



SMALL ISLANDS SPATIAL DATA INFRASTRUCTURE

KAREN RICHARDSON ASKS WHETHER SDI MAKE SENSE FOR SMALLER COUNTRIES AND ESPECIALLY ISLAND COMMUNITIES

GIS for spatial data infrastructure (SDI) is used throughout the world to instill cooperation and collaboration in spatial data to better address social, economic and environmental issues. It seems logical that large countries like the United States have invested in SDI, such as the GeoSpatial One-Stop and unions come together to share data and resources via the Infrastructure for Spatial Information in Europe (INSPIRE). Does SDI make sense for smaller countries and communities? Arguably, even smaller nations benefit from land ownership being carefully mapped, public works and utilities documented, environments and biodiversity protected, and resources assess and strategic planning completed.

Thanks to special funding through the joint United Kingdom Foreign Office/Department for International Development (DFID) Environment Programme, a group of UK Overseas Territories and the Organization of Eastern Caribbean States are able to rely on GIS for SDI; using the solution for data quality and control, information sharing and delivering finished products for use between governmental agencies and private organizations. Calling themselves 'tiny SDI', these small islands use ArcGIS as the backbone for spatial data sharing.

Most islands were using ESRI GIS software products in some form or fashion before SDI was implemented. As Alan Mills, Principal with Alan Mills Consulting, Ltd. and one of the brainchildren behind using SDI to help manage smaller islands explains it, "We realized there was synergy in sharing the same add-on applications developed with

ArcGIS across the islands. Along with the backup support from ESRI, the GIS managers on these remote places would feel a sense of community and have a place to go when they needed help. This is important when you live on a small island in the middle of the ocean three days boat ride from the nearest airport, and you have to be the expert in GPS, databases, cartography, digitizing and changing the ink in the plotter."

Ascension Island Discovers Benefit in Data Sharing

One island that has many unique needs housed in a small space is UK Overseas Territory (UKOT) Ascension Island, situated in the sea half way between Africa and Brazil. Only 34 square miles in area (approximately 91 square kilometers), the island is inhabited by about 1000 people. A relatively recent volcanic emergence close to the Mid Atlantic Ridge, there is little natural vegetation except for a few species of ferns and spurge, a plant that exudes a bitter milky juice. The island became a refuge for a wide variety of marine species and is the second largest Atlantic nesting site for green turtles.

Humans discovered the island in the 1500s and since that time, the island's ecology has changed significantly; invasive plant species have run rampant over parts of the island, rats and cats have decimated the bird populations. The bird and turtle populations have ocean wide impact on biodiversity and the Conservation Department established by the small Ascension Island Government is mandated to protect and



Boat is the only way to visit some of these islands. Hop aboard the Royal Mail Ship (RMS) St. Helena to travel to the island once or twice a month.



The Ascension Island Conservation team monitoring the spurge plants on cliff tops.

enhance the crucial nesting sites, as well as conserving the local plants, crabs and invertebrates.

Since 2005, GIS has been used to synthesize disparate databases and datasets and create new maps and images for environmental management. GIS also assists with other applications including the Environmental Health Department's mapping rat control and documenting the eclectic set of historical sites such as the guns of the sunk HMS Hood, Dampiers Drip (the original fresh water source), and concrete water catchments in the mountainside that collected scarce cloud water for the population pre-desalination plant.

Using ArcView, a component of ArcGIS Desktop, the system works well. "The software is easy enough to be handled by non-experts. ArcGIS also has a flexible framework that accepts new monitoring data and can integrate new datasets from a wide variety of sources and types," says Dr. Edsel Daniel, Professor, Vanderbilt University in Nashville, Tennessee, the GIS manager at Ascension Island and a colleague of Mills.

ArcView integrates all the data necessary for the government to make informed planning decisions to balance environmental, amenity and infrastructural priorities. Clear protocols and procedures have been determined to pass data from the field to the end user. "The key to this system to function in such a small area so economically with great benefit is the fact that data gathered for one purpose can be shared in many applications," says Alan Mills, Director, Alan Mills Consulting Ltd.

St Helena Finds Cooperation is the Key

St Helena, about 750 miles southeast of Ascension cannot be reached by air. Instead, a visitor must take the Royal Mail Ship (RMS) St. Helena which ploughs between Capetown, St. Helena and Ascension each month. 3,500 hardy settlers live on the island, many up above the precipitous cliffs or in a narrow canyon where the well-preserved Georgian capital of

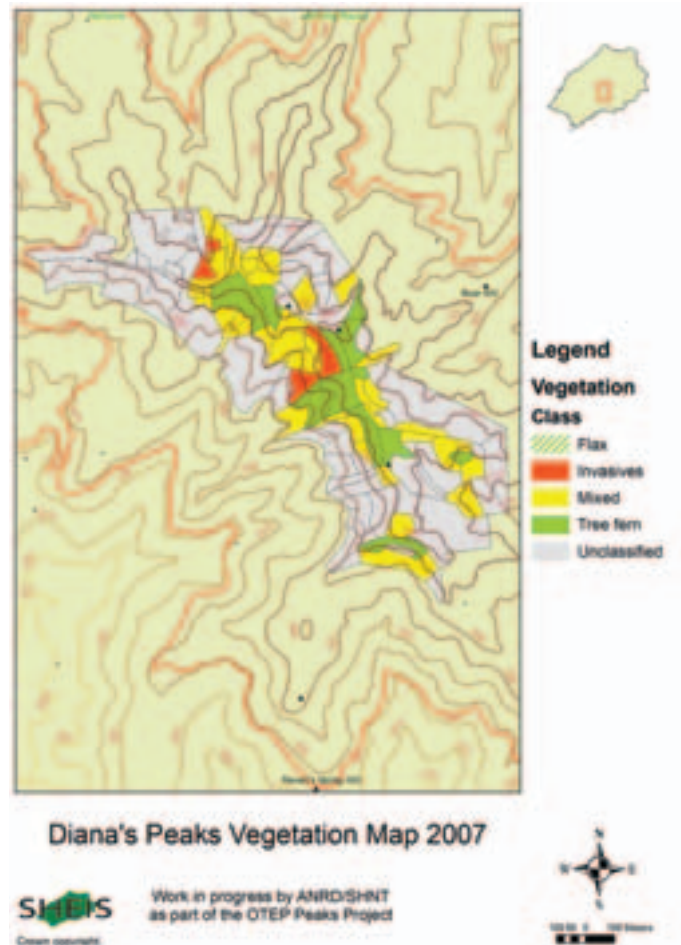
Jamestown nestles, near landscapes of rocky desert, rolling pastures, and eucalyptus and pine plantations. On the coast, humped-back whale mothers and calves shelter themselves and thousands of seabirds cling to cliff edges and stacks.

At first GIS was used to determine the best locations to place freshwater boreholes. In 2004, other projects began, the largest being building the island's cadastre. The Agriculture and Natural Resources Department (ANRD) along with the St. Helena National Trust (SHNT) implemented ArcView and a Microsoft Access database to monitor clearance of invasive flax and other plants and manage the growth of endemic cabbage trees and tree ferns. "The emergence of a map showing the recolonization of endemics over a ten year period gave other departments the idea to link their monitoring data with the mapping being accomplished," says Len Coleman, GIS manager, St. Helena.

A single system was then designed to minimize duplication of effort and share the burden of data collection and management. The Legal, Lands, and Planning Department (LLPD) was keen on expanding on their new cadastral GIS and database and working together with ANRD meant environmental concerns were known by the planning unit for both strategic plans and the development control process. Sharing resources also makes it easier for training sessions to be organized and held for occasional users of GIS. Data are not duplicated and there is better quality control and attribution when it is used for multiple applications. Visiting scientists and consultants can search the data catalogue and have a recognized way of contributing information back into the system in a structured manner once their project is completed.

GIS Maps Resources on Rodrigues Island to Sustain Human Activity

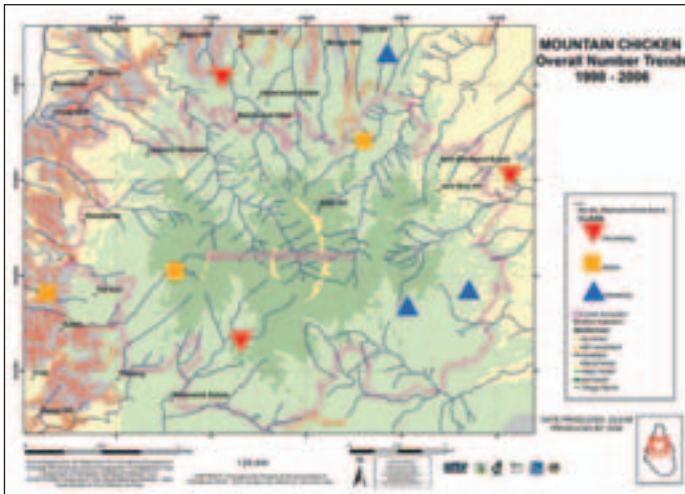
Rodrigues is a partly autonomous island found 650 kilometers east of Mauritius. One of the more populated islands in this grouping, 40,000



The St. Helena National Trust and Government's Agriculture and Natural Resources Department work together on Diana's Peak to monitor endemic tree ferns and threatening weeds.



The shallow Rorigués lagoon is twice the size of the island itself and a key resource which SHOALS of Rodrigues helps monitor and maintain.



The Mountain Chicken of Montserrat



Alan Mills with Jervaine Greenaway and Lavern Rogers-Ryan, GIS Manager in the GIS Office, Town and Country Planning Department, Brades, Montserrat

people live off reef and subsistence farming, having few support services and only a fledgling tourism industry.

SHOALS, a non-governmental organization (NGO) working closely with the island's government, the Regional Assembly, conducts marine research, education and training about the extensive reef area, which extends over twice the size of the land itself. One major activity is assessing the extent and health of the marine resources, including the corals, seagrasses and mangroves. With the support of the Universities of Newcastle and Bangor in the United Kingdom, SHOALS created a map of the basic reef structure using supervised classification of Landsat Enhanced Thematic Mapper (ETM) data, with an eye to using QuickBird satellite imagery in the near future for the more detailed map of the

resources, as well as being used in educational work and in governmental planning.

GIS Keep People and Mountain Chickens Safe on Montserrat

In the Eastern Caribbean Sea, Montserrat is another UK Overseas Territory, 20 kilometers west of Antigua. After a volcanic eruption in 1997, the population dwindled from 11,000 to 3500 and is now settled in only one third of the island. These few people on the island are in need of GIS to assist them in mapping safe zones and planning for permanent homes and services away from the danger area around the volcano. GIS is also used to map endangered species in the Center Hills area, including the curiously named Mountain Chicken, a frog that is a local delicacy and has been unfortunately decimated by a fungal disease. (see banner image to this article)

Led by GIS manager Lavern Rogers-Ryan who works in the Physical Planning Department, the GIS team uses ArcGIS to cover the requests of clients on the island, including updating the land cadastre, mapping for natural disasters and environmental protection. "Assisting the Department of the Environment in mapping their data opened our eyes to the spatial comparisons across the island," says Rogers-Ryan

Alan Mills assisted in developing a database and training field staff in how to make simple maps. "This assistance helped me better structure my data to provide wider services to several government departments without being overwhelmed by the work," Rogers-Ryan says.

GIS used to evaluate land resources for St. Kitts in a post sugar era

St. Kitts (also called St. Christopher) is part of an independent twin island federal state with the island of Nevis. Both islands achieved their independence in 1983 from the British making them the smallest independent state in the western hemisphere. St. Kitts has a land area of 168 km² with extremely fertile soils used primarily for sugar production for the past 350 years.

Fluctuating commodity prices and reduced European Union trade preferences have made the island's reliance on single crop agriculture an economic vulnerability. To address such vulnerabilities, in 2005 the Government of St. Kitts and Nevis (GoSKN) made the decision to close the sugar industry and vigorously pursue its economic diversification by placing emphasis on more viable alternatives, such as tourism and non-sugar agriculture including field crops and livestock. One of the major challenges of this effort is adopting careful planning which ensures that the island's land resources previously utilized by the sugar cane crops are optimized for the long term economic, social and environmental sustainability of the country.

After the closing of the sugar industry, the Physical Planning Department (PPD) and Department of Agriculture (DoA) spearheaded the planning for the agricultural transition. A land resource analysis study was conducted identifying the most suitable lands for six non-sugar agriculture crops. "While specific areas have been quantified based on suitability, an added benefit of this study was the ability to identify, compare and quantify areas for uses beyond agriculture; we were able to evaluate future land use such as housing for tourism, industrial and residential along with suitable lands for tree crops. Using GIS we were able to see the bigger picture of how to develop areas for the benefit of the community."

Article by Alan Mills, an independent GIS consultant based in Kent, UK (alanmillsuk@yahoo.co.uk). Alan has worked for over 18 years in geographical research and consultancy in developing countries and has particular interest in small island developing states. He served for over 2 years as National GIS coordinator in the British Virgin Islands and works in the Caribbean, South Atlantic and Indian Ocean, as well as for MapAction, who use GIS to assist humanitarian relief operations post disasters (www.mapaction.org).