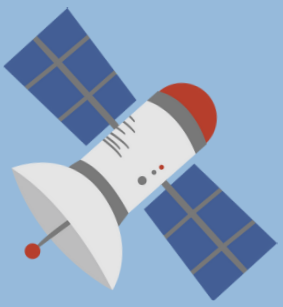
Data to Waves



Ages: 7+ **Players: 2-4**

Background:

Earth's surface is predominately covered by water. Places like oceans, rivers, and lakes provide us all with the resources we need to survive and thrive. Yet our bodies of water face challenges that can disrupt societal and economic prosperity of communities. Phenomenons such as overfishing, ocean acidification, and Harmful Algal Blooms (HABs) can affect the livelihood of communities in addition to their ability to withstand natural disasters. It is important to recognize the work that is being done by satellite imagery and Earth observations data to combat these harms. *Data to Waves* aims to teach students about the different aspects of ocean health through the lens of data that can be tracked by satellites. If you want to explore more of what members of the Earth observation community are doing, visit eo4sdg.org.

Materials:

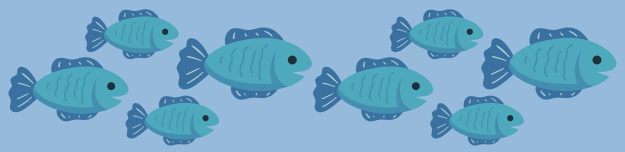
Materials included: 1 game board, 17 event cards, and 12 player piece circles.
Additional materials needed: 1 pair of scissors (to cut out pieces) and 1 six-sided die.

Setup:

1. Cut along the dotted blue lines on the two sheets of paper. This should result in 17 square cards and 12 small circles.
2. Place the game board face up and the 17 event cards face-down next to the board. Shuffle the cards before game play.
3. Each player will pick one of the small circle cut-outs to be their game piece for the game.
4. Place all player pieces on start (which is the bottom left tan circle with beans on it).

Instructions:

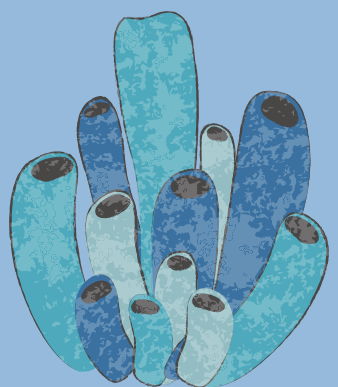
Each player will start by placing their circular game piece on the start circle. Players take turns, from youngest to oldest, rolling the six-sided die and moving that number of spaces. When a player lands on a circle with a , they will draw one card from the event cards pile and follow the instructions on the card. Some cards will tell the player to move backwards and some to move forwards. If you run out of event cards, shuffle the cards and reuse them. The game ends once one of the players reaches the circle at the top of the board labeled "End," indicating they have successfully completed their journey along the waves!



Start

End

Data to Waves



Stay away Harmful Algal Blooms (HABs)! HABs happen when algae harm people and animals. One action that contribute to HABs include a type of pollution called eutrophication, caused by excess amounts of nutrients from agriculture and sewage runoff. Yuck! **Move back three circles.**

What's with all this acid? Oceans absorb a lot of our atmosphere's carbon dioxide (CO_2). When atmospheric CO_2 levels increase, so do the ocean's levels. Too much CO_2 in seawater increases ocean acidity, harming ocean habitats and having large-scale negative effects. **Move back two circles.**

Not that bycatch! Bycatch is when people accidentally capture additional species when fishing for a specific one. This can cause population decline, economic loss for fishing communities, and disruption of ecosystems. **Move back one circle.**

Oh no! A storm! Mangroves are tropical shrubs and trees that remove carbon dioxide from water and protect against floods. Unfortunately, natural disasters such as hurricanes, can damage mangroves, increasing societal and economic vulnerability. **Move back three circles.**

Why so salty? The ocean is pretty salty. But the specific ocean saltiness, or salinity, is a key indicator of ocean health. When the ocean salinity is not balanced, it can cause a host of problems for fisheries, coastal communities, coral reefs, water quality, farmers, etc. **Move back two circles.**

Grab your gear! Large debris such as fishing gear can include things like lines, nets, pots, traps, and more. When people lose their gear, it often entraps and harms all kinds of sea animals and habitats. **Move back four circles.**

Coral work with microscopic algae to receive the necessary nutrients to survive. When ocean temperatures rise, coral get rid of these algae from their tissue out of stress. This often leads to a whitening color change known as coral bleaching. **Move back one circle.**

Sediments! Construction and agriculture processes can increase sedimentation, the accumulation of sediments on the seafloor. Sediments, when deposited into coral reefs, can block the ability of the coral to receive sunlight and therefore nutrients, making the corals sick. **Move back two circles.**

Pathogens beware. Pathogens are tiny microorganisms that can cause people and animals to get sick. These microorganisms can get into bodies of water through leaky septic systems, poorly treated sewage, farm runoff, pollution, and more. **Move back three circles.**

Thank you satellites! Satellites monitor Earth every day. The Surface Water and Ocean Topography (SWOT) mission is led by NASA and CNES. SWOT survey's both fresh and saltwater areas and covers the whole Earth at least once every three weeks! **Move forward three circles.**

Nothing Fishy here! Scientists use information about phytoplankton (microscopic algae) to predict catch rates for up to 4 years! This information can help fisheries plan for the future. **Move forward three circles.**

Not that CO2! While too much carbon dioxide in the water can harm ocean ecosystems, mangroves can help. Mangroves help to remove carbon in a process called carbon sequestration. **Move forward two circles.**

Thank you, estuaries! Estuaries are places where freshwater and saltwater meet. Estuaries provide natural habitats for animals, support for public infrastructure serving as harbors and ports, and protect communities from storms and floods. **Move forward one circle.**

While Harmful Algal Blooms (HABs) are fast increases in harmful algae, satellites and earth observations can help tackle HABs by monitoring their location and acting as a warning system for people. **Move forward four circles.**

Yay for coral health! While corals are often bleached, there are ways to try and help mitigate these effects. One example of this is coral assisted evolution! This includes using genetic modification to help corals adapt to warmer waters. **Move forward two circles.**

Ever heard of a marine protected area (MPA)? MPAs are areas in the ocean where people have created limits on human activity. These protections can help address overfishing, pollution, habitat decline, and more! **Move forward three circles.**

Traps galore! Certain types of fish, such as lionfish, are invasive to the ocean. The National Oceanic and Atmospheric Administration (NOAA) recently created a lionfish trap to help control populations. It also provides humans with a source of protein! **Move forward two circles.**