

Baseline Highlights from California's South Coast Sandy Beach Ecosystems

Monitoring the Secret Life of Beaches



About This Snapshot Report

This report highlights some key scientific findings from the sandy beach monitoring project, one of ten baseline projects in California's South Coast region.¹ This project evaluated the initial conditions of sandy beach ecosystems at the time of marine protected area (MPA) implementation. Facts and figures are derived from the project's peer-reviewed technical report and references,² and can be found, along with the data, at [OceanSpaces.org](https://oceanspaces.org).

Snapshot Report Vol 3



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THE SECRET LIFE OF BEACHES

Sandy beaches make up 36% of the South Coast shoreline and are among the most intensely used coastal ecosystems. Though they are extremely important to coastal cultures and economies, **the ecology of sandy beaches is not as well studied as many other marine ecosystems**, and they are often overlooked in conservation efforts. Sandy beach ecosystems extend from the breaking waves of the surf zone to the uppermost extent of unvegetated sandy habitat—this means the ecosystem often extends well above MPA jurisdiction, which ends at the mean high tide line.

Sandy beaches provide a number of critical functions and services, including habitat and prey resources for wildlife such as pinnipeds, birds, and fishes, buffering of storm impacts, water filtration, and nutrient cycling. Despite these important functions, many South Coast sandy beaches, including those in MPAs, are often altered by activities such as grooming or raking, vehicle and heavy equipment driving, berm building, and beach filling.

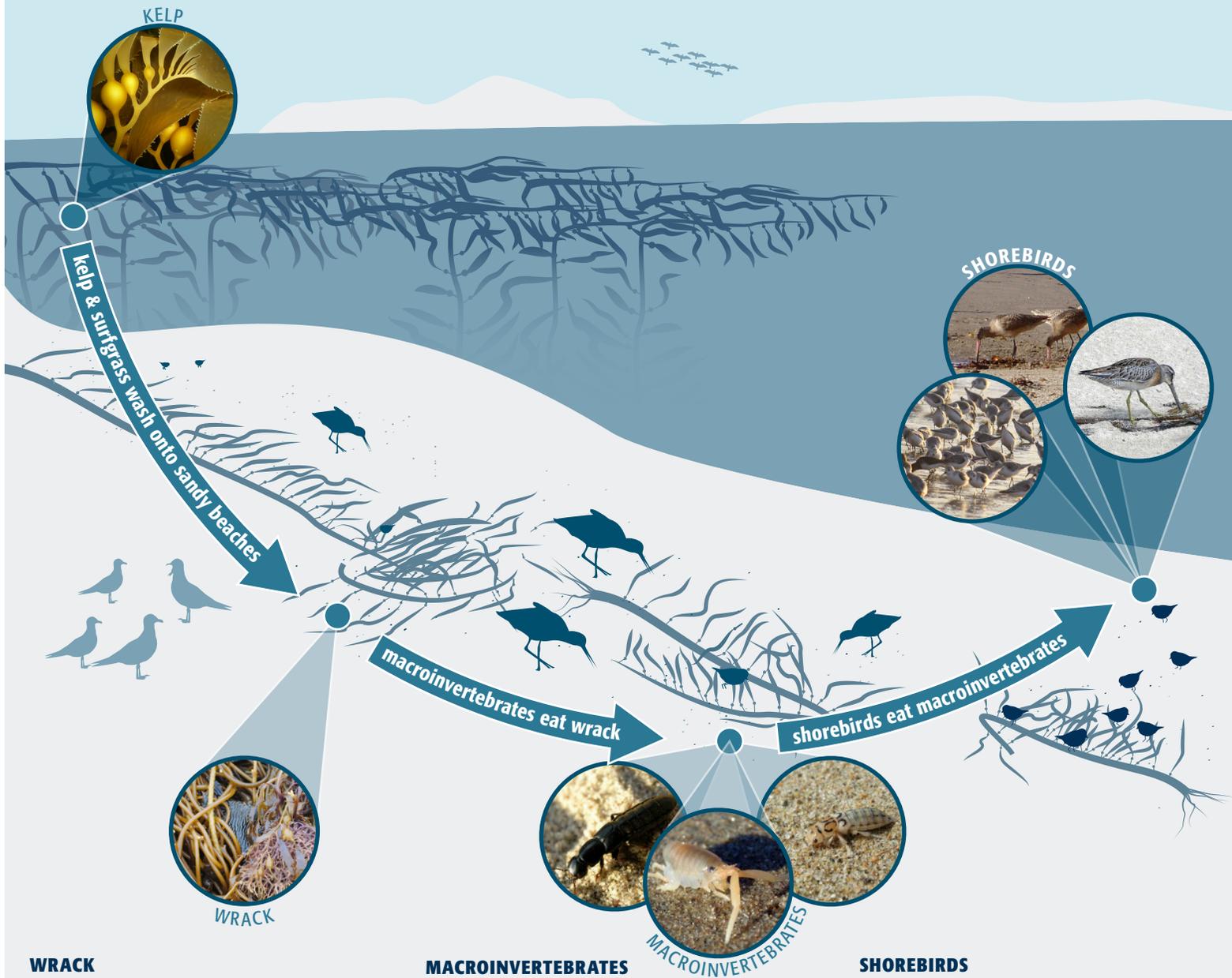
Sandy beaches rely on sediment inputs from rivers and coastal sources up-current to replace sand lost through wave action. These inputs have been severely restricted by dams and coastal armoring (e.g., seawalls, groins, revetments). In an attempt to compensate for this loss, millions of cubic meters of sand have been added to South Coast beaches over the last century.

Connected Ecosystems

In this project, researchers demonstrated a number of important relationships that shape South Coast sandy beach ecosystems and connect them to other ecosystems.

Key connections exist between sandy beaches and nearby kelp forests and rocky reefs—kelp and surfgrass wash ashore, forming 'wrack'. Wrack supports a large and diverse macroinvertebrate community, which in turn supports a large and diverse shorebird community. This sets the scene for the high diversity of species that rely on South Coast sandy beach habitats for survival.

Kelp Forest and Sandy Beach Connections in the South Coast



WRACK

Wrack is a key ecological connection between sandy beaches and nearby kelp forests and rocky reefs. Wrack accumulation is highly variable from beach to beach and throughout the year. Peak wrack abundance is in fall and early winter.

Wrack includes:

- giant kelp
- surfgrass
- feather boa kelp

Wrack accumulation is influenced by:

- nearby kelp forests and rocky reefs
- local wind and swell patterns
- presence of an upper beach zone for accumulation
- abundance of macroinvertebrate consumers
- beach grooming
- armoring of the shoreline

MACROINVERTEBRATES

Macroinvertebrates are more abundant and diverse on beaches with large amounts of wrack, which is an important food source for many species.

Macroinvertebrates are animals without a spine that can be seen with the naked eye. Researchers found they ranged from tiny flies and mites to large Pismo clams in the South Coast.

Unlike the fairly stable habitat provided by rocky and muddy shores, the sandy beach is always changing in slope, width, and profile. Beach macroinvertebrates must be highly mobile to adapt to the ever-changing conditions of waves, tides, and sand. Macroinvertebrates can more easily burrow on beaches with smaller sand grains and flatter slopes, especially in the “swash” zone. Beaches with these characteristics have a greater abundance and diversity of macroinvertebrates.

SHOREBIRDS

Beaches with more abundant and diverse macroinvertebrate populations support more abundant and diverse shorebird populations.

Shorebirds were the most abundant group of birds observed. Shorebirds utilizing South Coast sandy beach habitats tend to spend the majority of the year in California, only leaving during the summer breeding months.

Small, wrack-associated macroinvertebrates and swash-riding sand crabs are especially important food sources for shorebirds

73 Total Bird Species Observed
27,982 Total Birds Counted
 Average Survey Abundance: **94** birds/km
 Average Survey Diversity: **7.4** species/km



SHOREBIRDS
 Birds Counted **2,555**
 Species Observed **24** (e.g. *Western Snowy Plover*, *Marbled Godwit*)
 Peak Abundance **April**
 Main Activities **Feeding**



SEABIRDS
 Birds Counted **2,695**
 Species Observed **11** (e.g. *Double Crested Cormorant*, *Brown Pelican*)
 Peak Abundance **Fall & Winter**
 Main Activities **Roosting & Feeding**



GULLS
 Birds Counted **1,494**
 Species Observed **6** (e.g. *Western Gull*, *Heermann's Gull*)
 Peak Abundance **November–January**
 Main Activities **Roosting & Feeding**



WADING BIRDS
 Birds Counted **241**
 Species Observed **7** (e.g. *Snowy Egret*, *Mallard*)
 Peak Abundance **November**
 Main Activities **Feeding**



TERRESTRIAL BIRDS
 Birds Counted **997**
 Species Observed **29** (e.g. *Black Phoebe*, *American Crow*)
 Peak Abundance **Summer**
 Main Activities **Feeding**

HUMANS

Researchers saw people utilizing sandy beaches in the South Coast in the following ways:

- walking and jogging
 - socializing
 - dog-walking
 - fishing
 - surfing
 - beach play
 - sunbathing
 - photo shoots and filming
- People Counted: **11,893** (avg. 34.4 people/km)
 - Dogs Counted: **183** (avg. ~1 dog/km)
 - Peak Density: **July** (avg. 85.5 people/km)
 - Minimum Density: **January** (avg. 3.9 people/km)
 - Peak Survey Density: Over **500** people/km were recorded at San Clemente State Beach during one summer survey.

SOUTH COAST SANDY BEACHES: BIODIVERSITY HOTSPOTS?

The South Coast may represent a biodiversity hotspot for sandy beach macroinvertebrates, due to high diversity, abundance, and biomass when compared to global values.

A total of 87 macroinvertebrate types were observed during this study, with a peak of 45 species observed at Isla Vista Beach. More than 30 species were observed in a single survey at half of the study beaches. Approximately 45% of observed macroinvertebrate species use wrack as food and/or habitat, including 34 species of endemic beach beetles, several of which are flightless.

Macroinvertebrate abundance peaked at 134,649 individuals per meter at East Campus Beach, with abundances of more than 40,000 individuals per meter at five of the study beaches.

Peak biomass in this study was 8,685 grams per meter at Leo Carrillo beach, and over 5,000 grams per meter were observed at four beaches. These high biomass values are especially important for fish feeding.



Innovations in Citizen Science

Researchers worked with LiMPETS,³ a citizen science group that focuses on monitoring sandy beach and rocky intertidal ecosystems, primarily with middle and high school students. They compared the results of surveys conducted using the baseline project protocol with those conducted using the LiMPETS protocol. Recommended updates to the LiMPETS protocol would better incorporate the dynamics of mobile beach animals and enhance the rigor of this educational program. These modifications could potentially **produce more scientifically rigorous data while still being appropriate for students** with little or no data collection experience or knowledge of intertidal species.

Researchers are also collaborating with Surfrider Foundation and other groups to develop **"All Ashore," a new citizen science program for monitoring a wide range of physical and biological beach metrics**. As part of this new program, they are creating a website and iPhone/iPad application to aid with beach species identification.



Suspension Feeders on Sandy Beaches

Researchers found that by weight, the **sandy beach macroinvertebrate community is dominated by suspension feeders**. These animals sieve plankton, moving to follow the swash zone to maximize feeding. The most abundant players in the South Coast are fast moving sand crabs and colorful bean clams. Sand crabs made up an average of 50% of the biomass, making these highly mobile crabs a good indicator of food availability for shorebirds and fishes that forage in the surf zone. The striking seasonal variation in sand crab abundance observed on several study beaches may be associated with important food web interactions, such as predation by fishes. Seasonal declines in sand crab abundance were particularly striking in older MPAs, such as San Diego-Scripps Coastal SMCA, where fish were regularly observed feeding in the swash zone.



About South Coast MPA Baseline Monitoring

California Ocean Science Trust, California Department of Fish and Wildlife (CDFW), California Ocean Protection Council (OPC), and California Sea Grant coordinated and collaborated in implementation of baseline monitoring, which was funded by OPC. Results from this work will inform CDFW management recommendations to the California Fish and Game Commission from the first five years of MPA implementation in the region, anticipated in 2017. MPA monitoring results can also inform the management of fisheries, water quality, coastal development, and climate change.

Footnotes

1. To learn more about the sandy beach baseline monitoring project, visit <http://oceanspaces.org/sc-sandy-beach>
2. Jenifer E. Dugan, David M. Hubbard, Karina J. Nielsen, Jessica Altstatt, and Julie Bursek. 2015. Baseline Characterization of Sandy Beach Ecosystems along the South Coast of California. California Sea Grant. San Diego, CA. 134pp. <http://goo.gl/LCBkyv>
3. Long-term Monitoring Program and Experiential Training for Students <http://oceanspaces.org/limpets>