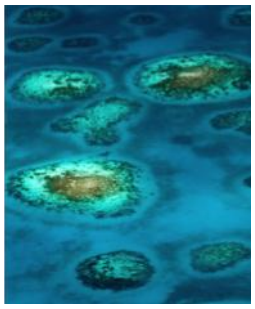
Coastal Belize

Comprehensive Nationwide Coastal and Marine Spatial Planning

Coastal Belize is a complex and dynamic ecosystem supporting a diversity of marine species and habitats, including three offshore atolls, abundant mangrove forests and over 300 cayes. The nation's most distinctive natural feature, the Belize Barrier Reef System, stretches over 250 km of the Belizean shoreline and forms the longest unbroken barrier reef in the Western Hemisphere. The reef is a site of great ecological importance, supporting unique corals and reef dwelling species. Its extraordinary beauty and its designation as a World Heritage Site draw thousands of international visitors each year.

Although the Belizean people rely on the coastal and marine environment to support a vibrant tourism industry, as well as opportunities for commercial and subsistence fishing, the health of the coastline and marine waters has been severely compromised by human activities. Mangrove clearance, overfishing, and pollution threaten the vitality of species and food sources, and jeopardize revenues. The ecosystem faces broad-scale threats posed by pollution, sedimentation, coral bleaching and disease.



In 1998, the Belizean government passed visionary legislation requiring government agencies to address threats to marine ecosystems and the livelihoods that depend upon them. Yet in 2010, an Integrated Coastal Zone Management Plan had not been passed. One obstacle was the lack of good information about the health of the coastal zone and the many existing uses it supported. A second related challenge involved reconciling competing interests. Without an integrated plan, national and local governments in Belize have struggled to manage conflicting interests and to make defensible, enduring decisions in managing their marine resources.

To design a plan that balances coastal development and business opportunities with sustained delivery of environmental services, the Natural Capital Project and World Wildlife Fund (WWF) are working with the Belize Coastal Management Authority and Institute (CZMAI) to value marine ecosystem services and compare tradeoffs among zoning plans. Using the InVEST software suite, managers and researchers are answering critical questions, such as:

- To what extent do mangrove forests and coral reefs reduce the need for investment in seawalls to protect coastal property and lives?
- How will designating certain areas for oil exploration and aquaculture affect catch and revenue from lobster fishing?
- Where will limits on coastal development and conservation of habitats lead to the greatest increases in revenue from tourism?

Results

- **Informed Integrated Coastal Zone Management Plan:** Through partnership with the Coastal Management Authority and Institute (CZMAI) we created maps of marine ecosystem services to inform the design of Belize's first comprehensive coastal zone management plan which will be completed by the end of 2012.

- **Convened and engaged stakeholders** in collaboration with CZMAI to raise issues and document recommendations for conservation and development. Consultations with government agencies, private sector representatives and leaders of various coastal communities are helping to refine the national zoning plan to better reflect local realities and interests.

- **Trained Professionals in InVEST Software** in several workshops, where the CZMAI demonstrated its use of InVEST throughout Belize. Participants were able to run InVEST on their own computers and contributed local knowledge to zone planning.

- **Employed and Expanded Marine InVEST models for Belize:** A new Spiny Lobster Model was developed for Belize in 2011. We also added mangrove forests and corals to our coastal protection models and quantified their ability to draw visitors and generate tourism revenue in Belize.

NATURAL CAPITAL PROJECT:
Coastal Belize

Life Support Systems

- **Tourism:** Belize's natural beauty attracts over 800,000 tourists to its shores annually. The tourism industry employs over 25% of working Belizeans, and fuels construction of airports, urban areas, and cruise ship ports.

- **Biodiversity:** Endangered species such as the West Indian manatee, American crocodile, and marine turtles find shelter on the Belizean coastline. It also houses a vast array of reef fish, mollusks, and coastal birds.

- **Coastal Protection:** Belize's barrier reefs, mangrove forests, and wetlands protect coastlines from erosion and storm surge. These habitats form protective shield that defrays costs from hurricane damage and protects coastal communities.

- **Carbon Sequestration:** Coastal mangroves and seagrasses store carbon in their standing stocks and bury it in their sediments, creating large reservoirs of long-term sequestered carbon.

- **Fisheries and Aquaculture:** Belize is a hotspot for commercial, recreational and subsistence fishing. The commercial lobster and conch fishery is a multi-million dollar industry, supporting over 25,000 Belizean fishermen.

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Integrated Coastal Zone Management Plan

In partnership with WWF, The Natural Capital Project supports the Coastal Zone Management Authority and Institute (CZMAI) in developing an Integrated Coastal Zone Management Plan (ICZMP) that will guide future coastal permitting and zoning in Belize. Together, the team is consulting stakeholders to understand their use of, and visions for, the coastal zone. We are also mapping and valuing marine environmental services provided now and under alternative zoning schemes in the future. The results will be used to produce an ICZMP that designates areas for preservation, restoration, development, and other uses. This plan will reflect local visions and values, be based on the best available science, and will ensure the coastal zone's ability to provide for people now and in the future.

Mapping Ecosystem Services with InVEST

We are mapping and valuing marine ecosystem services using the Natural Capital Project's InVEST software. InVEST demonstrates how various sectors, from tourism to fisheries, are affected by humans' interactions with the marine environment. InVEST provides biophysical, ecosystem service, and socioeconomic outputs to analyze trade-offs and synergies between conservation and development objectives. In Belize, we created three zoning options for each of the nine planning regions along the coast and offshore cayes. Each of these three options emphasizes different stakeholder priorities. We then used InVEST to consider the consequences of alternative choices.

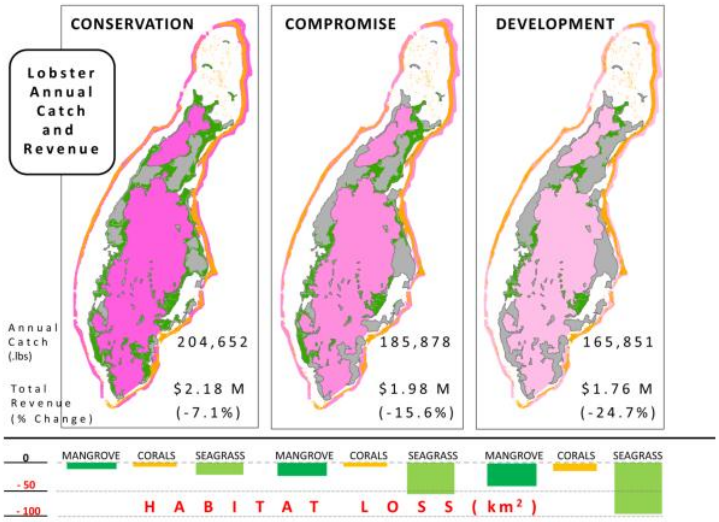

Figure 5 Outcomes for lobster fisheries and habitat for Turneffe Atoll under the three alternative zoning scenarios.

For example, on Turneffe Atoll, in central Belize (pictured above), different levels of permitted coastal development, transportation, and dredging affect the mangrove, coral and seagrass habitat important for spiny lobsters and thus change the catch and revenue expected to be generated by this industry.

Preserving an Ecosystem and an Economy

The Natural Capital Project and its partners gather the scientific knowledge, economic valuation, spatial planning, and sociopolitical support to overcome *ad hoc* development decisions. An integrated coastal zone management planning process based on robust modeling of consequences of alternative management decisions is advancing the dialogue beyond sector-specific issues and providing an open platform for stakeholder and government discussions about trade-offs. More broadly, it will preserve national opportunities for sustainable economic growth and ensure the long-term viability of Belize's spectacular barrier reef and the full range of benefits it provides to people.