### EDUCATOR EDITION

with classroom resources at the back!

LAKESIDE FARMS ELEMENTARY PRESENTS

# LIFE ON THE EDGE

WE ARE HEROES FOR THE TIDEPOOLS AND YOU CAN BE TOO!



## LIFE ON THE EDGE

WILDCOAST, founded in 2000, is an international non-profit organization that conserves coastal and marine ecosystems and addresses climate change through natural solutions. Through the establishment and management of protected areas, the advancement of conservation policy, and the direct engagement of local communities in stewardship projects, WILDCOAST is conserving more than 31.6 million acres of some of the most ecologically important coastline, wetlands, islands, and marine wilderness in California and Mexico.

WILDCOAST partnered with the incredible student scientists at Lakeside Farms Elementary School to collect data, educate the public, and conserve our local tidepools.

A special thanks to Points of Light KPMG Youth Grants for funding this work.

### FOR MORE RESOURCES VISIT WILDCOAST.ORG









Tide pools are Pools of water left behind in the rocks during low tide.

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Anika Sth Grade













Tide pools are home to a lot of. amazing creatures! My favorite tide pool critter is a Stripped Shore crab!

5th Grade

ara



### My fyrerite tide Poor critter is ynor them ".

3779

CRIISTI UN 4+4 SALE



Fun Fact about startfish if one of there legs

Tristan 5th Grade



Tidepools are theatened by humans by Stepping on rocks and sea critters,





Keita 5th gtat





Tide pools are threatened by humans because we are touching and hurting the tide pools.

Tide pools need to be protected because there are many creatures that depend on the habbitat they live in.

Cheyenne 55grade

Tide pools are important to me because they are home to may different types of sea creatures.

Kylinn Stand

OB CONTRACTOR

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Lan a hero when I leave all the creatures in the tide pool. NISS S. Mia G





## The Intertidal Zone

The intertidal zone, the unique area between the high and low tide lines, is a harsh and unforgiving habitat. The highly conditioned species that live there are subject to the rigors of both the land and the sea, going from completely submerged to only occasionally wet within just a few feet of space. Organisms that inhabit the intertidal zone must endure extreme fluctuations in moisture level, temperature, salinity, and sunlight creating a robust assortment of biologically diverse organisms. These fascinating creatures boast an even more fascinating set of adaptations, creating an adventure for anyone who visits this space between the land and the sea.





### **Key Words**

Intertidal Zone: The area between high and low tides.

**High Tide:** The tide when the water is at its highest level.

Low Tide: The tide when the water is at its lowest level.

Adaptation: A physical or behavioral change that helps an organism survive in its environment.

**Photosynthesizer**: An organism capable of using sunlight and carbon dioxide to make food (in the form of sugar). Most plants and algae are photosynthesizers.

**Brown Algae**: A group of organisms in the class Phaeophyceae, Kingdom Protista. Brown algaes are a large group of mostly marine multicellular algae, including many of the kelp (seaweed) species found in colder Northern Hemisphere waters. Many algaes, such as kelp, anchor themselves using a root-like structure called a holdfast, rather than the taproots present in plants.

Salinity: The concentration of dissolved salt in water.

**Desiccation:** A state of extreme dryness caused by prolonged periods of being out of the water.



Competition for space is a common challenge of living in the intertidal zone.

### There are many **advantages** of living in the rocky intertidal including:

- Many organisms have adapted to the constant battering of waves by permanently affixing themselves to the rocks, while other mobile creatures get "stuck" in pools of water during the low tide. This, combined with the close proximity of organisms in the intertidal, creates an abundance of food.
- Photosynthesizers, such as brown algae and plants, are typically abundant in the intertidal and can help support an entire food chain.
- Wave action supplies a constant influx of oxygen and nutrients.
- Varied substrate provides good places to cling to and ample places to hide.

However, there are also many challenges of living in the rocky intertidal:

- Intertidal organisms must deal with both marine predators during high tide and terrestrial predators during low tide.
- Wave action can carry unprotected animals out to sea.
- The changing water level leads to variances in salinity (the saltiness of the water).
- The intertidal is marked by plentiful sunlight, which may lead to desiccation (drying out) and increased water temperatures.
- Space is often extremely limited, forcing organisms to compete for substrate.

In order to survive in this harsh environment intertidal organisms have evolved a wide array of specialized adaptations.



### Adaptations

To deal with the wide variety of challenges in the rocky intertidal, organisms developed an even wider array of adaptations:









**THREAT**: Constant pounding of waves **ADAPTATIONS**: Some animals such as echinoderms (sea stars, urchins) cling fast to rocky substrates. Other organisms such as crabs find shelter inside of crevices or thick mats of kelp.





**THREAT**: Desiccation **ADAPTATIONS**: Some bivalves, like clams, clamp down their shells to limit water loss. Some mollusks, such as marine snails, slow down evaporation rates with hard outer layers. Some crustaceans, like barnacles, cluster together to reduce individual exposure.

**THREAT**: Predation from terrestrial species (birds and mammals) **ADAPTATIONS**: In addition to fastening to substrate and closing their protective shells, organisms tend to gravitate towards the lower intertidal zones, towards deeper water and abundant hiding places, that is, for safety.



### Tidepools

The intertidal zone is the strip of land that exists between the high and low tide lines. During high tide this area may be completely submerged while low tide sees moisture only from the random wave.

Unique within this habitat is the "rocky intertidal," intertidal areas filled with rocks. When the tide goes out small pools of water are left behind in the rocks, creating a haven for those intertidal creatures looking for more moisture. These "tidepools" boast a distinctive assortment of creatures that lend themselves well to lessons focused on adaptations and biodiversity.





## **Tidepool Etiquette**

- Watch where you step, that might not be a rock!
- Leave things how you found them. If you turn over a rock put it back exactly how you found it.
- **Take only pictures.** Leave all rocks, plants, animals, and other tidepool creatures exactly how you found them.
- Leave animals be. Tidepool organisms have a hard enough life as it is without being touched by a bunch of sticky fingers.
- **Be careful where you put your fingers.** Many animals like sea urchins and crabs have defenses against predators.
- Never turn your back on the ocean....it needs you too much! But seriously, watch out for waves and the incoming tide.



### Marine Protected Areas (MPAs)

California's coastal and marine ecosystems are some of the most iconic and treasured resources in the state and contribute greatly to the history, identity, and economy of the area. Unfortunately, these same ecosystems are also some of the most exploited and without proper care the long-term health of these resources is in jeopardy. Recognizing the need to safeguard California's coastal and marine ecosystems, the state legislature passed the Marine Life Protection Act in 1999. This act aimed to protect California's precious marine resources by creating a statewide network of marine protected areas (MPAs). Designed to protect the diversity and abundance of marine life while still maintaining recreational access for people, MPAs now protect over sixteen percent, or 850 miles, of the California coast.

Just as state parks protect resources on land, MPAs protect resources in the ocean by managing human activities within biologically important areas. The Marine Life Protection Act recognizes that a combination of MPAs with varied amounts of allowed activities and protections (marine reserves, marine conservation areas, and marine parks) can help conserve biological diversity, provide a sanctuary for marine life, and enhance recreational and educational opportunities.

There are 11 MPAs in San Diego County that fall under three categories:

### **Key Words**

Marine Protected Area (MPA): MPAs are areas in or near the ocean made to protect or conserve marine life and habitat, safeguard cultural sites, and provide enhanced recreational opportunities.

Natural Resource: Materials or substances such as minerals, forests, water, or animals that are found in nature and are valuable to humans.

**Take**: To hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill.

#### State Marine Reserve (SMR)

Take, damage, injury, or possession of any marine resource (living, geological, or cultural) is prohibited. Recreational activities are encouraged.

Matlahuayl South La Jolla Cabrillo

No-Take State Marine Conservation Area (SMCA)

Take, damage, injury, or possession of any natural resource (living, geological, or cultural) is prohibited.

Batiquitos Lagoon San Elijo Lagoon Famosa Slough

#### State Marine Conservation Area (SMCA)

Take, including fishing/harvest of some marine resources is permitted. Some consumptive recreational and commercial activities are allowed at specific locations.

Swami's





# Tidepool in a Pan

#### Lesson adapted from Buggy and Buddy All photos from:

https://buggyandbuddy.com/tide-pool-science-experiment-kids/

#### Materials

Dish pan or paint tray Lots of rocks and stones in various sizes Mini toy sea creatures Water

#### Directions

1. Fill your dish pan with rocks and stones. Make sure to arrange them so there are varying levels of rocks in your pan, resembling the levels of a tidepool.

2. Place your mini animals in the tide pool model.

3. Before adding water, discuss which animals will be underwater first as water is added.

4. Begin to add water one pitcher or cup at a time. (Pay attention to which animals are covered with water first.)

5. Continue adding water until you reach high tide. Notice how all the animals are underwater during high tide.

6. Before dropping your water level to low tide, discuss which animals will be exposed to the air first. Begin removing water one pitcher at a time until you've reached low tide. Notice how at low tide most animals are exposed to air. (This is a great time to talk about any body parts or movements sea creatures have to help them with low tide!)







TIDEPOOLS ARE DIVERSE AND IMPORTANT COASTAL ECOSYSTEMS.THEY PROVIDE SHELTER AND FOOD FOR SOME OF THE MOST AMAZING CREATURES WITH DIVERSE ADAPTATIONS SUCH AS SEA ANEMONES, SEA STARS, BARNACLES, CRABS, SHOREBIRDS, AND EVEN OCTOPUS AND LOBSTER.

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WILDCOAST AND THE STUDENTS AT LAKESIDE FARMS ELEMENTARY ARE WORKING TO SAVE TIDEPOOLS AND YOU CAN HELP!

