

PEMAQUID BEACH · A BRIEF HISTORY

26,000 BCE: Glaciers flow over the land, sculpting Maine's landscape and forming Pemaquid Beach

11,000 BCE: The glaciers recede and leave sand and rocks behind them. Rivers of meltwater wash this sediment out into the ocean.

11,000 BCE to Present: The sea level falls and then rises again, as the Pemaquid Beach area changes from a forested upland, to a freshwater wetland, to its current state as a pocket barrier beach with a salt marsh.

3,000 BCE: First evidence of human habitation of Pemaquid Beach

Early 1900s: Sand from Pemaquid Beach is hauled away to use for concrete. Seaweed is harvested to sell as fertilizer.

1958: The Town of Bristol purchases Pemaquid Beach from the Partridge Family. The following year the Parks Commission is created to oversee Pemaquid Beach and the Lighthouse Park.

2003: Beachcombers' Rest Nature Center is founded by Bristol residents and Pemaquid Watershed Association members, Joan Lyford and Diane Perry, in space at the Pemaquid Beach pavilion provided courtesy of the Bristol Parks and Recreation Commission.

Want to learn more about Pemaquid Beach?

- Visit Beachcombers' Rest Nature Center, which is open in July and August.
- Borrow a book from the Bristol Area Library or Skidompha Library in Damariscotta.
- Attend one of Beachcombers' Rest Nature Center's weekly workshops.
- Study the murals along the walls as you pass through the pavilion.
- Talk to Pemaquid Beach Park staff.

FREQUENTLY ASKED QUESTIONS

Q: Why do some areas of the beach have reddish water?

A: The red color comes from a high concentration of iron and plant tannins in freshwater run-off. The iron comes from the surrounding mainland soil and rocks, and the tannins come from the plants in the area, especially cedar trees. This does not affect the health of the beach and it is NOT red tide.

Q: Where did all this sand come from?

A: The sand at Pemaquid Beach is naturally occurring. Thousands of years ago glaciers flowed over this area and ground up rocks into sand, which was then deposited into the ocean. Ocean waves then transported this sand back onto the land, forming a sandy beach.

Q: Why does the sand sparkle?

A: The sand contains particles of mica, a mineral that reflects the light and looks like glitter in the sand.

*Pemaquid Watershed Association is a 501 (c)(3) charitable nonprofit organization dedicated to conserving the natural resources of the Pemaquid Peninsula of Maine through land and water stewardship and education.
Est. 1966*



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Association

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Pemaquid Beach Interpretive Guide



This brochure is provided by Beachcombers' Rest Nature Center, which is a collaboration between:



MOTHER NATURE'S GUIDE TO TIDEPOOL ETIQUETTE:

- * Walk carefully around each pool. Don't stomp on creatures' homes!



- * Find a comfortable rock next to a tidepool. Sit quietly and watch for signs of life.

- * Observe the animals and live plants. Don't take them home.

- * Don't turn over rocks. Animals will die!



- * Don't tug the critters from their homes. You could really hurt them!



- * Be gentle and place the plants and animals you find back in the pool.

- * Hide the animals you look at under the seaweed. Otherwise they will be food for the gulls!

Did you know there are art supplies inside the nature center? Borrow them to capture your day at the beach!



TIDEPOOL ANIMAL IDENTIFICATION

Common Periwinkle



Littorina littorea

Aptly named, this is the most prevalent periwinkle species at Pemaquid Beach. The small snail has a grey or dark brown shell, often with darker spiral bands and a sharp point at the top.

Rough Periwinkle



Littorina saxatilis

The least common periwinkle species at Pemaquid Beach. These snails are similar in size and shape to the common periwinkle but have deep spiraling grooves on their shell.

Yellow Periwinkle



Littorina obtusata

Smaller than the common periwinkle, with a yellow to light-brown shell. The shape of the yellow periwinkle is similar to a land snail, with a flattened spiral shell.

Hermit Crab



Pagurus acadianus

Most often found walking along the sandy bottom, hermit crabs can be identified by their habit of living inside an otherwise empty snail's shell. Although rarely observed, they can leave their shells at will to find new shells as they grow.

Green Crab



Carcinus maenas

This dark green crab can grow up to 8 cm across but are most often 1-5 cm. Males and young crabs have bright green or yellowish undersides, whereas adult females are red-orange underneath.

Rock Springtails



Anurida maritima

These tiny insects are blue-grey in color and most often found in large groups on the surface tension of calm tide pools. They cannot swim and return to higher ground as the tide comes in.

The rocky outcroppings at both ends of the beach are full of animal life — what can you find?

COMMON SEAWEED IDENTIFICATION

Knotted Wrack



Ascophyllum nodosum

Cylindrical, olive-colored fronds with knots, or bladders of air, that keep the plant afloat. Found on intertidal rocks at either end of the beach.

Rockweed



Fucus vesiculosus

Green-brown plant with flat blades, prominent midrib, and air bladders within the blades. Found on intertidal rocks on either end of the beach, often closer to the high-tide line than knotted wrack.

Irish Moss



Chondrus crispus

Green or dark red bushy plants attached to rocks with a short stalk. Blades are flat and branched, with a fan-like appearance. Found at or below the low tide line. Less abundant than Rockweed or Knotted Wrack.

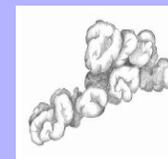
Hollow Green Weeds



Enteromorpha species

Small, bright green plants found growing on intertidal rocks. Can be identified by the presence of air bubbles inside the filaments, which are 1-3 mm wide.

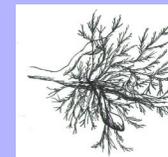
Sea Potato



Leathesia difformis

Yellow-brown lumpy and hollow masses. Sea potatoes are epiphytes, which means they grow by attaching themselves to other seaweeds. Often found floating free or washed up on the beach.

Red Tubed Weed



Polysiphonia species

This reddish, hair-like plant grows only upon other seaweeds, similar to the sea potato. It is most commonly found growing on Knotted Wrack in the intertidal zone.

Did you find a different kind of seaweed? Borrow field guide from Beachcombers' Rest to identify it

SALT MARSH RESTORATION

Many beach visitors do not realize that there is a salt marsh next to Pemaquid Beach Park. This salt marsh was almost destroyed when a culvert connecting the tidal waters to the marsh collapsed and cut off the flow of saltwater into the marsh. A new, wider culvert was installed in 2007, and the salt marsh has since returned to a healthy state.

This salt marsh is important to the ocean ecosystem because it provides protection for young sea creatures, allowing them to survive the difficult first stages of their lives. The salt marsh also nurtures the population of phytoplankton and algae, which forms the base of the marine food chain. It is important to protect this salt marsh, as this type of ecosystem is rare on the rocky coast of Maine.



Setting a lift net to catch fish for a study of the restoration of the salt marsh.

To see the salt marsh, walk through the field to the right as you head towards the beach and follow the path labeled **Salt Marsh Overlook**. There you will find an interpretive panel with more information about what lives in the salt marsh and more about the ecosystem services that the marsh provides.

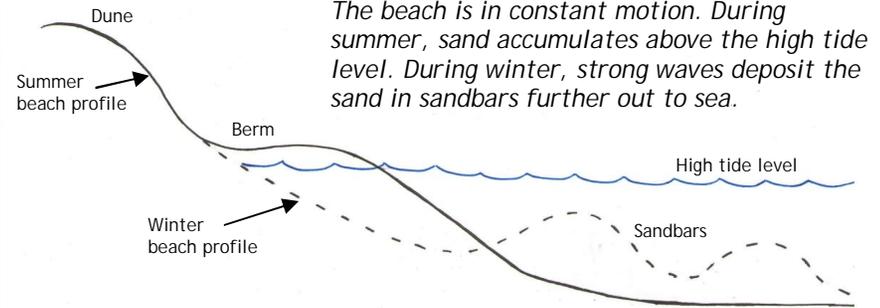
PEMAQUID BEACH GEOLOGY

Cross River Formation

The rocks you see at both ends of the beach are part of the Cross River Formation, a type of metamorphic rock, granite gneiss, that contains quartz, feldspar, black mica, and garnet.

You can identify rocks that make up this formation by their rusty orange color, the flat cleavage planes of yellowish crystals of feldspar, and dark particles of mica.

The Cross River Formation is about 450 million years old and is the oldest layer of rock in the area. It lies under the entire Pemaquid Peninsula but is visible only in certain places where the younger layers of rock on top are worn away, such as at Pemaquid Beach, Pemaquid Harbor, and Pemaquid Falls.



The beach is in constant motion. During summer, sand accumulates above the high tide level. During winter, strong waves deposit the sand in sandbars further out to sea.

A Barrier Beach

Pemaquid Beach is classified by scientists as a "closed pocket barrier beach." It is a barrier beach because it forms a barrier between the ocean and the marsh, protecting the marsh from wave action. The beach is closed, rather than open, because there is no stream that runs across the beach from the marsh to the ocean.

The action of the waves on the beach causes seasonal variations in the shape of the beach. During the winter, strong storms carry the sand seaward, often exposing layers of peat and ancient tree trunks. The sand returns to the beach during the calmer weather in spring and summer months.

For the last several thousand years, the land has been sinking and the sea level has been rising, causing the beach to migrate landward. This process is ongoing and as time progresses the beach will move farther inland.



A very large crystal of black mica or biotite

Pemaquid Beach Sand

The sand at Pemaquid Beach really is natural! Its bright white color comes from the large amount of quartz and feldspar in the parent rock. The dark streaks and sparkle in the sand come from black mica, a mineral that reflects the sun and can glitter like gold. Black mica also is called biotite. The reddish streaks are tiny particles of garnet from the rocks of the Cross River Formation.

SANDY SURVIVORS - RESILIENT BEACH PLANTS

Dune Restoration

American Beachgrass (*Ammophila breviligulata*) plays a vital role in dune formation and beach stability. The dunes at Pemaquid Beach form a barrier to protect the salt marsh and backdune area from storm surges and also act as a storage area for wind-blown sand. The sand in the dunes then replenishes the beachface as it naturally erodes over time. American Beachgrass helps dune formation by trapping the blowing sand in its tall blades and by anchoring accumulated sand with its branching root system.

In the 1800s, the shape of the beach was radically changed when sheep were allowed to graze on the beachgrass. Without this plant, the dunes soon were eroded by the force of the waves and the wind, and the beachface became much narrower. In 1978 a dune restoration project began, and today Pemaquid Beach is wider and sandier once again. **Please do not walk on the fragile dune grass.**



American Beachgrass is the most abundant plant on the dunes of Pemaquid Beach. Among the beachgrass, you also will find Sea Beach Sandwort, Sea Beach Orach, Beach Pea, and Beach Rose.

The Harsh Beach Environment

Beach plants are unique because they can survive in harsh conditions that would kill most other plants. They thrive in the constant salt spray, burial by blowing sand, extreme soil temperature changes, extreme soil moisture changes, variations in soil salinity, and fluctuations in air moisture level. Despite their proximity to the ocean, beach plants constantly face water shortages because terrestrial plants cannot use the salty water from the ocean.



Beach Rose, *Rosa Rugosa*

Unique Adaptations

Beach plants have adapted in ways that help them survive on the sandy shores. Many of these adaptations aim to help the plant conserve water in their salty, sunny habitat.

Most beach plants can grow very quickly after being buried by sand, have thick, hairy, or curled leaves that resist dehydration, and some use C₄ photosynthesis — a variation on normal photosynthesis that allows plants to use water more efficiently. C₄ photosynthesis is an adaptation most often found in desert plants.



Beach Pea, *Lathyrus japonicus*

SEA BIRDS

Did you know that there are many different species of gulls, none of which are formally known as "seagulls"?

At Pemaquid Beach, you are likely to see both herring gulls and laughing gulls. Herring gulls are the large white and grey birds that are commonly called seagulls. Laughing gulls are smaller than the herring gulls and have a black head. They are named for their distinctive call, which sounds like a high-pitched laugh.



Top left: Herring Gull, *Larus smithsonius*
 Top right: Common Tern, *Sterna hirundo*
 Bottom left: Laughing Gull, *Leucophaeus atricilla*

Terns are another common species at Pemaquid Beach and often are confused with the laughing gull. You will see common terns soaring high over the ocean and diving head-first to catch small fish. Terns are not gulls, but they are closely related.

Gulls will eat almost anything! They are naturally omnivorous and are often observed eating shellfish, either alive or dead, fish, rodents, and fruit. They also will happily eat any human food that they can find or steal. Gulls have long lives and good memories — if they become accustomed to eating human food they can become a major nuisance. Please **DO NOT** feed the gulls.



French fries are delicious, but they are not part of my natural diet!