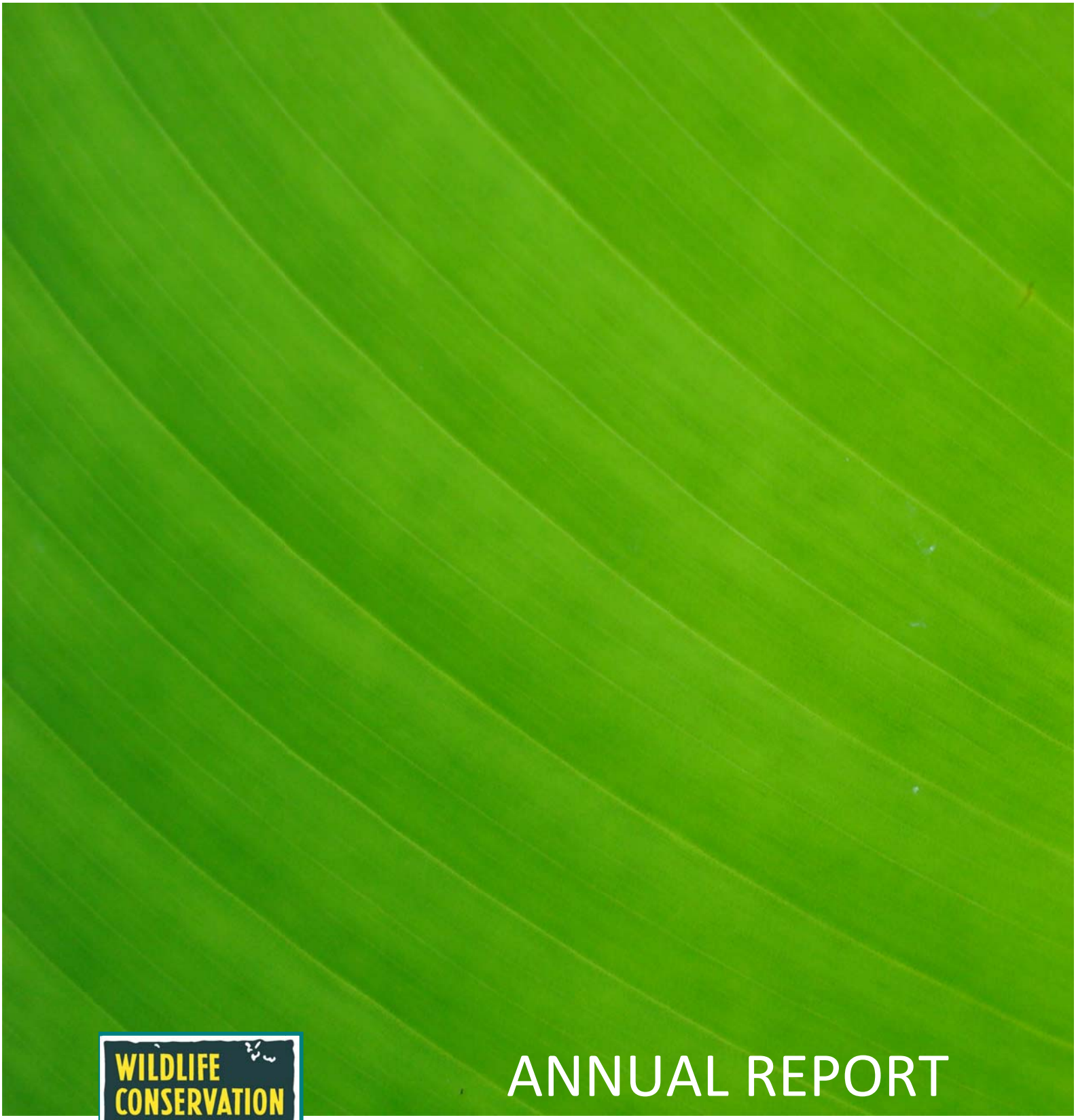

ANNUAL REPORT

WILDLIFE CONSERVATION SOCIETY
FIJI COUNTRY PROGRAM 2013

EXECUTIVE SUMMARY

This report highlights the Wildlife Conservation Society (WCS) Fiji Country Program's achievements from January to December 2013. Our Science, Management and Communication activities continue to focus on three main themes: (1) integrating ecosystem-based management and adaptation principles into planning for natural resource management; (2) designing protected area networks that confer resilience to climate change disturbance and preserve ecosystem services; and (3) strengthening local and national capacity for management planning and enforcement.

In 2013, our collaborative scientific studies focused on:

- Assessing the impact of periodic harvests of no-take fisheries closures (*tabu* areas) on achievement of short-term and long-term objectives;
- Assessing the status of sea cucumber fisheries in Lau Province; and
- Evaluating candidate terrestrial protected area networks for achieving targets for terrestrial protection and providing benefits to downstream reef systems.

In our efforts to help strengthen natural resource management across Fiji, WCS Fiji:

- Sought agreements from Bua and Cakaudrove clans to establish community forest parks and river buffer zones;
- Worked with the communities of Nadi and Solevu districts (Bua Province) to confirm protected area boundaries and management rules;
- Discussed processes for management plan development and presented ecological monitoring data to communities in Vuya and Dama districts (Bua Province);
- Made initial engagements with communities in Lekutu and Navakasiga districts (Bua Province) to initiate management planning;
- Held an adaptive management planning workshop with communities of Bua District (Bua Province);
- Worked with the Bua Yaubula Management Support Team to develop their mission, organization structure, and terms of reference; and
- Provided training and capacity building to burgeoning women's business cooperatives in Bua Province.

In 2013, WCS Fiji launched an educational comic book, "The Search for the Groovy Grotto", to coincide with the launch of the Fiji Grouper Campaign. We also communicated outputs from our work at the 12th Pacific Science Intercongress and 9th Pacific Islands Conference on Nature Conservation and Protected Areas, both held in Suva.

Lastly, WCS Fiji has maintained a strong presence on national and regional committees and steering groups, including the: Protected Area Committee, Integrated Coastal Management Committee, and Fiji Locally Management Marine Area network Executive Committee and various working groups. Through these organizations, WCS Fiji has worked to help achieve national objectives in biodiversity protection, conservation planning, coastal management and climate change preparedness.

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INTRODUCTION

This report highlights the Wildlife Conservation Society (WCS) Fiji Country Program's achievements in Fiji from January to December 2013.

During the early part of 2013, our marine team worked to analyze data collected from coral reef habitats in Western Bua province to create recommendations for resilient marine protected area (MPA) networks. Meanwhile, our terrestrial team completed second and third rounds of consultations with forest owning clans (*mataqali*) to identify areas that could be managed by local communities as community forest parks or river buffer zones. These data and recommendations for priority marine and terrestrial sites for management were taken to each village in Vuya and Dama districts in April 2013 to begin the process of engaging communities to develop ecosystem-based management (EBM) plans, complementary to those already endorsed and being implemented in Kubulau and Wainunu (Bua Province) and Wailevu (Cakaudrove Province) districts.

In May, our marine team joined up with our collaborator Jordan Goetze from the University of Western Australia to conduct the first set of two experimental harvests of no-take fisheries closures (*tabu* areas) on Koro Island in Tuatua and Nakodu villages. With full participation from the communities, our team collected household surveys and underwater reef fish and benthic assemblage data prior to and following the harvest, as well as catch per unit effort of all fish and invertebrates landed during the openings. We repeated these experiments on Ovalau Island in Nauouo and Natokalau villages in October 2013, with the aim to use the data to develop best practice guidelines for communities regarding when communities can open their tabu areas and how much they can take while still maintaining sustainable fisheries.

In June, while the WCS Fiji Director Stacy Jupiter joined the Living Oceans Foundation expedition to survey sea cucumber populations in Lau Province, the management team was busy facilitating district-level management planning workshops for Vuya and Dama districts. This information is presently being collated to develop their respective EBM plans. The team also brought together women's business cooperatives for a business planning and empowerment training workshop in Naruwai village in Dama District. The women have been developing various small enterprises, such as kuta mat weaving and honey and virgin coconut oil production.

In July, WCS chaired a symposium at the 12th Pacific Science Intercongress, hosted by the University of the South Pacific, on "Building Resilience in Locally-Managed Marine Areas." We were able to support participation by LMMA network representatives from Pohnpei, Philippines, Papua New Guinea, Indonesia, Palau and Australia to participate in the symposium, as well as spend time developing funding proposals for the LMMA network. Following the conference, WCS hosted a group of regional natural and social scientists, practitioners from the LMMA Network, and program officers from the David and Lucile Packard Foundation at a workshop on Leleuvia Island with the aims to: (1) review existing data on periodic harvests to determine research gaps; and (2) develop a funding proposal for a broader research, which was submitted to the Packard Foundation in December.

In September, the marine team was fortunate to be invited back on the Waitt Institute's research platform for an expedition through the Vatu-i-Ra Seascape, with collaborating scientists from University of Western Australia, WCS Argentina and University of California-Santa Cruz. We conducted shallow and deep water surveys of fish assemblages and benthic habitats at notable sites (e.g., Namena Marine

Reserve, Vatu-i-Ra Marine Reserve, Mt. Mutiny Seamount, E6 Seamount). We also took the opportunity to bring a film director and cameraman to develop a documentary. Both the documentary and the data collected will feature in a campaign that WCS will launch in 2014 to promote offshore MPA establishment within the Vatu-i-Ra Seascape.

Our management team continued to engage with communities across western Bua Province, with initial village visits in Lekutu and Navakasiga districts in October. They additionally facilitated an adaptive management workshop with Bua District in November. Our WCS management team also supported the development and capacity building of the Bua Yaubula Management Support Team, and offered guidance to them to develop a funding application to the GEF Small Grants Programme. By December, the WCS team came together to participate in the 9th Pacific Islands Nature Conservation and Protected Areas Conference. Many of our staff served as volunteers for the event and also hosted a booth where women from the Bua women's business cooperatives could sell their products.

In terms of staffing turnover, in early 2012, we bade farewell to our Mapping Specialist, Natalie Askew, who returned to England to take back up a position at the Joint Nature Conservation Committee. In October, we hired Manoa Malani as our new Policy Adviser and Dwain Qalovaki as our new Communications Officer to lead the campaign to establish offshore MPAs in Fiji. In November, we said goodbye to Akuila Cakacaka, our long-serving marine biologist who left Fiji to undertake studies towards his PhD in Germany. WCS additionally wishes to thank Loody Keppler, Chantal Pagel, Sirkka Killmann and Naomi Folaukitoga Gade for their efforts as volunteers with our cetacean, livelihoods and community engagement work.

WCS continued to pursue opportunities for local staff training. Akuila Cakacaka completed year-long NGO Leadership and Management Course, accredited through Unitec of New Zealand, with top marks. Our finance manager Nischal Narain graduated from his MBA program at USP. Meanwhile, field officers Yashika Nand and Margaret Fox have taken up new postgraduate work – for Yashika towards a Masters and for Margaret some advanced level coursework, both at the University of the South Pacific. Kini Koto undertook a month long dive training with Global Vision International in an effort to develop his skills for marine surveys.

WCS continued to engage in government planning processes, including the revitalization of the Integrated Coastal Management (ICM) Committee and input towards the development of a provincial-level ICM plan through Ra, funded through an ADB-GEF Coral Triangle project to the Department of Environment. We additionally participated in work under the Protected Area Committee, in particular undertaking a marine gap analysis that showed an increase from 12.1% (2010) to 16.7% (2013) of inshore marine habitats effectively protected through Fiji's LMMA network.

This report focuses on WCS Fiji's achievements during 2013 under our three main themes of Science, Management and Communication. We additionally highlight our engagement with national and regional planning processes. Consistent with our Memorandum of Understanding (MoU) with the Fiji Department of Environment, we note the links to national priority strategies under the NBSAP Implementation Framework 2010-2014, as well as the National Climate Change Policy. Lastly, we describe our projected activities for 2014, including their: funding status; relationship to national priorities; potential outputs; location in Fiji; project partners; donors; timelines; and level of investment in conservation and management action.

SCIENCE

The following sub-sections present a synthesis of completed and ongoing scientific activities by WCS and partners for 2013.

Assessing Impacts of Periodic Harvests on Reef Fish Populations

STATUS: In progress

FUNDING: David and Lucile Packard Foundation (2012-38137)

PARTNER ORGANISATIONS: University of Western Australia, Fiji Locally Managed Marine Area Network, University of the South Pacific – Institute of Applied Sciences

OUTPUTS:

- *Phase II funding proposal submitted to the Packard Foundation:* Investigating the Effectiveness of Periodically Harvested Closures for Achieving Fisheries and Economic Objectives in Melanesia
- *Journal article in prep:* Goetze JS, Jupiter SD, Wilson SK, Langlois TJ, Bond T, Harvey ES, Batilekaleka, WN (in prep). Variation in the ability to detect the impacts of fishing between three common sampling techniques.

RESEARCH HIGHLIGHTS:

Historically, Pacific island communities employed a variety of tools to control marine and coastal resource use. NGOs, resource management organizations, and donors have eagerly embraced this local willingness to implement resource management, and programs to revitalize customary management practice through locally managed marine areas (LMMAs) have spread throughout the region. In the modern context, there are many ecological, socioeconomic, and cultural objectives associated with LMMA establishment and many different tools employed to reach those objectives. Periodically harvested closures (PHCs) are one of the most commonly employed tools. While most LMMA communities express an interest in long-term sustainability of fisheries, in practice, many communities use PHCs within LMMAs as a "bank in the water" to ensure a ready supply of fish and invertebrates for special occasions. Such pulse harvests benefit fishers in the short term but could potentially enhance the likelihood of overharvesting, thus compromising long-term ecological and socioeconomic objectives.

In recognition that it is generally not socially acceptable to establish permanent no-take areas in many parts of the tropical western Pacific, there is an urgent need to address the following questions:

- Under what harvesting regimes (frequency, intensity, duration) can PHCs be sustainably fished and what size do they need to be relative to the size of the LMMA to achieve both socioeconomic and ecological objectives?; and
- What are the appropriate indicators of when PHCs can be opened and when they should be closed?

From October 2012 to the present, with support from the David and Lucile Packard Foundation, the Wildlife Conservation Society (WCS) has been leading research in Fiji to build credible, legitimate knowledge in order to provide guidelines to communities in the LMMA Network regarding optimum harvesting schemes for achieving ecological and socioeconomic objectives (Phase I).

In 2013, WCS and our partner researchers at the University of Western Australia have:

- Analyzed impacts of the October 2012 harvest from Cakau Naitaga in Kubulau District using data collected with three different methods;
- Conducted socioeconomic surveys, ecological surveys, and catch per unit effort (CPUE) surveys of all fish landed during four harvests from Koro and Ovalau islands; and
- Facilitated a workshop on Leleuvia Island with regional experts to determine research gaps associated with periodic harvests and develop an outline for a funding proposal for a broader research program across the western Pacific to investigate the effectiveness of PHCs for achieving socioeconomic and ecological objectives associated with small-scale fisheries.

Each of these activities is discussed in brief below.

Comparison of sampling techniques to assess the Cakau Naitaga tabu harvest

In 2012, we gathered information on conditions on fish community structure and benthos inside and adjacent to tabu areas before and after harvests of Cakau Naitaga tabu in Kubulau District (Bua Province). For this harvest in particular, we worked with Jordan Goetze, a PhD candidate from the University of Western Australia, to evaluate which of three methods most cost-effectively records impact from harvest extraction. We surveyed before and after a 1 week harvest using underwater visual census (UVC), diver operated video (DOV), and baited remote underwater video (BRUV) surveys. During the harvest event, we recorded all fish and invertebrates landed and the fate of each (e.g., consumed, given away, sold).

We found BRUV surveys recorded significantly more fish species than UVC or DOV surveys. UVC surveys recorded significantly greater total abundance of fish, which may be related to the increased amount of time per transect, diver error in recording fish outside of the belt transect, and possibly reduced visibility from the video methods. DOV surveys appeared to most accurately record changes in targeted species abundance from before to after the harvest. We additionally noted that there was no significant difference in total fish biomass inside the tabu prior to the harvest, suggesting non-compliance with the fishing ban. Furthermore, Lethrinidae (emperor), Serranidae (grouper) and Carangidae (jacks/trevally) populations appear to be severely depleted both within and adjacent to the tabu area, which is problematic given populations of these types of are typically slow to recover.

New harvests monitored from Koro and Ovalau

In May 2013, we conducted household perception surveys, before and after UVC and DOV surveys, and CPUE surveys from two tabu on Koro Island at Tuatua and Nakodu villages. The

Tuatua tabu harvest was for one day in a small, backreef tabu that had been opened on a quarterly basis over the past year. The Nakodu tabu harvest occurred over 4 days from a small, backreef tabu that had never been opened since its establishment in 2009. From our UVC data, we observed that there was no significant different in fish biomass inside or outside the tabu area, and there was no significant impact on total fish biomass from a harvest of only 191 fish. By contract, the total fish biomass inside the Nakodu tabu was significantly greater than in the adjacent areas open to fishing, but after the harvest of well over 2000 fish, the remaining fish biomass inside the tabu was similar to the biomass outside (Figure 1). From our household surveys, we the motivation behind the vast majority of prior harvests of tabu areas on Koro was to cater for village and church functions. In October 2013, we conducted further household perception surveys, before and after UVC and DOV surveys, and CPUE surveys from two tabu on Ovalau Island at Nauouo and Natokalu (DOV surveys only) villages. These data are presently being analyzed.

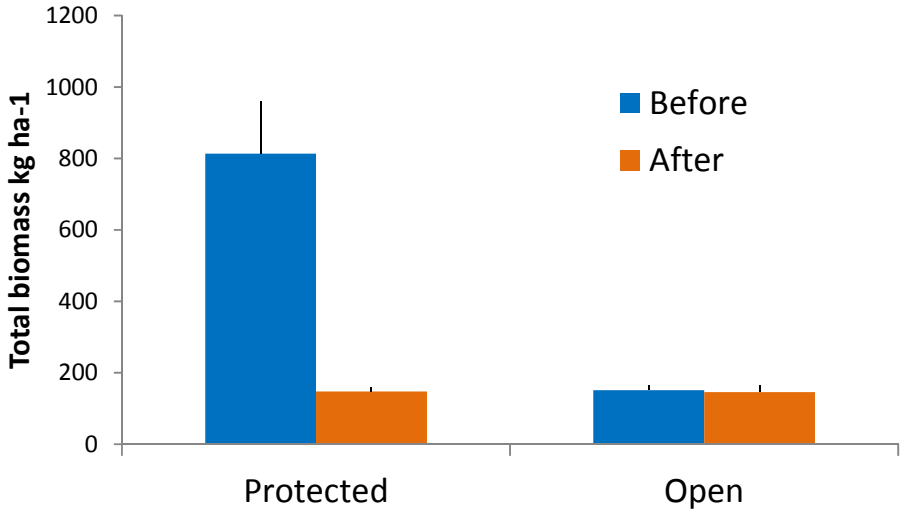

Figure 1. Mean total fish biomass recorded with UVC surveys before (blue) and after (orange) the harvest of Nakodu tabu.

Expert workshop to develop Phase II research programme

In July 2013, WCS organized and facilitated a workshop in Fiji which was attended by 19 natural and social scientists, practitioners from the LMMA Network, and program officers from the Packard Foundation. The aims of the workshop were to: (1) review existing data on periodic harvests to determine research gaps; and (2) develop a funding proposal for a broader research program across the western Pacific to investigate the effectiveness of PHCs for achieving socioeconomic and ecological objectives associated with small-scale fisheries. As a result of the workshop, a proposal outline was drafted and developed into a proposal submitted to the Packard Foundation in December 2013 to undertake further research against three main objectives:

1. Assess motivations and drivers for opening of PHCs to fishing ;

2. Evaluate from empirical data the effectiveness of PHCs for achieving ecological and socioeconomic objectives ; and
3. Develop models to inform guidelines for harvest conditions and use of PHCs within broader management schemes.

Figure 2 below shows a logic model indicating how the activities under Phase II grant will contribute to the development of communications products that can be disseminated across the LMMA network with the ultimate goal to achieve more sustainable management of coastal fisheries.

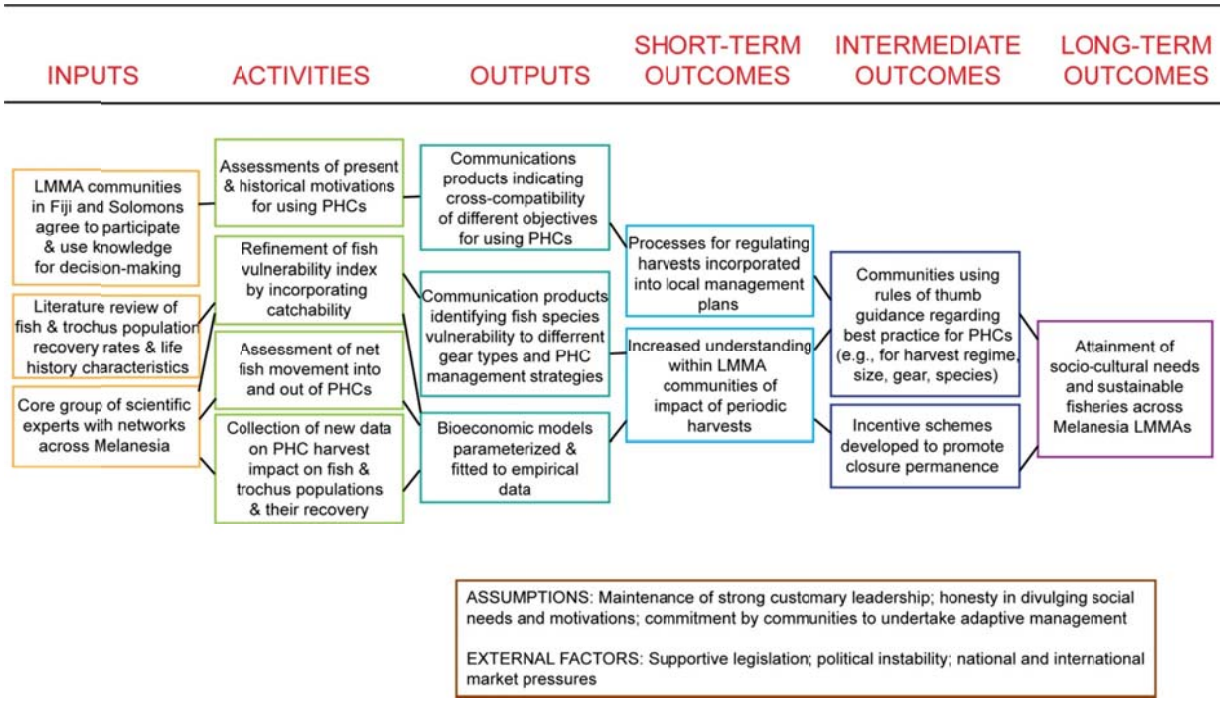

Figure 2. Logic model for achievement of ecological and socioeconomic objectives through sustainable management of periodically-harvested closures. Model depicts inputs required to contribute to project success, planned activities, key outputs that will lead to adaptive management, outcomes at different temporal scales, and assumptions and external factors that must be managed as risks.

NEXT STEPS:

- Survey a broader sub-section of FLMMA communities to assess the contemporary motivations for harvesting tabu areas and how these motivations may have evolved over time.
- Incorporate fish species behavior and catchability into a fishing vulnerability index. WCS will facilitate a workshop in August 2014, coupled with the International Marine Conservation Congress in Glasgow, to bring together a subset of our expert working group to develop a fishing vulnerability index based on life history characteristics and behavior of targeted fish species. This information will be used to: (1) parameterize the bioeconomic models being developed to provide harvest guidelines to communities; and(2) develop communications products to help communities understand the

combinations of fish species, gear types, and PHC management strategies that are sustainable and those that should be avoided.
- Conduct follow-up surveys of Koro tabu areas to assess population recovery.
- Develop models to assess the effectiveness of PHCs for meeting ecological and socioeconomic objectives under different fish harvest regimes and with varying sizes of periodically-harvested closures. A key output from this analysis will be identification of what sets of harvest/closure schedules and closure size characteristics best meet ecological (conservation) and socioeconomic (fishery yield) objectives. This output will be presented in a rules-of-thumb format (e.g., "Closure length should be x-fold longer than harvest length") so that it can be communicated easily and effectively to communities.

LINKS TO NATIONAL PRIORITIES:
This project supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries. The information collected through the scientific work will also support **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 5:** Support the ecosystem-based approach throughout Fiji, recognising that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience and **Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

Assessment of Lau sea cucumber fisheries

STATUS: Completed

FUNDING: Living Oceans Foundation

PARTNER ORGANISATIONS: Living Oceans Foundation, Department of Fisheries, Institute of Applied Sciences-University of the South Pacific, Lau Provincial Office

OUTPUTS:
- *Report:* Jupiter S, Saladrau W, Vave R (2013) Assessment of sea cucumber fisheries through targeted surveys of Lau Province, Fiji. Wildlife Conservation Society/University of the South Pacific/Fiji Department of Fisheries/Khaled bin Sultan Living Oceans Foundation, Suva, Fiji, 22 pp
- *Database:* All in-water resource assessments, fisher perception surveys, measurements of dried bêche-de-mer processed in villages, and general observations were distributed to Fiji Department of Fisheries and the Secretariat of the Pacific Community Division of Fisheries, Aquaculture and Marine Ecosystems.

RESEARCH HIGHLIGHTS:
In June 2013, by staff from the Fiji Department of Fisheries, the Institute of Applied Sciences and the Wildlife Conservation Society conducted a 24 day survey of sea cucumber resources

and the status of the fishery from 10 islands (Cicia, Fulaga, Kabara, Mago, Matuku, Moala, Totoya, Tuvuca, Vanua Vatu, Vanuabalavu) in Lau Province, Fiji. The surveys were conducted as part of the Khaled bin Sultan Living Oceans Foundation Global Reef Expedition. Direct in-water resource assessments were carried out using standardized protocols developed by the Secretariat of the Pacific Community (SPC) Regional Fisheries Observatory program. These data were combined with fisher perception surveys, measurements of dried bêche-de-mer processed in villages, and general observations from community discussions to assess the overall status of the fishery.

Within species densities of commercially important sea cucumber species across individual islands surveyed ranged from 0 – 132.8 individuals ha^{-1}. Densities were below SPC regional indicator values for all species except for *Pearsonothuria graeffei* (flowerfish). The highest densities were observed from Totoya and Vanuabalavu, however the values generally fell below suggested threshold densities of 10-50 individuals ha^{-1} required to avoid reproductive failure (Table 1). Furthermore, with the exception of some well-managed and long-established community marine protected areas (tabu), individuals tended to be widely dispersed, which will also prevent successful fertilization. Sea cucumber densities were generally comparable to or lower than those measured from Kubulau and Bua districts, Bua Province, in 2012, and considerably lower than densities from four sites on Viti Levu and Vanua Levu surveyed in 2003 and 2009, suggesting that already depleted populations are likely further declining. The one optimistic finding was that community-based management does seem to be having a positive effect in preserving some remaining individuals, as total sea cucumber abundance was significantly higher in tabu areas than in areas open to fishing surveyed using belt transects.

Mean sizes of sea cucumber species measured underwater were generally above minimum recommended wet sizes, with the exception of *Holothuria atra* and *P. graeffei*. The general absence of very small sea cucumbers on the reef is of concern, and may be indicative of recruitment failure. Village measurements of dried samples indicate that many undersized individuals of *Actinopyga lecanora*, *Bohadschia vitiensis* and *H. atra* are being harvested, as well as almost all species harvested from Matuku Island reefs. As prices have increased due to reduction in supply, fishers have not yet been proactive about management measures given that they are still able to meet their daily needs with income derived from bêche-de-mer as they are using techniques (e.g. underwater breathing apparatus, free diving with 'bombs') to extract individuals from deep refuges.

Dive fatalities and injuries are regular features of the bêche-de-mer industry as individuals are exceeding depth and time limits in pursuit of valuable catch. Several companies appear to be undercutting local communities on prices, while other companies refused to pay out or failed to keep promises to assist with village development projects.

Table 1. Mean total density ha^{-1} of sea cucumbers sighted during in-water surveys

Island	Method	# stations	Mean density ha^{-1}	Standard error
Cicia	Manta	1	8.33	3.73
	Belt	5	19.74	11.22
Fulaga	Belt	2	0.00	0.00
Kabara	Manta	2	1.39	1.39
	Belt	4	26.79	14.88
Mago	Manta	2	1.39	1.39
	Belt	2	25.00	17.21
Matuku	Manta	5	0.67	0.73
	Belt	4	0	0
Moala	Manta	6	6.94	2.52
	Belt	1	25.00	25.00
Totoya	Manta	8	35.56	14.90
	Belt	2	20.83	20.83
Tuvuca	Manta	3	2.78	1.51
Vanua Vatu	Belt	3	0	0
Vanuabalavu	Manta	11	21.88	6.67
	Belt	12	129.46	29.91

NEXT STEPS:

- Present findings to the Lau Provincial Council (several attempts were made in 2013, but the meetings were repeatedly cancelled)
- Conduct further baseline sea cucumber surveys at various sites around the Vatu-i-Ra Seascape prior to initiating different types of management with local communities to test management effectiveness.

LINKS TO NATIONAL PRIORITIES:
This project supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries.

Expedition to Fiji's Vatu-i-Ra Seascape

STATUS: Expedition completed, project ongoing

FUNDING: Waitt Institute and Foundation

PARTNER ORGANISATIONS: University of Western Australia, University of California-Santa Cruz

OUTPUTS:

- *Expedition report:* Jupiter S (2013) Fiji's Vatu-i-Ra Seascape: Development of Offshore MPAs Supporting Seascape-scale Fisheries Management & Biodiversity Conservation. Expedition report to the Waitt Institute and Foundation. Wildlife Conservation Society, Suva, Fiji.

RESEARCH HIGHLIGHTS:

With generous support from the Waitt Foundation, the Wildlife Conservation Society (WCS) Fiji Country Program is working with government, industry, and other stakeholders to commit at least 12,900 km^2 of offshore waters within Fiji's Vatu-i-Ra Seascape under management, including no-take areas. The Vatu-i-Ra Seascape includes the four provinces of Bua, Ra, Lomaivit and Tailevu and their adjacent inshore and offshore waters. This initiative will support the Fiji Government's 2005 declaration to effectively protect 30% of its inshore and offshore waters by 2020. WCS's campaign for offshore marine protected area (MPA) establishment led off with an expedition through the Vatu-i-Ra Seascape on the Waitt Institute's research platform. During the expedition, which took place from September 9 to 27, 2013, WCS: (1) collected data through a variety of techniques to assess shallow and deeper water coral reef fish assemblages and habitats; (2) collected topside and underwater footage to develop a documentary associated with the campaign; and (3) co-hosted a high-level reception officiated by the President of Fiji to launch the offshore MPA campaign. The assessment of reef fish assemblages and habitats is described below, while the documentary and high-level reception are discussed in the Communications section.

The expedition on the Waitt Institute research platform was organized in two phases. During Phase I, from September 9 – 18, researchers from WCS and the University of Western Australia collected shallow water coral reef survey data using underwater visual census (UVC), diver operated video (DOV) and baited remote underwater video (BRUV) surveys. During Phase II, from September 19 – 27, researchers from WCS, the University of Western Australia, and the University of California-Santa Cruz collected deeper water coral reef survey data using remotely operated vehicle (ROV) and BRUV surveys.

We had three objectives for UVC data collection: (1) add to existing long-term monitoring of sites within and adjacent to the Namena Marine Reserve, established in 2005 – September 12-14, 2013; (2) conduct assessments of seamount fisheries condition at Mt. Mutiny at shallow (5 meter) and deep (10 meter) depths – September 15, 2013; and (3) undertake new surveys within and adjacent to the Vatu-i-Ra Marine Reserve, established in 2012, to evaluate effectiveness of protection and assist with broader-scale MPA network planning – September 17-18, 2013.

We had four objectives for collection of DOV data (1) follow-up surveys of Cakau Naitaga tabu, harvested in October 2012 to assess fish population recovery – September 10-11, 2013; (2) assessments of tourist dive site condition in Kubulau and Vatu-i-Ra – September 13-14 and 16, 2013; (3) new surveys within and adjacent to the Vatu-i-Ra Marine Reserve, established in 2012 – September 17-18, 2013; and (4) assessments of seamount fisheries condition at Mt. Mutiny and E6 – September 15 and 26, 2013 (Figure 3).

We had two objectives for BRUV surveys: (1) conduct follow-up surveys of sites within and adjacent to the Namuri Reserve, Kubulau District – September 11-13, 2013; and (2) survey deeper (>25 m) benthic fish communities at various sites around the Vatu-i-Ra Seascape – September 21 – 25, 2013. Finally, our objective for work with the Waitt Institute's ROV was to

explore the composition and vulnerabilities of deep water benthic communities. In this regard, we were limited to depths within approximately 230 meters, as the winch aboard the Waitt Institute's research platform was not available for use and the tether required deployment by hand. We were able to make six successful deployments of the ROV at Mt. Mutiny, Vatu-i-Cake, Namena and E6.

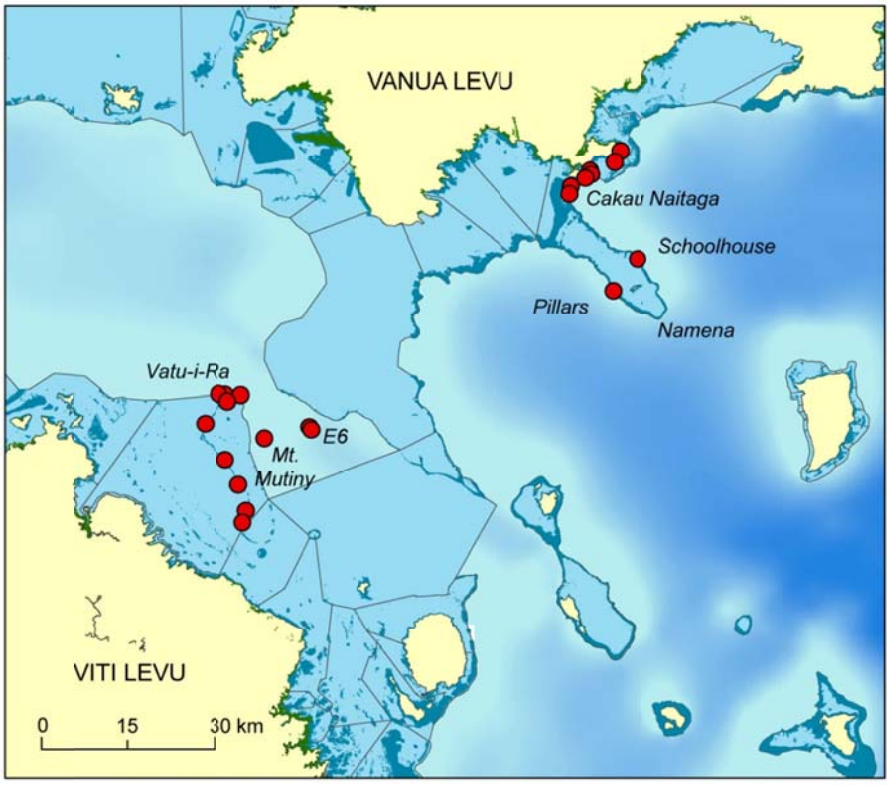

Figure 3. Location of DOV survey sites within and adjacent to Cakau Naitaga tabu, dive sites at Pillars and Schoolhouse, within and adjacent to the Vatu-i-Ra Marine Reserve, and on Mt. Mutiny and E6 seamounts.

NEXT STEPS:

- UVC data from the Namena Marine Reserve will be compared with published records from 2007 to 2009 (Jupiter and Egli 2011) and unpublished data collected in 2010 and 2011.
- UVC and DOV data from Mt. Mutiny seamount data will be compared with summary results from a 2003 WCS expedition (Marnane et al. 2003) to evaluate whether ongoing fishing pressure has impacted fish populations.
- Analysis of UVC and DOV data from Vatu-i-Ra Reef will provide a good overview as to the status of the Vatu-i-Ra Marine Reserve a year and a half after its establishment.
- DOV data from the Cakau Naitaga tabu will be used to assess fish population recovery 1 year following the tabu harvest and will inform the development of models that will be used to provide guidelines to communities about when and for how long they can open their tabu.

- BRUV data from inside and adjacent to the Namuri Marine Reserve will be compared with data collected in 2009 gauge the effect of heightened protection, particularly following adaptive reconfiguration of the Kubulau MPA network in 2012.
- BRUV data collected from deeper depths around Kubulau, Vatu-i-Cake and Vatu-i-Ra reefs will be used to describe deepwater fish assemblages and to assist with development of management rules to promote sustainable fisheries.
- We will use comments and framegrabs recorded from ROV dives to aid in definition of a typology of deepwater benthic communities for classification of the video data. Once described, we will assess vulnerability of the deeper coral reef communities to human disturbance.

LINKS TO NATIONAL PRIORITIES:
This project supports the Fiji Government declaration in 2005 at the meeting of small island developing states in Mauritius to effectively protect 30% of its inshore and offshore marine habitats by 2020.

Land-Sea Prioritization to Maximize Coral Reef Health While Achieving Terrestrial Biodiversity Targets

STATUS: Completed

FUNDING: David and Lucile Packard Foundation (2012-37915)

PARTNER ORGANISATIONS: ARC Centre of Excellence for Environmental Decisions (CEED), University of Queensland

OUTPUTS:
- *Journal article:* Klein CJ, Jupiter SD, Watts M, Possingham HP (2013) Evaluating the influence of candidate terrestrial protected areas on coral reef condition in Fiji. Marine Policy 44:360-365
- Recommendations for revising Fiji's Priority Forests for Conservation presented to the terrestrial working group of the national Protected Area Committee

RESEARCH HIGHLIGHTS:
In 2011, WCS and collaborating partners at the University of Queensland, University of California-Santa Barbara and Conservation International created a model for conservation in Fiji with the purpose to maximize coral reef condition through investment in terrestrial protected areas across Fiji's coastal watersheds, focused on the three main islands of Viti Levu, Vanua Levu and Taveuni. The simple model estimates coral reef condition as influenced by watershed-based pollution and fishing impacts. These stressors were chosen as they are the only stressors for which we have consistent data across the whole study region that can be mitigated through implementation of a protected area. The model was published in Ecological

Applications (Klein et al. 2012) and was presented to the Protected Area Committee (PAC) in 2011.

During the presentation to PAC, a criticism was brought up that the model did not simultaneously consider terrestrial priorities when selecting optimum areas for conservation action. Therefore, in this current project, we used model developed by Klein et al. (2012) to evaluate how implementation of different options for terrestrial protected area networks *would achieve terrestrial habitat protection targets* as well as benefit coral reef condition. As systematic conservation planning has not been used in Fiji to identify potential terrestrial networks, we first designed several 'potential' networks that achieve conservation goals of Fiji's Protected Area Committee. These options included:

- 40% representation of the distribution of each vegetation type on each island, unless the vegetation type does not exist on the island.
- 40% representation of vegetation types, but also including the number of mataqali tenure blocks intersecting the selected area as a cost.

We aimed to determine how much each network, if implemented, would impact coral reef condition and also how well they achieve the terrestrial targets. We compared the results of our networks to other conservation scenarios, in terms of reef condition and representation of vegetation communities:

- Existing protected areas only;
- Proposed "high priority" areas for conservation determined by the terrestrial working group of the PAC;
- A scenario in which 20% of the land that delivers the most benefit to coral reef condition was selected; and
- A scenario in which 20% of the land that delivers the most benefit to coral reef condition was selected, but only if it contributed to achieving protection of target terrestrial vegetation types.

Results indicated that the PAC's originally selected priority forests for protection can, in fact, offer significant downstream benefits to coral reefs. However, these priority places for management did a poor job of representing target terrestrial vegetation types (Figure 4). We presented the results to the terrestrial working group of the PAC with the recommendation to add certain forest areas to their proposed network that were consistently selected in the systematic conservation planning scenarios. As a consequence, additional forest areas were added, particularly on Vanua Levu, to a map of existing and proposed protected areas that was submitted to and endorsed by the National Environment Council in October 2013.

NEXT STEPS:

- Work with communities in priority forests for management to safeguard forest resources and simultaneously minimize runoff to downstream coastal ecosystems.

LINKS TO NATIONAL PRIORITIES:

The activities under this project support the following objectives: **NBSAP Implementation Plan Thematic Group 1 (Forest Conversion), Strategy 2:** Promote research and awareness on forests and terrestrial resources, **Objective 2.2:** By 2012, promote at least 2 case studies on the relationship between forests cover and ecosystem services; and **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.1**: By end 2011, complete list of priority terrestrial and marine sites developed, **Actions 2.1a-c**. The outputs from this research will also support **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 5:** Support the ecosystem-based approach throughout Fiji, recognising that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience

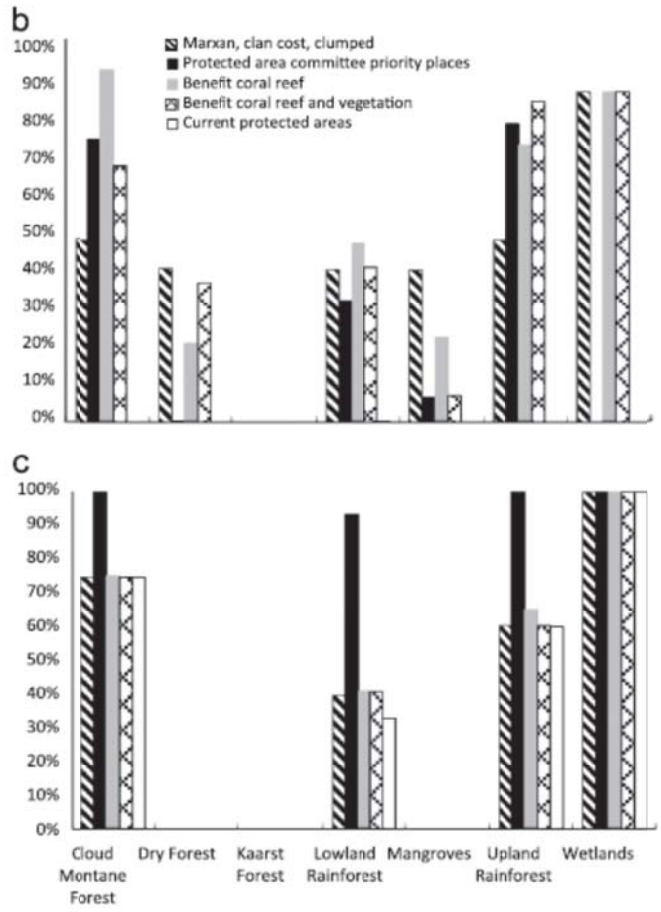

Figure 4. Percent of each vegetation type represented in the forest areas selected for protection under five different scenarios for terrestrial protected area networks on (b) Vanua Levu and (c) Taveuni.

MANAGEMENT

The following sub-sections present a synthesis of completed and ongoing activities that have strengthened and supported community-based natural resource management in Fiji

Spreading Ecosystem-Based Management

Strengthening forest conservation

STATUS: Completed

FUNDING: Critical Ecosystem Partnership Fund (60909)

PARTNER ORGANISATIONS: iTaukei Affairs Board, iTaukei Land Trust Board, iTaukei Lands and Fisheries Commission, Department of Forestry, NatureFiji-MarqetiViti, Bua and Cakaudrove Provincial Council offices. We additionally received critical input from the National Trust of Fiji, the Fiji Herbarium at the University of the South Pacific, as well as several logging companies active on Vanua Levu.

HIGHLIGHTS:
In May 2012, WCS received a 13 month grant from the Critical Ecosystem Partnership Fund (CEPF) for "Strengthening Conservation and Management Across the Mt. Navotuvotu-Mt. Kasi Forest Corridor, Fiji." The long-term goal of project is to work with communities to achieve, by 2020, 20% protection of forests and streams within key biodiversity areas across the Mt. Navotuvotu-Mt. Kasi forest corridor and 10% protection outside. The Mt. Navotuvotu-Mt. Kasi forest corridor covers the heavily forested districts of Dama, Vuya, Solevu, Nadi, Wainunu, Kubulau (Bua Province), and Wailevu and adjacent catchments in Koroala (Cakaudrove Province), on Fiji's second largest island of Vanua Levu.

We undertook two spatial prioritizations to identify land tenure parcels most suitable to achieve biodiversity targets, while minimizing threats from other land uses and capitalizing on already identified community willingness to manage their natural resources. We developed a project steering committee composed of representatives from the iTaukei Affairs Board, iTaukei Land Trust Board, iTaukei Lands and Fisheries Commission, Department of Forestry, and local NGO NatureFiji-MarqetiViti to advise on how to proceed with community consultations and how to overcome hurdles associated with conflicts in land use.

We targeted 23 clans for engagement to discuss the establishment of protected areas and sustainable land management leading towards permanent forest estates, as recommended under the Fiji Forest Policy (DoF 2007). As a direct result of CEPF investment, eleven landowning clans across the Mt. Navotuvotu-Mt.Kasi forest corridor committed to establish 6,585 ha new community forest parks (CFPs) and river buffer zones (RBZs) (Figure 5). These new protected areas increased the total area protected within the planning region from 5.6% to 10.8%, with 6.9% of key biodiversity areas protected and 13.1% of the broader forest corridor protected. Management rules for the protected areas have been included in adapted ecosystem-based management plans (EBM) for Kubulau, Wainunu and Wailevu/Koroalau districts, which will be endorsed by the respective councils of chiefs. New EBM plans for Nadi and Solevu districts have additionally been developed and are awaiting endorsement by their council of chiefs in January 2014.

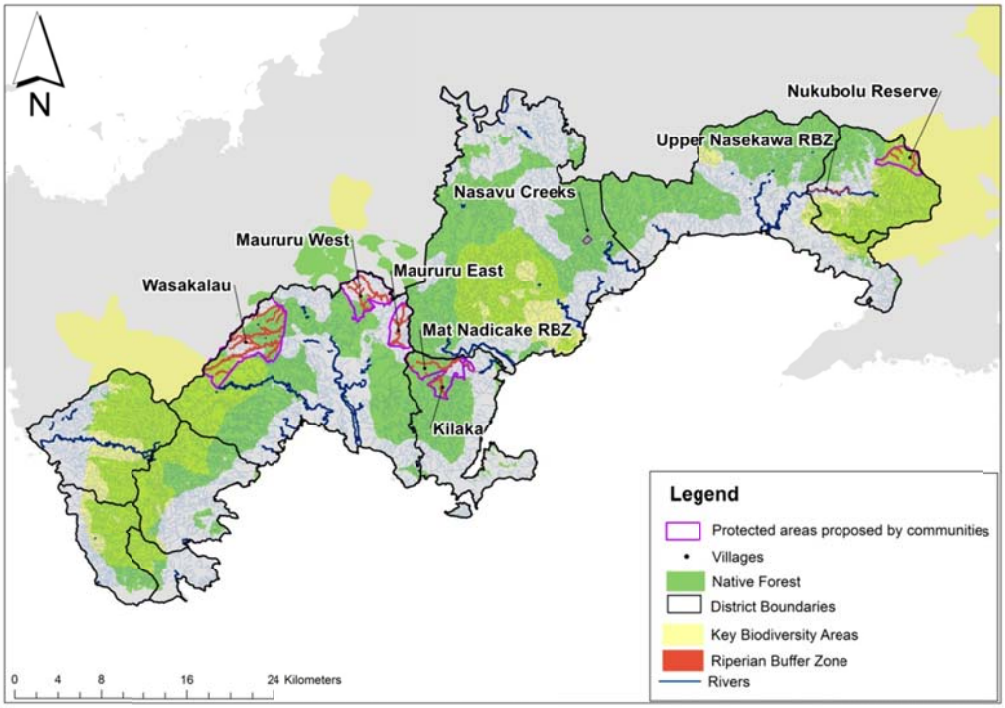

Figure 5. Location of community forest parks (CFPs; purple outline) and river buffer zones (RBZs; red) across the Mt. Navotuvotu-Mt. Kasi forest corridor.

Establishment of community-managed protected areas across the Mt. Navotuvotu-Mt. Kasi forest corridor was constrained by current legal and practical obstacles. Fifty-nine percent of the Mt. Navotuvotu KBA is currently allocated as logging concessions, while 80% of the Mt. Kasi KBA is under mining tenement. WCS is encouraging landowners to sustainably manage their land holdings with a view toward establishing permanent forest estates, and we recommend that new protected area legislation provides greater opportunity for registration and incentives for community conserved areas. We will continue to work with landowners to demonstrate the direct (e.g. through natural products) and indirect links (e.g. through ecosystem service provisioning) between healthy natural resources and livelihoods.

LINKS TO NATIONAL PRIORITIES:

The activities completed under this grant supported the following objectives: **NBSAP Implementation Plan Thematic Group 1 (Forest Conversion), Strategy 2:** Promote research and awareness on forests and terrestrial resources, **Objective 2.2:** By 2012, promote at least 2 case studies on the relationship between forests cover and ecosystem services, **Action 2.2h**: Undertake a survey on current status of biological resources, specifically those of subsistence and economic importance and those that are threatened or need attention for protection; **NBSAP Implementation Plan Thematic Group 7 (Inland Waters), Strategy 1:** Improve and update information on status of wetlands and wetland biodiversity, **Objective 1.1:** By end 2011,

national wetland inventory of habitats (as well as their flora and fauna) produced as baseline for national planning, **Action 1.1b:** Collate and update information into spatially registered database; and **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.1**: By end 2011, complete list of priority terrestrial and marine sites developed, **Actions 2.1a-c**. This project also supports Fiji **Climate Change Policy Objective 5: Adaptation, Strategy 5**: Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.

Engaging districts of Western Bua Province

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2012-37915)

PARTNER ORGANISATIONS: Bua Provincial Council Office, Institute of Applied Science-University of the South Pacific, SeaWeb, FLMMA, Bua YMST

HIGHLIGHTS:
In December 2012, the Bua Provincial Council Office and WCS proposed to roll out district-level management planning across the six remaining unmanaged districts (those without management plans, see Figure 6) in the province of Bua. This has been a major focus for WCS in 2013. The districts (Navakasiga, Lekutu, Nadi, Solevu, Vuya and Dama) have been engaged separately and each is developing its own management plan. However for the purposes of planning they have been grouped into pairs with respect to their management status, geographic location and traditional ties. The progress of management plan development is described in the paired districts below, as well as for Bua District.

Vuya and Dama

Initial engagement and awareness-raising sessions were undertaken in 11 villages across Vuya and Dama districts in April 2013. Involving representatives from the Provincial Council Office and Bua Yaubula Management Support Team (BYMST), these one-day sessions observed traditional protocols to formally introduce the WCS team and establish each village's commitment to the district management planning process as part of a 'bottom-up' approach. They also built awareness on the ecosystem-based management (EBM) approach, mapped local resources, identified threats and outlined requirements for village representatives to participate in district management planning workshops.

Representatives from the villages (including women and young people) came together for district management planning workshops in June 2013. As well as input from the Provincial Administrator (on economic development plans), Fiji Museum and the National Trust for Fiji (on cultural heritage issues), participants considered a range of data on the health of their rivers and customary fishing grounds, including data on marine ecosystems from the WCS' Western Bua Resilience Survey. Participants mapped drinking water sources, land uses and existing

community protected areas. They undertook conceptual modeling to identify a vision, targets, threats and strategies for ecosystem-based management. Finally they proposed local management rules and activities in relation to some of the strategies, including new marine protected areas.

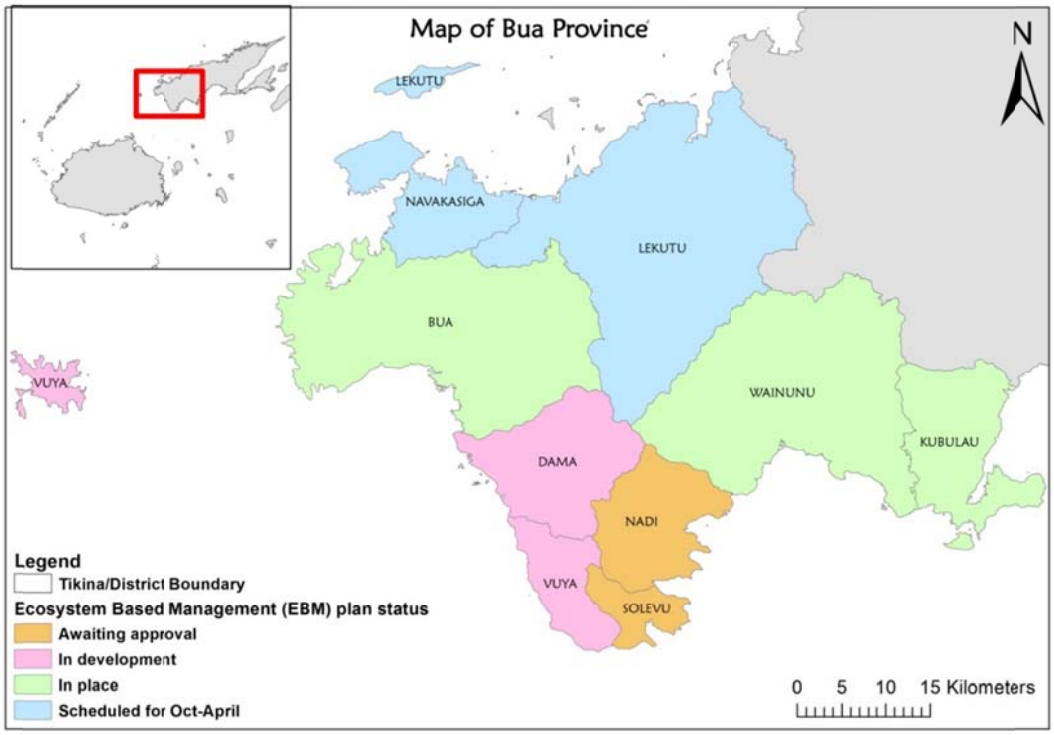

Figure 6. Current management status of districts in Bua Province. Green = management plans endorsed; Orange = management plans awaiting approval; Pink = management plans under development; Blue = first engagement completed in October-November 2013.

Feedback from village representatives highlighted the need for capacity building to help them fulfill their role to raise awareness, facilitate discussion and generate input from their village. Further district management planning workshops in October 2013 sought to address this with targeted communications training as well as updating management rules and protected areas.

The focus for the first half of 2014 will be to consolidate another round of community input to create draft district management plans and to define the structure through which they will be implemented and monitored.

Lekutu and Navakasiga

The WCS team visited each village in Lekutu and Navakasiga districts in October 2013. This was the first time that many of the communities had been engaged in formalized management planning. Sessions focused on raising awareness about EBM, identifying some priority issues and establishing relationships and commitment to district management planning processes in 2014.

Partners in Community Development Fiji (PCDF) and SeaWeb have provided training for a nominated Community Facilitator in each village in Lekutu and Navakasiga. WCS activities will utilize and support those individuals as co-facilitators in order to increase and utilize their capacity as conduits for community engagement.

Nadi and Solevu

Management planning was already advanced in Nadi and Solevu, where the focus for 2013 has been on confirming protected area boundaries and local management rules as well as building understanding and commitment amongst traditional leaders. District management plans for Nadi and Solevu are scheduled to be launched in January and February 2014 respectively.

Bua district

WCS facilitated a multi-stakeholder workshop in November 2013 to refresh the Bua District management plan, which was established in 2010 with support from the Institute of Applied Sciences-University of the South Pacific. The workshop incorporated a review of new marine survey data and perceived threats to local ecosystems. The district hierarchy council (*bose vanua*) was also engaged and is in the process of incorporating resulting new management rules and amendments to protected area boundaries.

LINKS TO NATIONAL PRIORITIES:
This project supports **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.2**: By 2014, develop management structures and implement paths to gazettal at highest priority sites, **Actions 2.2b-c**; and **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 4**: Design new ecologically relevant inshore MPAs, **Objective 4.6:** By mid-2014, 25% of the communities will have established new management structures for new MPAs, **Action 4.6a:** Consult with communities at priority regions outside of existing MMAs to establish new MPA management structures. This work also supports **Climate Change Policy Adaptation Strategy 5:** Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.

Provincial-scale engagement

STATUS: Ongoing

FUNDING: David and Lucile Packard Foundation (2012-37915)

PARTNER ORGANISATIONS: (Main partners include) Bua Provincial Council Office, iTaukei Affairs Board, Bua YMST, FLMMA, Institute of Applied Science-University of the South Pacific, SeaWeb

HIGHLIGHTS AND NEXT STEPS:

The establishment of management plans covering all nine districts in Bua will provide a foundation on which to build a provincial Integrated Coastal Management (ICM) plan. Our approach to ICM planning aims to ensure that local management priorities are incorporated at the wider scale and to facilitate well-informed 'bottom-up' input into district and provincial management planning processes. A 'roadmap' for provincial ICM planning was agreed with the Provincial Council Office in December 2012 and has been consistently communicated to stakeholders through Bua Yaubula Management Support Team (BYMST) and in the course of district management planning activities.

As well as taking account of district management plans (to facilitate well-informed 'bottom-up' input and ensure that local management priorities are incorporated at the provincial scale) the Bua provincial ICM planning process is designed to reflect the processes outlined, and the terminology used, in the National ICM Framework. Copies of the framework have been provided to BYMST and the Provincial Council Office and facilitators have encouraged consistent use of its terminology and processes to promote consideration of top-down government agendas and strategic alignment between the national, provincial and district-level plans (see Figure 7 below).

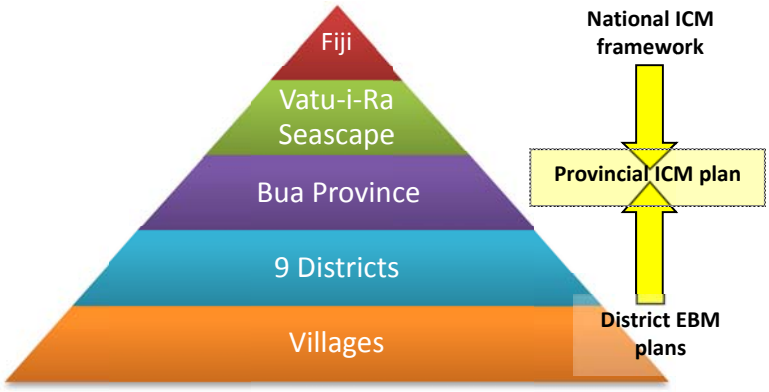

Figure 7. Schematic of relationship between 'bottom-up' and 'top-down' processes for integrated coastal management planning in Bua

The expansion of EBM across all nine districts in Bua requires additional local capacity to support management planning and implementation. The BYMST was formed in November 2012 to address this by providing human infrastructure linking communities, government departments, NGOs and other agencies for sustainable management of natural resources.

The WCS team facilitated workshops with the BYMST in February, August and November 2013 during which the BYMST developed their mission (to raise awareness, direct information and resources, facilitate planning and collaboration, empower action and undertake monitoring), reporting and communication structure (Figure 8), terms of reference and operational guidelines.

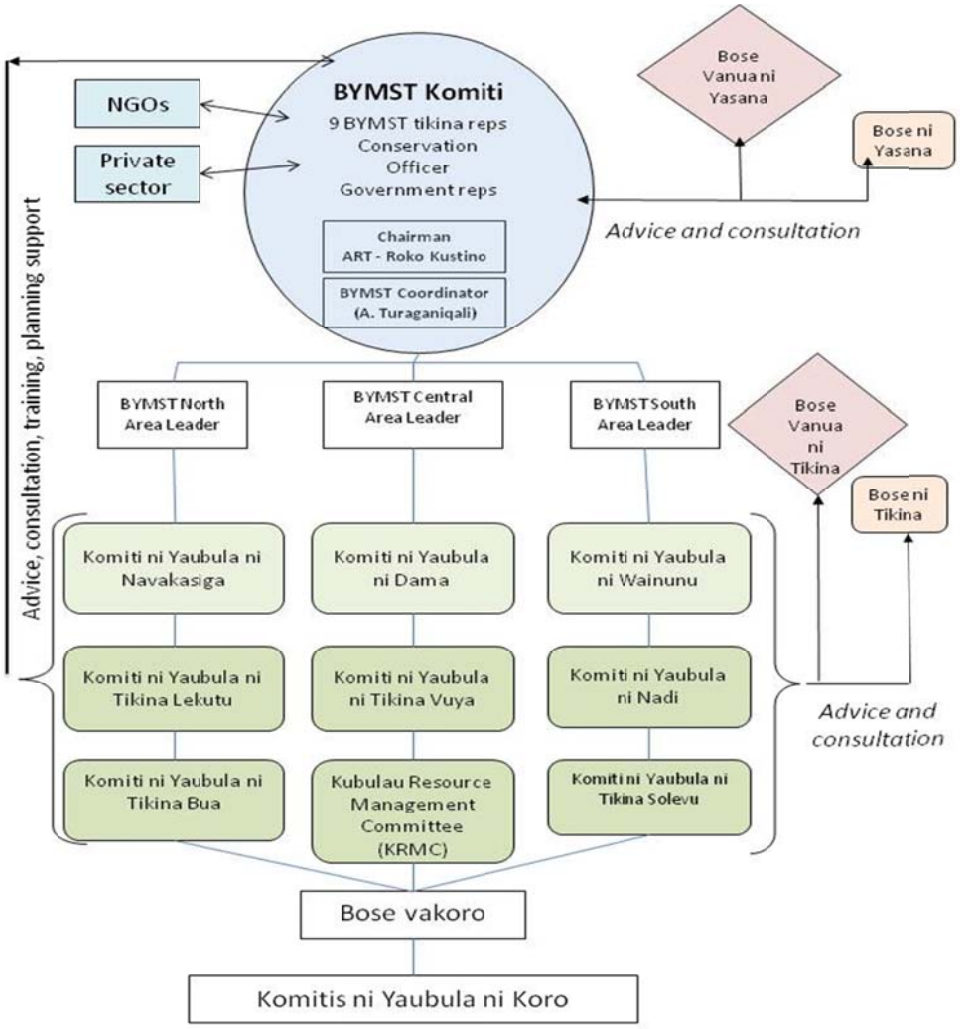

Figure 8. The structure, membership and lines of communication for Bua Yaubula Management Support Team (BYMST) were defined over the course of 2013.

In February 2013, WCS provided training for BYMST members on conceptual modeling, a facilitated exercise through which participants identify specific targets, threats and strategies. Along with SeaWeb, WCS also delivered training on communication and facilitation skills in order to help BYMST members to fulfill their role. These skills have been applied, reinforced and enhanced by involving BYMST members as co-facilitators with WCS at district management planning workshops.

WCS also facilitated a process for BYMST to develop and submit a funding application to the Global Environment Facility's Small Grants Program in December 2013. If successful, this will provide BYMST with the resources to implement village management planning, targeted training activities and cross-site knowledge exchange. The experience of implementation and

reflective learning from these activities will accelerate progress towards an effective and sustainable BYMST.

In 2014, WCS will continue to support BYMST and the Provincial Council Office to increase their role leading facilitation and engagement with communities, traditional leaders and other stakeholders in support effective integrated management at district and provincial levels.

LINKS TO NATIONAL PRIORITIES:
Strengthening of the Bua YMST will contribute to: **NBSAP Implementation Plan Thematic Group 4 (Coastal Development) Strategy 1:** Strengthen national guidelines for inter-sectoral coastal development, **Objective 1.3:** By 2014, a national coastal development plan to be developed to regulate/monitor coastal development activities; **Action 1.3b:** ICMC will collate and develop the coastal development plan with relevant stakeholders targeted to mainstream all current and planned development activities; **NBSAP Implementation Plan Thematic Group 6 (Protected Areas), Strategy 2**: Expand protected area network in priority sites at the national level and provincial level to achieve national targets, **Objective 2.2**: By 2014, develop management structures and implement paths to gazettal at highest priority sites; and **Climate Change Policy Adaptation Strategy 5:** Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.

Building Capacity and Awareness

Developing alternative livelihoods

STATUS: Ongoing

FUNDING: Flora Family Foundation, Critical Ecosystem Partnership Fund (60909), David and Lucile Packard Foundation (2012-37915)

PARTNER ORGANISATIONS: NCSMED

HIGHLIGHTS:
Increasing demand for money and over-reliance on limited income streams (primarily from farming, fishing, forestry and beche-de-mer harvesting) often leads communities to exploit their natural resources unsustainably. This was identified as a major threat in all districts across Bua Province. Scoping research in 2012 identified several small businesses with potential to help diversify and grow communities' income streams. WCS has been supporting these formative initiatives which are managed by rural women and involve the production and sale of virgin coconut oil, honey and woven handicrafts.

WCS facilitated workshops to transfer skills (on traditional weaving and honey-production) as a means of preserving traditional knowledge, building social networks and increasing production capacity. Further workshops in June and October 2013 helped the women to establish business

plans, identify and access new markets. These included empowerment training to foster leadership skills and to help identify and address a range of social barriers faced by local women.

WCS sponsored a group of six businesswomen from Bua to attend the 9th Pacific Islands Conference on Nature Conservation and Protected Areas in Suva in December 2013. As well as telling their story and selling products to delegates (Figure 9), they received training from the National Centre for Small and Medium Enterprise Development (NCSMED) and engaged with potential future buyers.

In 2014, the WCS team plans to support the women to raise local awareness and support for their businesses, establish mechanisms for investing profits in community projects, develop their input into local conservation management and establish links with business support agencies as a source of ongoing support.

Figure 9. Handicrafts and virgin coconut oil manufactured by womens cooperatives from Bua Province on sale at the 9th Pacific Islands Conference on Nature Conservation and Protected Areas.

LINKS TO NATIONAL PRIORITIES:
By providing means to alternate revenue streams, this activity in principle supports **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 9**: Reduce demand for marine natural resources and biodiversity products. However, monitoring will be required to evaluate whether revenue is additive or alternative.

COMMUNICATIONS

The following sub-sections present a synthesis of completed and ongoing activities that WCS Fiji has undertaken to improve communication between our organization, community partners and external stakeholders.

The Search for the Groovy Grotto: A Comic Book

STATUS: Complete

FUNDING: David and Lucile Packard Foundation (2012-38137)

OUTPUTS:

- *Comic Book:* Ledua T (2012) The Search for the Groovy Grotto. Wildlife Conservation Society, Suva, Fiji
- Comic book launched with Fiji Grouper Campaign during Hibiscus Festival, August 2013

HIGHLIGHTS:

WCS is supporting our partner SeaWeb and other organisations wtihin FLMMA to conduct a national campaign aiming to reduce fishing pressure on key targeted grouper species during a broad spawning season from July through September. The campaign was launched in August 2012 and is already gaining wide support from government, the private sector, and local communities. As part of the campaign, WCS developed a comic book titled "The Search for the Groovy Grotto" (Figure 10) featuring the impacts of human activities on spawning aggregation sites. The comic book was launched at the Hibiscus festival in August 2013, and is presently being distributed during other major campaign activities.

Figure 10. Cover of comic "The Search for the Groovy Grotto"

LINKS TO NATIONAL PRIORITIES:
This work supports **NBSAP Implementation Plan Thematic Section 5 (Species Conservation), Strategy 5:** Improved communication amongst stakeholders (including communities) on threatened & endangered species, **Objective 5.3:** By 2014, empower communities through knowledge to protect and conserve endangered and threatened species.

Press releases

Saving Fiji's coral reefs linked to forest conservation upstream

The health of coral reefs offshore depend on the protection of forests near the sea, according to a new study by the Wildlife Conservation Society that outlines the importance of terrestrial protected areas to coastal biodiversity.

In a study conducted by WCS and the University of Queensland evaluating the effects of terrestrial protected area designs on Fiji's coral reefs, it turns out that what's best for land ecosystems is also best for coastal corals.

The study appears in the online edition of Marine Policy. The authors are: Carissa Klein of the University of Queensland; Stacy Jupiter of the Wildlife Conservation Society; and Matthew Watts and Hugh Possingham of the University of Queensland.

"When designing terrestrial protected areas, the key is to consider not only how much they benefit terrestrial biodiversity but also how much they benefit coral reef ecosystems," said lead author Dr. Carissa Klein. "Thinking about the connections between the land and sea is rarely done when designing protected areas – Fiji is leading the way globally."

Most managers realize how downstream ecosystems such as coral reefs can be negatively affected by land-based activities that cause increases in runoff and associated sediments, nutrients, and chemicals. Yet, there have been very few on-the-ground cases where protected area networks have been designed using truly integrated planning to minimize such external threats.

This matters in small island developing states like Fiji, where selection of the locations of terrestrial protected areas have been mostly ad hoc, and based more on the cultural or timber value of forests than on any desire to protect biodiversity. Fiji's current terrestrial protected areas, which cover less than 3 percent of land area in the country, neither adequately protect Fiji's sensitive island habitats and species nor contribute much to minimize runoff to adjacent coral reefs.

In 2008, a national Protected Area Committee was created by the Fiji government, in part to achieve the goals of protecting 20 percent of the country's land and 30 percent of its coastal waters by the year 2020. Looking to support the committee's efforts to land-sea planning initiative, the study authors systematically analyzed six scenarios for expanding Fiji's network of

terrestrial protected area networks, with the aim to uncover how well each approach did to protect different forest types and minimize land-based runoff to downstream coral reefs. One scenario evaluated included all of the priority forests for conservation identified by the committee based on field data and rules of thumb.

"We're pleased that the results of our study confirm that the forests that the committee was considering for protection can offer significant downstream benefits to coral reefs," said Dr. Stacy Jupiter, Fiji Country Program Director and co-author on the study. "However, we were surprised to find that these priority places for management actually did not include a lot of the key threatened forest vegetation types. We therefore recommended to the committee to add some additional forests to their national register of priority places for protection."

This advice was taken by the committee, and additional forest areas were added to the final register of priority places for management endorsed by the Fiji government National Environment Council in October 2013.

"Fiji is to be commended for their constructive response to the findings of this important scientific research," said Dr. Caleb McClennen, Director of the WCS Marine Program. "Their decision to take action and link land to sea conservation helps to ensure the long term security of their globally important coral reef ecosystems while supporting the livelihoods and resilience of coastal communities."

Marine Reserve Swimming With Sharks

In Fiji's largest marine reserve, where fishing is banned, sharks are thriving. Marine researchers from WCS and the University of Western Australia have found that Namena Reserve—located on the southern coast of Fiji's Vanua Levu Island—has two to four times more sharks compared to adjacent areas where fishing is permitted.

In a study published in the journal Coral Reefs, authors Jordan Goetze of WCS and the University of Western Australia and Laura Fullwood of the University of Western Australia say that the significantly higher availability of prey fish within Namena's boundaries accounts for its shark densities. The 60-square-kilometer reserve was established in 1997 and is managed by local communities.

The researchers conducted their study during a three-week period in 2009. In order to survey the sharks, Goetze and the WCS Fiji team used stereo baited remote underwater video systems to record data at eight sites within the reserve and eight outside the reserve. The 60-minute video segments taken captured images of five different species of reef shark, providing the researchers with data on shark abundance.

Outside the reserve, in areas where fishing is permitted, the researchers found fewer sharks. They note that, because local Fiji communities traditionally considered sharks to be sacred, eating them is typically taboo. But as demand for shark products grows, higher prices are driving some locals to catch sharks. The island country's shark populations are also vulnerable to foreign fishing fleets. Worldwide, increasing rates of harvesting are leading to the depletion of many shark species.

"The news from Fiji gives us solid proof that marine reserves can have positive effects on reef shark populations," said Dr. Caleb McClennen, Director of WCS's Marine Program. "Shark populations are declining worldwide due to the demand for shark products, particularly fins for the Asian markets. We need to establish management strategies that will protect these ancient predators and the ecosystems they inhabit."

The study was made possible by the generous support of the David and Lucile Packard Foundation, the Gordon and Betty Moore Foundation, the Stavros Niarchos Foundation, and the University of Western Australia (UWA) Marine Science Honours program.

Science and Tradition Secure a Fishier Future for Fiji

In a world where fish catches are collapsing around the globe, Fijian fish are on the comeback trail thanks to a remarkable blend of centuries-old tradition and the latest science.

In Kubulau District, Fiji, local fishers, marine biologists and staff of the Wildlife Conservation Society (WCS) are combining ancient tabu (taboo) customs and modern science to manage fish stocks.

The communities of Kubulau – pronounced Kumbulau – have extended their network of Marine Protected Areas (MPAs) to cover almost half their traditional fisheries area using a mix of traditional and "western" management styles.

"The practice of establishing a tabu – which places temporary bans on fishing in certain areas – goes back hundreds of years in Fijian history," says Dr Rebecca Weeks from the ARC Centre of Excellence

for Coral Reef Studies (CoECRS), Australia and James Cook University. "But growing populations, modern fishing methods, increasing water pollution, climate change and deforestation have seen fish stocks dwindle.

"By working together to create a network of tabu areas, and adding some large, permanently closed MPAs, the communities in Kubulau are making sure that their management efforts are better able to address the problem of sustainable fishing in the 21st century."

In July 2011, Dr Weeks and her colleague, Dr Stacy Jupiter, Director of the WCS Fiji Country Program, along with WCS staff, facilitated a workshop for local fishers and community leaders, following which the communities of Kubulau added five new MPAs to their existing network. Three villages significantly increased the size of their MPAs, and 500 metre buffer zones were added to the three permanent reserves for the district.

"This means an additional 35 square kilometres of marine area has been protected, increasing the total area of the MPA network to 120 sq km or 44 per cent of the Kubulau District traditional fisheries area," explains Dr Weeks.

"Considering that the target for protection of marine habitats under the Convention on Biological Diversity's new strategic plan is only 10 per cent, the communities of Kubulau are setting a leading example in helping Fiji meet its international commitments."

Offshore MPA Campaign Launch

Figure 11. His Excellency the President, Ratu Epeli Nailatikau, discussing potential to develop offshore MPAs with WCS Fiji Director Stacy Jupiter and Etika Rupeni of IUCN.

On September 27, 2013, WCS, in partnership with the IUCN Oceania Regional Office and WWF South Pacific Programme, hosted a reception with senior government officials and members of the diplomatic corps to launch the offshore MPAs campaign aboard the Waitt Institute research platform (Figure 11). WCS Fiji Director, Dr. Stacy Jupiter, opened the evening with a call to develop offshore MPAs, considering that only 1.7% of Fiji's Exclusive Economic Zone (EEZ) is currently protected, and this protection comes exclusively from inshore management. The event was officiated by His Excellency the President, Ratu Epeli Nailatikau, who noted that the new Offshore Fisheries Management Decree "provides the scope to conserve, manage, and develop Fijian fisheries to ensure long term sustainable use." In response, IUCN representative Dr. Milika Sobey challenged the President to be a champion of

this issue through government. The event was well attended by Australian and New Zealand high commissions, representatives from tourism, the Permanent Secretary for Fisheries, and the acting Permanent Secretary for Environment, who requested a draft paper to be put to Fiji Cabinet recommending follow-up actions. Good momentum was generated, which now requires thoughtful follow-up at the appropriate levels in government. WCS has engaged a new Policy Adviser to develop this information paper and policy roadmap towards gazetting offshore MPAs.

Documentary Production

WCS engaged award-winning documentary filmmaker Emma Robens to produce and direct a short film, entitled *Roots to Happiness*. With support from local and international cameramen, underwater and topside footage is currently being edited to produce a compelling documentary elucidating the strong cultural and livelihood connection that Fijians have with the sea. The documentary will be shown locally to decision-makers, aired on Fiji TV, and submitted to international film festivals to garner support at various levels for management across the Vatu-i-Ra Seascape and adjacent offshore waters. A 3 minute trailer of the documentary was showcased during the 9th Pacific Islands Conference on Nature Conservation and Protected Areas during the Fiji Highlights session on Natural Solutions.

ENGAGING WITH NATIONAL AND REGIONAL PROCESSES AND PLANNING

The following sub-sections present a synthesis of ways that WCS Fiji has participated in development of national and regional conservation and resource management planning and policies during 2013.

Protected Area Committee

Through our research in collaboration with the University of Queensland, WCS was able to demonstrate to the terrestrial working group of the Protected Area Committee that the areas selected as priorities for expansion of Fiji's terrestrial protected area estate actually did a poor job at representing target vegetation types. Thus, the working group added several additional forests to the proposed priority list and map, which was endorsed by the National Environment Council in October 2013. WCS, on behalf of the Protected Area Committee, additionally updated the national marine gap analysis, using the relative effectiveness scores for different management actions that we developed in 2010. The results showed an increase from 12.1% (2010) to 16.7% (2013) of inshore marine habitats effectively protected through Fiji's locally-managed marine area network.

Integrated Coastal Management Committee

WCS has been active in attendance and support of the Integrated Coastal Management Committee in 2013 as they seek to explore the range of approaches to provincial-level ICM planning across Fiji in order to ascertain what is working well and promote widespread

incorporation of learning points. WCS Fiji continued to refine approaches for developing a provincial-level integrated coastal management plan for Bua Province, following the guidance of the Department of Environment's National Integrated Coastal Management Plan Framework. In December, WCS submitted a report to the national ICM Committee on the key features of the ICM process in the province of Bua, as requested following a presentation on the same subject in September.

Fiji Locally Managed Marine Area Network

WCS Fiji continues to strongly support the Fiji LMMA network through our participation on the Executive Committee and multiple working groups (Biological Working Group, Communications Working Group, Design and Administration Working Group), as well as the broader parent LMMA network. In 2013, we hosted a symposium at the 12th Pacific Science Intercongress on the effectiveness of locally-managed marine areas for building community resilience. As an outcome of the session, WCS Fiji director Stacy Jupiter, in collaboration with Pip Cohen of WorldFish, Rebecca Weeks of the ARC Centre of Excellence for Coral Reef Research, and Hugh Govan and Alifereti Tawake of the LMMA network submitted a paper to Pacific Conservation Biology on "Locally-managed marine areas in the tropical Pacific: Diverse strategies to achieve multiple objectives." This paper highlighted that there are many different reasons why communities establish LMMAs, and different tools with have varying effectiveness for achieving these many objectives. In October, WCS received a new grant from the John D. and Catherine T. MacArthur Foundation, under which we make a sizable sub-grant ($200,000) to FLMMA to cover their operational costs over 3 years. In November and December, WCS staff participated in various strategic planning sessions with FLMMA to develop a forward-looking workplan towards achieving sustainable inshore fisheries in Fiji.

PUBLICATIONS AND RESOURCES 2013

Book Chapters

Jupiter S, Roelfsema CM, Phinn SR (2013) Science and Management. In: Goodman JA, Phinn SR, Purkis SJ (eds), Coral Reef Remote Sensing: A Guide for Mapping, Monitoring and Management. Springer, pp. 403-426

Journal Articles

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Govan H, **Jupiter S** (2013) Can the IUCN 2008 protected area guidelines support Pacific island approaches to conservation? PARKS 19.1:73-80

Klein CJ, **Jupiter SD**, Watts M, Possingham HP (2013) Evaluating the influence of candidate terrestrial protected areas on coral reef condition in Fiji. Marine Policy 44:360-365

Knudby A, **Jupiter S**, Roelfsema C, Lyons M, Phinn S (2013) Mapping coral reef resilience indicators for management in Fiji. Remote Sensing 5:1311-1334

Makino A, Klein CJ, Beger M, **Jupiter SD**, Possingham HP (2013) Incorporating differential effectiveness and costs of zones into a marine spatial plan for the Vatu-i-Ra Seascape, Fiji. PLoS ONE 8(11): e78986. doi:10.1371/journal.pone.0078986

Makino A, Beger M, Klein CJ, **Jupiter SD**, Possingham HP (2013) Incorporating ecosystem connectivity between the land and sea to protect coral reefs. Biological Conservation 165:35-42

Pressey RL, Mills M, **Weeks R**, Day JC (2013) The plan of the day: managing the dynamic transition from regional conservation designs to local conservation actions. Biological Conservation 166:155-169

Roelfsema C, Phinn S, **Jupiter S**, Comley J, Albert S (2013) Mapping coral reefs at reef to reef-system scales, 10's – 1000's km2, using object based image analysis. International Journal of Remote Sensing 34:6367-6388

Tulloch VJ, Possingham HP, **Jupiter SD**, Roelfsema C, Tulloch AIT, Klein CJ (2013) Incorporating uncertainty associated with habitat data in marine reserve design. Biological Conservation 162:41-51

Weeks R, **Jupiter SD** (2013) Adaptive comanagement of a marine protected area network in Fiji. Conservation Biology doi: 10.1111/cobi.12153

Reports

Askew N, **Mailautoka K**, **Caginitoba A**, Jenkins A, **Jupiter S** (2013) Strengthening conservation and management across the Mt. Navotuvotu – Mt. Kasi Forest Corridor: Biodiversity Summary Report, December 2012. Wildlife Conservation Society, Suva, Fiji, 35 pp

Jupiter SD, Jenkins AP, Lee Long WJ, Maxwell SL, Watson JEM, Hodge KB, Govan H, Carruthers TJB (2013) Pacific Island Ecosystem Management – Principles, Case Studies and Lessons Learned. Secretariat of the Pacific Regional Environment Programme (SPREP), Apia, 68 pp

Jupiter S, Saladrau W, Vave R (2013) Assessment of sea cucumber fisheries through targeted surveys of Lau Province, Fiji. Wildlife Conservation Society/University of the South Pacific/Fiji Department of Fisheries/Khaled bin Sultan Living Oceans Foundation, Suva, Fiji, 22 pp

Jupiter S, Acton G, Caginitoba A, Koto K, Askew N, Wainiqolo G (2013) Strengthening conservation and management across the Mt. Navotuvotu-Mt. Kasi forest corridor: Final stakeholders report. Wildlife Conservation Society, Suva, Fiji, 18 pp

Nand Y, **Cakacaka A**, **Weeks R**, **Jupiter S** (2013) Western Bua resilience survey 2012 report. Wildlife Conservation Society, Suva, Fiji, 23 pp

Conference Presentations

Jupiter S, Jenkins AP, Lee Long WJ, Maxwell SL, Watson JEM, Hodge KB, Govan H, Carruthers TJB (2013) Pacific Island Ecosystem Management – Principles, Case Studies and Lessons Learned. 9th Pacific Islands Conference on Nature Conservation and Protected Areas, Suva, Fiji, 2-6 Dec

Jupiter S (2013) Bottom up and top down: three scales of marine spatial planning in Fiji. 9th Pacific Islands Conference on Nature Conservation and Protected Areas, Suva, Fiji, 2-6 Dec

Jupiter S, **Weeks R** (2013) Locally managed marine areas: How well are we doing and what do we still need to learn? 12th Pacific Science Intercongress, Suva, Fiji, 8-12 July

Wainiqolo G, Askew N, Caginitoba A, Koto K, Nand Y, Fox M, Qauqau I, Naisilisili W, Jupiter S (2013) Using Spatial Prioritization Tools to Help Strengthen Terrestrial Conservation and Management across Mt. Navotuvotu – Mt Kasi Corridor. 12th Pacific Science Intercongress, Suva, Fiji, 8-12 July

Comic Book

Ledua T (2013) The Search for the Groovy Grotto. Wildlife Conservation Society, Suva, Fiji

PROJECTED ACTIVITES FOR 2014

The following sub-sections present a brief list of confirmed and pending projects for 2014 and their links to National Priorities. All dollar values inclusive of indirect cost recovery by the WCS Global Conservation Program headquarters in New York.

Improving community-based fishery and MPA management in Fiji and Indonesia

STATUS: Confirmed

NATIONAL PRIORITIES:
This project supports:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Objective 5.1:** By 2014, 50% increase in number of villages and management units that have undergone leadership training, **Action 5.1a:** Provide leadership training to managers of marine biodiversity and fisheries resources
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Objective 5.3**: By 2014, all inshore MMAs will have a management plan that is adaptively managed, **Action 5.3a:** Provide all MMA sites with a management plan template and assistance developing management actions
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Objective 5.4**: By 2010, resource managers at 50 selected sites are recording incidents of destructive fishing and by 2014, multi-sectoral enforcement plans developed for all MMA sites, **Action 5.4a:** Develop strategic, multi-sectoral enforcement plans.
- **National Climate Change Policy Adaptation Strategy 5:** Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience;

2014 EXPECTED OUTPUTS:

- EBM plans endorsed for Vuya, Dama, Lekutu, Navakasiga, Nadi and Solevu districts
- Roadmap for Bua Integrated Coastal Management Plan refined
- GEF Small Grants Project approved to operationalize Bua YMST
- Community Educators Network Trainings conducted to strengthen district level awareness and communication skills

LOCATION: All districts of Bua Province; Wailevu District, Cakaudrove Province

PARTNERS: SeaWeb

DONOR: David and Lucile Packard Foundation (2012-37915)

TIMELINE: July 2012 - June 2014

INVESTMENT: USD$300,000 to WCS Fiji

Impacts of periodic harvests from customary marine closures on achievement of short-term socio-cultural and long-term conservation objectives

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries;
- **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

2014 EXPECTED OUTPUTS:

- Perception surveys completed across FLMMA communities of shifting baselines in motivations for harvesting tabu areas
- Paper submitted on methods comparison for assessing impact from a tabu harvest in Kubulau
- Analysis of ecological and socioeconomic data from 5 experimental harvests conducted to date from Kiobo (Kubulau District), Tuatua (Koro Island), Nakodu (Koro Island), Nauouo (Ovalau Island), Natokalau (Ovalau Island)

LOCATION: various FLMMA sites across Fiji

PARTNERS: Institute of Applied Sciences – University of the South Pacific, FLMMA

DONOR: David and Lucile Packard Foundation (2012-38137)

TIMELINE: October 2012 – March 2014

INVESTMENT: USD$250,000

Investigating the effectiveness of periodically harvested closures for achieving fisheries and economic objectives in Melanesia

STATUS: Pending

NATIONAL PRIORITIES:
The activities under this grant will support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Action 8.2a:** Perform stock assessments of inshore fisheries;
- **Fiji Climate Change Policy Objective 5 (Adaptation), Strategy 13:** Implement best practice adaptation measures, based on sound scientific research, and lessons learnt from local, regional and international experiences.

2014 EXPECTED OUTPUTS:

- Experimental fish tagging to assess net fish movement inside and outside of tabu areas in relation to natural movement and movement related to fishing pressure.
- Incorporate fish species behavior and catchability into a fishing vulnerability index.
- Conduct follow-up surveys of Koro and Ovalau tabu areas to assess population recovery.
- Initial development of bioeconomic fisheries models to optimize the use of periodically harvested closures to achieve ecological and socioeconomic objectives.

LOCATION: Koro Island tabu areas, Ovalau Island tabu areas

PARTNERS: The Nature Conservancy, California Polytechnic State University San Luis Obispo, WorldFish

DONOR: David and Lucile Packard Foundation

TIMELINE: February 2014 – July 2015

INVESTMENT: USD$250,000

Advancing payments for ecosystem services and developing alternative livelihoods in Vatu-i-Ra Seascape, Fiji

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 9**: Reduce demand for marine natural resources and biodiversity products.

2014 EXPECTED OUTPUTS:

- Develop two alternative livelihood projects, including a kuta mat weaving cooperative.
- Develop two alternative livelihood projects, including a kuta mat weaving cooperative.

- Finalized business plans and secured markets and supply chains for products (kuta mats, virgin coconut oil, honey) created by women's small business cooperatives.
- Production and marketing of a map of culturally and ecologically significant sites within the Vatu-i-Ra Seascape, focusing specifically on locally-managed ecotourism initiatives.

LOCATION: Vatu-i-Ra Seascape

PARTNERS: NCSMED

DONOR: Flora Family Foundation

TIMELINE: July 2012 – June 2014

INVESTMENT: USD$80,000

Expanding and strengthening effectiveness of coastal fisheries management and biodiversity conservation in the Vatu-i-Ra Seascape

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 3:** Maintain existing protected areas, **Action 3.1a:** Provide resources, technical assistance and annual training to existing LMMA sites.
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 3:** Maintain existing protected areas, **Action 3.2ab:** Monitor core set of existing MPAs for biodiversity and fisheries resources compared with unmanaged sites.
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 4:** Design new ecologically relevant inshore MPAs**, Action 4.6a:** Consult with communities at priority regions outside of existing MMAs to establish new MPA management structures.
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Action 5.1a:** Provide leadership training to managers of marine biodiversity and fisheries resources
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Action 5.3a:** Provide all MMA sites with a management plan template and assistance developing management actions
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 5**: Strengthen natural resource leadership, management and governance, **Action 5.4a:** Develop strategic, multi-sectoral enforcement plans.

- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 8:** Reform fisheries legislation and management institutions, **Action 8.2a:** Perform stock assessments of inshore fisheries;
- **NBSAP Implementation Plan Thematic Group 3 (Inshore Fisheries), Strategy 8:** Reform fisheries legislation and management institutions, **Action 8.4a:** Base licensing guidelines on outcomes of stock assessments with better conditions.
- **NBSAP Implementation Plan Thematic Group 4 (Coastal Development), Strategy 1:** Strengthen national guidelines for inter-sectoral coastal development, **Action 1.3b:** ICMC will collate and develop the coastal development plan with relevant stakeholders targeted to mainstream all current and planned development activities**.**
- **National Climate Change Policy Adaptation Strategy 5:** Support the ecosystem based management approach throughout Fiji, recognizing that ecosystem services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience;

2014 EXPECTED OUTPUTS:

- Social network analysis completed to facilitate expansion and coordination of Bua LMMAs into development of a draft provincial-level ICM plan.
- Underwater, catch-effort and socioeconomic monitoring of existing LMMAs across a gradient of land-based impact.
- Evaluation of land-cover change across the main islands of Fiji from 2013 data compared with 2001-02 data.
- A template for district-level EBM plans developed and translated into iTaukei (Fijian) and Hindi.
- Engagement with iTaukei Affairs Board to ensure environmental sustainability of village development plans.
- Principles of management planning and visioning introduced through village level introductory meetings on Koro and Ovalau.
- Strategic communications plan for increased fisheries management across the the Vatu-i-Ra Seascape produced, including prioritized communications objectives and a grassroots campaign strategy.
- Draft zoning plan produced for Bua Integrated Coastal Management Plan.
- Agreements on establishment of dive tag system for Vatu-i-Ra Reefs in Ra Province.

LOCATION: Bua, Ra and Lomaiviti Provinces

PARTNERS: Institute of Applied Sciences – University of the South Pacific, SeaWeb, FLMMA

DONOR: John D and Catherine T MacArthur Foundation

TIMELINE: October 2013 – September 2016

INVESTMENT: USD$950,000 (of which $450,039 will be subgranted to IAS-USP, SeaWeb and FLMMA)

Foundational aspects for a research collaboration on health, water and landscapes: a database and a learning network

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant support the following objectives:

- **Fiji Ministry of Health Strategic Plan (2011 - 2015)**, Objective 2.3: Reduce confirmed cases of typhoid by 75% by 2015;
- **Fiji Ministry of Health Strategic Plan (2011 - 2015)**, Objective 2.7: Reduce incidence rates of leptospirosis by 50% by 2015; Objective 7.1: Increase the proportion of people with access to safe water;
- **Fiji Ministry of Health Strategic Plan (2011 - 2015)**, Objective 7.2: Increase the proportion of people with access to safe sanitation.
- **Fiji National Climate Change Policy Objective 5.9**: "Build the capacity of the health and agriculture sectors to respond effectively to climate sensitive diseases";
- Core visions of the **2011 Fiji Department of Environment National Coastal Plan Framework** to "Improve health and well-being of the people of Fiji."

2014 EXPECTED OUTPUTS:

- Examination of the spatial and temporal nature of confirmed historical cases of typhoid to identify potential environmental and behavioural co-variates and confounding factors.
- Establishment of a learning network around the environmental-typhoid database and its interpretation.

LOCATION: Main islands of Fiji

PARTNERS: Edith Cowan University, Ministry of Health

DONOR: Edith Cowan University Industry Collaboration Scheme

TIMELINE: March 2013 – February 2016

INVESTMENT: AUD$29,752 to Edith Cowan University for work in Fiji, with additional AU$7,500 contribution from WCS

Understanding the links between local ecological knowledge, ecosystem services, and resilience to climate change in Pacific Islands

STATUS: Confirmed

NATIONAL PRIORITIES:
The activities under this grant supports:

- **Fiji National Climate Change Policy Objective 5.2**: Fiji National Climate Change Policy Objective 5.4: Support the development of adaptation technologies and systems that are sustainable, consider traditional knowledge and are culturally acceptable.
- **Fiji National Climate Change Policy Objective 5.4**: Support the development of adaptation technologies and systems that are sustainable, consider traditional knowledge and are culturally acceptable.
- **Fiji National Climate Change Policy Objective 5.5**: Support the ecosystem based management approach throughout Fiji, recognizing natural adaptation services, such as food security, natural hazard mitigation and physical coastal buffer zones, increase resilience.

2014 EXPECTED OUTPUTS:

- Agroforestry and garden surveys at study site locations in Kubulau, Navakavu, Malolo, and Nakorotubu
- Household and focal group surveys of traditional knowledge at study site locations

LOCATION: Project sites likely to be base at prior MMAS study locations in Kubulau, Navakavu, Malolo, and Nakorotubu

PARTNERS: University of Hawaii, University of the South Pacific

DONOR: National Science Foundation

TIMELINE: January 2014 – December 2015

INVESTMENT: USD$85,535 to WCS Fiji