

Grades	NGSS	Enhanced Whale Watching Cruise
K	K-LS1: Survival methods for plants and animals.	We will observe marine animals and plants and discuss survival methods in a marine environment.
	K-ESS3: Explain the resources used by animals and plants; how can humans reduce their usage and impact.	We will discuss the resources marine animals and plants use in the ocean and how humans compete for these same ocean resources.
	K-2-ETS1: Ask questions and make inferences on a problem that can be fixed through technology.	Through our EWW Cruises we explore problems facing the ocean (pollution, ocean noise, overfishing) and ways technology could help solve these issues.
1 st Grade	1-PS4: Sound waves make vibrations and vibrating matter can make sound	Demonstrations of waves making vibrations and in turn making sounds through use of a tuning fork and discussing dolphin echolocation.
	1-LS1: Adults and offspring both contribute to the survival of the offspring	Discussions of dolphin pods working together to take care of offspring and how it differs from the large baleen whale parental care. This is demonstrated when viewing wild dolphin during our marine mammal observations onboard
2 nd Grade	2-LS4: Different & similar ecosystems have diverse living organisms .	We will observe species diversity within coastal Orange County ;marine mammals, fish, birds and more all within a similar ecosystem. Some of these animals can be seen on land as well, which is a very different ecosystem.
3 rd Grade	3-LS2: living in groups is a way of life for some species; foraging, defense from predators and dealing with environmental changes can be easier in groups	We will observe and discuss why dolphin live in pods, why fish school, and why coastal marine birds flock together. We will touch upon how these species deal with and adapt to environmental changes . This is demonstrated when viewing wild dolphin during our marine mammal observations onboard
	3-LS4: All organisms have a tolerance of specific habitats, where some can thrive others cannot. Over time environments will go through long sometimes permanent changes.	Marine Mammals like whales and dolphin choose to live within or migrate through Orange County. We discuss why these animals can be seen year round, or only seasonal, and some new species who have only recently been sighted in the area and why.
	3-LS3: Characteristics and traits that individuals possess can be from inheritance or caused by the environment.	Discussions the differences between baleen and toothed whales and how the characteristics and traits they possess are shaped from inheritance and environmental pressures.
	3-LS1: Animals and plants have unique life cycles but within those cycles they have birth, reproduction and death.	We discuss planktons importance in the food web through their prolific life cycle via our plankton tow. Life cycles of cetaceans are also discussed.
4 th Grade	4-PS3: Energy is transferred from object to object or place to place through heat, light, and sound	We discuss how plankton grow through photosynthesis (plankton tow) and how dolphin hunt with sound (use of onboard tuning fork).
	4-LS1: Animals have a unique variety of structures in their body to receive, process and react to stimuli.	Students will have the chance to observe & investigate the anatomy of skulls, teeth & body parts of marine animals through our on board marine artifacts.

Grades

NGSS

Enhanced Whale Watching Cruise

5th Grade

5-LS1: Plants develop from air and water.

We explain how marine plants (seaweeds/ algae) get air & fresh water for growth.

5-PS3: Energy in the form of food is a core component of all living things to survive.

Living in the ocean can be a cold life; we discuss how the energy from food helps large whales maintain body heat & homeostasis.

5-ESS3: Human's advancements have had major impacts on all ecosystems.

We discuss how humans impact the oceans and animals within through marine plastic debris removal and discussion.

MS

MS-LS1: Photosynthesis uses carbon dioxide and water; then releases oxygen.

We will look at phytoplankton through microscopes and discuss how important these microscopic plankton are to oxygen production for Earth through a process called photosynthesis.

MS-LS2: Organisms rely on their environment and interactions with other organisms for survival.

We describe the food web in the ocean and how all these things depend on the organisms around them surviving. There are finite resources in an ecosystem, if a resource changes it will affect all living and nonliving things depending on that resource.

MS-LS4: Survival of the fittest models.

Evolution of cetaceans allowed for certain species to thrive while others became extinct. We go over why and how these mammals made it to the sea, and what traits allowed these marine mammals to survive to the cetaceans we know today.

MS-ESS3: Human's have impacted and altered their environments. Sometimes this is good sometimes its not.

We delve into how marine protected areas work, why they need to be enacted along our coast, and what types of successes we are seeing with our local MPA off of Crystal Cove State Park.

Grade	NGSS	General Whale Watching <i>With On-board Naturalist</i>
K	K-LS1: Survival methods for plants and animals.	We discuss survival methods marine organisms use to avoid predation in the marine food web.
1 st Grade	1-PS4: Sound waves make vibrations and vibrating matter can make sound	Demonstrations of waves making vibrations and in turn making sounds through use of a tuning fork and discussing dolphin echolocation.
	1-LS1: Adults and offspring both contribute to the survival of the offspring	Discussions of dolphin pods working together to take care of offspring and how it differs from the large baleen whale parental care
2 nd Grade	2-LS4: Different & similar ecosystems have diverse living organisms .	We will observe species diversity within coastal Orange County ;marine mammals, fish, birds and more all within a similar ecosystem. Some of these animals can be seen on land as well, which is a very different ecosystem.
	2-PS1: Substances that are heated or cooled can be observed; sometimes the change can be reversed	We cannot “see” the ocean temperatures changing just by looking at it; but we will discuss the effects changing temperatures have on organisms that live within the ocean, and what drives these temperature changes.
3 rd Grade	3-LS2: Living in groups is a way of life for some species; foraging, defense from predators and dealing with environmental changes can be easier in groups.	We will observe and discuss why dolphin live in pods, why fish school, and why coastal marine birds flock together. We will touch upon how these species deal with and adapt to environmental changes .
	3-LS4: All organisms have a tolerance of specific habitats, where some can thrive others cannot. Over time environments will go through long and sometimes permanent changes.	Marine Mammals like whales and dolphin choose to live within or migrate through Orange County. We discuss why these animals can be seen year round, or only seasonal, and some new species who have only recently been sighted in the area and why.
4 th Grade	4-LS1: Animals have a unique variety of structures in their body to receive, process and react to stimuli.	Students will have the chance to observe & investigate the anatomy of skulls, teeth & body parts of marine animals through our on board marine artifacts.
5 th Grade	5-LS1: Plants develop using air and water.	We explain how marine plants (seaweeds/ algae) get air & fresh water for growth.
	5-PS3: Energy in the form of food is a core component of all living things to survive.	Living in the ocean can be a cold life; we discuss how the energy from food helps large whales maintain body heat & homeostasis .

Grade	NGSS	MPA STEM Cruises
Middle	MS-LS2: Organisms are dependent on their ecosystems and the interactions within. Competition for resources within an environment can limit an organisms livelihood. Changes in biodiversity and ecosystems has affects on humans.	We will investigate the health of an ecosystem based upon the fish and plankton biodiversity. The available resources such as habitat, food availability and the quality of those resources. We will explore how the coastal kelp forest habitat affects humans . (Digital Fishing Station)
	MS-LS1: Photosynthesis occurs in the ocean and produces oxygen and sugar.	We discuss marine phytoplankton and algae photosynthesis & simple sugar production and their importance for the marine and terrestrial habitats on Earth. (Plankton Station)
	MS-ESS3: Human activity on Earth has had many negative effects but some positive. As we consume resources this has impacts on the surrounding environment.	While immersed in an MPA on a sportfishing boat, we will discuss what causes humans to implement restricted ocean areas , why there is a need for MPA's, and how they positively impact marine ecosystems.
High School	HS-LS1: The process of photosynthesis converts water and CO2 into sugars and O2.	Aboard, we discuss phytoplankton, algae and their importance in photosynthesis , creating more than 50% of Earth's O2.
	HS-LS2: Carrying capacities are regulated by finite, nonliving and living resources. Minor changes to an environment can have little to possibly no effects on an ecosystem, where large changes can have more drastic effects. Human involvement can have major negative impacts on ecosystems.	Marine ecosystems are adaptive to small changes, but with overfishing, climate change, near shore pollution create more negative human impact on the environment , we discuss the reasons behind MPA implementation and how humans have impacted the kelp forest ecosystems.
	HS-LS4: The ever changing environments have influenced different species in a positive way or in more severe ways. Environments can change drastically, leading to the extinction of some organisms who can no longer replace their loses.	We discuss the changes overtime in an environment by discussing keystone species and by studying the presence or absence of certain key kelp forest species . The long term data we've been collecting shows the impacts that MPA's can have on the species we've been monitoring.
	HS-ESS3: Humans now have the ability to predict, model and manage current or future human impacts.	The MPA is a great example of environmental management for future and current impacts on kelp forest ecosystems. Analysis of our long term data collection can assist in understanding human impacts.