



The Mystery of the Disappearing Shells



NATIONAL MARINE
SANCTUARIES

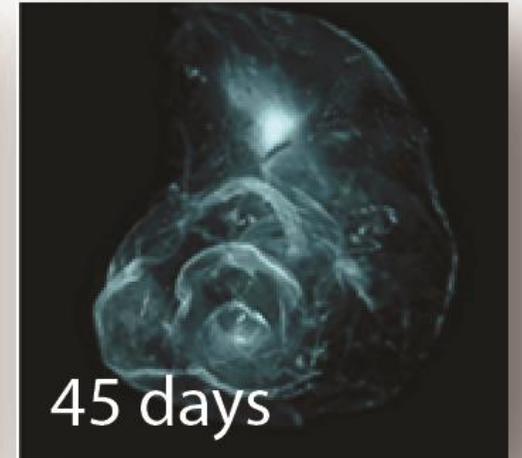
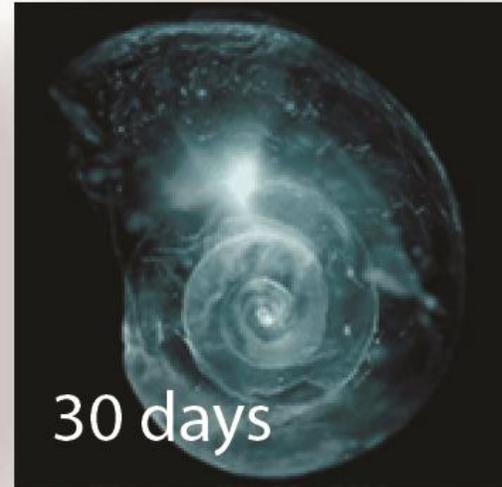
What type of organism might this be? What differences do you observe?

Pteropods (Sea Butterflies)



Magnified from pinhead size

What is happening to the pteropod shown here? Why?



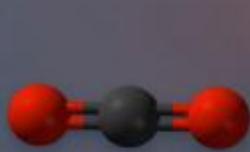
Magnified from pinhead size

Let's Experiment!

OCEAN ACIDIFICATION

HOW WILL CHANGES IN OCEAN CHEMISTRY AFFECT MARINE LIFE?

CO₂ absorbed from the atmosphere



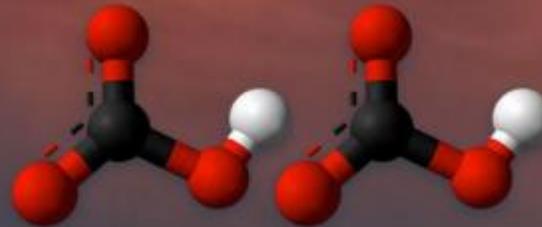
carbon dioxide



water

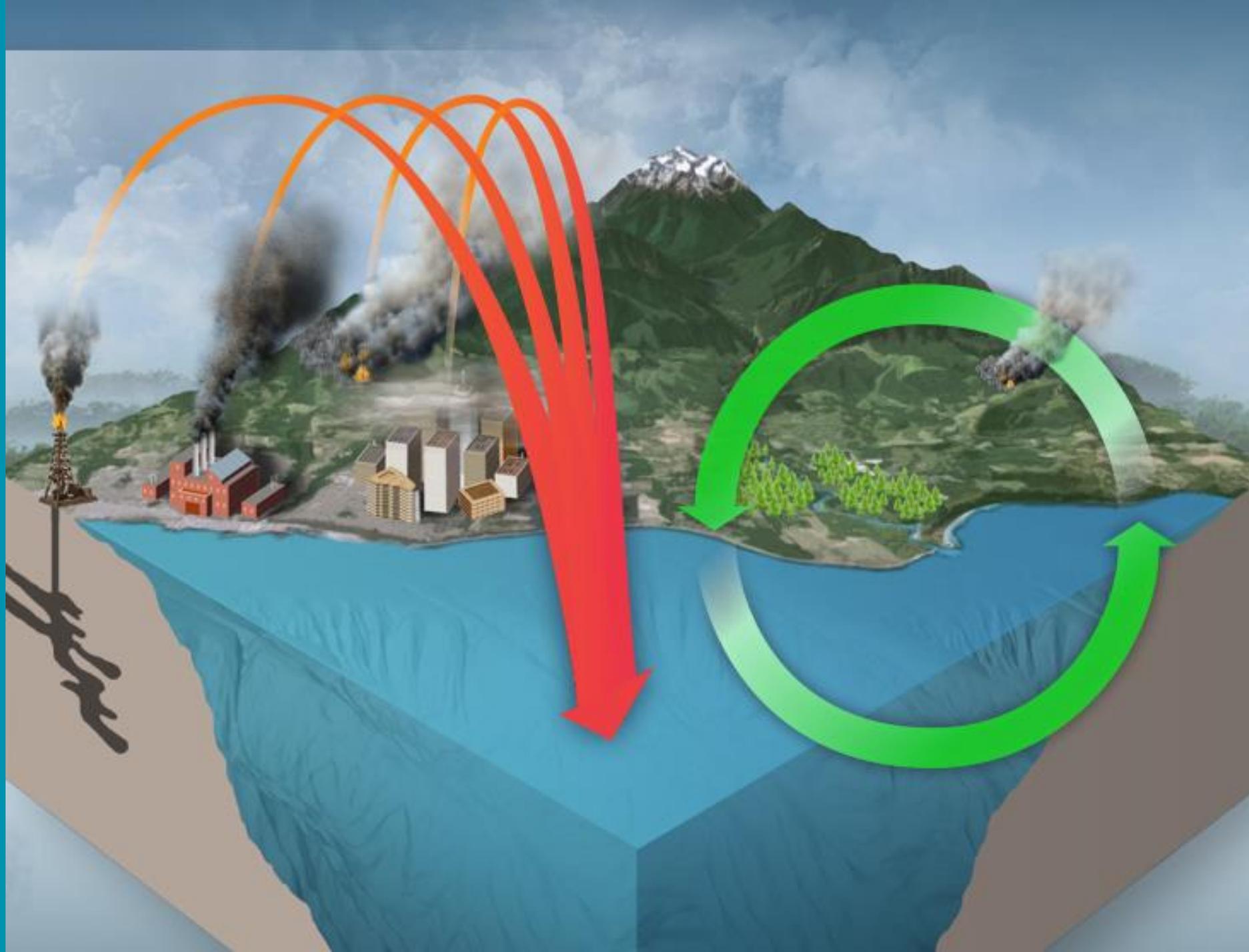


carbonate ion



2 bicarbonate ions

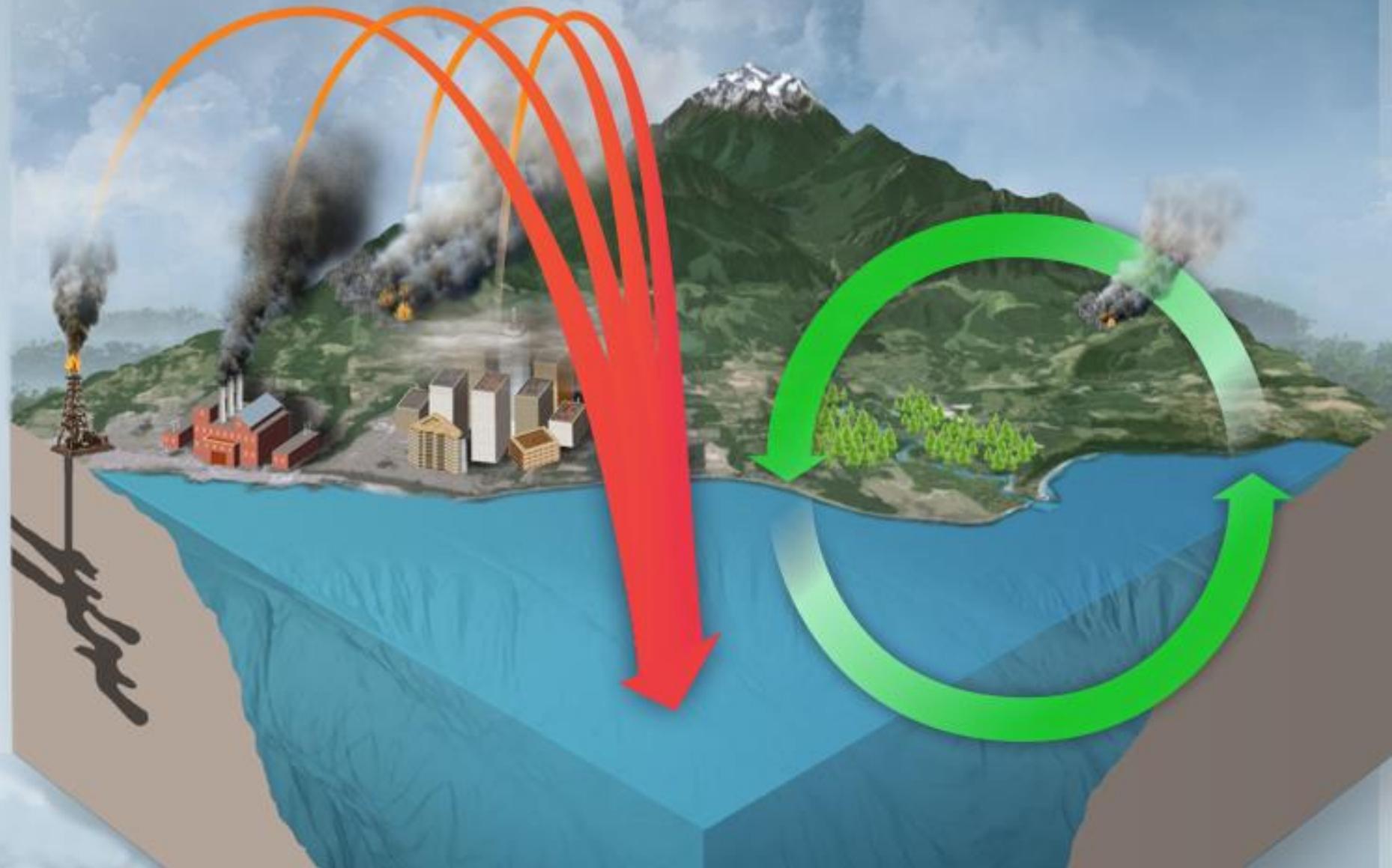
consumption of carbonate ions impedes calcification



The Ocean's Role in the Global Carbon Cycle

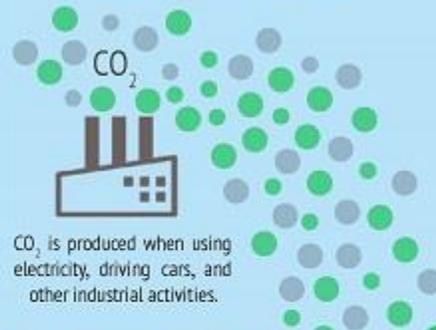
Prior to the industrial revolution carbon dioxide (CO_2) was absorbed from the air by land plants, exported via rivers to the ocean and released back into the air creating a balanced cycle on time scales of centuries to millennia.

Today, humans are altering this balance by releasing fossil carbon (e.g. coal, oil, natural gas). About one third of the fossil CO_2 is absorbed by the ocean, changing the ocean from a net source of CO_2 to the air to a net CO_2 sink.



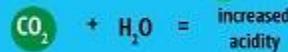
ACIDIFICATION IN OUR OCEAN

OCEAN ACIDIFICATION: Our ocean absorbs excess CO_2 when we burn fossil fuels to power cars and create electricity. This excess CO_2 increases acidity in our ocean on a global scale.

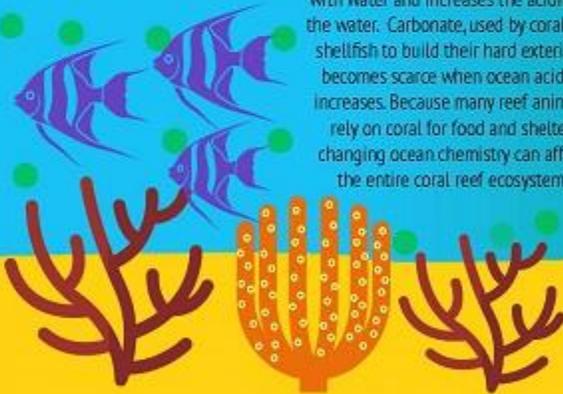


We, as humans, are deeply connected to our ocean whether we realize it or not. Our ocean regulates climate like the heart regulates blood flow in our bodies. Humidity, rain, and temperature are all controlled by our ocean. Burning fossil fuels adds excess heat and carbon dioxide that disrupt this system and make it harder to maintain a stable climate.

COASTAL ACIDIFICATION: Nutrients entering the water from land exacerbates acidification in near shore waters.



The ocean absorbs CO_2 , which mixes with water and increases the acidity of the water. Carbonate, used by coral and shellfish to build their hard exteriors, becomes scarce when ocean acidity increases. Because many reef animals rely on coral for food and shelter, changing ocean chemistry can affect the entire coral reef ecosystem.



Plankton populations thrive in high nutrient environments and can become so dense that they block light from sun-dependent organisms like coral. When this algal bloom dies, the plankton sink and are broken down. The decay process depletes oxygen and adds nutrients, exacerbating changes in ocean chemistry and creating a challenging environment for marine life.



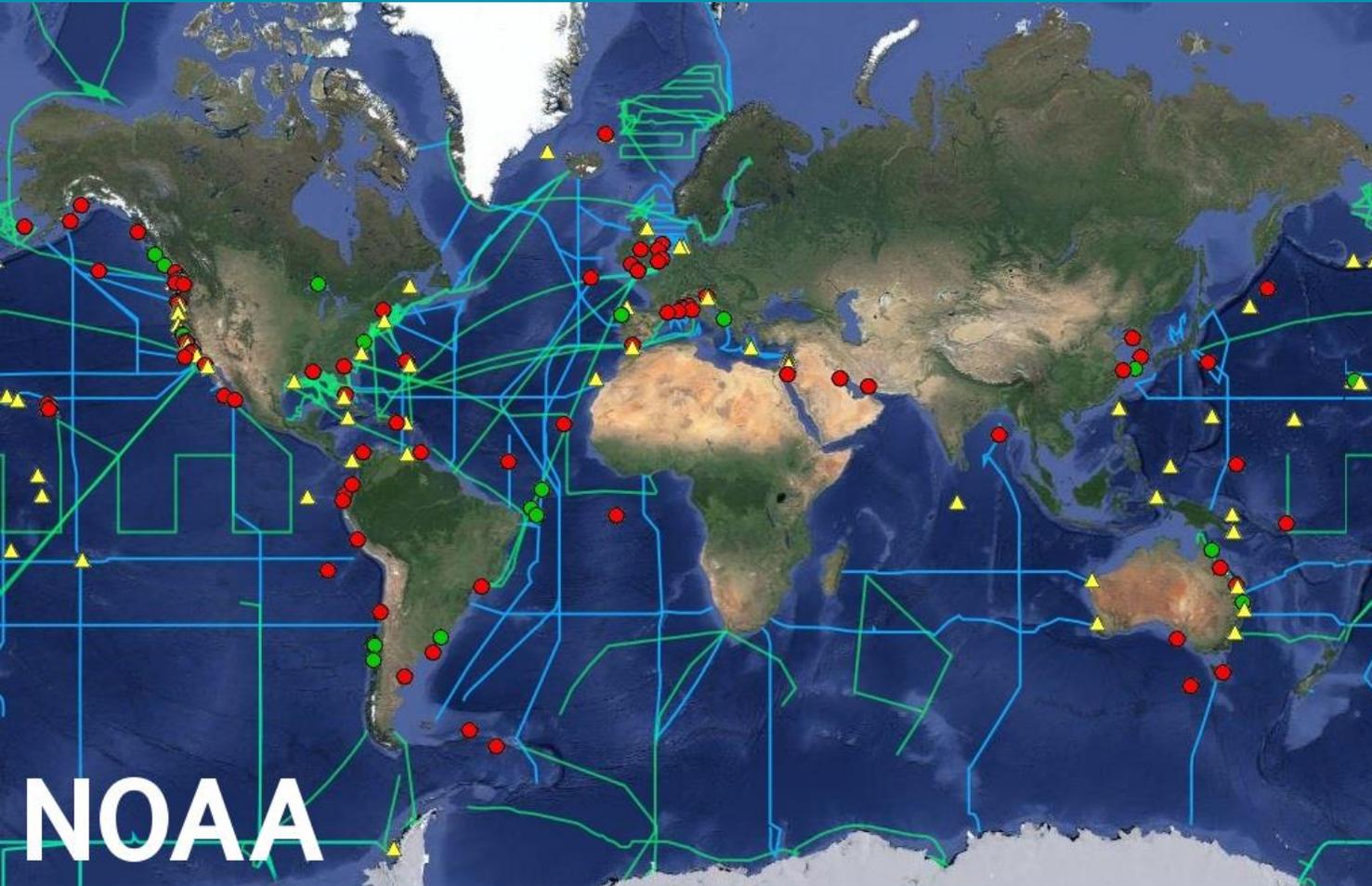
WHAT CAN WE DO TO HELP?

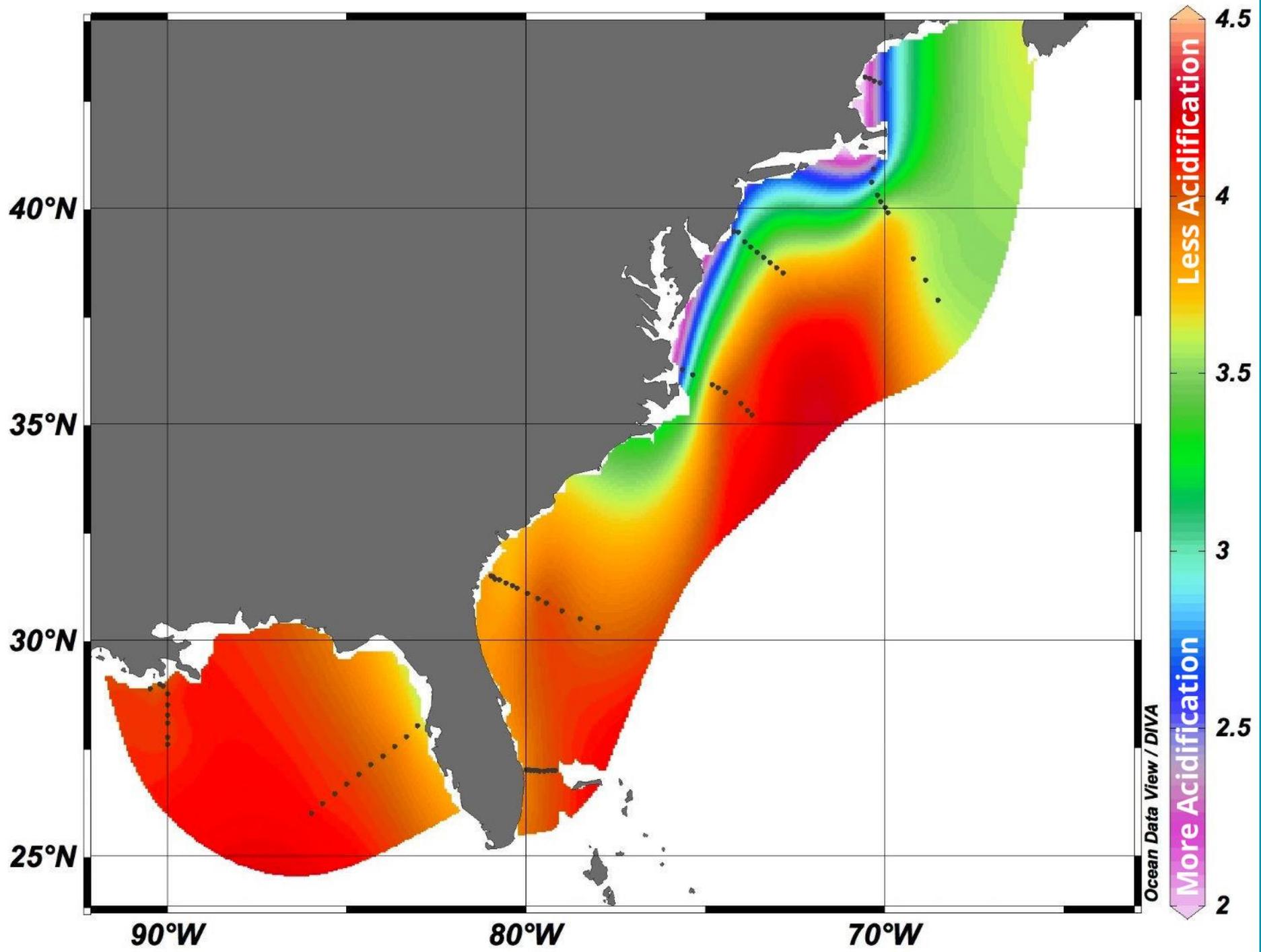


Which national marine sanctuaries might ocean acidification impact?



Ocean Acidification Monitoring Network







Learn More



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sanctuaries.noaa.gov



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Engaging Every Student

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