

An Economic Valuation of the Natural Resources of Andros Islands, Bahamas.

By Venetia Hargreaves-Allen (PhD) of the Conservation Strategy Fund for The Nature Conservancy, August 2010.

The island of Andros is located off the Southern tip of Florida and roughly 65km West of Nassau. It is 104 miles long and 45 miles wide with a population of approximately 10,000. Human activities on the island are mainly related to agriculture, tourism, fishing and general development, with some employment by the government and the Water and Sewage Company. The number of visitors to Andros is typically 10,000 per year, with a mean of 85,000 visitor nights from 2006-2008. There are 34 registered hotels (393 hotel rooms). Andros is often referred to as the ‘bone fishing capital of the world.’ Andros supports a number of habitat types, including broadleaf coppice forests, pine forests, palm shrublands, sawgrass, rocky shores, beaches, mangroves, seagrass beds and tidal creeks which provide a habitat for many rare and endangered species. It retains some of the most intact and least developed natural areas in the Bahamas and has high levels of biodiversity, some of the most extensive wetlands in the region and the largest source of freshwater in the Bahamas. Indeed water from Andros supplies over 50% of the water to capital in New Providence. In addition, the third largest barrier reef in the world is found off the East coast of Andros.

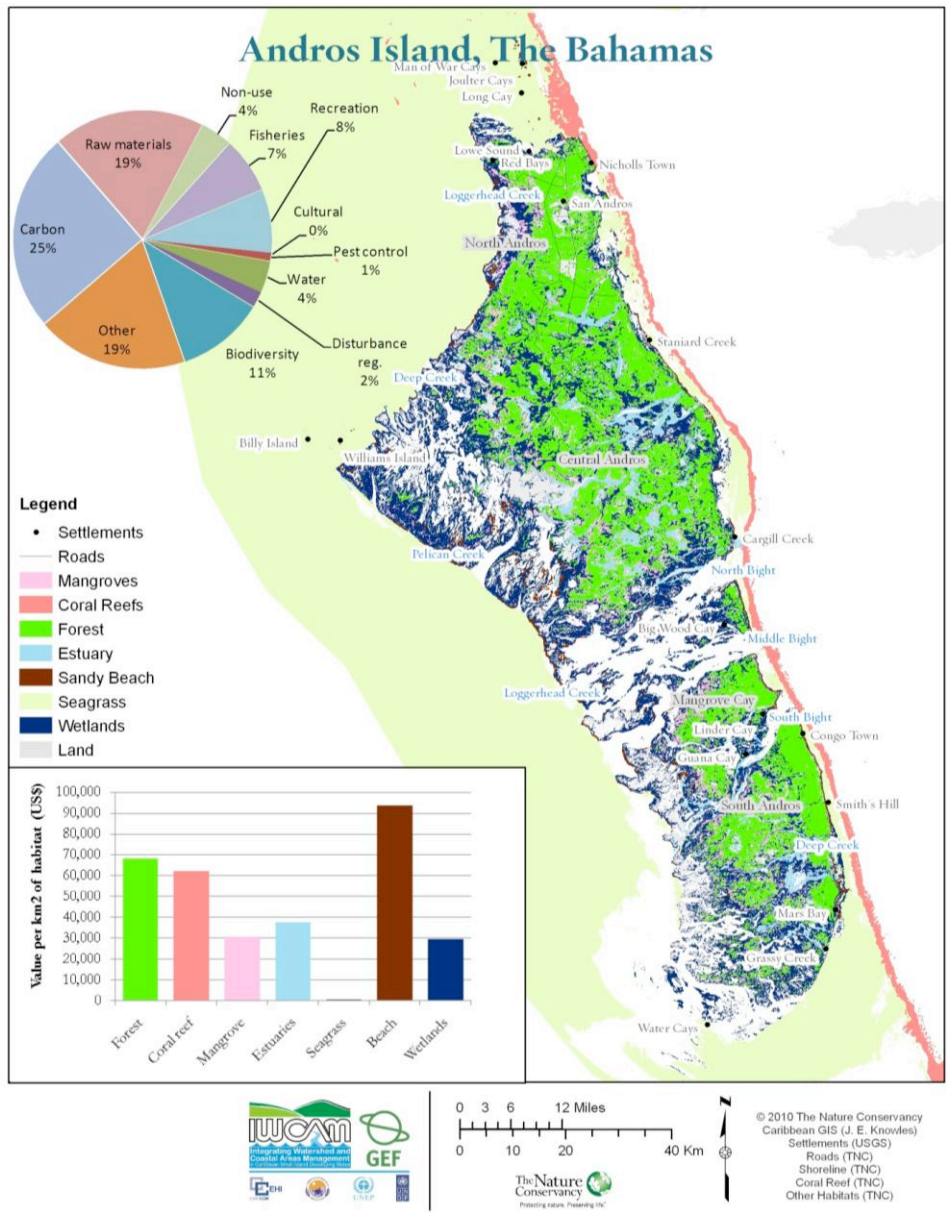


Figure. Summary map of Habitat Economic Values.

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Net Economic Value of Water and Androsian Habitats

To estimate economic values, the area of each habitat type was multiplied by the average values, drawn from current academic literature, of ecosystem services from each habitat. Those habitats which tend to generate large values per area are beaches, wetlands and to a lesser extent forests and mangroves. On Andros, the most extensive habitats are forests and wetlands, followed by estuaries and seagrass beds. The value of ecosystem services provided by these habitats is approximately \$260 million, although estimating such values is complicated by issues of additionality and marginality, as well as inadequate data. Of this, 59% comes from forests, 23% from wetlands and 7% from coral reefs. Furthermore, 25% comes from carbon storage, 19% from extraction of raw materials and 11% from biodiversity values. In addition, water resources generate a net value of \$3.5 million.

Contribution of Natural Resources to the Economy.

In addition to net ecosystem values, we estimated the impact of ecosystems on the Bahamian economy, measured in terms of gross revenues from activities that depend on natural resources. This concept of impact is different from value in that it does not separate out all the non-natural inputs to production but simply aims to assess how much activity and employment is related to the areas natural ecosystems. In order to account for the indirect and induced effect of natural resource related revenues, an economic multiplier of 25% was used.

Overall, 67% of these revenues are generated by extractive activities and 33% by non-extractive ones. Commercial fishing (including crabbing and sponging) generates a huge \$70 million in revenues, which is shared among a huge number of people and households. If all tourism related activities are added together, they constitute \$43.6 million in revenues each year. Much of this tourism is related to recreational fishing, for which guided trips alone generate over \$10 million each year. Farming, research /education programs and sponging generate relatively fewer revenues.

Table 2. Summary of direct Economic Impacts. ¹ not including fishing or diving etc.

| Type of Activity | Aggregated impact in 2009 (US\$'000) | Principal income | Secondary income | % of Economic Impact |
|----------------------------------|--------------------------------------|------------------|------------------|----------------------|
| Fishing | 47,265 | 392 | 3700 | 33% |
| Crabbing | 19,687 | 53 | 3700 | 14% |
| Sponging | 3,180 | 32 | 275 | 2% |
| Farming | 1,234 | 486 | 28 | 1% |
| Crafts ¹ | 8,345 | 448 | 17 | 6% |
| Water revenues | 15,830 | 31 | 0 | 11% |
| Guided recreational fishing | 10,000 | 18 | 35 | 7% |
| Tourism expenditure ¹ | 32,555 | 178 | 176 | 23% |
| Eco-trips | 1,025 | 20 | 60 | 1% |
| Education / research | 2,800 | 18 | 8 | 2% |
| Total | \$141.9 million | 1,676 | 8,000 | |

Andros' natural resources generate \$142 million in direct revenues each year and employ over 80% of the population either full or part-time. Overall, \$70 million stems from commercial fishing and \$44 million from nature-based tourism. If we consider secondary impacts (related to spending not included here, such as fisheries equipment, construction and inter-island transport), we estimate that the total impact is \$177 million each year. It should be noted that these are gross revenue estimates and that direct, indirect and opportunity costs can be significant.

¹ Craft is used as a collective term for weaving, basket making, curio making, furniture production, wood carving and bush medicine.

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Economic Values and Impacts into the Future.

The annual economic benefits and impacts were projected over 25 years and discounted to estimate present values. A present value in economics is simply the sum of annual values over many years, with future years' benefits adjusted downward to account for the fact that people favor current income over future income. Inflation-adjusted discount rates of 1%, 3% and 5% were used. For the most part, we assume a business as usual scenario rather than increases or decreases in particular activities, a forecast that may not hold in reality. In fact it is likely that growing scarcity will cause the value of the habitats in Andros to rise over time, so we also assess the impact of a 1% and 2% increase in relative value of these resources.

If the economic values cited in this paper remained constant over the next 25 years the value of the ecosystem services would be \$3.8-5.8 billion in present value terms. If there is a 1% annual increase in the relative value of these ecosystems, their present value rises to \$4.2-6.5 billion. In addition, water is shown to have a value of \$51-78 million over this time. The same ecosystems could generate \$2.6-3.8 billion in gross revenues over a 25 year time period. A 1% real annual increase in revenues in Andros could increase this to \$2.9-5 billion.

This study's short timeframe and lack of biophysical data means that habitat values are speculative. Nevertheless, it is apparent that residents of Andros have become adept at finding a high quality of life, based largely on the utilisation of natural resources. People benefit directly in many ways from the flora and fauna, from extraction of crabs, sponge, fish, wood and palm for crafts, medicine and fruits from the forest, as well as water from the ground. They also benefit indirectly in terms of income and employment from nature based tourism, such as guided fishing and diving or visiting blue holes. In short, residents depend on a healthy environment and are therefore potentially vulnerable to environmental degradation.

Current and emerging threats in Andros include unchecked development (involving pollution, dredging and indiscriminant habitat clearing), over-fishing, invasive species, sewage, climate change and ocean acidification. Each of these threats is expected to reduce the economic value and impact of these resources. Conservation projects are urgently need to avoid this outcome and even to increase the value of these resources.

Sustainable Management and Finance

There are a large number of projects and policies that could be enacted in Andros to help protect habitats and biodiversity of this island. In total, it is estimated that it is necessary to raise \$1.62 million initially and \$540,000 each year to enable the minimum level of sustainable management of these resources through parks management, ecotourism development, consultation, recycling, habitat restoration and vulnerability assessments. This is equivalent to 0.6% of the economic benefits and 1% of the gross revenues this islands ecosystems produce each year. Several potential sources of funding appear feasible, both solely for Andros and nationwide (where part of the funds raised could be used for conservation projects on Andros).

Table. Potential Sources of Funding.

| Andros | Nationwide |
|---|--------------------------------------|
| A bonefishing fee | Voluntary hotel surcharges |
| Fines for environmental damage | Voluntary carbon offsets for flights |
| Grants from international organizations for specific projects | Cruise ship fees |
| Mitigation banking agreements with developers | Lottery revenues |
| A "friends of Andros" fundraising program | Debt for Nature swaps or debt relief |

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Key messages from the Economic Valuation of the Natural Resources of Andros Islands, Bahamas

- The ecosystems, species and landscapes of Andros represent a huge ecological and economic endowment for the people of Andros, The Bahamas and the wider Caribbean region.
- The habitats on Andros provide an estimated mean of \$46,000 per km² per year in ecosystem services, such as carbon storage, water supply and recreation.
- Overall, habitats on Andros are thought to generate \$260 million a year in net economic benefits, which if sustained, will be worth \$4.6 billion over the next 25 years.
- The net benefit of fresh water on Andros is \$3.5 million each year.
- Nature provides income and employment for 80% of Andros; 1,645 full time jobs and 8,000 part time jobs.
- Commercial fisheries in Andros (including crabbing and sponging) generate \$70 million in revenues each year, which provides food and income for many people and households.
- Nature based tourism activities (including accommodation, bonefishing and diving) constitute \$43.6 million in revenues each year in Andros.
- Overall, the extractive and non-extractive use of Androsian natural resources generates \$142 million in direct gross economic activity and an additional \$35 million in associated spending, which is at least 60% of all economic activity on Andros. Over the next 25 years, this could add up to \$3 billion in revenues.
- Environmental degradation in the Caribbean means that natural resources on Andros are likely to become more valuable, if they are properly protected. Conversely, the potential losses in values and the loss in income, jobs and welfare could be enormous, if effective conservation actions are not implemented.
- In order to establish a basic level of sustainable management of these habitats, initial funding of \$1.62 million is needed, which is equivalent to 0.6% of the economic benefits and 1% of the gross revenues this island's ecosystems produce each year.
- Promising sources of funding include bonefishing fees, fines for environmental damage, grants from international organizations, a "friends of Andros" fundraising program, cruise ship fees and voluntary hotel surcharges.