



# Sustaining Marine Ecosystems in a Changing Climate

America is blessed with the world's largest ocean and coastal Exclusive Economic Zone, which is a major contributor to our nation's economy. America depends on thriving marine ecosystems to provide jobs, food, storm protection, health benefits, and recreation. But ongoing changes in the climate system are altering the ocean's environment, impacting vital marine ecosystems, and hurting our economy. NOAA is at the forefront of protecting our fisheries and ecosystems and providing managers and businesses with information they need to make better decisions.

The stakes are high. In 2011 alone, the U.S. seafood industry supported 1.2 million jobs with \$129 billion in sales and \$37 billion in revenues. In that same year, the U.S. coastal recreational fishery supported 455,000 jobs and 70 million saltwater fishing trips with \$70 billion in sales and \$20 billion in income impacts.<sup>1</sup> Additionally, according to a 2003 study, annual net benefits to the U.S. economy from overall goods and services provided by U.S. coral reefs is about \$1.1 billion.<sup>2</sup> If considered an individual country, the coastal counties of the U.S. would be 3<sup>rd</sup> in global gross domestic product rank in 2011 (behind the U.S. and China).<sup>3</sup>

Given all that's at risk, it's not surprising that NOAA has seen a growing demand from Americans who want to understand how and why the ocean's environment is changing, and how it will impact them. Commercial and recreational fishermen, shellfish farmers, resource managers, decision makers in the recreation and tourism communities, and concerned citizens all turn to NOAA for trusted information to help them make climate-smart decisions.



NOAA/NMFS

*Just one year after implementing the West Coast Groundfish Trawl Catch Share Program, it has become a national model for sustainable fisheries management that ensures overfishing is behind us, provides stability to the fishing industry, and supports the fishing infrastructure of many Pacific coastal communities.*

## **NOAA envisions a future with a strong economy and thriving marine ecosystems.**

Climate-related changes are already affecting our nation's marine ecosystems and the economies that depend upon them. These impacts are expected to increase as the climate system continues to change. Many ecosystems and species are at risk and we must prepare for and respond to climate impacts on marine resources and the communities that depend on them.

NOAA envisions a public-private partnership of scientists, businesses, and policy leaders working together to identify, adapt, and adopt best practices for balancing our economic interests

with our values for healthy marine ecosystems. Working together, we can use NOAA's unique foundational science expertise and information to reduce impacts, increase resilience, and help communities take advantage of beneficial opportunities, such as sustainably harvesting fish populations as they move into new areas.

## **NOAA is committed to helping the nation understand, prepare, and respond to changes in marine ecosystems.**

NOAA recently established a cross-agency, interdisciplinary team of scientists to develop products and services designed to help people make more informed decisions. For example:

- ***We track ocean changes and provide timely scientific information*** on past and present ocean and climate conditions to put today's trends into perspective. As ocean temperatures have increased over the past 40 years, most of the major commercial fish stocks off the Northeast U.S. coast have shifted northward or toward deeper waters, leading to changes in fish availability.
- ***We assess risks and impacts to marine resources*** by conducting research on how individual species, habitats, and ecosystems are responding to changing ocean conditions. For example, human-emitted carbon dioxide is causing seawater to become more acidic. NOAA is actively researching the impacts of ocean acidification on marine ecosystems and fish stocks.
- ***We forecast future marine resource conditions*** and provide early warnings of possible changes to come to help people manage risks and opportunities in possible future scenarios. For example, NOAA scientists are studying the possible impacts of climate change on Bluefin Tuna and other important fish stocks by modeling climate impacts on the Gulf of Mexico where these species reproduce.

- ***We strengthen marine resource management*** by developing decision-support tools and other resources to incorporate climate-related information into marine resource management. For example, NOAA scientists are developing coupled climate-fisheries models to better predict how our changing ocean may impact fish stocks and commercial fisheries.
- ***We build awareness and responses*** through outreach and engagement programs designed to help key stakeholder communities understand risks, impacts, and opportunities.

**NOAA is using its unique expertise in science and marine resource management to help build climate-smart communities that identify and manage risks to our nation's valuable marine ecosystems and the services they provide.**



NOAA routinely monitors the health of coral reefs and other marine ecosystems in U.S. coastal regions and other parts of the world.

<sup>1</sup> <http://www.st.nmfs.noaa.gov/Assets/economics/documents/feus/2011/FEUS%202011-Revised.pdf>

<sup>2</sup> Source: Cesar, H., L. Burke, and L. Pet-Soede. 2003. The Economics of Worldwide Coral Reef Degradation. Arnhem, The Netherlands: Cesar Environmental Economics Consulting. <http://pdf.wri.org/cesardegradationreport100203.pdf>

<sup>3</sup> [http://stateofthecoast.noaa.gov/coastal\\_economy/welcome.html](http://stateofthecoast.noaa.gov/coastal_economy/welcome.html)