Fiji Ecosystem Based Management (EBM) = Healthy People, Processes and Systems

Key EBM Messages:

Preservation of functional integrity of Fiji's eco-scapes through multiple stakeholder management.

- Successful EBM relies on cross sectoral planning and management
- Inland and lowland communities need to manage resources together
- EBM protects habitat for all stages of life
- Improving land and fishing practices helps protect natural resources
- Public health and livelihoods depend on environmental health

Inside this issue:

FIJI EBM PARTNERSHIP NEWSLETTER

Volume 1, Issue 2 **April 2009**

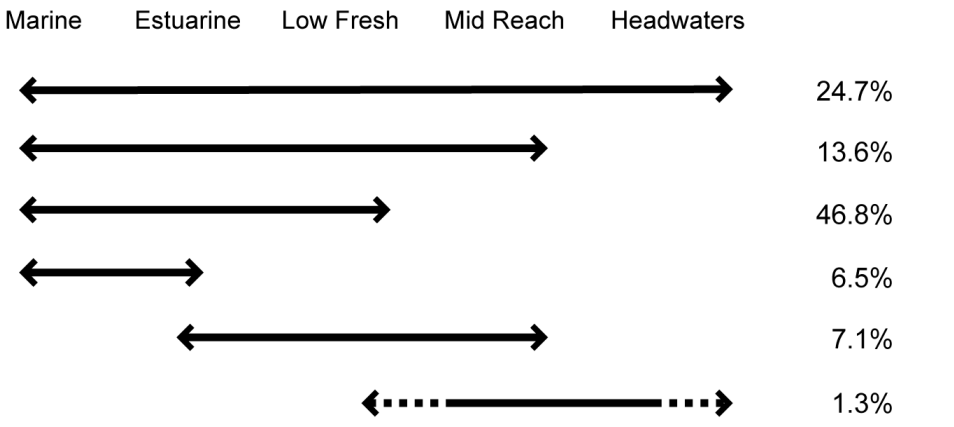
Wetlands: living connections between land and sea

Wetlands contain the one natural resource upon which all life depends: freshwater. The wetlands of Fiji can be divided into five main types; mangrove forests; peat bogs; rivers; lakes; and reservoirs. The value and importance of wetlands to our lives cannot be overstated. The continued lack of comprehensive river basin management increases the annual number of people who are at risk to flooding in Fiji, as clearly illustrated in the recent devastating floods this year.

Wetlands and groundwater resources are also closely linked, as groundwater provides drinking water for over half of the world's population. Wetlands act as water purifiers. They trap sediment, remove excess nitrogen and phosphorous from water, and even filter some diseases. Mangroves and coastal wetlands additionally provide critical nursery areas for marine fishes while stabilizing shorelines. These river and stream wetlands are connected by more than water flow. They also provide corridors for the "flow" of living organisms that maintain the health of a river system. Fijian wetlands, from freshwater to estuaries have approximately 164 species of fishes. Based on extensive field surveys and literature review we now understand that 98.7% of these fishes will interact with the sea either for feeding or breeding and almost all will move across 3 or more habitats during their lives. If there were no large waterfalls or manmade barriers then about 40% would move across all 5 habitat types, and about 28% will make this full migration from headwaters to the sea and all the way back. This highly migratory group of fishes are the embodiment of the living connections of river basins from headwaters to ocean and include; freshwater eels (Duna), worm eels (balolo), freshwater moray (dadarikai), some gobies (beli), and flagtails (ikadroka).

Freshwater fish survey in lower Kilaka, Vanua levu.

Submitted by Aaron Jenkins and Kinikoto Mailautoka of Wetlands International-Oceania



Percentage of Fijian freshwater and estuarine fishes that are connected across different wetland habitats during their life history.

Bull shark tagging

Shark reef is a small reef patch located on the fringing reef off the coast of Viti Levu, Fiji, as a no-take zone that would be used as a self-sustaining shark diving site. The Shark Reef Marine Reserve project started to develop in 2002 and is aimed at declaring parts of Shark Reef.

In 2008, a bull shark tagging study began to see how and where the sharks move. This is interesting because bull sharks are known to move between the marine and freshwater mainly for breeding. Since bull sharks have very specific requirements for nursery areas (bays and estuaries), they are highly vulnerable to coastal fishing pressure. Therefore, it is necessary to have well connected marine and freshwater system. Building dams, roads and other structures can prevent the flow of water and the pathways for animal movement.

Besides healthy coral reefs, charismatic marine animals such as sharks increasingly attract divers and have led to growth in the popularity of marine wildlife watching as a marine tourism activity.

Despite being a diving site, Shark Reef Marine Reserve has been serving as an observing and tagging site for sharks and other fishes, and a detailed database comprising presence/absence data for various fishes as well as oceanographic parameters is maintained.

In the future, these data will allow the assessment of the effectiveness of the protected area with regard to species abundance and diversity. Furthermore, a knowledge base is being built about the effects of tourism activity upon the health and well-being of the target species, in this case the large predatory bull shark.

'Kinky' the bull shark in the Shark Reef Marine Reserve

Submitted by Eroni Rasalato of Shark Reef Fiji

Flood prevention through sound land management

There are five main ways that natural forest systems decrease the amount of water and sediments running off the land. First, the tree canopy reduces the energy of raindrops and the potential to wash away the soil. Second, the high rates of decomposition of organic matter on the forest floor increases water penetration of the soil. Third, the trees themselves remove large quantities of water through transpiration. Fourth, the roots of forest vegetation bind soil, thereby preventing erosion. And fifth, logs and woody debris that are exported downstream form pools that slow stream flow and trap sediments.

When natural forest stands are cleared, both runoff and erosion rates increase. For example, when researchers deforested an entire watershed at the Hubbard Brook Experimental Forest in the USA they found that stream flow increased by 39% in the first year, and by 28% in the second year (Likens *et al.* 1970). Similarly, the average yearly discharge of the Tocantins River in Brazil increased by 24% following a period when agriculture expanded by 19% within the catchment area (Costa *et al.* 2003). In addition to increasing the volume of runoff, land clearing can result in higher runoff frequency, higher maximum runoff rates and higher runoff ratios (discharge to rainfall) compared to adjacent, uncleared areas.

What does this mean for Fiji? The recent flooding in January 2009 disproportionately affected areas where there has been a large extent of land clearing for forestry and agricultural activities. Because some climate researchers have predicted a greater frequency of extreme events in the future, there is reason to be concerned that unless measures are taken to improve land management, more flooding is to be expected. Simple land management measures that can be taken include reforesting buffer zones around waterways, preserving native forests as reserves, and ensuring that logging operations obey the logging code of practice.

Nadi as seen from air during the recent flooding

Submitted by Stacy Jupiter of Wildlife Conservation Society.

References:
Costa, M. H., A. Botta, and J. A. Cardille. 2003. Effects of large-scale changes in land cover on the discharge of the Tocantins River, Southeastern Amazonia. Journal of Hydrology **283**:206-217.
Likens, G. E., F. H. Bormann, N. M. Johnson, D. W. Fisher, and R. S. Pierce. 1970. Effects of forest cutting and herbicide treatment on nutrient budgets in the Hubbard Brook watershed-ecosystem. Ecological Monographs **40**:23-47.

Assessing the application of ecosystem based management (EBM) tools to community-based management in Kadavu

Kadavu leadership and management team

The southern island province of Kadavu is leading community-based marine management with 52 Qoliqoli-wide locally-managed marine areas (LMMAs), in which there are each one or more no-take tabu areas. These LMMAs were set up by communities with the Kadavu Yaubula Management Support Team (KYMST), and support from the Institute of Applied Sciences (IAS) at the University of the South Pacific. The site locations and their specific management purposes grew through community-based adaptive management processes to meet local-scale conservation and fisheries needs. However, after a workshop hosted by the provincial administration, Kadavu sought the help of IAS in scaling up these into a Province-wide network of ecologically functioning LMMAs.

Now, the KYMST and IAS, will explore how Ecosystem Based Management (EBM) tools can be applied to small Pacific Island nations. This project is unique because communities are coming together at the provincial level and have therefore "dissolved" the constraints of small-scale governance management planning units. As a result, management can be done at larger spatial scales that may be more relevant to ecological processes. Funding from the David and Lucille Packard Foundation and NOAA's Coral International program will be used to: 1) assist Kadavu in establishing a trans-qoliqoli network of protected areas based upon the present community-selected sites, and 2) examine through this case study the relevance, cost-effectiveness and utility of EBM tools in a traditional Melanesian setting. The province-wide network using this EBM approach will be compared against the existing community-based management planning approach to understand the costs and benefits of different planning tools to the Pacific Islands.

Submitted by Rikki Dunsmore of IAS.

Linking the ridge to the reef: USGS work in Hawai'i

There is evidence that land-based impacts such as sediment, nutrients, and other pollutants arising from human activities have harmed coral reef ecosystems around the world. Therefore, making ridge to reef conservation is vital for maintaining essential connectivity and ecosystem services.

In Hawai'i, the United States Geological Survey (USGS) is studying these effects by examining the pathways and concentrations of sediment and other pollutants as they erode from steep hillslopes (fig. 1), travel through the stream network, and disperse across the reef (fig. 2).

Erosion rates on steep mountainous slopes are measured by installing networks of new sensors on hilltops and streams, where other techniques tend to fail. These instruments helped measure 0.5 inches of soil erosion during last year's storms, (about 100X the estimate of the long-term erosion rate). The biologists are collecting data to monitor changes in vegetation composition and structure in response to management actions (e.g., ungulate control) to restore native-dominated plant communities.

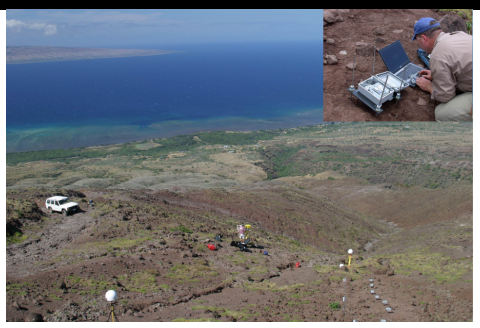


Fig 1 Instruments for monitoring erosion on Moloka'i

On the reef, a network of advanced sensors has aided laboratory and field studies of coral response to varying levels of sedimentation and decreased light availability, helping managers set goals for acceptable levels of sedimentation from adjacent watersheds. A newly published atlas "The Coral Reef of South Moloka'i, Hawai'i—Portrait of a Sediment-Threatened Fringing Reef" details some of the exciting new work and is available at: http://pubs. usgs.gov / sir/2007/5101/.

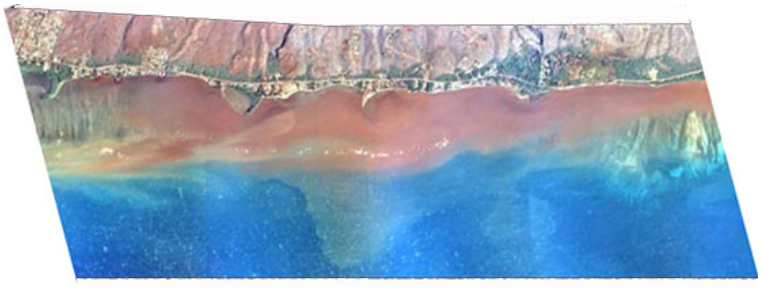


Fig 2 Wave-resuspended sediment on south coast of Moloka'i

Submitted by: Jonathan D. Stock, Gordon W. Tribble, Jim Jacobi, Mike Field, of the U.S. Geological Survey.

THE SUBMISSION DEADLINE OF ARTICLES FOR NEXT ISSUE IS JUNE 1ST 2009

FOR MORE INFORMATION, QUERIES OR TO SEND ANY FUTURE EBM ARTICLES PLEASE CONTACT

The Editor,
Fiji EBM Partnership Newsletter,
WCS-South Pacific Program,
11 Ma'afu Street, Suva.
Fiji Islands.

Phone: + 679 331 5174
Fax: + 679 331 0178
E-mail: infofiji@wcs.org

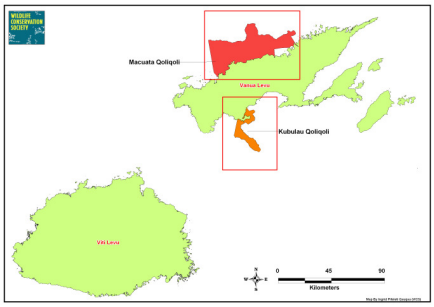
WWW.WCS.ORG/MARINE

FIJI EBM PROJECT OVERVIEW

The Wildlife Conservation Society (WCS), in partnership with WWF and Wetlands International-Oceania (WI-O), are working directly with communities and government towards the vision of protecting the Vatu-i-Ra and Cakau Levu Reefs Seascape using Ecosystem-Based Management (EBM) principles and approaches.

Science-based marine protected areas (MPAs) have been demonstrated to protect exploited marine resources, may increase coral reef ecosystem resilience, and are considered an essential tool for the long-term management and conservation of high priority seascapes around the world. Recognizing the connectivity between terrestrial and marine systems has led to a more holistic approach that also includes terrestrial processes and their potential impact on marine habitats. For example, sedimentation and nutrient enrichment have been found to be key threats to the health of nearshore marine ecosystems and therefore understanding the potential impacts of runoff from watersheds on the adjacent marine areas is vital.

Our research and advocacy as part of this EBM project is building an applied understanding of how terrestrial and marine systems are connected in terms of fauna and habitat quality, and what the implications are for conservation management in a tropical high island setting. The areas we are investigating include the aquatic fauna that utilize "wet" ecosystem types during different life stages (living connections between the land and the sea), spatial patterns of perceptions of ecosystem change, community resource use, potential influence of terrestrial nutrients and run off on near shore environments, the effects of intensive harvesting of a traditional MPA on reef fish communities, fish community responses to management in Fiji, a low cost resource mapping approach for Pacific Islands, the connectivity of marine habitats, including understanding the movement ranges of adult reef fishes from MPAs, and priority conservation regions (Ecoscapes) for Fiji Islands to preserve ecosystem connectivity.



The Fiji Ecosystem Based Management (EBM) project has two focal sites, Macuata and Kubulau, on the island of Vanua Levu. This is the second largest island in Fiji (5,538 km^2). Macuata is made up of four districts, including 37 villages with a population of approximately 10,000, while Kubulau is made up of one district, encompassing 10 villages and 1 settlement with a population of approximately 1,000. Macuata has a total *qoliqoli* (traditional fisheries management region) area of 1,349 km^2 out of which 112 km^2 is currently protected through a network of 9 marine protected areas (MPAs). Kubulau, with a total qoliqoli size of 260 km^2 has a network incorporating 16 MPAs (89 km^2) and 1 proposed forest reserve (0.8 km^2).

The Fiji Ecosystem-Based Management project is primarily funded by the David and Lucile Packard Foundation and the Gordon and Betty Moore Foundation, which started in 2004. It is led by WCS, with the partners WWF and WI-O.