



# Sandy Beaches of the Gulf of the Farallones



Along the coast of the Gulf of the Farallones National Marine Sanctuary is the often-visited marine habitat of the sandy beach. The sand-covered area where the land meets the sea is a physically harsh habitat with only a small number of living organisms in comparison to other shoreline habitats. The daily ebb and flow of the tides and the action of waves and currents keeps water in constant motion, while below the sand shifts.

The sandy beach begins underwater in the subtidal region, continues up through the crashing waves of the surf zone, into the swash zone where the waves cover and uncover the sand regularly and extends to the cliffs or sand dunes.

Specialized animals inhabit this turbulent habitat. The ability to move quickly to stay above the waterline or to burrow in the sand is a common adaptation among beach animals. Most beach animals make a living by filtering meals from the organic material that washes in with each wave. Beach organisms are vulnerable to human impact which often causes changes in physical environment. These changes can be the result of pollution, careless building, or overuse. Humans that interact with the sandy beach must be mindful of the factors which are important to its health.

## Sand and Water

In the Sanctuary, the beaches range from sand only to sand with cobbles or boulders. The slope of the beach and the size of the sand particles indicate the power of the waves that strike it. Steep slopes and larger-sized grains mean big waves. The high-energy beach is cleaned of the small particles because fast moving water can carry them easily. Wide, gradually sloped beaches have finer sand and smaller surf. The low energy beach allows finer grains to accumulate.

The sandy beach can change appearance seasonally. Bigger waves during winter storms pull sand offshore to form bars, leaving behind only the larger gravel or cobble. When the gentler seas of summer return, sand is redeposited on the beach.

The day-to-day appearance of a sandy beach may not change, but it is always in motion. Each breaker lifts millions of grains from one spot and deposits them at another. When the prevailing wave

direction strikes the beach at an angle, sand grains are deposited by the receding backwash a short distance down the beach in the direction of the wind.

## Life at the Sandy Beach

One of the most difficult obstacles that sandy beach organisms face is the lack of stable ground on which to hold. It is a swim, burrow, or be swept away habitat. Burrowing beneath the sand protects animals from predation, wave impact, drying out, and extreme temperatures. Yet, life in the sand presents the problems of finding food. The sandy beach habitat provides little shelter or cover to avoid predation. During low tide, shorebirds, small mammals, and insects prey on sand crabs and other animals in the swash zone. High tide brings in another group of predators – fish, crabs, shrimp, and worms feed on the animals in the sand.

Very little food grows in the sandy beach habitat. What photosynthesis there is at the sandy beach is from the microscopic algae in the top few centimeters of the sand. Most sandy beach animals depend on organic debris, called detritus, grown in other habitats. Kelp and other large algae are washed to the shore where they are broken into small pieces.

Clams and crabs filter plankton and detritus kept suspended in the water by wave action for their food. In the spring when the upwelling of cold, nutrient-rich waters along the Pacific coast is at its highest, waves turn dark green indicating very abundant phytoplankton. When prevailing westerly winds slacken or shift, the surf may carry a brown froth that is often mistaken for pollution. This foam is merely the concentrated remains of phytoplankton.

At the highest reach of the tide is the beach wrack, where the debris from the ocean is left onshore. The beach wrack reflects what lives just offshore. Kelp and other algae are the biggest contributors to the wrack on the Gulf of the Farallones beaches. Beach wrack also contains the dead and dying remains of fish, birds, and the formless masses of jellies.

Small shrimp-like amphipods, commonly called beach hoppers, feed on the rich food of beach wrack. They have gills that function almost like lungs yet must be kept wet from the damp sand to function.





### In the Swash Zone

Commonly called the sand crab or mole crab, *Emerita analoga* is the epitome of burrowing efficiency. While other crabs are able to move in any direction, the sand crab can only move backwards. Its rear legs are modified as paddles, which gives it very good swimming capability, an essential skill when it is stirred out of the sand by crashing waves. The sand crab burrows tail first into the sand, with its head near the surface facing seaward. Only its eyes and antennae are held above the sand. When a wave recedes, its large antennae are unfurled to capture phytoplankton. The entire population moves up and down the beach with the tides.

### Beyond the Tides

Though unseen by the beach stroller, there are several fish species that live in the sandy beach habitat. Skates, rays, and other flatfish patrol for prey just beyond the waves. When the tide is in, they have access to the intertidal crabs, clams, and worms. By flapping their “wings,” they create their own surf-like action to blow away the sand and expose their prey. Some fish feed just behind the leading edge of the breaking waves. Surfperches and sand eels take advantage of the dislodging force of the waves to grab crabs and worms otherwise unobtainable.

### Above the Tides



Probably the most familiar birds of the sandy beach are the little Sanderlings. These are the birds that move like little wind-up toys, darting back and forth at the edge of the crashing surf. Sanderlings seem as anxious to avoid getting wet as they do to snatch an exposed mole crab or worm. They aren't equipped to probe deep into the sand, so they try to find prey as it is stirred up by the waves and before it can re-burrow. The larger Willets with longer bills are less restricted to find loosened prey at the sand surface. The tips of their bills are sensitive and are able to feel tiny vibrations that indicate prey deeper in the sand.

Higher on the beach small Snowy Plovers chase about in the dry sand and beach wrack to snatch insects and beach hoppers from the surface. The most

noticeable birds of the beach, and certainly the loudest, are the ubiquitous gulls. These scavengers are opportunists that feed on most any food item tossed on the shore – whether by wave or picnicker.



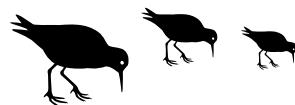
### Human Impact

Beaches are in constant motion with sand moving seasonally on and offshore and along the coast in the prevailing direction of wind and waves. A shoreline that moves 25 meters in 50 years gets noticed when it is near a manmade structure. Seawalls and groins have been used in the past to try to control the natural processes of erosion and deposition of sand. Building of any structure in the Sanctuary is strictly regulated, because it is very hard to correctly predict how the sand and water will flow around the new structure.

The sandy beach is a major deposition area for not only beach wrack but for anything that floats at the surface – flotsam and jetsam of merchant vessels and uprooted trees. Plastic and garbage on the beach may be mistaken for food by birds. Oil from spills and chronic pollution washes onto sandy beaches, coating the sand grains and animals. Toxic chemicals of oil kill many animals and may pollute the sandy beach for many years.

### Gulf of the Farallones National Marine Sanctuary

Through the Beach Watch program, the Gulf of the Farallones NMS monitors the beaches along its boundary with the help of volunteers. Every two to four weeks dedicated citizen scientists survey their beaches for marine life and human activity. Fluctuations in bird and marine mammal populations are detected in the long-term database. Volunteers find and report oil or tarballs on a beach and collect and preserve oil samples as evidence. The Beach Watch program provides additional eyes and ears for the Sanctuary's sandy beaches.



For more information contact:

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Gulf of the Farallones National Marine Sanctuary  
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