



BACKGROUND TALKING POINTS FOR CLIMATE CHANGE ADAPTATION

What does climate change look like for our coasts and oceans? Until recently, that question was obscure. Scientists, researchers, governments, environmental planners, and the like, have spent decades chasing an answer.

During that time, scientific research has documented that climate change has slowly been occurring since the industrial revolution. Starting in the 1800s, humans began burning fossil fuels and emitting pollution at unprecedented rates. Some of the pollutants, such as carbon dioxide (CO₂) and nitrous oxides, are known as greenhouse gases (GHG) that build up in our atmosphere **and** oceans, creating a warming effect that contributes to a rise in average global temperatures.

Once the earth's atmosphere and oceans absorb GHG, normal "weather" and "climate patterns" change, increasing the frequency and severity of storms.¹ Currently, CO₂ concentrations are nearly 40% higher than preindustrial levels and higher than at any point in the past 800,000 years.²

In the 1970s, scientists warned us about the implications of GHG in the earth's atmosphere and ocean. Yet those repercussions were not fully realized until the 1990s and into the 21st century. Over the past decades, the U.S. has witnessed record-setting temperatures; rapidly melting glaciers; horrific scenes from Hurricanes Andrew, Katrina, and Superstorm Sandy; extreme drought in the West; the "polar vortex" in the Northeast; abnormal freezing in the Southeast; increased forest fires, coastal flooding, and other abnormal weather-phenomenon.

Unfortunately, halting or reversing the impacts of climate change is no longer possible, at least in the short term. Instead, humans must adapt, while continuing to reduce GHG emissions. The time is now for humans to begin adapting to a "changing climate" and how society fuels itself. Adaptation efforts and curbing GHG must be a 'first order priority' for our Nation and the world. Existence on earth is only possible if our atmosphere and oceans are brought back to their former equilibrium so they can again work in tandem to moderate climatic conditions.

OCEAN CONNECTIONS

Our oceans produce more than half the Earth's oxygen.³ A recent study calculated how unbridled climate change would affect marine organisms (phytoplankton) that generate breathable air.⁴ The results were astounding, concluding that: "By 2100, the earth at sea level could have atmospheric oxygen levels comparable to the top of Mount Everest today."⁵

ABSORPTION OF GHG IN OCEANS

¹ Environmental Protection Agency <http://www3.epa.gov/climatechange/basics/facts.html>

² National Research Council http://nas-sites.org/americasclimatechoices/files/2012/06/19014_cvtx_R1.pdf

³ NOAA <http://oceanexplorer.noaa.gov/facts/oceanproduction.html>

⁴ Mathematical Modeling of Plankton-Oxygen Dynamics Under the Climate Change <http://link.springer.com/article/10.1007%2Fs11538-015-0126-0>

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More than half of GHG emitted by burning fossil fuels are absorbed by ocean water. As a result, high concentrations CO₂ are causing the oceans to acidify at rapid rates. Evidence from the Pacific Northwest suggests these drastic changes in ocean chemistry are detrimental to marine life like shellfish, coral reefs and crustaceans; and more acidic water (lower pH) is dissolving sea creatures' protective shells. If climate change continues at its present rate, the pH level of the Earth's oceans will decrease by 150 to 200 percent by 2100.⁶

COASTAL CONNECTIONS

One of the most complicated aspects of climate change is rising seas. Sea level rise occurs when glaciers, polar ice caps, and land-based ice sheets melt into the ocean adding more water. In addition, sea level rise occurs when water molecules expand as a result of increasing sea temperatures.

Since 1901, global seas have risen an average of 7.4 inches. A recent study projected that sea levels could rise up to six feet by 2100.⁷ It is obvious that public and private infrastructure will be at risk; yet what is not obvious is that traditional ways to keep the 'sea at bay' actually exacerbate erosion. Traditionally, coastal planners have built "coastal armoring" mechanisms (seawalls, levees, rock revetments, etc.) to protect infrastructure; and while these mechanism can help they are often expensive to install and maintain.⁸

Nature holds some of the most pragmatic and economical solutions to climate change adaptation. Healthy, natural ecosystems serve as 'buffers' from sea level rise. A paradigm shift is occurring. Planners are advancing "living shorelines" by investing in the conservation, restoration, and enhancement of wetlands, dunes, and estuaries and moving vulnerable structures out of harm's way.

PROACTIVE SOLUTIONS FOR LOCAL COMMUNITIES

- Regional governments should update "land use plans" in light of sea level rise by:
 - Pinpointing vulnerable beaches and infrastructure impacted by sea level rise and then financially planning for projected impacts.
 - Identifying proactive and nature-based resilience strategies to combat impacts of climate change.
- Local, state and federal governments can reduce risk to public assets and adjacent natural habitats by limiting shoreline development and locating public infrastructure out of the pathway of the sea and the moving shoreline.
- Move structures "out of harm's way." This concept is known as "managed retreat". Over time, managed retreat will create a barrier between eroding beaches and raising sea levels; and keep important infrastructure (utilities, roads, airports, wastewater plants, etc.) safe from rising sea levels.
- Avoid armoring along the coast (building seawalls, jetties, rock revetments, etc.). By armoring our coasts we are interrupting the natural process of sand getting to the beach—causing shrinking beaches that are defenseless against rising sea levels.

⁶ Oceans and Climate Change <http://www.wno.org/oceans-and-climate>

⁷ The Physical Science Basis. Final Draft Underlying Scientific-Technical Assessment. <http://www.ipcc.ch/report/ar5/wg1/>

⁸ IPPC; https://www.ipcc.ch/ipccreports/far/wg_1/ipcc_far_wg_1_chapter_09.pdf

SHORT VERSION OF TALKING POINTS FOR CLIMATE CHANGE ADAPTATION

WHAT DOES CLIMATE CHANGE MEAN TO YOUR BEACH?

Climate change is predicted to bring more intense storms and increased sea levels. Your local beach will be impacted in several ways, including:

- **Pollution:** More rain can result in sewage overflows and urban runoff cascading into the ocean.
- **Ocean Acidification:** More than half of GHG emitted by burning fossil fuels are absorbed by ocean water. As a result, high concentrations CO₂ are causing the oceans to acidify at rapid rates. Evidence from the Pacific Northwest suggests these drastic changes in ocean chemistry are detrimental to marine life like shellfish, coral reefs and crustaceans; and more acidic water (lower pH) is dissolving sea creatures' protective shells. If climate change continues at its present rate, the pH level of the Earth's oceans will decrease by 150 to 200 percent by 2100.⁹
- **Shrinking beaches:** Rising sea levels will swallow beaches—impacting public access, recreation, and healthy ecosystems. Beach erosion from increased storms will also chip away at our beaches. Unfortunately, seawalls are often installed to address erosion and protect unwise coastal development, but they often exacerbate the erosion problems and shrink beaches.
- **Surfing:** Climate change and rising seas will contribute to extreme tides that will impact how waves break. In areas where the seafloor is sandy and flat (a beach break), the wave may break further inshore (perhaps not breaking at all until the shorebreak), thus changing the size and shape of the wave.¹⁰ In areas where the seafloor is uneven and rocky (a reef break), higher sea levels will inundate the reef, leaving less area for the wave to break and increasing the possibility that the wave might not break at all.

WHAT IS SURFRIDER FOUNDATION UNIQUELY DOING TO ADDRESS CLIMATE CHANGE?

- Through our Coastal Preservation initiative, we are working to influence policy at the national and local levels to improve how coastal areas are managed and developed. We advocate for beaches to remain naturally intact without excessive shoreline development that leads to armoring (seawalls etc.). While climate change is a large and complex issue, there are encouraging signs that sensible adaptation measures are beginning to be considered. Government agencies at all levels are looking for proactive solutions, and local communities are engaging in the development of such actions.
- Across the country, Surfrider is engaged in the following:

⁹ Oceans and Climate Change <http://www.wno.org/oceans-and-climate>

¹⁰ Climate Change, a Surfer's Perceptive. <http://www.sas.org.uk/wp-content/uploads/sas-climate-change-report.pdf>

- Many of our chapters regularly participate in dune restoration projects in order to promote 'living shorelines' that can withstand rising seas.
- Our chapters are working to strengthen "land use planning documents" to incorporate "coastal adaptation." For example, Surfrider Staff and volunteers are participating in local planning efforts to:
 - Establish "setbacks" on development (setbacks maintain a minimum distance from the coast within which structures cannot be built)
 - Identify vulnerable coastal areas and infrastructure threatened by sea level rise.
 - Prioritize maintaining public access as beaches shrink.
 - Develop and participate in restoration plans.
 - Minimize impacts from dredge and fill and shoreline armoring projects.
 - Educate decision makers and local communities about ocean acidification.
- We have also successfully advocated for broader policy reforms. In Florida, we pursued insurance reform by helping pass a law that ends subsidized insurance for new construction or substantial improvements within the coastal zone. In California we participated in a nationally-recognized 'managed retreat' project through our Surfers' Point campaign where a bike path and parking lot were moved further inland; ultimately preserving public beach access and restoring parts of the beach to natural conditions.

HOW CAN YOU GET INVOLVED?

- Join a dune/watershed restoration project in your area.
- Help influence policy change. Work with Surfrider Staff and Chapters to advocate for proactive planning and building climate change resilient communities.
- Plant an Ocean Friendly Garden. Reducing hard surfaces in our neighborhoods and watersheds promotes more robust coastal ecosystems that will 'weather storms' better and will help absorb carbon and fossil fuel emission that contribute to global warming.
- Donate. Climate change is one of the largest issues this generation will face, and Surfrider needs to help fund experts and Staff in order to protect our coast from the impacts of climate change.