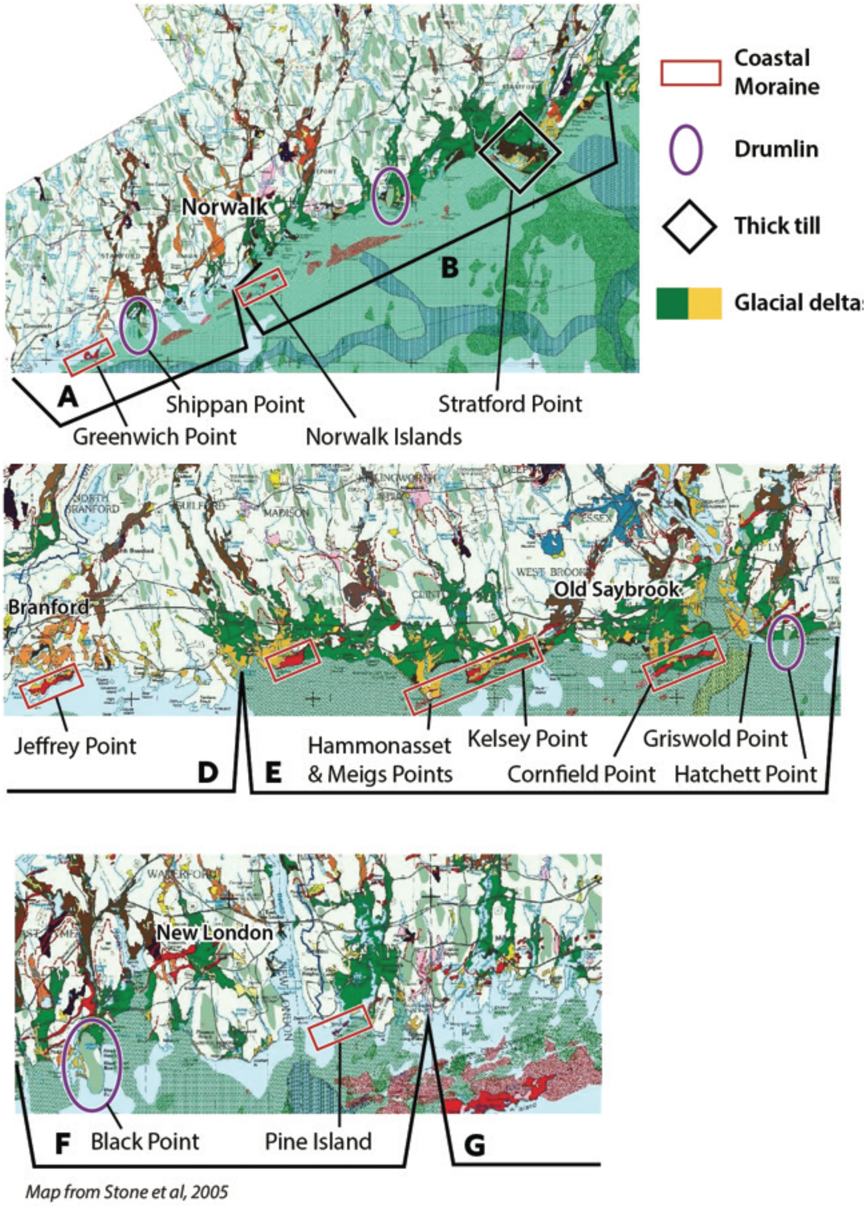


Figure 11A-G. *Excerpts from the Quaternary Geologic Map of Connecticut and Long Island Sound Basin showing the geology of Bloom's segments (A, B, E, F, and G). In addition to bedrock outcrops, coastal moraines, drumlins and thick till deposits also form points and necks along the CT coast.*

sediment by their feeder streams. The confined, low-lying, sandy/gravelly beaches that we know today are the eroded remnants of these 20,000-year-old glacial deltas. A variety of factors, including dams and modern sediment control measures have resulted in a reduction in the amount of sediment that modern day streams are delivering to Long Island Sound. An unintended consequence of this is a shortfall in the supply of sediment needed to help replenish the salt marshes and sandy beaches that have developed on, and along, the eroding glacial delta fronts. Lacking sufficient sediment replenishment by stream deposition and/or littoral transport, the low-lying delta remnants are generally less resilient than the points, necks and thick till deposits that surround them so they retreat landward faster as dune formation and overwash transports sediments eroded from the

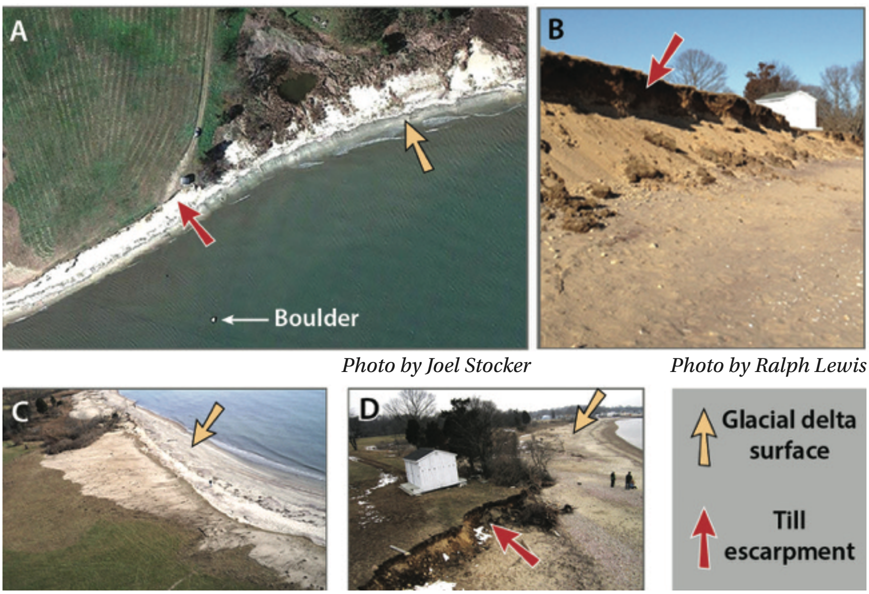


Photo by Joel Stocker *Photo by Ralph Lewis*

Photo by Joel Stocker *Photo by Joel Stocker*

Figure 12A-D. *Although exposure to wave energy is similar, the eroding steeply-sloping thick till escarpment at Griswold Point, Old Lyme, retreats landward differently than the gently-sloping delta surface being rolled over to form White Sands Beach, Old Lyme. Note the overwash fans overlying the delta surface at White Sands Beach. The boulder, sitting about 60 meters off the present beach, was in the surf zone of this beach in 1915.*

beach front to the backshore as part of the transgressive beach rollover process shown in Figure 3.

How do dunes form?

The conditions required for coastal dune development include: a flat beach with a berm and an adequate supply of sand/silt that is texturally conducive to being mobilized and moved landward (Figure 13) by local onshore winds (wind blowing from the sea to the land), an obstacle (e.g., driftwood) for the dune to start piling up against, and sufficient tidal period and range for sand to be exposed long enough to dry out and become mobile. Owing to the prevailing wind, wave and tidal environments of the northern Sound, dunes associated with these beaches tend to be low, often poorly developed and susceptible to breeching during storms (Figure 14).

Owing to the shape of the Long Island Sound Basin, tidal range increases from east (~2.7 feet) to west (~7.4 feet) along its north shore. The local setting (beach composition, aspect, fetch, surrounding land use) can cause changes in the width of the tidal zone and thus the amount of inundation and exposure that occurs during each tidal cycle. Gently sloping coastal segments, offshore bars, and tidal flats are more affected by this than steeper slopes and bluffs (Figure 15).

Exposed areas of Connecticut's beaches tend to be fairly narrow because, even in the west, the tidal range is comparatively small. This

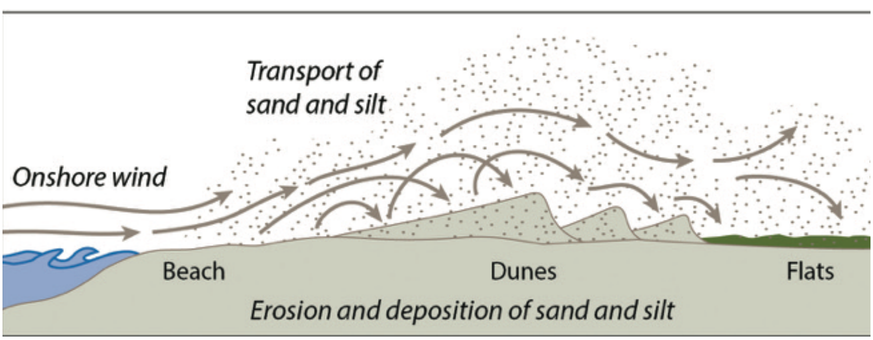


Figure 13. *The process of landward coastal dune migration.*

Photo by Ralph Lewis

Figure 14. *Westward view of Waterford Beach, showing the eroding, sandy glacial delta front, the dunes developed landward of it and the marsh sitting on the delta surface in the backshore area. This beach, like many similar to it, is a hybrid, cuspate barrier, somewhere between a baymouth barrier and a pocket barrier (see Figure 17). It is bookended by bedrock points, and it receives little to no replenishing sediment from littoral transport. The only future sandy/gravely, "beach making" material that the waves have to work with is the glacial delta sediment that underlies the marsh.*

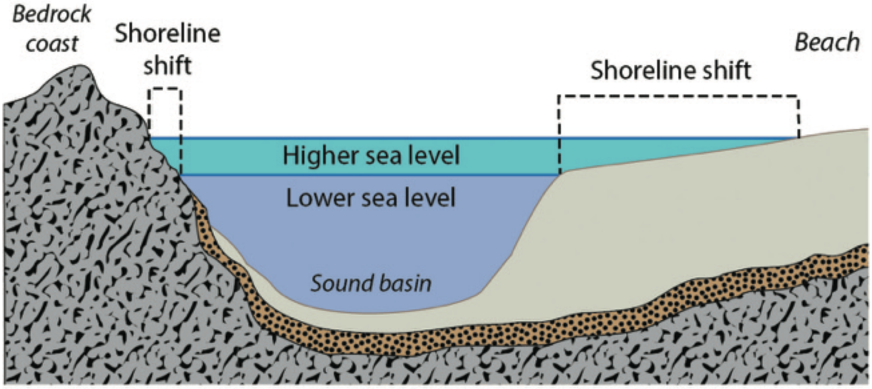


Figure 15. *Image depicting the effect slope has on the width of the tidal zone.*

limits the amount of sand/silt that the wind can interact with. As shown in Figure 2, there is no strong, year-round onshore wind to move large amounts of sand/silt landward and beach compositions can vary as delta fronts are cut back by waves, and from one delta to another. **All of these factors work to limit dune size and resilience of beaches from location to location along the Connecticut shoreline.**

As seen in Figures 7C and 16, storms can often expose outcrops of salt marsh peat that was rolled over (Figure 3) as the beach was driven landward. Figure 16 shows the different ways dunes migrate landward at Harkness Memorial State Park, Waterford. In the upper part of the picture, as beach transgression occurs, the marshes that

Drone photo by Joel Stocker

Figure 16. *A westward view from the upland toward the marsh covered delta surface at Harkness Memorial State Park, Waterford. As with all Connecticut beaches, the composition of the shoreline reflects the type of material that the waves have to work with; in this case, glacial deltaic sand to the west, the last vestiges of overridden marsh peat as dunes begin to encounter upland till deposits, and cobbles and boulders left behind as waves removed the transportable finer constituents of the upland till that they are eating into.*

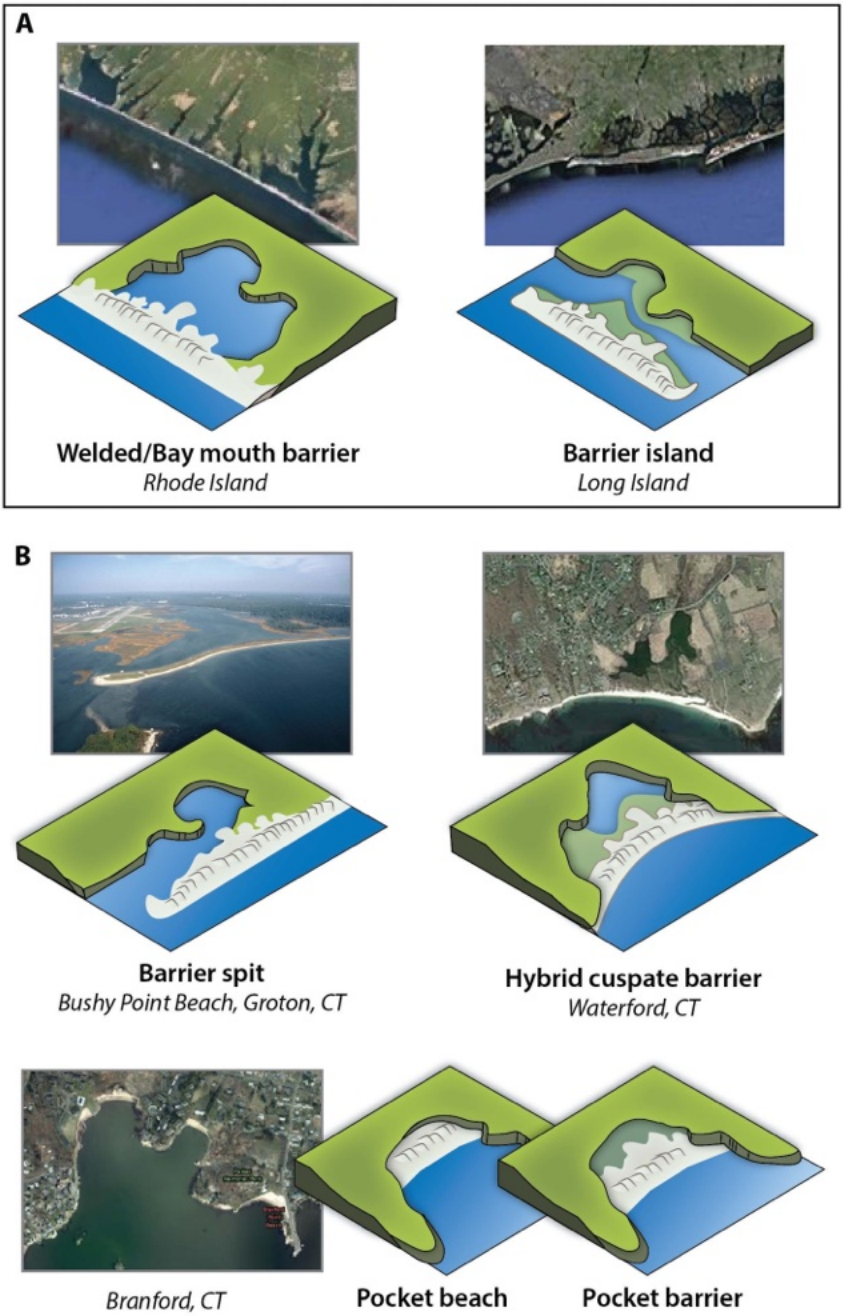

A
Welded/Bay mouth barrier
Rhode Island
Barrier island
Long Island
B
Barrier spit
Bushy Point Beach, Groton, CT
Hybrid cuspate barrier
Waterford, CT
Branford, CT
Pocket beach
Pocket barrier

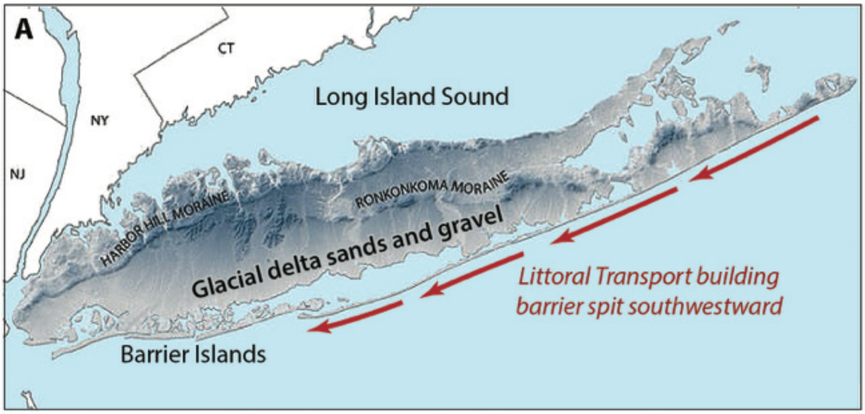
Figure 17A-B. *Barriers can be divided into two categories: attached and detached (Van Heteren 2014). Various types of barrier islands comprise the detached group. The balance of wave and tidal energy, and the abundant sediment supply that exists along the south shore of Long Island are ideal for the development of barrier islands (Figure 18A), but these conditions do not exist in Long Island Sound. (B) These images depict the types of beaches that are found along the Connecticut shoreline. (Adapted from "Guidelines for Barrier Beach Management in Massachusetts: A Report of the Massachusetts Barrier Beach Task Force, Feb 1994.")*

have developed on the low-flat delta surfaces of the backshore are progressively buried by migrating dunes and then eroded away at the beach front. In this area the beach is composed of sand eroded from the receding delta front. In the middle of the picture, the overridden marsh deposits are exposed at the beach front as the dunes are beginning to migrate onto the upland lawn. The marsh that once existed in this area has been completely overrun by the dunes as they encounter the upland glacial till. In the lower part of the picture the character of the beach has completely changed. The waning dunes are disappearing as their sand source is completely eroded away and the beach is now composed of boulders and cobbles eroded from the upland tills. This is how marshes and dunes die out as waves encroach over uplands in a rising sea. The other factor that comes into play with dune rollover and migration landward is land use. Figure 16 shows a situation in which there is room for migration of the beach/dune system landward onto the uplands. In many coastal situations along Long Island Sound, roads and other infrastructure will obstruct landward migration.

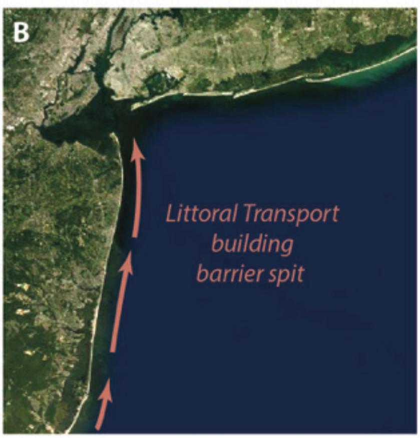
Barrier Beaches

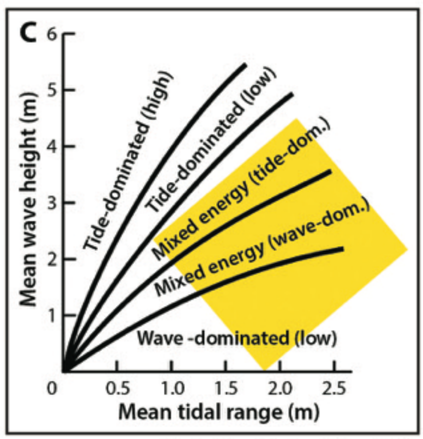
Numerous books and other publications describe the form and function of sediment-rich, mostly sandy shorelines where wind, wave and tidal energy is sufficient to mobilize enough sediment to sustain the growth and long-term existence of barrier beaches like the barrier island, and barrier spit complexes that typify the south shore of Long Island, NY (Figures 17A and 18A), and the Atlantic

Seaboard south of New York City (Figure 18B). The natural development and sustainability of this type of shoreline requires a continuous, ample supply of sediment (mostly sands and fine gravels) that local wave energy can readily move along the beachfront (littoral transport, Figure 4C) and a balance of wave and tidal energy (yellow box Figure 18C) that supports barrier formation and function.



Adapted from topo image of Long Island Sound, courtesy of USGS





Adapted from Davis and Hayes, 1984

Figure 18A-C*. Images showing the littoral transport of the abundant mobile sediment that feeds and sustains the barrier system of southern Long Island (A) and New Jersey (B), and (C) balance of wave and tidal energy (yellow box) needed for large scale barrier development. Image (B). © Esri*

Unfortunately, the terminology relating to barrier beaches can vary from publication to publication because authors sometimes have different opinions when it comes to barrier classification. Figure 17 is an attempt to provide some guidance as to naming conventions (Van Heteren, 2014) that are often applied to East Coast barrier beaches.

Figure 19. *(Top) Satellite image showing baymouth/welded barriers closing off the embayments of the Rhode Island shoreline between the barrier spit (Napatree Beach) at the western end of the Charlestown Moraine and the eastern end of the Charlestown Moraine at Point Judith. (Bottom) The Charlestown Moraine is shown in black on the bottom image, and glacial meltwater deposits to the south of it are composed of the easily transported sands and gravels that feed barrier formation.*

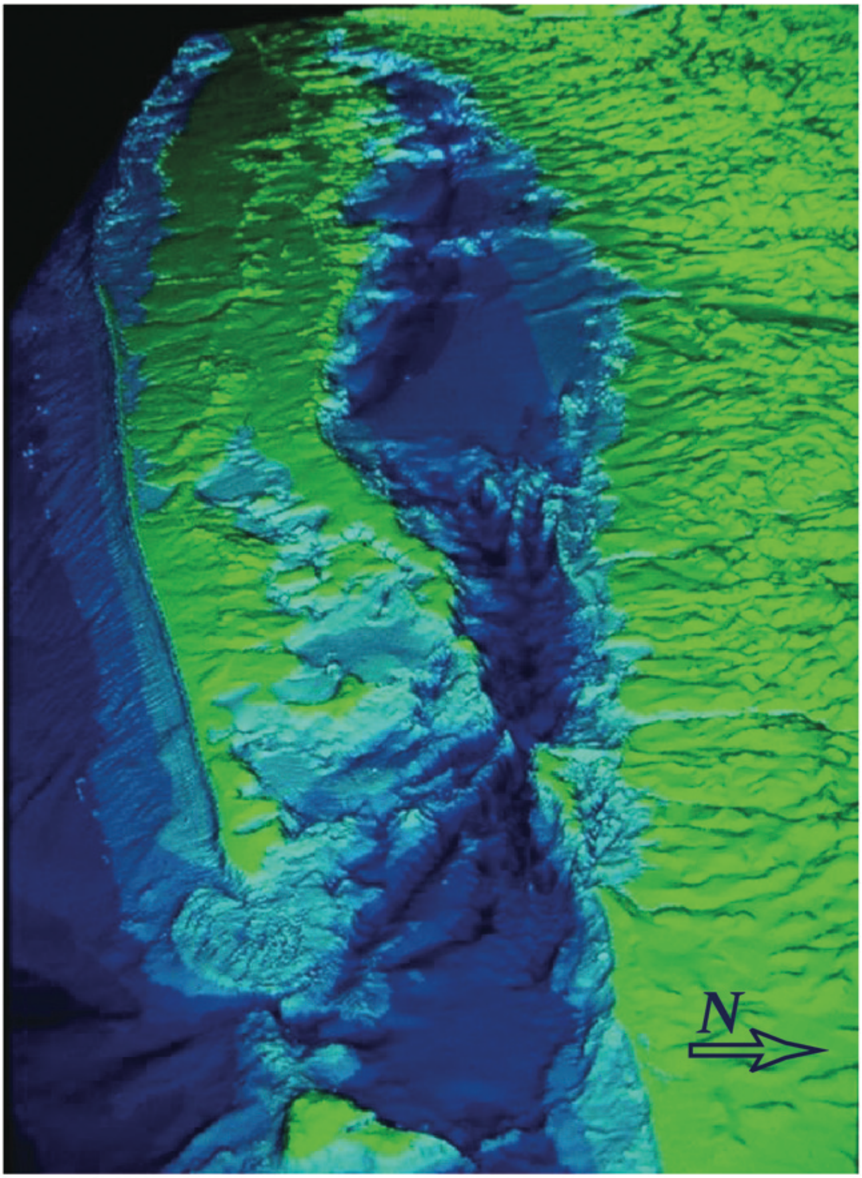


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Figure 20. *Topographic image looking westward to Throgs Neck, N.Y., from the vicinity of Point Judith, R.I. The topography of the land has been slightly exaggerated to highlight the topographic differences between the sand-rich barrier systems of the south shore of Long Island, N.Y., and western Rhode Island and the irregular, bedrock-controlled, sediment-poor, north shore of Long Island Sound (Connecticut coast).*

In the grouping shown in Figure 17, bay mouth/welded barriers require sufficient wave energy and sediment supply to close off the mouths of embayments and straighten beaches, as has happened along the western Rhode Island coast (Figure 19). Major modification of a coastline through the development of barrier spits (Figure 18) requires fairly high wave energy and plentiful sediment. Low wave energy and restricted sediment supply limit the development of barrier spits along the Connecticut coast. This type of low-wave energy, attached barrier types can be found all along the north shore of Long Island Sound. These are formed by waves cutting into the shore faces of sandy glacial deposits. Barriers fronting medium to large glacial deltas form cuspate barriers that are not quite bay mouth barriers and not quite pocket barriers. The beach fronting Goshen Cove, Waterford, is an example of this type of hybrid beach. Pocket barriers

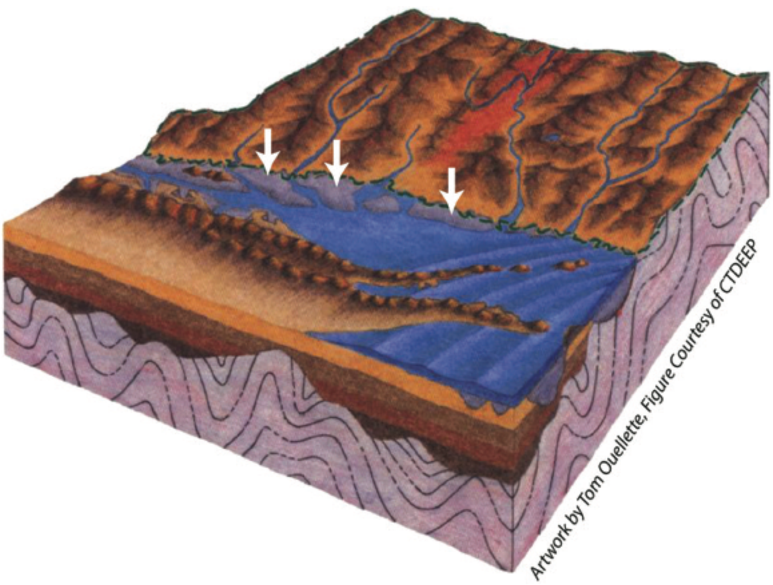
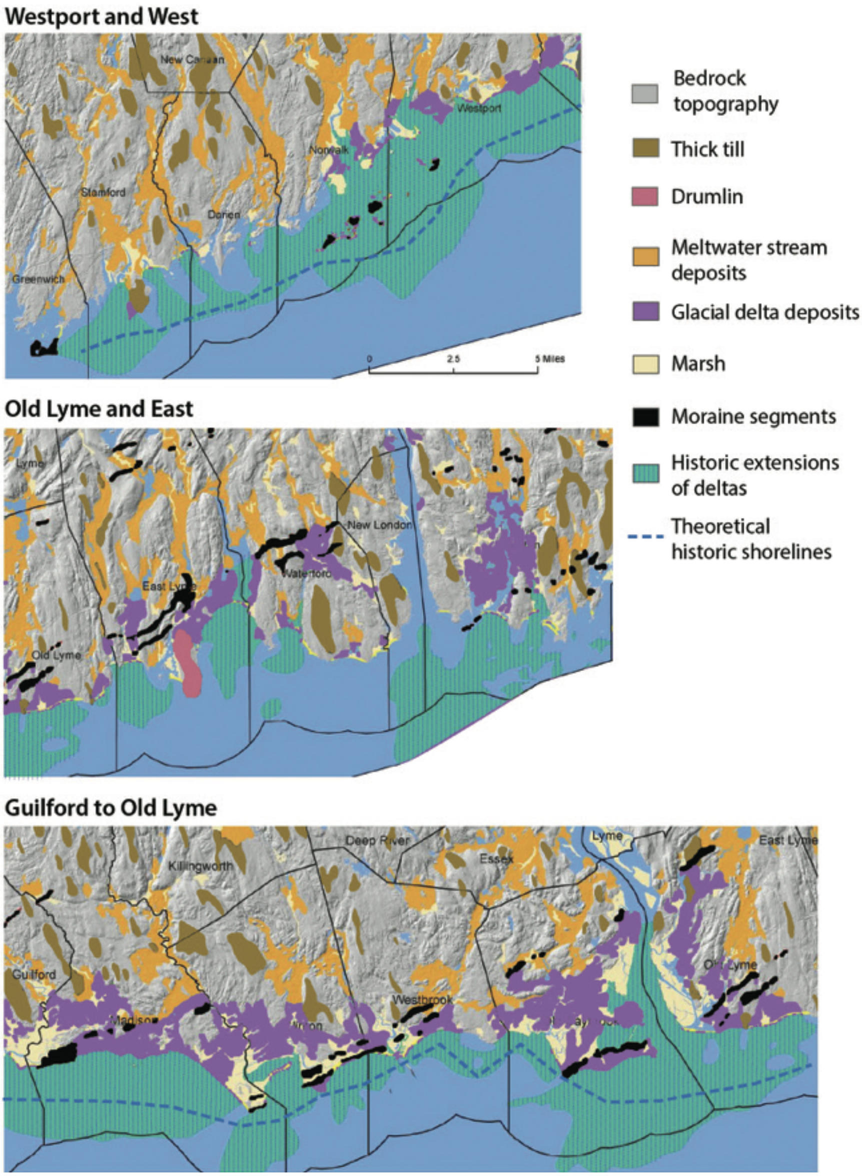


***Figure 21**. A depiction of an early transgression of the sea over exposed seaward extensions of Connecticut's coastal glacial deltas (white arrows). At this time, particularly west of Old Lyme, waves were chewing into a nearly continuous series of sandy glacial deltas. The southern margins of these deposits were thick enough to completely bury the underlying bedrock and older glacial deposits. This is inferred to have resulted in a sediment rich, fairly smooth shoreline (theoretical early shoreline west of Old Lyme – dashed blue line, Figure 22).*



Geology Courtesy of Janet Stone, USGS Emerita

Figure 22. *The glacial deposits of selected segments of the Connecticut shoreline superimposed on LIDAR data (light gray areas) to show the strong influence that the bedrock-controlled topography had on the distribution of sandy, glacial meltwater deposits along the present shoreline from Westport west (top) and from Old Lyme east (middle). Between Guilford and*

Old Lyme (bottom), bedrock topography held less sway and large glacial deltas associated with progressive younger ice positions (coastal and offshore moraine segments – black shading) at Old Lyme/Old Saybrook, Westbrook/Clinton and Madison dominate the shoreline. In this area the sandy delta deposits are sequestered between the more resilient coastal moraine segments (black). Marshes overlying the coastal delta deposits are shown in light tan on all three coastal segments. Blue dotted lines show theoretical historic shorelines established across offshore extensions (shaded blue/green) of these coastal glacial deltas at a time of lower sea level.

and pocket beaches develop where waves are chewing into smaller glacial delta fronts that are confined by prominent points/necks. Pocket barriers still have marshes overlying delta deposits in their back beach areas. Pocket beaches do not.

A different type of sediment-rich, Atlantic-facing shoreline has developed along the Rhode Island coast west of Point Judith (Figure 19). The extensive barrier spits and barrier beaches, characteristic of the south shore of Long Island, N.Y., are not present because the wind, wave and tidal energy regime in this area has combined with local sea-level rise to favor the development of transgressive (landward moving) baymouth/welded barriers (Figures 17 and 19) that close off the coast's embayments as they roll over.

Evolution of the Connecticut Shoreline

Throughout much of the evolution of Long Island Sound's north shore, the character of the coastline was quite different from the heterogeneous, irregular coast that we are familiar with today (Figure 20). As the rising, post-glacial sea entered and began inundating the Long Island Sound Basin, shorelines progressively transgressed up slope and landward.

Eventually, wave action began to chew into the southerly margins of a series of large glacial deltas (Figure 21, white arrows) that extended seaward from what is now the Connecticut coast (Figure 22, blue/green shading). The early Connecticut shorelines that are inferred to have resulted were not as irregular and sediment poor as today's version (Figure 22, blue dashed lines representing a hypothetical early shoreline cut into the sandy offshore deltas west of present-day Old Lyme).

During early stages of the sea's landward transgression, wave action was chewing into the thickest seaward margins of the coastal deltas. This was where the delta deposits tended to be thick enough to completely bury the underlying bedrock, moraines, drumlins or other material. Where this complete burial was prevalent, the waves only had sandy delta deposits to work with and fairly smooth, sandy beaches would have resulted. This was particularly true west of Old Lyme where coalesced seaward extensions of the deltas formed a nearly continuous series of sandy deposits (Figure 22, hypothetical shoreline drawn as dashed blue lines across coalesced offshore delta deposits shaded blue/green).

Eventually, as sea level rose with glacial melting, the sea began to encroach onto landward portions of the glacial deltas, waves began to encounter bedrock ridges, moraine segments and drumlins that were poking through thinner portions of the deltas. This was a game changer in the evolution of the coast because differential rates of shoreline retreat developed when bedrock, moraine and drumlin outcrops proved to be significantly more resilient than surrounding glacial delta deposits. From that point to the present, the various points and necks of the Connecticut coast have continuously retreated more slowly than the deltaic beach fronts.

This differential retreat has resulted in a coastline that does not resemble or function like the surrounding high energy, sediment rich beaches of Long Island's south shore or southwestern Rhode Island (Figures 18 and 19). The north shore of Long Island Sound is much more heterogeneous in composition (Figures 5 and 11) and it is sheltered from the high energy waves of the Atlantic Ocean by Long Island. Both of these factors have worked to create and perpetuate today's irregular, sediment-starved coastline.

The heterogeneous composition of this low-energy coast is particularly important in maintaining its irregularities because of the large disparities in resilience that exist between its low lying, sandy deltaic

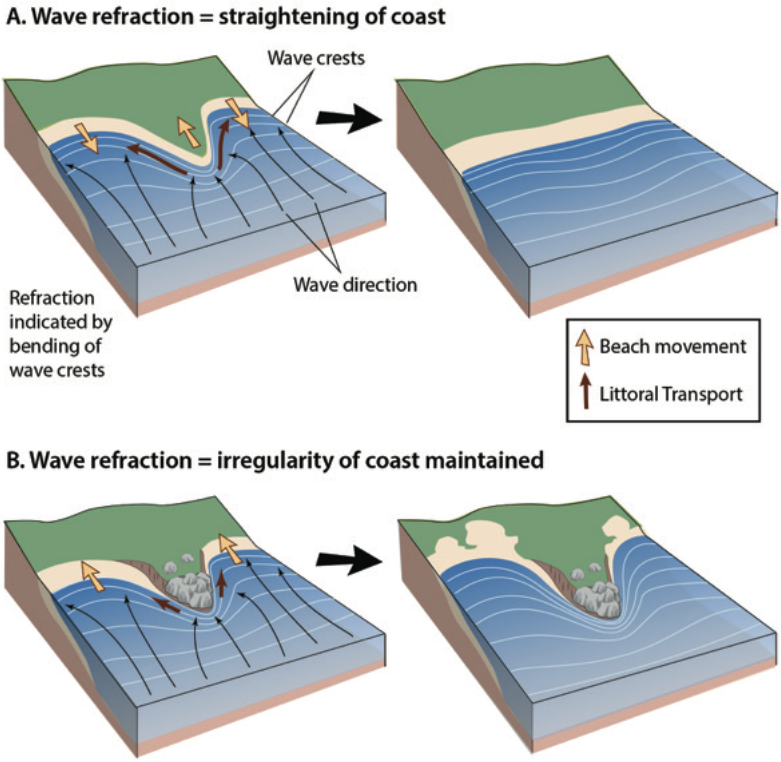
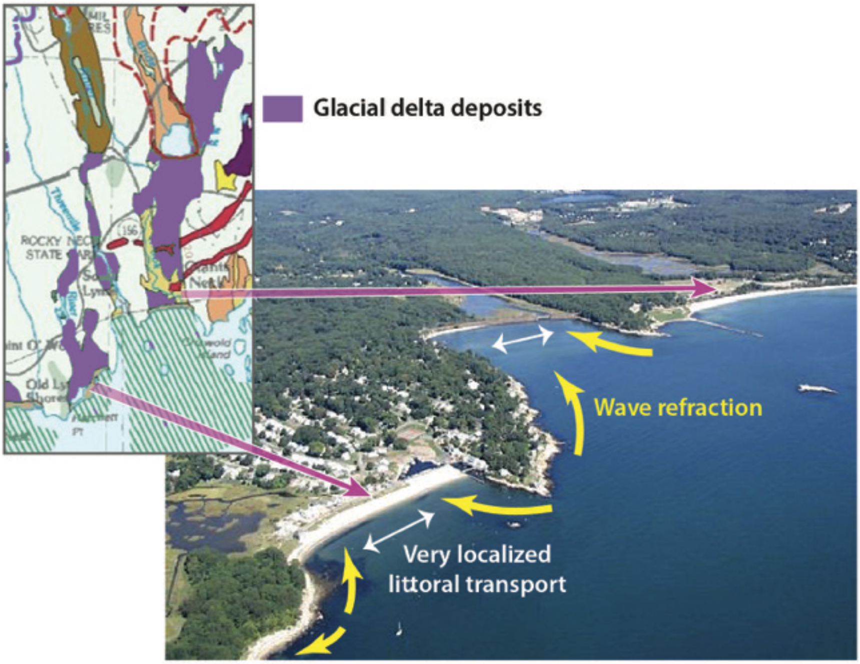


Figure 23A-B. *A comparison of the effects of wave refraction on two different coastal types. (A) depicts an irregular, high-energy shoreline with a headland that is fairly easily cut into by wave energy that is concentrated on the headland (black arrows) by wave refraction. In this scenario, littoral transport (long red arrows) delivers ample sediment, eroded from the headland, and deposits it on surrounding beaches. The result would be straightening of the coastline as the headland is eroded landward (yellow arrows) and replenishing sediment is added to surrounding beaches. As the coastline straightens, wave energy becomes more uniform along the beach and this helps maintain a straight coast with active littoral transport (A, right). (B) presents a scenario that is much more relevant to the north shore of Long Island Sound. In the low-energy environment depicted, the wave energy, concentrated on a resilient headland (e.g., resilient points and necks in Long Island Sound) by wave refraction (black arrows), is insufficient for an aggressive attack and littoral transport (short red arrows) consequently provides little replenishing sediment to surrounding beaches. Lacking an adequate supply of replenishing "outside" sediment, these beaches retreat landward (yellow arrows) because the only sediment available is derived from wave action chewing into the already existing, less resilient, beach front (glacial delta deposits in the Long Island Sound case). In Long Island Sound, the irregularity of the coastline would be maintained because more resilient points and necks retreat more slowly than glacial delta deposits.*



Drone photo by Joel Stocker; inset map from Stone et al, 2005

Figure 24. *Along the irregular north shore of Long Island Sound, wave refraction (yellow arrows) acts to sequester sandy glacial delta deposits (purple) between partitioning points and necks. The irregular configuration of this heterogeneous coastline is perpetuated by the generally slow retreat of resilient points and necks and the more rapid retreat of less resilient, low-flat glacial deltaic deposits (see Figure 15 depicting the effect of slope on inundation). As long as this differential retreat and the accompanying wave refraction by points and necks persist, there is no chance for having extensive straight, sandy beaches along the north shore of Long Island Sound.*

beach fronts (highly erodible) and its protruding points and necks (more resistant to erosion). Most textbook and popular literature discussions of coastal irregularity maintain that wave refraction coupled with littoral transport act to straighten shorelines over time (Figure 23A). While this is generally true for the high-energy, sediment-dominated shorelines, it is not true for the north shore of Long Island Sound where waves do not have enough energy to derive appreciable sediment from the resilient points and necks (Figure 23B).

Waves approaching headlands slow down in the shallowing water surrounding the headlands, but maintain speed in the deeper water between headlands. This speed differential causes the waves to be refracted toward the headlands, where wave energy is concentrated (Figure 23). Littoral transport (red arrows, Figure 23A and B) carries any sediment that is available away from the headlands and into the intervening coves, harbors and embayments.

The irony of all of this is that perpetuation of the irregularities in the Connecticut coast leads to a sequestration of the glacial delta deposits between partitioning points and necks. The predominance of wave refraction in the near shore works to keep whatever glacial sediment is available confined by shoreward moving littoral transport on the flanks of points and necks and pretty much precludes anything but very localized coast parallel littoral transport (Figure 24).

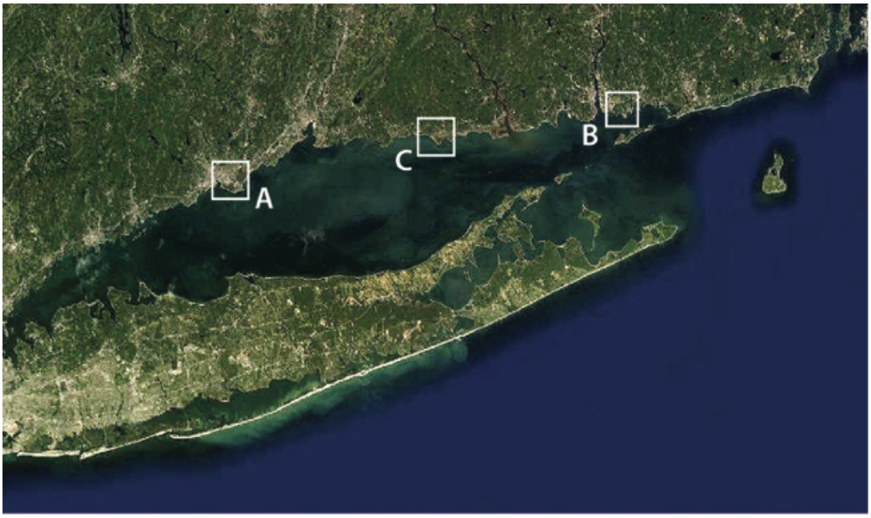


Figure 25. *Satellite image illustrating the large-scale barrier development that characterizes the south shore of Long Island, N.Y., and westernmost Rhode Island (see Figures 18 and 19 for more detail) in contrast to the two largest barrier spits of the Long Island Sound north shore the Long/Pleasure Beach system, (Bridgeport/Stratford) and Bushy Point Beach (Groton) to the east (Points A and B) which are barely visible in this figure. One of the largest beaches in Connecticut, Hammonasset Beach (Madison) (Point C) is also barely visible on this figure. It represents the eroding shoreface of the extensive glacial delta underlying Hammonasset Beach State Park.*

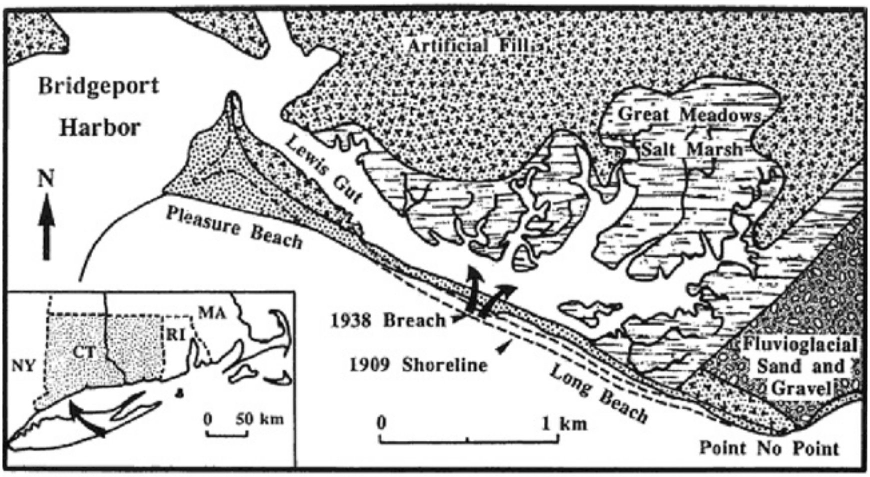


Figure 26. *Shoreline changes at Pleasure and Long Beaches (Bridgeport and Stratford). (Fitzgerald, D. M., Rosen, P. S., and Van Heteren, S., 1994; After Patton and Kent 1992)*

Figure 25 clearly shows that the south shore of Long Island and the Rhode Island coast, west of Point Judith, have been highly modified by large-scale barrier development that is occurring in high-energy, sediment-rich settings. In contrast, the coastline that stretches along the sheltered north shore of Long Island Sound from Throgs Neck, N.Y., to the Connecticut-Rhode Island border, is quite different in both form and function. It is the longest stretch of irregular, low-energy, sediment-starved shoreline on the Eastern Seaboard. Near-shore wave refraction associated with its various points and necks works to partition the coast and limit shore-parallel littoral transport (Figure 24).

As a result, large-scale, coastwide modification of this coastline is not occurring. The north shore of Long Island Sound is essentially being drowned by the rising sea with very little coastwide modification (Figure 25). The two largest barrier spits that have developed along the north shore (the Long/Pleasure Beach, Bridgeport/Stratford system and Bushy Point Beach, Groton) are barely recognizable at the scale of Figure 25. Nearly all of the sediment available to maintain partitioned, natural sandy/gravelly beaches comes from localized wave recycling of the already present glacial delta deposits. Owing to the lack of sediment replenishment from elsewhere along the coast, the sequestered, transgressive beaches that develop along eroding glacial delta fronts are characteristically narrow, low-lying and susceptible to overwash. The size of these sandy beaches is determined by the size of the glacial delta that they front. The largest sandy beaches are formed by waves chewing into existing, large glacial deltas (e.g., Hammonasset State Park, Madison, Figures 22 and 25).

At the local scale, hurricanes and nor'easters have a role in the development of barrier spits. During the hurricane of 1938, storm surge overwashed and severely eroded many of Connecticut's barrier spits. Many of these have still not fully recovered, owing to a lack of natural sand for replenishment. This is true for the Long/Pleasure Beach system (Bridgeport/Stratford) which forms a long transgressive barrier spit that occasionally has local exposures of salt marsh peat on the foreshore. In addition to its transgression shoreward, the spit had historically grown westward (Fitzgerald et al., 1994). This ended during the Hurricane of 1938 when its supply of sediment (Point No Point) was cut off by a breach in Long Beach (Figure 26). The breach had grown to a width of 200 m by 1950, but was artificially closed in 1961 (Fitzgerald et al., 1994). Closure of the breach did not restore the system to its pre-hurricane functioning because erosion at Point No Point was stopped by the riprap and the construction of a seawall (Patton and Kent, 1992). After that, Point No Point no longer yielded sufficient amounts of suitable, spit-building sediment to westward littoral transport. Long Beach has been eroding landward since Point No Point was armored.

With a few exceptions (e.g., Sandy Point in New Haven Harbor and Cedar Island in Clinton Harbor), nearly all of Connecticut's barrier spits are growing westward. This westward growth means that, over time, the amount of sand moving westward along the beach is greater than the amount of sand moving eastward. It is likely that much of this happens during nor'easters when strong winds blow from east to west. Prevailing winter winds out of the northwest would leave most of the Connecticut coast in the lee, and prevailing southwest summer winds are not particularly strong (Figure 2). The east-growing Sandy Point and Cedar Island spits would be sheltered from nor'easters by the harbors that they occupy but exposed to prevailing summer winds from the southwest.

Climate Change and Management of Beach Systems

In our region, the changes in global climate that we are currently experiencing tend to increase the effectiveness of the natural forces working to rearrange coastlines. These forces include higher rates of global (eustatic) sea level rise, an increase in the number of named storms impacting the coast, increased temperatures, prolonged droughts, and changes in rain patterns. The ability of local coastlines to resist change (based on their natural composition and character) has remained essentially the same since the last (Wisconsinan) glacier melted out of southern New York, Connecticut and Rhode Island. As the agents of change gain more advantage in the battle to rearrange our coast, the changes they bring about tend to have greater negative impacts on coastal populations and infrastructure. That, in turn, spurs the strong human drive to "fix" things and restore beloved coastlines to "the way they used to be."

When considering remediation and/or management measures aimed at "fixing" local coastal problems, it is very important to be keenly aware that not all coastlines are created equal. This is why the long-term success of transplanted remediation and management initiatives depends on careful analysis of their ability to function as intended, given the prevailing physical conditions where they will be sited. Before replicating a "fix" simply because it worked elsewhere, it is important to gain a good understanding of the physical setting where the candidate project worked and determine its degree of compatibility with the physical setting where the prospective project is to be located.

The uniqueness of the Sound's north shore makes assessing the suitability of potential remediation/resiliency installations difficult because there is a paucity of available literature that discusses the form and function of this sheltered, sediment-starved, rock-dominated coastline. Any resilience project along the north shore of Long Island Sound needs to take localized site conditions into account.

Ecology of Coastal Beaches, Dunes, Sand Flats and Forests

Juliana Barrett

Beaches and dunes are formed by water and wind currents, accretion and erosion. With Long Island forming a protective barrier, the Connecticut coast is not subject to the same intensity of water and wind currents as those coastal areas lying directly adjacent to the Atlantic Ocean. Partly for this reason, dune systems are smaller and less well developed along our coastline than in other coastal states.

Along Connecticut's sandy shores, there are several typical coastal settings. In the first, one could walk landward from the high tide line, up the beach to the dune, over the dune into sand flats or a shrub thicket and then down in elevation to a tidal marsh (Figure 27). One can find this situation on coastal spits such as Bushy Point Beach at Bluff Point State Park, Groton. In another setting, one would be able to walk landward from the high tide line, up the beach to the dune, over the dune into sand flats or a shrub thicket and then farther, into a coastal forest. However, it is rare to find all these components in any one area along the Connecticut coast, with its long history of development and land use change.

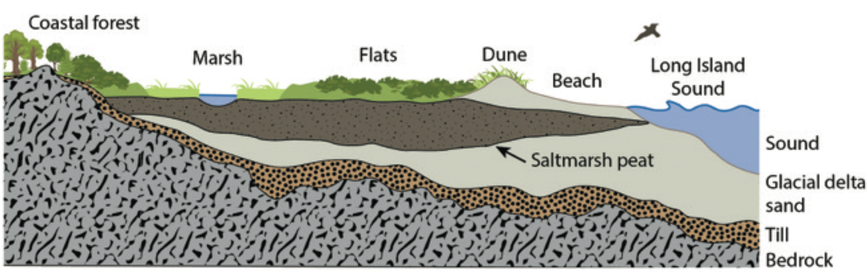


Image by Wendolyn Hill.

***Figure 27**. A typical beach/dune/upland cross section. This diagram shows a pocket barrier system which includes a marsh overlaying delta deposits landward of the flats. Pocket beaches (as in the centerfold image) do not have marshes behind the beach system. See Figure 17 in the Geology section for a complete explanation.*

While one may not see all the habitats at one location, the more one explores different coastal sites, the more likely one is to see all the different types. The different habitats of this system are described below.

Wrack line: This is the wavy "line" deposited by the most recent high tide swept across the wave-washed sand. Wrack is made up of organic material such as seaweeds, eelgrass leaves and shells, as well as human debris. The wrack line is an important interface between the land and water. The high tide line changes depending on the height of the tide and storm action so the wrack line is not always in the same place on any particular beach. Height of the tide varies with the lunar cycle. Many insects and other invertebrates live and feed in the wrack. Some birds feed in the wrack line, as well. Grabbing a handful of debris from the wrack line and turning it over invariably leads to jumping insects or an object of interest such as a skate egg case or an interesting shell.

Upper beach strand: This uppermost area of the beach is subject to flooding only during storm events or extremely high tides; it is landward of the wrack line, but seaward of the dune. The substrate can be sand or cobbles and is dry and drains rapidly. Vegetation on the beach is often sparse and may include: American beachgrass (*Ammophila breviligulata*), American sea-rocket (*Cakile edentula*), several orache species (*Atriplex prostrata* and *A. glabriuscula*), rough cocklebur (*Xanthium strumarium*), pitseed goosefoot (*Chenopodium berlandieri* var. *macrocalycium*), saltwort (*Salsola kali*), seaside sandmat (*Euphorbia polygonifolia*), and seabeach knotweed (*Polygonum glaucum*). Occasionally, one may find seaside goldenrod (*Solidago sempervirens*) in this area, as well. Such plants are found above the high tide line, often scattered near the base of dunes.

Dunes: Dunes can be thought of as having two sections: the foredune—the most exposed seaward front of the dune system, and the back dune on the lee (or sheltered) side of the dune. Plant diversity increases on the sheltered side of the dune. Vegetation of the dunes at any given time is dependent upon erosion and deposition due to wind and storm events. American beach grass (*A. breviligulata*) is the most common plant of the dunes and plays a critical role in dune stabilization. This grass has an extensive root system and can spread via underground stems or rhizomes. This root system acts as a natural erosion control device, helping to stabilize the shifting sands of the dunes. Other plants that may be found on the dune system are seaside goldenrod (*Solidago sempervirens*), beach pea (*Lathyrus japonicus*), dusty miller or beach wormwood (*Artemisia stelleriana*), Virginia rose (*Rosa virginiana*) and Carolina rose (*Rosa caroliniana*). The commonly seen beach rose (*Rosa rugosa*) is listed as a potentially invasive plant in Connecticut but has been planted extensively for sand stabilization. Poison ivy (*Toxicodendron radicans*) can form large stands on sandy areas, and ticks often hang on the ends of beach grass leaves, waiting for a passerby.

Erosion is a natural process of beaches and dunes. These are dynamic systems and expected to change over time. Sometimes an area may go years without a major storm event and at other times may rapidly change due to major nor'easters. Sand fencing along a dune is sometimes used to help trap sand, and occasionally even discarded, natural Christmas trees are collected and stacked to trap sand. When such trees are used, they need to be stabilized so that they don't wash away during a storm and litter the beach. Volunteers often get involved in beach grass plantings to help repopulate dunes that are impacted by major storm events. Dunes are fragile systems and beach grass cannot tolerate trampling, so people should always use designated pathways to cross dunes to get to the beach.

Beaches and dunes are alive with many different animals, some in plain view and others buried in the sand. Invertebrates, both those that fly and those that burrow into the wet sand, are plentiful. Many different bird species can be seen feeding along the beach, poking and prodding the sand and mud as waves roll back. Several bird species nest along the upper beach and dunes, scraping a few shells or pebbles into little hollows in the sand. Piping Plovers and Least Terns are two birds listed as threatened in Connecticut that nest in these areas. Another animal that can be found along the Connecticut shoreline and tidal marshes is the diamondback terrapin, a small turtle named for the diamond patterns on its top shell. This turtle lays eggs in the sand in the early summer. Mammals such as foxes, raccoons, rabbits, mice and voles are commonly found on dunes with occasional deer and coyotes.

Flats and Thickets: Farther landward, in areas with more stable soils and decreased salt spray, species diversity increases. In these areas landward of the dunes, the vegetation is highly variable. One may find dune flats (flat areas of sand landward of the dune) and/or shrub thickets (dwarf shrubs or dense tall shrubs) with a variety of plants including small trees and shrubs such as small bayberry (*Morella caroliniensis*), beach plum (*Prunus maritima*), winged sumac (*Rhus copallinum*), Eastern red cedar (*Juniperus virginiana*), Eastern shadbush (*Amelanchier canadensis*) and beach rose (*Rosa rugosa*). Herbaceous plants may include seaside goldenrod (*Solidago sempervirens*), evening primrose (*Oenothera* spp), switch-grass (*Panicum virgatum*) and other grasses, poison ivy (*Toxicodendron radicans*) and beach heather (*Hudsonia tomentosa*). The Eastern prickly pear cactus (*Opuntia humifusa*) can sometimes be found on dune flats and dunes. It can grow in dry, sandy areas with direct sunlight. This native cactus has bright yellow flowers in the spring and summer.

Maritime or Coastal Forest and Woodland: Maritime forests and woodlands refer to those that are in closest proximity to Long Island Sound or the ocean. The trees are subject to salt spray and onshore winds and are often low in stature and gnarled in appearance. Coastal forests and woodlands extend further inland than true maritime forests and are influenced more by the milder coastal climate than by salt spray. Due to intense agricultural and development pressures, Connecticut has very little forest left within the coastal zone. What is left is often browsed by deer and thickly populated by non-native species. The vegetation of these areas is highly variable. Oak trees, particularly black (*Quercus velutina*), white (*Q. alba*), and scarlet (*Q. coccinea*), are the dominant trees of these forests. Other trees or shrubs that may be intermixed with the oaks include black cherry (*Prunus serotina*), sassafras (*Sassafras albidum*), red maple (*Acer rubrum*), American beech (*Fagus grandifolia*), blackgum (*Nyssa sylvatica*), white pine (*Pinus strobus*), pitch pine (*Pinus rigida*), flowering big-bracted dogwood (*Benthamidia florida*) and Eastern shadbush (*A. canadensis*). Low lying shrubs such as low bush blueberries (*Vaccinium* spp.) and black huckleberry (*Gaylussacia baccata*) may also be found here. Vines are very characteristic of coastal forest edges and openings including Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*T. radicans*), grape (*Vitis* spp.) and greenbriers (*Smilax* spp.).

One may see a wide diversity of birds not just along the beach, but in the areas behind the dunes as well. See the bird, plant and invertebrate descriptions and photos for more information on individual species.

Please note: not all plant species listed above are represented with photos. Several field guides provide more species information such as *Newcomb's Wildflower Guid*e.

This guide follows the International Ornithological Congress recommendations for capitalization of bird names, and general nomenclature rules for other species. Latin names are provided for plants in the figure captions as some common names are used for multiple plant species. For example, shadbush can refer to several species of *Amelanchier*.

Plants

Plants play an important role on our beaches and dunes. They help trap sand and control erosion while also providing habitat, shelter and food for many animals, from butterflies to birds. Because many plants are fragile or play an important role within the beach dune ecosystem, it is important not to trample them or pick the leaves or flowers.

Plants are categorized by life form (trees/shrubs, herbaceous perennial, herbaceous annual) and are in alphabetical order by common name within each life form.

TREES AND SHRUBS

Beach plum

Prunus maritima

Family: Rosaceae

What it looks like:

This dense shrub has serrated egg-shaped leaves that taper to a point growing alternately along the branches which are reddish-brown in color. Shrubs are variable in height, usually between 4 to 7 feet (1.2 to 2 m) along the coast. Leaves are dull green and about 1 to 2.5 inches long (2 to 7 cm). Each leaf is attached to the branch by a stout, hairy stalk. Beach plum is part of the genus *Prunus* which have lenticels along the stem. Lenticels look like thick, horizontal lines and are actually pores that allow for gas exchange.

Where to find it:

Dune flats, shrub thicket

When to look:

Year-round; watch for flowers in mid-spring; fruits ripen in late summer.

Prunus maritima photos (entire shrub and close up of fruit.) Photos: Juliana Barrett

Notes:

Beach plum fruits have high wildlife value and are also used to make jam and jelly.

Rosa rugosa. Photo: Nancy Balcom

Beach rose

Rosa rugosa

Family: Rosaceae

Non-native/invasive along coast

What it looks like:
This rugged perennial rose is a shrub (2 to 6 feet tall) that can form dense thickets. Compound leaves occur alternately along the stem with each leaf composed of 5 to 9 leaflets. The leaves are dark green, shiny, and appear "wrinkled" along the veins. Branches and stems are densely covered in straight (not curving) prickles. With purple to pink (and sometimes white) flowers and bright red fruits called rose hips, these roses are commonly associated with beaches in Connecticut. The red hips are 0.5 to 1.5 inches in diameter.

Where to find it:
Dunes, dune flats and sandy soils along the coast.

When to look:
Flowers appear in early June and flowering continues until frost.

Notes:
While not native to Connecticut, beach rose was planted for its beauty and erosion control value. It was introduced from Asia in the mid 1800's. Beach rose is now considered potentially invasive along our coast, but there are two native roses that you may find on the coast as well, Virginia rose and Carolina rose. These native roses do not have wrinkled leaves. Native plants have benefits for wildlife and pollinators that not all non-native species provide and are preferred for plantings.

Black cherry

Prunus serotina

Family: Rosaceae

What it looks like:

This deciduous tree can grow to well over 40 feet (12 m) with leaves arranged alternately along branches. Leaves are simple with finely toothed edges. Leaves are 2 to 6 inches (5 to 15 cm) long and are dark green during the summer months. If you look closely, you will see small glands at the base of the leaf stalk and a hairy mid-rib beneath (on the back of the leaf). Small, white flowers bloom in elongated clusters. The bark on an older tree has a plate-like appearance, and branches have lenticels (like the related beach plum).

Where to find it:

A characteristic tree of Connecticut's coastal forests.

When to look:

Year-round, flowers appear in May and fruits mature in August

Notes:

The small cherry fruits are an important food source for numerous birds and other wildlife. The ripe fruits are very dark, almost black in color, hence the common name.

Prunus serotina (tree trunk and close up of leaves and fruit). Photos: Juliana Barrett

Blackgum

Nyssa sylvatica

Family: Cornaceae

What it looks like:

This deciduous tree can grow 60 to 80 feet (18 to 24 m). Leaves are dark green and glossy. Leaves are simple, generally oval in shape with a pointed tip, and arranged alternatively along the stem. The trunks are straight and bark on mature trees is deeply ridged.

Where to find it:

This tree is commonly found in Connecticut's coastal forests as well in forested wetlands and along the banks of rivers and lakes.

When to look:

Year-round

Notes:

In the fall, leaves turn bright red, making blackgum easy to identify. This tree has many common names and is also called: tupelo, black tupelo, sourgum and pepperridge. Plants are dioecious with male and female flowers on separate plants. Only the females produce fruits.

Nyssa sylvatica in spring (upper image) and in fall (lower image). Photos: Beth Sullivan and Juliana Barrett

Eastern red cedar

Juniperus virginiana

Family: Cupressaceae

What it looks like:
This plant is evergreen and often cone shaped. It is considered a tree or shrub as the height and shape depends on growing conditions. Often near the coast, plants are smaller and may be stunted due to poor soils, wind and salt spray. The bark is peeling and usually reddish brown in color. The plants have two types of leaves: scale-like leaves on the older mature branches and sharp needle-like leaves on the young shoots.

Where to find it:
Eastern red cedar grows in many places, particularly abandoned agricultural fields. Near the coast, it can be found in dune flats, coastal shrub thickets and coastal forests.

When to look:
You will recognize red cedar year-round as it is evergreen.

Juniperus virginiana.
Photo: Nancy Balcom

Notes:
Many birds such as cedar waxwings love to feed on the blue, berry-like cones. Plants are dioecious with male and female parts on separate plants. Only the females produce cones.

Eastern shadbush

Amelanchier canadensis

Family: Rosaceae

What it looks like:
This multi-stemmed shrub can grow to 20 feet (6 m). Oblong, finely toothed leaves grow alternately along the branches and are up to 3 inches (8 cm) long. Each leaf tip has a small, sharp projection. Each flower has 5 white petals. Fruits are purplish black when ripe.

Where to find it:
A characteristic shrub of Connecticut's coastal shrublands and forests

When to look:
Year-round; flowers appear in March/April and fruit in June

Notes:
The flowers bloom at about the same time as the shad swim up coastal rivers to spawn in freshwater areas of New England, hence the name shadbush. Flowers are an important nectar source for insects and the fruits are eaten by many types of wildlife. This shrub looks very similar to downy serviceberry (*Amelanchier arborea*) which has fine hairs on the underside of the leaves, hence "downy."

Amelanchier canadensis leaves and branches (upper image) and flowers (lower image)
Photos: Juliana Barrett

Poison ivy

Toxicodendron radicans

Family: Anacardiaceae

What it looks like:
Recognizable by its compound leaves made up of three leaflets, this plant can grow as a vine or upright shrub. The leaves grow alternately along the stem, and poison ivy has no thorns. The leaves are often a glossy green when young, turning bright red in the fall. Tiny greenish flowers produce small, grayish, white berries in the fall.

Where to find it:
Poison ivy seems to be able to survive anywhere, and it thrives on sandy dunes and other sandy soils.

When to look:
Watch for poison ivy year-round. The "leaves of three" appear in late spring, but the vines are recognizable any time of the year with aerial roots giving the stems a hairy appearance. Berries turn white and ripen in the fall.

Notes:
Poison ivy is eaten by many animals, and birds often feed on the ripe fruits in the fall.

Toxicodendron radicans. Photo: Juliana Barrett

Touching any part of the plant, including the stem, can cause a rash caused by urushiol, an oily liquid found in the plants' sap. Berries are noxious too.

Sassafras albidum. Photo: Juliana Barrett

Sassafras

Sassafras albidum

Family: Lauraceae

What it looks like:
This tall, deciduous shrub to medium sized tree has three different shaped leaves: a mitten shape (a large lobe and a smaller "thumb" lobe), a leaf with three lobes, and an oval leaf. Leaves are arranged alternately along branches. Sassafras can grow to medium tree range (30 to 60 feet/9 to 18 m). The bark of mature trees has a characteristic deeply ridged pattern, and young twigs are green.

Where to find it:
A characteristic shrub or tree of Connecticut's coastal forests

When to look:
Year-round, in winter the newest stem growth is bright green

Notes:
Fruits mature in September and are important for wildlife. Leaves and twigs are browsed by white-tailed deer and cottontail rabbits. Plants are dioecious with male and female flowers on different trees. Only the females produce fruits.

Quercus coccinea leaf. Photo: Juliana Barrett

Scarlet oak

Quercus coccinea

Family: Fagaceae

What it looks like:
This medium-to-tall (75 feet / 23 m), deciduous tree has shiny dark green leaves arranged alternately along the branches. Leaves have 7 lobes with a bristle tip on the end of each lobe. Sinuses (indentation) between the leaf lobes are "C" shaped. Fruits are a characteristic acorn, but with half of the nut covered by the cap. The bark is grooved with a reddish inner bark.

Where to find it:
A characteristic tree of Connecticut's coastal forests

When to look:
Year-round

Notes:
Another oak commonly found in Connecticut's coastal forests is white oak (*Quercus alba*). White oak leaves have rounded lobes with 5 to 9 lobes per leaf. Acorns are a staple food for wildlife.

Morella caroliniensis. Photo: Nancy Balcom

Small bayberry

Morella caroliniensis

Family: Myricaceae

What it looks like:
This dense shrub has semi-evergreen leaves growing alternately along the branches. Leaves are dark green, with a shiny, leather-like texture. Plants can grow to more than 8 feet (2.4 m) tall in full sun. Leaves grow alternately along the branches and are 1.5 to 4 inches long (4 to 10 cm) and about 1 inch wide (2.5 cm). Fruits appear along the stems and are small, round bluish gray and waxy.

Where to find it:
Dunes, dune flats, shrub thicket

When to look:
Year-round

Notes:
Leaves are aromatic when crushed. Wax from the fruits is used to make bayberry scented candles. Fruits attract birds. Plants are dioecious with male and female flowers on separate plants. Only the females produce fruits.

Rosa virginiana. Photo: Juliana Barrett

Virginia rose

Rosa virginiana

Family: Rosaceae

What it looks like:
This small deciduous shrub is usually smaller than the beach rose, and can grow to several feet tall. Leaves are arranged alternately along the stem, are dark green, and are made up of 7 to 9 leaflets. Flowers are pink and about 2.5 inches (6.4 cm) in width.

Where to find it:
Dune flats, occasionally on dunes

When to look:
Flowers appear in early June, fruits are small rose hips (0.5 inches/1.3 cm) and mature in August.

Notes:
This native rose does not grow as aggressively as beach rose. A similar species is the more southern Carolina rose (*Rosa carolina*).

Rhus copallinum in fruit. Photo: Juliana Barrett

Winged sumac

Rhus copallinum

Family: Anacardiaceae

What it looks like:

This deciduous shrub can form tall, dense thickets. Leaves are alternate and compound (made up of leaflets). Leaves (all the leaflets) can be 6 to 14 inches (15 to 35 cm) long, with a terminal leaflet. This plant has "wings" (flat, blade-like structures) along the leaf stalk between the leaflets.

Where to find it:

Dune flats, shrub thickets; found inland as well on poor, dry soils

When to look:

Year-round; flowers appear in June and the red fruits are mature by September and often persist through fall.

Notes:

Leaves turn bright red in the fall; fruits have high wildlife value.

HERBACEOUS PERENNIAL PLANTS

American beach grass

Ammophila breviligulata

Family: Poaceae

What it looks like:

This tall, stiff, perennial grass is 2 to 3 feet tall (up to 130 cm), upper surface of leaves is deeply furrowed and the bottom side is smooth. Leaves are 6 to 30 inches (15 to 80 cm) in length and up to 0.3 inches (8 mm) in width.

Where to find it:

Dunes and dune flats along the coast of Long Island Sound

When to look:

New leaves appear in the early spring; the panicle (loose cluster of flowers) appears in late July or August, extending about 10 inches (25 cm) above the leaves.

Notes:

This grass grows on sand ridges and dunes and spreads via rhizomes (or underground stems). As sand buries the rhizomes, vertical growth is stimulated and the plants spread. You can often follow a line of plants above ground that are likely the same plant. This grass is very important for erosion control of dunes and is easily damaged by trampling. Another grass that sometimes occurs on the back dune is switch panicgrass (*Panicum virgatum*). This clump-forming grass is usually about 3 to 4 feet tall (0.9 to 1.2 m) and has a bluish cast to the leaves in the summer and turns a reddish brown in the fall/winter.

Ammophila breviligulata. Photo: Juliana Barrett

Lathyrus japonicus. Photo: Juliana Barrett

Beach pea

Lathyrus japonicus

Family: Fabaceae

What it looks like:
This low-growing herbaceous perennial has sprawling, twining stems growing up to about 40 inches long (100 cm). This pea has waxy leaves in an alternate pattern along the stem. Leaves are compound and divided into 4 to 10 pairs of leaflets. The flowers are blue to purple.

Where to find it:
Dunes and can spread onto the beach or landward into the dune flats.

When to look:
Sweet pea-like flowers can be found throughout the summer.

Notes:
Like American beach grass, it also spreads by rhizomes. The seed pods are one to two inches long and contain seeds that can float and survive in salt water for several years. The seed pod looks like a pea pod but don't eat it!

Artemisia stelleriana. Photo: Judy Benson

Beach wormwood

Artemisia stelleriana

Family: Asteraceae

Non-native

What it looks like:

This perennial plant has leaves arranged alternately along the stem with the leaf edges lobed. The pale green leaves are covered with white, woolly hairs, giving plants a characteristic "dusty" appearance. Leaves are between 1 to 4 inches (3 to 10 cm) long. Yellow flowers appear during the summer months.

Where to find it:

Sandy beaches and dunes

When to look:

Yellow flowers appear from July to late August

Notes::

This common ornamental garden plant has escaped cultivation and is now commonly found on sand dunes. It is native to Asia.

Opuntia humifusa. Photo: Nancy Balcom

Eastern prickly-pear

Opuntia humifusa

Family: Cactaceae

What it looks like:

This perennial cactus spreads low to the ground up to about 20 inches (50 cm). The stems are wide, flat branching pads with bristles and spines. Flowers are usually clear yellow.

Where to find it:

Sandy coastal habitats such as dune flats; sometimes found on dry, rocky outcrops near the coast.

When to look:

Flowers appear in late spring and the pads are visible year-round.

Notes:

Tufted prickly-pear (*Opuntia cespitosa*) which has a yellow flower with an red-orange center, was recently identified as a closely related but separate species. Eastern prickly-pear is listed as a species of special concern in Connecticut.

Solidago sempervirens. Photo: Nancy Balcom

Seaside goldenrod

Solidago sempervirens

Family: Asteraceae

What it looks like:
This perennial goldenrod can grow to several feet tall. The dark green, lance-shaped leaves are arranged alternately along the stem and can be 8 to 10 inches (20 to 25 cm) long. The distinctive thick, waxy leaves help the plant retain water and survive in an area with salt spray.

Where to find it:
Dunes and dune flats, salt marshes.

When to look:
Golden yellow flowers appear in late summer to early fall.

Notes:
This goldenrod can tolerate high salinity, salt spray and drought – allowing it to grow well on sandy dunes and dune flats. You may also find this plant growing on the edges of salt marshes. The flowers are an important nectar source for migrating monarch butterflies traveling along the Atlantic coast in the fall.

Switch panicgrass

Panicum virgatum

Family: Poaceae

What it looks like:

Switch panicgrass is a perennial, deep rooted, bunchgrass that can grow both along the coast and further inland. Along the coast where it may be subject to strong winds and salt spray, it grows to 3 to 4 feet (0.9 to 1.2 m) but further inland, it can grow to over 8 feet (2.4 m). Each leaf blade is 12 to 35 inches long (30 to 90 cm), and has a prominent midrib. The leaves have a bluish cast in the summer and turn a reddish brown in the fall/winter. The inflorescence is light and feathery with reddish pink seedheads.

Panicum virgatum.
Photo: Juliana Barrett

Where to find it:

Switch panicgrass grows along sand flats and in back dune areas and along the saltmarsh border with the uplands.

When to look:

Year-round; leaves turn yellow in the fall.

Notes:

The seeds are a good food source for birds.

This centerfold painting is a semi-stylized image of a beach/dune system in Connecticut.

Going from right to left, the first panel shows the lower beach and wrack line with a seagull poking through the wrack for food and sandpipers at the water's edge. The middle panel depicts the upper beach strand and dune. In this depiction, seaside goldenrod (*Solidago sempervirens)* is growing at the base of the dune (as found at a beach in Old Lyme) along with other scattered, salt tolerant plants. The plants found in this area are highly variable and sometimes no vegetation is found. American beach grass (*Ammophila breviligulata*) is the dominant and most common plant on the dunes. A Piping Plover and chick can be seen on the upper beach along with a pair of least terns with chicks in a nest. Note how difficult the nest is to see in the sand. An Osprey with a fish flies overhead. The third panel shows the flats, thickets and coastal forest landward of the dune, painted so that individual plant species can be identified. Plants such as prickly pear cactus (*Opuntia humifusa*) with bright, yellow flowers, switch panicgrass (*Panicum virgatum*), beach pea (*Lathyrus japonicus*) with pinkish, purple flowers, and seaside goldenrod (*Solidago sempervirens*) are some of the herbaceous plants that are scattered throughout this area. Shrubs such as beach rose (*Rosa rugosa*), beach plum (*Prunus maritima*), small bayberry (*Morella caroliniensis*), Eastern shadbush (*Amelanchier canadensis*) and Eastern red cedar (*Juniperus virginiana*) may grow here. In the background, a coastal forest provides shelter for wildlife. The bottom panel illustrates how elevation changes from the water to the forest.

The centerfold image shows a compilation of plants in spring, summer and fall in order to capture different flowering times (e.g. Eastern shadbush flowers in the early spring while seaside goldenrod flowers in the late summer to early fall, yet both are shown flowering in this image.)

Painting by John H. Sargent

HERBACEOUS ANNUAL PLANTS

Cakile edentula. Photo: Nancy Balcom

American sea-rocket

Cakile edentula

Family: Brassicaceae

What it looks like:
This herbaceous annual plant can grow to about 30 inches (76 cm). The thick, succulent, green leaves grow alternately along the succulent stem and are usually slightly toothed. The upper side of the leaves is shiny. Flowers have 4 petals that vary in color from white to shades of pink or purple. Petals are less than 0.5 inches long (1.3 cm).

Where to find it:
Coastal beaches and upper beach strand

When to look:
Plants appear in late spring to early summer and flowering occurs mid-summer into early fall.

Notes:
While usually an annual in New England, this plant can be a biennial further south. The common name comes from the rocket-shaped seed capsule.

Hastate-leaved orache

***Atriplex prostrata* and**

Bracted orache

Atriplex glabriuscula

Family: Amaranthaceae

What they look like:

These annual plants are one of many *Atriplex* species, and can be confusing to identify because they have many highly variable features, and they are found in similar habitats. For *A. prostrata*, lower leaves are arranged in an opposite fashion along the stem, while upper ones are alternate. The leaf is usually triangular or spear-shaped, but you're likely to find other shapes as well. Even the leaf edges are variable: entire (meaning no lobes or teeth), wavy or serrate (the leaf edge has teeth like a saw along the edge). Leafy bracts and fruit size can help differentiate these two species: *A. glabriuscula*, has inflorescences (cluster of flowers) with leaf bracts pretty much throughout the plant and brown fruits are 0.1 to 0.15 inches (2.5 to 3.9 mm) wide, while in *A. prostrata,* the leafy bracts are found only on inflorescences (cluster of flowers) near the base of the plant and brown fruits are 0.06 to 0.1 inch (1.5 to 2.5 mm) wide.

Atriplex sp. Photo: Nancy Balcom

Where to find it:

Upper beach strand, edges of salt and brackish marshes, dune flats.

When to look:

Plants appear in early spring, but are conspicuous by June when stems and fleshy, triangular bracts enclosing the seeds are a rosy-pink color.

Notes:

For *A. prostrata*, the stem is somewhat weak, so the plant tends to sprawl along the ground (prostrate).

Xanthium strumarium. Photo: Nancy Balcom

Rough cocklebur

Xanthium strumarium

Family: Asteraceae

What it looks like:
This an annual plant that can grow to 2 to 4 feet (0.6 to 1.2 m). Leaves are alternately spaced along the stem and are roughly heart shaped. There are no spines on the plant, but the hairs on the leaves give it a sandpaper-like feel. Leaves can grow to about 7 inches across (18 cm). The stems are often speckled with purple.

Where to find it:
Coastal beaches, dunes and dune flats (as well as many other habitats).

When to look:
Plants appear by early summer and fruits ripen in the fall.

Notes:
The most characteristic feature of this plant is the burs one can find in the fall. These burs are dry fruits each containing 2 seeds. The hooks on the bur allow it to easily attach to animal fur for dispersal.

Salsola kali and Salsola kali closeup. Photos: Nancy Balcom

Saltwort

Salsola kali

Family: Amaranthaceae

Non-native

What it looks like:

This bushy, annual plant is non-native to the coastal area of New England. The leaves are alternate along the stem and there is a spine on the leaf tip. With many branches, the plant is rounded in form and is usually from 1 to 3 feet (30 to 90 cm) in height.

Where to find it:

Upper beach strand

When to look:

This plant germinates in spring and grows throughout the summer months until the first frost.

Notes:

Dead plants retain their shape and when blown by wind, resemble tumbleweeds. Native to Europe, Asia and northern Africa.

Euphorbia polygonifolia. Photo: Juliana Barrett

Seaside sandmat

Euphorbia polygonifolia also *Chamaesyce polygonifolia*

Family: Euphorbiaceae

What it looks like:
This prostrate, annual plant has opposite leaves growing along the stem that are generally less than 0.5 inches (1.3 cm) long, and the flat growth form can form a large clump on the sand. This plant is easily identified by the stems that turn red during the summer months.

Where to find it:
Coastal, sandy beaches and dunes

When to look:
This plant appears in early spring and continues to grow throughout the summer months.

Notes:
Care should be taken in picking this plant as the stems contain a latex that can cause a rash.

Carex kobomugi. Photo: By ∑64, CC BY 4.0, via Wikimedia Commons

An invasive plant to watch for:

Japanese sedge

Carex kobomugi

Family: Cyperaceae

Native to East Asia, it was introduced to several New England states including Rhode Island for dune stabilization. This sedge spreads through rhizomes and seeds, forming dense swards, and outcompetes native dune vegetation. This sedge grows to about 1 foot tall (30 cm) with leaves all growing from the base of the plant. Each leaf has a prominent mid-vein. It has not yet been found in Connecticut, but if found, please contact the Connecticut Invasive Plant Working Group at info@cipwg.org

Invertebrates

Invertebrates are animals without backbones. They may have an outer shell like a snail to protect the snail's soft body or a protective outer covering, like a crab's exoskeleton that covers its body and legs. Trips to the sandy shore may reveal live animals for closer inspection or clues to their presence through bits of shell or carapaces left in the sand or wrack line by the tides.

The featured animals are some of the more common ones found on sandy beaches or in the water. They are categorized by general life form and are in alphabetical order by common name within each life form. Taxonomic family names are provided.

Photo by Nancy Balcom

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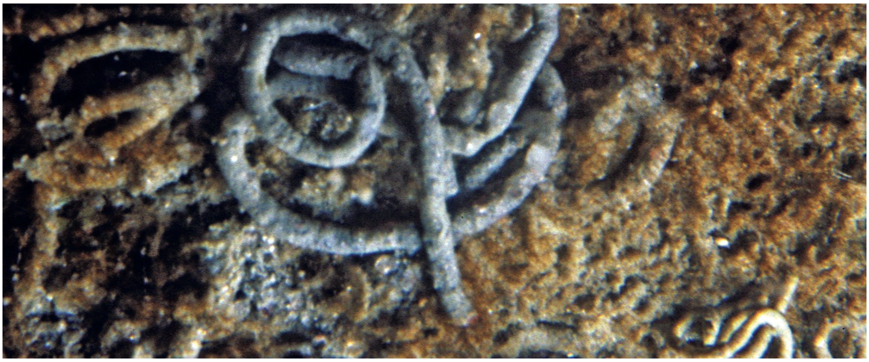


Lugworm cast. Photo: Robert Bachand

Lugworm or sandworm cast

Arenicola marina

Family: Arenicolidae

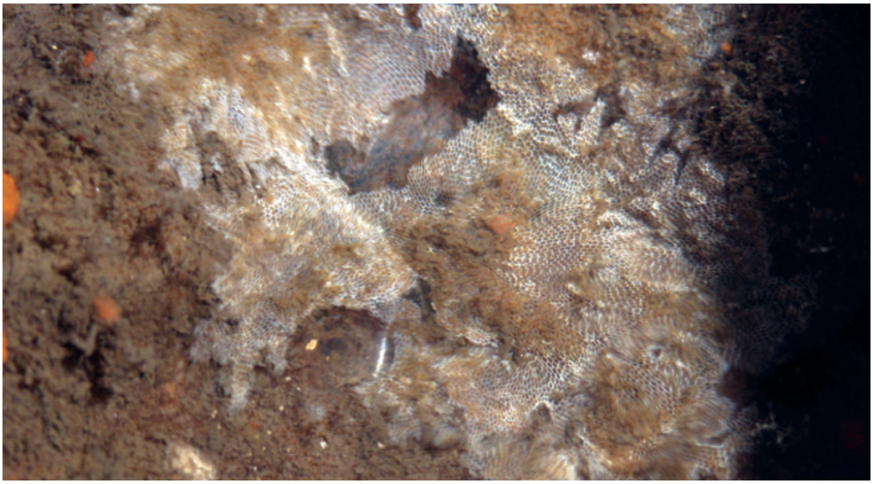
What it looks like:
Unless you dig for them, you're unlikely to see lugworms at the beach. Lugworms are segmented worms (like earthworms) with gills so that they can breathe underwater. They can grow to about 9 inches (23 cm) long. They feed on microorganisms and detritus within the sand and mud, expelling the sediment and recognizable worm casts, circular piles of tubes of sand or mud. Lugworms reproduce during low tide in early October, releasing ova in their burrows and sperm on the sand around the burrows. As the tide comes in, the ova are fertilized and the larvae develop while enclosed in gelatinous tubes attached to the sand, about 8 inches (20 cm) long, 3 inches (7.6 cm) in width and 1 inch (2.5 cm) high. Once hatched, the worms burrow into muddy or sandy substrates.

Where to find it:
At low tide, look for signs of worm casts on sand flats or gelatinous translucent tubes on the sand.

When to look:
Year-round for worm casts; October for egg masses.

Notes:
Lugworms live in J-shaped burrows 8 inches (20 cm) deep.

BRYOZOAN



Sea lace. Photo: Nancy Balcom

Sea lace

Membranipora membranacea

Family: Membraniporidae

Non-native/invasive

What it looks like:
Sea lace is a type of animal called a bryozoan of which there are many species. This species forms colonies of thin, encrusting mats made up of individuals called zooids. The zooids are gray to white in color.

Where to find it:
Mats of sea lace typically can be found in the intertidal and subtidal zones on seaweeds, shells and other hard substrates. Look for dead zooid mats on seaweed and shells that wash up on the beach.

When to look:
Year-round

Notes:
Bryozoan zooids have calcium carbonate exoskeletons and feed on plankton with a ring of tiny tentacles. This species was first noted off the coast of Maine in 1987 and is now found from Nova Scotia to Connecticut.

MOLLUSCS – GASTROPODS

Atlantic oyster drill shells. Photo: Nancy Balcolm

Atlantic oyster drill

Urosalpinx cinerea

Family: Muricidae

What it looks like:
The small sea snail has distinct ribs running lengthwise, crossed by fine spiral ridges. The shell is about 1.25 inches (3.2 cm) long and gray in color.

Where to find it:
Look for shells washed up on the beach and in the wrack. These sea snails live in intertidal and subtidal areas often on seagrass, rocky bottom areas and oyster beds.

When to look:
Year-round

Notes:
As its name implies, it drills through the shell of oysters and other bivalves and eats them. Commercial oyster beds can be decimated by these snails.

Common Atlantic slipper snail shells. Photo: Nancy Balcom

Atlantic slipper snail, Common

Crepidula fornicata

Family: Calyptraeidae

What it looks like:
This sea snail has an arched, rounded shell that grows to about 0.8 to 1.6 inches long (2 to 4 cm). The shell is white to yellowish in color with light brown streaks or lines. There is a "shelf" on the inside of the shell which supports the vital organs of the snail, giving it a slipper-like appearance. These snails are filter feeders.

Where to find it:
Tide pools, beaches and inlets. Some beaches accumulate large piles of empty slipper shells.

When to look:
Year-round

Notes:
These snails all start life as males, but some become females as they get older. They often live in stacks (one on top of another) for ease of reproduction. The largest and oldest individuals on the bottom are female, while the smaller and younger snails at the top are males. If the females die, then the largest male becomes a female.

Channeled whelk

Busycotypus canaliculatus

Knobbed whelk

Busycon carica

Family: Buccinidae

What it looks like:

These two species are large sea snails. The channeled whelk can grow from 5 to 8 inches (12.7 cm to 20.3 cm) in length. Shells have one large body whorl with several smaller whorls near the tip of the shell, are generally smooth in texture, and are gray to brown in color. Channeled whelk have a groove, or channel, running along the shell spiral (see arrow). Knobbed whelks are larger, growing up to 9 inches (23 cm) in length. They also have one large body whorl with several smaller ones, but the edges of the whorls have small knobs. Shell color ranges from gray to ivory.

Where to find it:

Channeled and knobbed whelk live in sandy/muddy intertidal and subtidal areas. Empty shells or shell fragments wash up on beaches.

Channeled whelk. Photo: Robert Bachand

Knobbed whelk. Photo: Judy Benson

When to look:

Year-round

Notes:

Channeled whelk are more common than knobbed whelk. Both species of whelks feed on marine bivalves and are commercially fished.

Mermaid's necklace. Photo: Robert Bachand

Mermaid's necklace

(Whelk egg case)

Family: Buccinidae

What it looks like:
Washed up along the shoreline, you may find a snake-like coil made up of flat, round capsules that are about the size of a bottle cap. Whelks (large sea snails) mate in the spring and fall during migration. Eggs are fertilized internally and then the fertilized eggs, surrounded in albumen, are laid in egg cases that are strung together. Many eggs may be contained within each egg case, and when they emerge, the tiny shelled whelk may be only 0.2 inches (5 mm) in size.

Where to find it:
Along the wrack line or washed up further on the beach.

When to look:
Year-round

Notes:
Young whelk are eaten by horseshoe crabs, some fish species and crustaceans.

Moon snail. Photo: Jenna Castle

Northern moon snail

Euspira heroes

Family: Naticidae

What it looks like:
This large sea snail has a globe-like shell that is usually about 2 to 3 inches in width (5 to 8 cm). Shell color ranges from light yellow to brown.

Where to find it:
Usually found in subtidal zone and occasionally in intertidal areas. Empty shells or shell fragments can be found washed up on beaches.

When to look:
Year-round

Notes:
These snails are predators, eating shellfish and other snails. They secrete an acidic substance to soften the shell and then drill through to reach the soft tissues of their prey. Females encase thousands of eggs in a fragile sand collar which sometimes can be found on the sand.

Common periwinkles. Photo: Nancy Balcom

Periwinkle, Common

Littorina littorea

Family: Littorinidae

Non-native

What it looks like:
This sea snail has a spiral shell that is about 1 inch (2.5 cm) long. The shell is often dark in color ranging from gray to brown/black. The shell grows with the snail and can have 6 to 7 whorls. The snail uses its fleshy foot to attach itself to rocks or other substrates. The snails feed mainly on algae.

Where to find it:
Rocky shorelines, tide pools and beaches

When to look:
Year-round

Notes:
People eat the snails after a light boiling in sea water and they are also used as bait in fishing.

MOLLUSCS – BIVALVES

Angel wing clam shell. Photo: Tessa Getchis.

Angel wing clam

Cyrtopleura costata

Family: Pholadidae

Non-native

What it looks like:
This bivalve mollusc can have shells up to about 7 inches (17.8 cm) in length. The shells are white, ridged (often referred to as ribs) and asymmetrical in shape—an elongated oval, with a rounded point.

Where to find it:
Look for shells washed up on the beach and in the wrack. This mollusc lives in the subtidal zone and burrows in sand and mud in waters between 3 feet and 8 feet in depth.

When to look:
Year-round

Notes:
This clam is regularly eaten in the West Indies and has been looked at for commercial aquaculture. While previously uncommon in Long Island Sound, shellfish commissions are finding them more frequently along the shoreline.

Atlantic surf clam. Photo: Judy Benson

Atlantic surf clam

Spisula solidissima

Family: Mactridae

What it looks like:
This bivalve mollusc's shells are roughly triangular in shape with rounded edges and grow to over 8 inches (20 cm) in length. Shell color is white to yellow-white.

Where to find it:
Look for shells in the wrack line along the beach where waves wash up. These clams live buried in sand in both intertidal and subtidal areas, using their siphons to filter plankton from the water column and eliminate wastes.

When to look:
Year-round

Notes:
These clams are often eaten in chowder and as fried clam strips.

Eastern oyster shells. Photo: Judy Benson

Eastern oyster

Crassostrea virginica

Family: Ostreidae

What it looks like:
This bivalve mollusc has elongated oval shells that are generally about 3 to 5 inches (7.6 to 12.7 cm) long. The shell color is off white. Adult oysters are sessile, settling and attaching to each other and other firm bottom substrates to form oyster reefs.

Where to find it:
Look for shells washed up on the beach and in the wrack. Oysters live in brackish to salt waters, usually in the subtidal zone.

When to look:
Year-round

Notes:
Eastern oysters are the primary mollusc grown and harvested by the commercial shellfish industry in Long Island Sound. They are filter feeders. An individual adult oyster can filter up to 50 gallons of water daily, removing excess nutrients and providing an important ecosystem service.

Common jingle shells. Photo: Judy Benson

Jingles, Common

Anomia simplex

Family: Anomiidae

What it looks like:
The common jingle is a bivalve mollusc like oysters and clams. The bottom shell attaches to a hard substrate such as a rock, boat or other shells. Even though the shells are very thin, they are strong. Common jingles grow to about 2 to 3 inches (5 to 7.6 cm). The bottom shell (or valve) is white while the upper shell ranges in color from white to yellow to orange, and even black.

Where to find it:
You'll find jingle shells washed up on the beach.

When to look:
Year-round

Notes: These shells are often used in jewelry and wind chimes (they make a jingling sound when they touch each other with a breeze).

Northern quahog or Hardshell clam

Mercenaria mercenaria

Family: Veneridae

What it looks like:
These bivalves (2 hard shells) can grow to 4 inches (10 cm) or more. The shells are rounded, ridged and can range in color from light brown to gray to white. The two shells are held together at the hinge by a brown ligament. The inner shell is often white with patches of purple. Clams have a foot and two siphons.

Where to find it:
These clams live mainly in the intertidal zone on sand or mud flats. They bury themselves in the sand and have two siphons, both of which stick up above the sand or mud surface. One siphon takes in water and the clam filters food (plankton) and then ejects the water through the other siphon.

When to look:
While you can easily find parts of clam shells washed up on the beach, low tide is the time to go "clamming." Recreational clammers must have a permit to dig clams in locations where shellfishing is allowed.

Hardshell clam shells.
Photo: Judy Benson

Notes:
Hard clams, the second most important commercial shellfish in Long Island Sound, have different names depending on their size. In a fish market, you'll find littlenecks, cherrystones and quahogs in ascending order of size. The term quahog comes from a Native American language. Native tribes made wampum (valuable beads) from the shells, particularly the purple-colored interior.

Razor clam shell. Photo: Jenna Castle

Razor clam or Atlantic jackknife clam

Ensis leei

Family: Pharidae

What it looks like:
These long, thin bivalves can grow to 10 inches long (25 cm). Shells are brown-green in color.

Where to find it:
These clams burrow in intertidal and subtidal sand and mud along the shoreline. They filter feed just below the surface and can burrow rapidly if they sense predators via vibrations.

When to look:
Year-round

Notes: These clams are named after their resemblance to long straight-edged razor blades. Watch for shells on the beach as the shells are sharp and can cut bare feet.

Softshell clam shell. Photo: Tessa Getchis

Softshell clam

Mya arenaria

Family: Myidae

What it looks like:
Like the hard clam, this is a bivalve, but the shell is elongated and more oval than round, about 3 to 4 inches long (7.6 to 10.2 cm). The shells are off-white with a thin and brittle covering that ranges in color from gray to brown.

Where to find it:
These clams live in tidal flats, often muddy areas but they prefer a sand/mud combination. They are usually buried 3 to 8 inches (7.6 to 10.3 cm) under the substrate surface. Similar to the hard clam, they have two siphons and are filter feeders.

When to look:
While you can easily find parts of clam shells washed up on the beach, low tide is the time to go "clamming." Recreational clammers must have a permit to dig clams in locations where shellfishing is allowed.

Notes:
The soft shell clam tends to bury itself deeper in mud/sand flats than the hard clam, so it has longer siphons. These siphons cannot be fully retracted into the shell, so the clams never completely close. Soft shell clams are sometimes called "steamers" or "long necks" and used in clam bakes.

ARTHROPOD

Horseshoe crab. Photo: Jenna Castle

Atlantic horseshoe crab

Limulus polyphemus

Family: Limulidae

What it looks like:
A horseshoe crab is not a true crab, but a type of arachnid (in the arthropod phylum) like spiders and ticks. They have a hard hinged carapace (hard upper shell) and can grow to 1 foot (30.5 cm) wide and 2 feet (61 cm) long. Males are smaller than females, identifiable by their specialized front legs with hooks ("boxing gloves"). Bottom dwellers, they have a bristle-like mouth on the underside and eat mainly worms, small clams and crustaceans. Five pairs of legs are used for movement; a pair of shorter appendages with pincers move food crushed between the crab's legs to its mouth. The long tail (telson) is not dangerous and

is used for steering and to upright the animal if it gets flipped over. Horseshoe crabs have 9 eyes, including 2 compound eyes, and several light receptors near the tail.

Where to find it:
Horseshoe crabs come ashore to mate and lay eggs in the spring at night during new and full moon high tides. Males hook onto females using their front claws, and fertilize eggs as they are laid in the sand. You may also find a dead horseshoe crab washed up along the shoreline—if the front part of the shell seam is split, you have found a shed outer shell or exoskeleton. Horseshoe crabs and true crabs must shed their shells to grow.

When to look:
Anytime but watch for the mass mating/egg laying events in the spring.

Notes:
Horseshoe crab eggs are an important food source for migrating shorebird species; the crabs are used as bait for whelks. Their blood also plays an important role in the medical industry and medical research. In the photo, the tag on the horseshoe crab is used as part of a study to understand the distribution, movement, longevity and mortality of the horseshoe crab.

CRUSTACEANS

Northern rock barnacles. Photo: Juliana Barrett

Northern rock barnacle

Semibalanus balanoides

Family: Balanidae

What it looks like:
These barnacles can grow to 1 inch in diameter (2.5 cm). The shell is made up of six white wall plates, one end plate usually larger and overlapping plates to either side. Triangular beak plates in the center open when the barnacle is filtering plankton with feathery appendages called cirri.

Where to find it:
These barnacles begin life as larvae, floating in the water, and then settle on hard substrates in the intertidal area such as rocks, horseshoe crab shells or boat hulls.

When to look:
Year-round

Notes:
Barnacles are the only crustaceans that settle and remain in one place for life.

Long-horned sandhopper (sand flea)

Americorchestia longicornis;

Big-eyed sandhopper

A. megalophthalma

(Top) Big-eyed sandhopper; (Bottom) Long-horned sandhopper. Photos: Aaron Hunt

Family: Talitridae

What they look like:
The color of these pill-shaped, tiny amphipods (crustaceans), enables them to blend in with the beach. Commonly called sand fleas, their bodies, flattened side to side, are armored with antennae-like structures extending from their heads. The long-horned sandhopper grows up to about 1 1/8 inches (2.7 cm) in length, while the big-eyed sandhopper grows up to 1 inch (24 mm).

Where to find it:
Sand fleas are typically found hiding under seaweed and other debris in the wrack line or in sandy burrows. Long-horned sandhoppers are often found well above the high tide line while big-eyed sandhoppers are found at or just below the high tide line.

When to look:
During the day, sand fleas are found under seaweed debris. At night, they hop around freely in search of food. They emerge in the warmer months from their overwinter burrows.

Notes:
Unlike other amphipods, sand fleas can spend long amounts of time out of the water without drying out. Many call the land their home. Avid hoppers, sand fleas contract their abdomen to make their jumps.

Atlantic ghost crab. Photo: Diana Payne

Atlantic ghost crab

Ocypode quadrata

Family: Ocypodidae

What it looks like:

Adult ghost crabs are often colored with gray or light-yellow hues, while young crabs have mottled patterns that blend in with their sandy habitat. They have thick legs, long eye stalks and are rather squat; their shells are about 3 inches (7.6 cm) long.

Where to find it:

Atlantic ghost crabs inhabit the coast from Massachusetts to Brazil. They burrow in the beach sand above the wrack line. Adult crabs burrow much farther from the water's edge than young crabs.

When to look:

True to their name, ghost crabs are more active at night. They overwinter in their burrows.

Notes:

This is the only ghost crab species on the Atlantic coast. Burrows can be four feet deep. The crabs communicate through bubbling, rubbing their legs together and creating vibrations by banging their claws against the ground.

Mole crab. Photo: Tessa Getchis

Atlantic mole crab or sand crab

Emerita talpoida

Family: Hippidae

What it looks like:
A mole or sand crab is oval-shaped and tan or sand colored (darker on top and lighter on bottom). Five pairs of very short legs are used for digging itself backwards into the sand so it faces the oncoming waves. Generally 1 to 2 inches (2.5 to 5 cm) long, it lacks claws and is harmless.

Where to find it:
In the beach swash zone, where the waves crash.

When to look:
Summertime

Notes:
Backed into the sand, the mole or sand crab sits with its eyestalks and antennae poking above the sand surface. Feathery antennae are used to capture algae or plankton as the water recedes.

European green crab. Photo: Robert Bachand

European green crab

Carcinus maenas

Family: Portunidae

Non-native / Invasive

What it looks like:
The green crab has a distinctively mottled forest green and brown coloration, sometimes with orange. It is most easily identified by the five notches along the carapace (shell) on either side of its stalked eyes. They are 3 to 4 inches (7.6 to 10 cm) wide and 2 to 3 inches (5 to 7.6 cm) long.

Where to find it:
The green crab thrives in the intertidal zone in habitats with mud, sand or rocky bottom, as well as tidal marshes and creeks.

When to look:
Able to withstand a wide range of water temperatures, green crabs are present year-round, but easiest to find in warmer weather.

Notes:
European green crabs are non-indigenous species, transported from Europe more than 200 years ago. They are now considered a resident or naturalized species on the U.S. Eastern seaboard and an invasive species on the West Coast.

Longnose spider crab

Libinia dubia

Common spider crab

Libinia emarginata

Longnose spider crab.
Photo: Robert Bachand

Family: Epialtidae

What they look like:
Roughly triangular in shape, spider crabs have a thick, armored carapace up to 4 inches (10 cm) long. Their muddy-brown shells are very rough and bumpy with a number of short spines protruding from the outer edge. A decorator crab species, they often carry other invertebrates or seaweed on their shells attached to short velcro-like bristles (setae). Their legs can span 12 inches (30 cm) and their claws are relatively small.

Where to find it:
Spider crabs can live in deep water but are often found in soft bottom habitats in estuary waters. Muddy areas around docks are a good place to look.

When to look:
You can find them most frequently in the spring, summer and fall. They hibernate in dense patches in the winter.

Notes:
Spider crabs are extremely common in the New England area. They are slow and non-aggressive, preferring to scavenge for food.

Chordates

Chordates are animals, which at some time in their life cycle, have a flexible rod supporting their dorsal (upper) or back sides, also called a notochord, pharyngeal slits, a dorsal, hollow nerve cord, a post-anal tail and an endostyle (a structure that secretes mucus). Most species within the phylum Chordata are vertebrates, or animals with backbones. Skates (skate egg case described below) have cartilaginous skeletons, while birds (next section) have bony skeletons.

Mermaid's purse. Photo: Judy Benson

Mermaid's purse

Skate egg case, various species of skates

Family: Rajidae

What it looks like:
Skates (along with sharks and rays) are cartilaginous (as opposed to bony) fishes. Skates lay their young in tough, leathery

pouches called a mermaid's purse. The embryo grows inside this pouch for several months until it is ready to hatch. The empty egg cases often wash up on the beach. They are often black or very dark in color when you find them on the beach. Different species of skates have different size pouches and they range in size from approximately 2 to 4 inches (5 to 10 cm) and 1.3 to 2.5 inches (3.3 to 6.4 cm) in length. There are four horns on the egg case protruding from each corner. Differences in pouch size and length/shape of horns aid in identification of the skate species.

Where to find it:
Often found in the wrack or high tide line.

When to look:
Egg cases can wash up any time of year.

Notes:
Much is unknown about skates and their breeding areas. In many parts of the world, scientists are working with people to gather information about skate egg cases and where they are found through citizen science efforts.

Birds

The Connecticut shoreline is a great place for birding during any season. There are many birds that migrate through the area in the spring and fall and many other birds may be found year-round. The list below is not meant to be a comprehensive list, but highlights some of the birds that might be seen.

The bird species listed here are organized by taxonomic order: birds of prey, shorebirds and passerines (or perching birds) and are in alphabetical order by common name within each order. Taxonomic family names are provided.

BIRDS OF PREY

Osprey with fish. Photo: Lisa Jarosik

Osprey

Pandion haliaetus

Family: Pandionidae

What it looks like:
These large birds are generally 21 to 23 inches in length (53 to 58 cm) with a brown back and white belly. The head is white with a brown stripe through the eyes. The beak is black and hooked. Ospreys have large, curved talons allowing them to hold onto fish.

Where to find it:
Ospreys feed on fish and are found along the coast and further inland near water bodies. Watch for them diving into the water to catch fish or perching in trees. They can be seen nesting on platforms installed specifically for their use in tidal marshes.

When to look:
See Ospreys during breeding season in early spring and migrating in the fall.

Notes:
Osprey populations were decimated by DDT (an insecticide since banned) and PCB's (polychlorinated biphenyls). These chemicals built up in the tissues of the fish eaten by osprey and in the osprey itself, causing the osprey eggshells to be extremely thin. Eggs were then crushed when the adults incubated them. Since banning these chemicals, Osprey populations, as well as Bald Eagle populations, have made a remarkable recovery.

SHOREBIRDS

American Oystercatcher. Photo: Lisa Jarosik

American Oystercatcher

(Haematopus palliatus)

Family: Haematopodidae

What it looks like:
These birds are hard to miss with large, bright orange-red bills and yellow eyes surrounded by a red eye ring. They are 16 to 20 inches long (41 to 51 cm) with black head and breast, white belly and brown back and wings.

Where to find it::
Found along coastal beaches and salt marshes, these birds eat shellfish such as clams and oysters and other marine invertebrates.

When to look:
Oystercatchers can be found along Long Island Sound during the spring and fall migrations as well as during the breeding season. Watch for them between March and early November.

Notes:
They nest on the ground above high tide line, building a small indentation in the sand and sometimes lining it with pebbles or shells.

Dunlin. Photo: Lisa Jarosik

Dunlin

Calidris alpina

Family: Scolopacidae

What it looks like:
Dunlins are small shorebirds about 6 to 9 inches long (15 to 23 cm) with a long bill that is curved at the end. The non-breeding adults are gray-brown on the head, neck and back with dark legs.

Where to find it:
These birds feed along the shoreline, preferring mud flats but also found along sandy beaches and rocky shorelines. Along our coast, they mainly feed on small marine invertebrates.

When to look:
Dunlins nest in northern Canada and Alaska and can be found along our shoreline in the winter months.

Notes:
Breeding birds are strikingly different in their coloring with a bright rust mottling on their back and a black patch on their bellies.

Greater Yellowlegs. Photo: Thomas Morris

Greater Yellowlegs

Tringa melanoleuca

Family: Scolopacidae

What it looks like:
These birds have long yellow legs and are about 11 to 13 inches long (28 to 33 cm) with speckles of black, white and brown on top and a white belly. The neck and breast are streaked with brown. The long dark beak curves slightly upward. There is usually a white eye ring.

Where to find it:
Found along shallow water, flats and marshes foraging for crustaceans and other invertebrates as well as small fish.

When to look:
Look for Greater Yellowlegs during the early spring and again during fall migration.

Notes:
This bird forages for food in shallow water, "high stepping" as it wades through the water.

Great Black-backed Gull. Photo: Judy Benson

Great Black-backed Gull

Larus marinus

Family: Laridae

What it looks like:
This is the largest of the gulls with a stout body, a wing span of up to 5.6 feet (1.7 m) and up to 2.6 feet (0.8 m) in length. The back and upper wings are dark gray to black with a white head and belly. Legs are dull pink, beak is yellow with a red spot.

Where to find it:
Found along the coast; will look for food far out to sea in the winter months.

When to look:
Found year-round in New England

Notes:
Food preferences are similar to the Herring Gull.

Herring Gull (non-breeding). Photo: Nancy Balcom

Herring Gull

Larus argentatus

Family: Laridae

What it looks like:
This large gull has a gray back and wings, head and body are white, and tips of wings are black spotted with white. The beak is yellow with a red dot, eyes are also yellow and the legs are pink. An adult is about 2 feet (0.6 m) long.

Where to find it:
Common on beaches, docks and piers, as well as further inland locations.

When to look:
Found year-round in New England

Notes:
The Herring Gull will drop shellfish onto roads, pavement or rocks in order to break the shells open. These gulls are omnivorous, feeding on fish, shellfish and other ocean animals, as well as eggs and garbage. It is best not to feed wild animals but don't be surprised if these gulls try to steal something from your picnic.

Laughing Gull. Photo: Mark Szantyr

Laughing Gull

Leucophaeus atricilla

Family: Laridae

What it looks like:
This is a medium-sized gull with a length of up to about 18 inches (46 cm). Wing color is dark gray and the breast and belly are white. Summer adults (breeding) have a black head ("hood") with white crescents above and below the eyes. Bill is red during the breeding season and black at other times of the year.

Where to find it:
Common on beaches, salt marshes and piers.

When to look:
Found along the coast in the summer months. This gull generally heads south for the winter.

Notes:
Another omnivore, this gull is best known for its strident, laugh-like call.

Ring-billed Gull. Photo: Nancy Balcom

Ring-billed Gull

Larus delawarensis

Family: Laridae

What it looks like:
This is a medium-sized gull growing to about 17.5 inches (44.5 cm) in length. Wing color is gray with a white belly. Breeding adults have a white head, yellow bill with a distinctive black ring around it and yellow legs.

Where to find it:
Common on beaches, inland wetlands, reservoirs, parking lots and landfills

When to look:
Found both along the coast and inland year-round.

Notes:
Another omnivore, this is a bird that is happy to share your beach picnic, French fries or anything else it can find. Please don't be tempted to feed them!

Ruddy Turnstone. Photo: Mark Szantyr

Ruddy Turnstone

(Arenaria interpres)

Family: Scolopacidae

What it looks like:
These small shorebirds are short and stocky with orange legs and average about 9.5 inches long (24 cm). Breeding males have colorful plumage, with a rusty and black dappled pattern on the back (described as looking like a calico cat), and black and white markings on their faces. The non-breeding birds are muted in color with dark grays, browns and black dominating their backs and white bellies.

Where to find it:
Watch for these birds along the tidal flats and beach shoreline foraging in the wrack line for insects and small marine invertebrates. They also forage along rocky shorelines.

When to look:
Breeding birds nest in the tundra regions of North America but non-breeding birds can be found year-round along the shoreline in mudflats, sandy beaches and rocky shorelines. They are most common during spring and fall migrations.

Notes:
These birds often flip over small rocks and shells looking for food, hence the name "turn stone."

Sanderling (winter plumage). Photo: Thomas Morris

Sanderling
(Calidris alba)

Family: Scolopacidae

What it looks like:
We usually see these small birds in their non-breeding plumage. Adults are about 9.5 inches long (18 to 20 cm) with black legs and bills. Their backs are pale gray and have white bellies with a black marking at the shoulder.

Where to find it:
These birds run back and forth with the waves, probing the sand for marine invertebrates when wet sand is exposed by a receding wave. They also feed on tidal mudflats.

When to look:
Sanderlings breed in the Arctic tundra and migrate south in the fall. We can see them during the fall, winter and spring.

Notes:
The species name for these birds "alba," means white, referring to its pale, non-breeding coloration.

Least Sandpiper. Photo: Thomas Morris

Least Sandpiper

Calidris minutilla

Family: Scolopacidae

What it looks like:
The smallest of the sandpipers, these birds are about the same size as a sparrow (5 to 6 inches long; 13 to 17 cm), with green-yellow legs. Breeding adults have white bellies with dark brown and rust-colored streaks on the back and wings.

Where to find it:
Least Sandpipers are often found along tidal creeks, mud flats and salt marshes, but they also frequently forage in the seaweed along the wrack line on beaches.

When to look:
This bird breeds in the Arctic, so we can see them along Long Island Sound during the spring/fall migrations or during the winter.

Notes:
Adults have a dark, thin, slightly curved bill that they can use to probe for small, aquatic crustaceans.

Pectoral Sandpiper. Photo: Mark Szantyr

Pectoral Sandpiper

Calidris melanotos

Family: Scolopacidae

What it looks like:
These are among the larger sandpipers and are about 8 inches long (20 cm). Coloration includes a brown, black and gold back, brown streaked breast and a white belly. Legs are yellowish.

Where to find it:
During migration these birds prefer grassy wetlands and salt marshes where they probe for invertebrates on which to feed.

When to look:
Another East Coast migrant, watch for these birds in the spring and fall.

Notes:
Male birds are larger and heavier than females though their coloration is similar.

Semipalmated Sandpiper. Photo: Mark Szantyr

Semipalmated Sandpiper

Calidris pusilla

Family: Scolopacidae

What it looks like:
This very small sandpiper is only 6 to 7 inches long (15 to 18 cm). It has a small head and neck with a dark, tubular bill. Birds have a dark grayish-brown back with a white belly (some streaking in non-breeding adults), and dark legs. The head and neck are also gray-brown.

Where to find it:
Birds feed on intertidal mudflats and beaches, eating mainly very small aquatic invertebrates.

When to look:
These birds nest on the Arctic tundra so we see them as they migrate to South America for the winter.

Notes:
Groups of thousands of birds congregate at stopover points during migration. Research shows that some birds can fly more than 2000 miles nonstop as they head south for the winter.

Short-billed Dowitcher. Photo: Mark Szantyr

Short-billed Dowitcher

Limnodromus griseus

Family: Scolopacidae

What it looks like:
Non-breeding adults are brownish gray, paler on their undersides with some speckling and yellowish legs. Contrary to their name, they do not have short bills. The name differentiates them from the Long-billed Dowitcher but even then, the difference is not that much. Birds can range from 9 to 12 inches long (23 to 31 cm).

Where to find it:
Watch the coastal mudflats and tidal wetlands for flocks of these birds feeding in shallow water as the tide goes in and out, looking for aquatic invertebrates.

When to look:
Watch for dowitchers during migration in the spring and fall.

Notes:
These birds probe the mud for food and resemble a sewing machine needle as they rapidly move their bills into and out of the mud.

Black-bellied plover. Photo: Thomas Morris

Black-bellied Plover

Pluvialis squatarola

Family: Charadriidae

What it looks like:
These birds are the largest (11 to 12 inches long) (28 to 30 cm) of the plovers that you'll find along Long Island Sound, with distinctive black and white feathers. The face, neck and belly are black, as are the bill and legs in breeding adults. The back and wings are speckled black and white. A non-breeding adult is shown in the photo.

Where to find it:
Look along the beach and exposed tidal flats for this ground forager.

When to look:
This plover breeds in Arctic areas but is a common migrant along the East Coast.

Notes:
This species can be distinguished from other plovers by its stout bill, which is thick and more than an inch long (24 to 34 mm). These plovers feed on insects and aquatic invertebrates.

Piping Plover. Photo: Thomas Morris

Piping Plover

Charadrius melodus

Family: Charadriidae

What it looks like:
These plovers are small, growing to about 7 inches (18 cm) in length. Wings/back are a sandy, gray-brown with a white belly and yellow/orange legs. During the breeding season, the short bill is orange with a black tip, and the bird has a black collar and a black marking on the forehead.

Where to find it:
This bird flits along near the water's edge and in tidal flats when foraging for food. At other times, they blend into the sand on the beach and dunes.

When to look:
Birds return north (including Long Island Sound) to breed and nest during the spring and summer and migrate south for the winter.

Notes:
These birds are on the endangered species list due to habitat loss and disturbance of nesting areas as well as predation. String fencing along the beach is intended to keep people out of nesting areas. Nests are often small, shallow indentations in the sand, sometimes with a few small stones or shells. The nests, eggs and chicks are very hard to see and easy to unknowingly step on.

Semipalmated Plover. Photo: Mark Szantyr

Semipalmated Plover

Charadrius semipalmatus

Family: Charadriidae

What it looks like:
These short, plump birds have a short, orange bill with a black tip. Birds are about 6 to 7 inches long (24 cm) with brown backs and crown (top of head), white bellies with a black band around the neck, a white forehead and black markings around the eyes.

Where to find it:
You will see these birds along the shoreline and tidal flats feeding on marine worms, crustaceans and other small invertebrates.

When to look:
We see these plovers along our shoreline during spring and fall migration periods.

Notes:
This bird looks a bit like a killdeer but is much smaller and has only one black band on its neck.


Common Tern still and in flight. Photos: Nancy Balcom

Common Tern

Sterna hirundo

Family: Laridae

What it looks like:
Breeding and non-breeding common terns look different. Breeding birds are pale gray with a black cap on their heads. Their bills are bright reddish-orange with a black tip and their legs are orange. Non-breeding birds also have a gray body with a white forehead, and legs are black or reddish black and bills are black or black and red. Wings are long and narrow, with pointed tips, and these terns have a forked tail (visible only in flight). Common Terns are 12 to 14 inches long (30 to 36 cm).

Where to find it:
These birds are ground nesters on beaches, rocky islands and salt marshes. Watch for them flying over the water in search of food.

When to look:
Common Terns breed along Long Island Sound, so look for them in the spring and summer months. They nest in colonies.

Notes:
The Common Tern is an aerial acrobat flying over the water in search of fish and other food. It can do shallow dives into the water to catch its prey or sometimes skims the surface.

Least Tern and egg. Photo: Lisa Jarosik

Least Tern

Sternula antillarum)

Family: Laridae

What it looks like:
During the breeding season, these small seabirds (approx 8 to 9 inches long; 21 to 23 cm) have pale gray upper parts and white underparts. The head has a black cap with a white forehead. The bill is yellow, often with a small black tip in the summer and black during the winter; the legs are orange/yellow.

Where to find it:
Watch for birds along sandy beaches and islands.

When to look:
Arriving in early May, Least Terns nest in colonies on some Long Island Sound sandy beaches during the spring. Nests are scraped in the sand and are hard to see. In order to protect the eggs and young chicks, nesting areas are often fenced off with string to avoid trampling by people and dogs.

Notes:
These graceful birds dive into the water to catch small fish and aggressively defend their nests, diving and defecating on intruders.

Roseate Terns. Photo: Mark Szantyr

Roseate Tern

Sterna dougallii

Family: Laridae

What it looks like:
Roseate Terns are about the same size as common terns (13 to 16 inches; 33 to 41 cm). The top of the head is all black with no white forehead, and the relatively thin bill is black or black and red, the legs are red, and there is a rosy tinge to the underparts during the early summer. The tail is forked and exceptionally long.

Where to find it:
They nest in colonies on beaches, usually near beach vegetation and in colonies with common terns. They dive into the water to catch fish both near the shore and further out in deep water.

When to look:
These birds nest almost exclusively on offshore islands. They build nests by scraping the ground with their feet to create slight indentations. Birds arrive along the Connecticut coast in late April/early May.

Notes:
Roseate Terns are federally endangered and listed as Endangered by the State of Connecticut. Historically, Roseate Terns were killed for feathers for the millinery trade. More recently, they have declined because of coastal development, disturbance of nesting sites, predation, and competition for nesting sites with other bird species.

Willet in flight. Photo: Lisa Jarosik

Willet

Tringa semipalmata

Family: Scolopacidae

What it looks like:
These large shorebirds have long, gray legs. They are approximately 13 to 16 inches long (33 to 41cm) with a wingspan of about 28 inches (71 cm). Breeding plumage is a mottled brown/gray with barring on the breast. Non-breeding birds are lighter in color. When flying, Willets have a distinctive black and white stripe on their wings. Their bills are thick and straight and longer than their heads.

Where to find it:
Birds forage along beaches, intertidal mudflats and rocky shorelines, eating small crabs, clams and other invertebrates. Birds nest in salt marshes or sand dunes.

When to look:
Willets start to migrate north in March and reach breeding grounds (ranging from New Jersey to southern Canada) in April to May.

Notes:
Prior to the Migratory Bird Treaty Act of 1928, Willets and other large sandpipers were intensively hunted and eaten.

PASSERINES (PERCHING BIRDS)

Common Yellowthroat. Photo: Mark Szantyr

Common Yellowthroat

Geothlypis trichas

Family: Parulidae

What it looks like:
This small songbird is about 4.3 to 5.1 inches (11 to 13 cm) long with an olive-colored back, wings and tail. The throat is bright yellow. Adult males have a black face mask bordered on the top of the head by a white line. Female birds are more subdued in color and lack the black face mask.

Where to find it:
These birds prefer scrubby habitat where they feed on insects and spiders. Watch for them along the edges of marshes, and landward of the dunes in areas with dense shrubs and grasses.

When to look:
Common Yellowthroats can be seen during the breeding season arriving in the early spring and then migrating in the fall.

Notes:
Common Yellowthroats prefer nesting in marshes and other wet habitats.

Horned Lark. Photo: Mark Szantyr

Horned Lark

Eremophila alpestris

Family: Alaudidae

What it looks like:
These small birds are about 6 to 8 inches (15 to 20 cm) in length. The back is a brown-rust-gray color with a whitish underbelly. Males have a black band across the chest and a black and yellow face with a black mask. Black stripes on the head extend back and are sometimes raised, resembling "horns." Females are similar in coloring but with less distinct patterns.

Where to find it:
These songbirds are frequently found along the coast, particularly in grasslands, fields and other open areas, where they forage on bare ground.

When to look:
Birds occur in coastal Connecticut during migration and in the winter.

Notes:
The Horned Lark is noted to be a common bird in steep decline. This is thought to be due to loss of open, grassy habitats.

Snow Bunting. Photo: Mark Szantyr

Snow Bunting

Plectrophenax nivalis

Family: Calcariidae

What it looks like:
This medium-sized songbird is about 6 inches long (15 cm). During the non-breeding season, birds have white breasts, white and black wings, rust-colored backs and heads and yellow-orange bills. In flight, large white patches on the wings are distinctive.

Where to find it:
Watch for these birds along the shoreline or in open fields. They eat grass and wildflower seeds including goldenrod and amaranth, as well as insects.

When to look:
These birds breed in the Arctic but can be found along the Connecticut shoreline during the winter months.

Notes:
Snow Buntings do not forage in the same place for very long and blend in well with their surroundings while searching for food.

Savannah Sparrow

Passerculus sandwichensis

Family: Passerellidae

What it looks like:
Savannah Sparrows are approximately 4.3 to 6 inches long (11 to 15 cm) with brown backs with black streaks and white underparts with brown or black streaks. There is a yellow patch near the eye. Savannah Sparrows have finer streaking on the breast and a smaller bill than do Song Sparrows.

Where to find it:
Found in areas with low vegetation such as grasslands, low shrublands, and marshes. They feed on seeds and sometimes during the breeding season, insects. Along the coast, they may also feed on small crustaceans.

When to look:
Savannah Sparrows are most common during migration in the early spring and fall. Smaller numbers spend the winter in coastal habitats with sparse vegetation. It is infrequent along the coast during the breeding season. Most of the breeding populations are now in inland grasslands.

Savannah Sparrow. Photo: Mark Szantyr

Notes:
Watch for these birds walking along the beach, in the beach grass and in grassy areas landward of the dunes foraging for insects.

Song Sparrow. Photo: Mark Szantyr

Song Sparrow

Melospiza melodia

Family: Passerellidae

What it looks like:
While variable in size (4.7 to 6.7 inches; 12 to 17 cm) and coloration across North America, Song Sparrows generally have backs that are streaked brown or rust, white underparts streaked with brown or rust, and a brown or rust-colored cap with a brown streak through each eye. They have a large dark spot in the center of the breast.

Where to find it:
Birds prefer open areas including marsh edges, fields and woodlands, so look for them landward of the dunes in areas with scattered, shrubby or grassy vegetation. They eat insects and seeds, and near the coast, may also feed on small crustaceans.

When to look:
The Song Sparrow can be found year-round in Connecticut.

Notes:
Song Sparrows have a wide repertoire of songs with males using songs to both attract females and declare territories.

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Glossary

Berm – a low, horizontal or sub-horizontal, shore-parallel, bench or narrow terrace that is landward of the swash zone and formed of material thrown up or deposited by storm waves

Drumlin ^ – a low, smoothly rounded, elongate oval hill or mound (resembling an inverted spoon) composed of compacted older glacial deposits that were overridden and smoothed by a subsequent glacial advance

Fetch + – the distance over which wind blows to form waves

Glacial outwash ^ – layered, generally well-sorted sediments (typically sands and gravels) "washed out" from a glacier and deposited downstream of the glacier by meltwater streams. As these streams lose energy, coarser material is deposited closest to the glacier and finer material is transported further downstream (also known as water-laid glacial deposits)

Lag deposit ^– a residual deposit (such as boulders or gravel) that is left behind after physical processes (such as wind, waves and tidal action) remove finer material

Littoral drift + – the movement of sediment along a shoreline resulting from a longshore current and also from the swash and backwash on a beach face (another name for longshore transport)

Longshore currents + – the movement of water along a shoreline produced by the approach of waves at an angle to the shore

Moraine ^ – a mound, ridge or other distinct accumulation of unsorted, unstratified glacial material, predominantly till, deposited chiefly by the action of glacial ice

Shoreline ^ – the part of the coastline which is directly related to water-land interaction, typically the tidal and swash zones

Shoreface (nearshore) ^ – the sloping zone seaward of the low-water shoreline, permanently covered by water, where bottom sediments can be mobilized by wave action

Storm surge – the abnormal rise in seawater level during a storm, measured as the height of the water above the normal predicted astronomical tide. (For more information see: "What is storm surge?" NOAA National Ocean Service website, **https://oceanservice.noaa.gov/facts/stormsurge-stormtide.html**, 3/18/2022.)

Surficial deposit ^ – unconsolidated deposits of various origins (including soils) that overlie bedrock and/or other older deposits so as to be exposed on the Earth's surface

Swash zone ^ – the sloping portion of a beach that is alternatively covered (uprush) and uncovered (backwash) by wave action, and where longshore movement of water occurs in a zigzag (upslope-downslope) manner

Tidal range +– the difference in height between the high and low tides

Transgression ^– the spread or extension of the sea over land areas as a result of sea level rise and/or land subsidence

Wave base ^ – the depth at which the movement of waves can be felt, by bottom sediments (this is approximately equal to 1/2 the wavelength so wave base varies with changes in wave characteristics, e.g., fair weather waves verses larger stormy weather waves)

Wave refraction ^ – a change in water wave direction as waves approaching the shore (e.g., a headland) are slowed in shallow water but maintain speed in adjacent deeper water; this causes wave crests to bend toward a parallel alignment with the shoreline.

Definitions from:
+: https://rwu.pressbooks.pub/webboceanography/back-matter/glossary-2//
^ Definitions adapted from various sources to clarify/simplify existing on-line definitions

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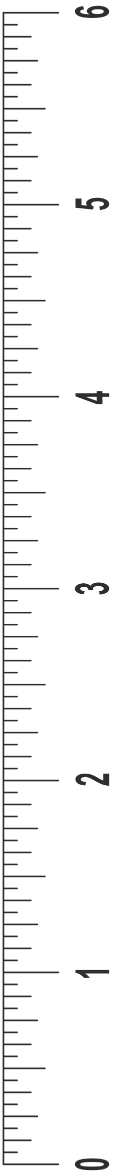
Connecticut Sea Grant College Program

Connecticut Sea Grant, based at the University of Connecticut, is a partnership between the university and the National Oceanic and Atmospheric Administration (NOAA). It is Connecticut's component of the National Sea Grant College Program, a network of 34 university-based programs. The program's mission is to work towards achieving healthy coastal and marine ecosystems and consequent public benefits by supporting integrated locally and nationally relevant research, outreach and education programs in partnership with stakeholders. The University of Connecticut is the State's flagship research university. https://seagrant.uconn.edu/
For additional publications go to:
https://seagrant.uconn.edu/publications/



Connecticut College Arboretum

The Connecticut College Arboretum, established in 1931, encompasses 750 acres consisting of the 115-acre campus, 30-acre Native Plant Collection, three acre Caroline Black Garden, a teaching and display greenhouse facility, and numerous natural environments including a bog, restored meadows, oak/hickory forests, a wooded island in the Thames River, and a salt marsh. The Arboretum is integrated into the everyday life of the College, serves as an outdoor classroom for numerous courses, and is the focus of several long-term research programs. The Arboretum provides stewardship of College lands and leadership on conservation issues locally and statewide. It is an integral part of the New London community, offering an array of walking trails for education and recreation, programs, public workshops and conferences.

Aerial view of Waterford Beach Park, Ocean Beach Park and the mouth of the Thames River. Photo by Joel Stocker.