

Integrated land-and-sea management: Examining three cases where marine practitioners are looking upstream

Coastal systems are linked to upland areas, just as they are to offshore areas. We can think of the connections among systems as two sides of the same coin. On one side, the connections are positive: with land, freshwater, and offshore marine systems delivering critical nutrients, biota, sediments for land accretion, and the physical space to allow passage between ecosystems. On the other side, the connections can be negative, as when upland areas deliver various human-caused stresses to coastal systems - like excessive nutrients from agriculture, sediments that smother nearshore biota, toxins, etc.

A key to effective EBM in inshore and coastal ecosystems is to maintain the natural connections while controlling the stresses that cause degradation. That balance, in large part, comes from integrating land management and sea management. Such integration is more easily said than done, as pointed out in this issue by Tundi Agardy (see [Tundi's Take](#)). But there are examples of integrated land-sea management in practice. Here we examine three cases.

Case A

Fiji: Developing a way to coordinate upstream and downstream conservation

In the Western Pacific, the nation of Fiji holds roughly 4% of all coral reefs in the world, including the third-longest barrier reef on Earth - the Great Sea Reef, or Cakau Levu. Most of the country's population lives along the coast and relies on the sea's resources for food and income. The marine ecosystem is under threat, however, partly from direct overuse (i.e., overfishing of reefs) and partly from the downstream impacts of various upland practices, including rapid land conversion due to forestry and farming.

In the context of this land-sea connection, Carissa Klein of the University of Queensland (Australia) led a study in 2011 to examine how best to coordinate conservation efforts in Fiji, upstream and downstream. Namely her team determined which forest areas, if prioritized for protection against forestry, would in turn protect the greatest amount of nearby reefs from land-based runoff. They found, for example, that protecting 2% of forest in one area was almost 500 times more beneficial to reef health than protecting 2% in another area. The study results are now being used to inform decisions by the Fiji Protected Area Committee (PAC); the PAC is supporting national targets to increase Fiji's protected area estate to protect 20% of land and 30% of inshore waters by 2020.

Below, Carissa Klein describes the research and is joined by Stacy Jupiter, a colleague on the study and the director of the Fiji program for the Wildlife Conservation Society (WCS), which has worked with partner organizations to foster "ridge-to-reef" management in Fiji ([MEAM 3:2](#)).

MEAM: What has been the response of Fiji's Protected Area Committee to your study results?

Carissa Klein: Stacy presented the study scenario and outcomes to the PAC Terrestrial Working Group in February 2013. Overall, the results seemed to validate selection of forest areas that were prioritized in an earlier study of 40 priority forests for Fiji but which missed out when a subsequent ranking exercise was conducted. In May 2013, the Terrestrial Working Group met again to finalize boundaries of priority forest areas for a map that will be distributed to government agencies across Fiji; these agencies are responsible for issuing permits for development or natural resource extraction. Our study was presented again and contributed to designation of some new priority areas, particularly on Fiji's second largest island of Vanua Levu, where certain habitat types had been severely under-represented in the PAC's ranking scheme.

MEAM: You have written that the results of your study will not be used to determine the exact location of protected areas in Fiji. What are some of the other factors that will be considered?

Stacy Jupiter: The suggested boundaries on the map produced by the PAC Terrestrial Working Group tend to follow edges of intact forest areas, often with some buffer. Because over 87% of land in Fiji is owned by indigenous Fijians at the clan level, legal gazettal of terrestrial protected areas in Fiji requires some sort of leasing agreement with the clans. Given this, protected area boundaries would tend to follow land tenure boundaries of clans, and one would seek to maximize the area of high biodiversity value within the fewest number of clan tenure boundaries - this will help reduce the transaction costs of payouts to different clans. This system actually strengthens protection afforded because a high level of consensus by clan owners is required for sign-off on the lease. This means that they will have bought into the process and will be less likely (in principle) to infringe on management rules.

MEAM: WCS and partners have been applying a ridge-to-reef approach in Fiji for several years. Has this study led to changes in the strategy of the ridge-to-reef work in any way?

Jupiter: The outcomes of this work may end up influencing where WCS and others prioritize investment as we continue to scale up this ridge-to-reef approach across other districts and their adjacent fishing grounds. I refer regularly to the map of which forests have the greatest return on investment for reef condition and overlay this with areas that we know to be principally beneficial for terrestrial conservation as one measure of good areas to direct donor funding. That said, a lot of what ultimately determines where WCS and others work in Fiji is community willingness to participate in management.

Klein: This work was not meant to influence only ridge-to-reef planning in Fiji. Our general approach can be adapted and applied in other places and can consider other management actions (e.g., improving farming practices). We are currently working with WWF-Australia, WCS-Papua New Guinea, and The Nature Conservancy-Indonesia to help inform ridge-to-reef planning in those places that considers the impacts of other land uses on coral reefs, such as oil palm plantations, farming, and coastal development.

For more information:

Carissa Klein, University of Queensland, Brisbane, Australia. Email: c.klein@uq.edu.au

Stacy Jupiter, WCS Fiji Country Program, Suva, Fiji. Email: sjupiter@wcs.org

Their study "Forest conservation delivers highly variable coral reef conservation outcomes", published in the journal *Ecological Applications* in 2012, is at www.esajournals.org/doi/abs/10.1890/11-1718.1

Klein and Jupiter conducted a webinar in January 2013 on the Fijian land-sea conservation study. A recording of the webinar is at www.youtube.com/watch?v=IXLWRNgkB_U

Case B

Monterey Bay, California: Working with upstream farmers to restore prior conservation practices

California's Salinas Valley is the main growing region for leafy green vegetables in the US. It is also upstream from Monterey Bay and the 21,000-km² Monterey Bay National Marine Sanctuary (MBNMS). Early last decade, the sanctuary and its partners on the regional Agriculture Water Quality Alliance (AWQA) worked successfully with the valley's farmers to apply voluntary conservation practices around their fields, including the addition of wooded natural areas between fields and streams to reduce agricultural runoff. By 2006, most growers in the valley had adopted at least one conservation practice under AWQA guidance. The practices were estimated to prevent 258,000 tons of sediment from entering the sanctuary annually.

In 2006, however, a strain of *E. coli* bacteria contaminated fresh spinach from the valley, leading to a national outbreak of *E. coli*-related illness. Nearly 200 people across the US became sick. It remains unknown how the bacterium came in contact with the spinach. But under pressure from spinach-processing companies and other buyers who wanted to avoid any chance of *E. coli* contamination from animal feces, the spinach growers removed the voluntary conservation practices they had put in place (MEAM 3:1). Within three years of the *E. coli* scare, there was a 13% loss of wetland and riparian habitat in the valley, leading to greater runoff into Monterey Bay again.

Bridget Hoover, Water Quality Protection Program Director for MBNMS, talks here about efforts to restore the conservation practices in Salinas Valley.

MEAM: What is the current state of the use of wooded buffers and other conservation practices in Salinas Valley agriculture?

Bridget Hoover: We have not gotten back to the amount of buffers and conservation practices that were installed prior to the scare as they relate to food safety. The Agriculture Water Quality Alliance partners continue to work with growers to implement practices to improve water quality, but they have been primarily programmatic in nature such as irrigation and nutrient management - i.e., things that do not affect food safety. There are some growers who have been willing to construct vegetated treatments regardless of food safety, but they are the minority. The problem remains with the very stringent requirements of buyers and auditors that are not based on science and have little to no evidence that there is a risk.

MEAM: MBNMS and its AWQA partners are working to develop solutions to address both food safety and conservation at once. Can you point to some specific outcomes and advances from this work?

Hoover: The Farm Food Safety Conservation Network continues to meet on a monthly basis, and includes representatives of government, NGOs, and industry. Members hold a bi-annual co-management forum that brings together industry, conservation practitioners, and agencies. The last meeting in 2011 was focused on the food companies - the buyers and auditors of the food grown on the farms. Afternoon field trips got industry representatives into the field to look at how some growers are addressing the conflicts. The next forum will take place this August 2013.

The Network developed an issue brief for large food buyers describing the conflicts between food safety and conservation, and encouraging a positive path forward through coordination of corporate sustainability and food safety programs. Additionally, materials were developed to educate food safety auditors on conservation practices they may see in the fields. The materials also facilitate discussions between auditors and farmers on methods to mitigate any food safety concerns associated with these practices through monitoring and management, rather than removal of the practice. The outreach materials are at http://ucfoodsafety.ucdavis.edu/Preharvest/Co-Management_of_Food_Safety_and_Sustainability/

MEAM: What tips can you offer other marine area managers when it comes to working and partnering with upstream stakeholders?

Hoover: We always find ourselves in a unique situation, be it with local cities working on stormwater issues or with growers addressing agricultural runoff. Because we have no authority in the watersheds, we are able to provide context and justification (i.e., there is a National Marine Sanctuary downstream) for implementing best practices, but on a purely collaborative and voluntary nature. I think it provides a safe environment to tackle hard issues.

My advice is to reach out to a very broad and diverse audience so that everyone feels they are being heard and included. Be persistent and in it for the long-term. These relationships take a long time to establish, and seeing results also takes a very long time. We are trying simply to be able to show progress with efforts to improve water quality. You can't expect drastic changes overnight.

For more information:

Bridget Hoover, Monterey Bay National Marine Sanctuary, California, US. Email: bridget.hoover@noaa.gov

A study on the removal of conservation practices around farms in Salinas Valley - "Farm practices for food safety: an emerging threat to floodplain and riparian ecosystems" - was published in the journal *Frontiers in Ecology and the Environment* in June 2013. The abstract is at www.esajournals.org/doi/abs/10.1890/120243

Case C

Queensland, Australia: Ambitious goals for improving water quality in catchments

The Reef Water Quality Protection Plan - or Reef Plan - is a joint initiative of the Queensland and Australian governments, involving an array of coordinated projects and partnerships (www.reefplan.qld.gov.au). It is designed to improve the quality of water flowing from inland areas of the state of Queensland to the (nationally governed) Great Barrier Reef. The Reef Plan focuses in particular on non-point source pollution: namely sediments, nutrients, and pesticides released into reef catchments from food-growing and livestock areas.

Established in 2003, the Reef Plan sets ambitious targets for water quality and land management improvement, and identifies actions to improve the quality of water entering the reef. The plan was updated in 2009 (one goal: "By 2013 the Reef Plan...will have achieved world's best practice in efforts to halt and reverse declining water quality from rural catchments"), and is set to be updated again this year. The long-term goal is to ensure that by 2020 the quality of water entering the reef from adjacent catchments has no detrimental effect on the health and resilience of the Great Barrier Reef.

Wendy Craik is chair of the Partnership Committee that advises the Queensland and Australian governments on implementing the Reef Plan. She speaks below about progress so far.

MEAM: In what ways do you anticipate the forthcoming, updated Reef Plan may be different from the 2009 Reef Plan?

Wendy Craik: The major differences proposed are based on the valuable information and experience gained to date. They are the need to:

- Focus on game-changing practices, such as the introduction and uptake of slow release fertilizer;
- Prioritize areas to focus on for improvement;
- Prioritize pollutants;
- Put greater emphasis on integrated knowledge transfer into extension [outreach and education to farmers]; and
- Increase research into economic and social issues, including assessments of the costs and benefits of Reef Plan actions at various scales (Great Barrier Reef, catchment, and property).

To date, monitoring has shown progress towards targets, but there is much further to go. Monitoring and modeling have been critical to understanding the effectiveness of our actions and what more may be required to achieve desired pollutant load reductions.

MEAM: Reef Plan focuses on non-point source pollution. Other sources of pollution - such as from coastal development, sewage, and mining waste - are addressed through a variety of other regulatory and planning processes managed by both the Australian and Queensland Governments. Are there benefits to not integrating all pollution sources in management?

Craik: Non-point source pollution from agriculture makes up about 90% of pollution [in the Reef Plan region]. While there is awareness of other point source pollution programs, running separate programs allows for clear focus and enables a greater ability to respond more speedily. I do not believe Reef Plan suffers from non-integration; on the contrary, I think its ability to focus on agriculture is a strength. The Partnership Committee specifically agreed it would not be advantageous to dilute efforts into other, more minor sources of pollution.

MEAM: To some extent, the Partnership Committee embodies the integrated management that the Reef Plan aims to achieve, with members drawn from state and national government, regional resource management bodies, industry, and conservation organizations. What are the main challenges the Committee faces?

Craik: Committee member fatigue is a potential issue although modest turnover of members seems to have proceeded smoothly, even when some of those departing were long-time players in this area. I think the level of commitment of members facilitates the committee's progress. Obtaining agreement on geographic priority areas can be a challenge due to members being from different areas; similarly, deciding on appropriate management responses can also be a challenge due to the variety of interests represented. Hearing all points of view and seeking new information to assist with resolution over time has so far enabled the Committee to reach agreement, even on some challenging issues. Some of these challenges may become more difficult as we get more information on what might be required to achieve the long-term goal of no detrimental impact on the health and resilience of the reef.

For more information:

Wendy Craik, Reef Plan Partnership Committee, Queensland, Australia. Email: Wendy.Craik@pc.gov.au

The Reef Plan Second Report Card was released in April 2013: www.gbrmpa.gov.au/media-room/latest-news/water-quality/2013/reef-water-quality-report-card-unveils-encouraging-results

BOX: More resources on land-sea connections and integrated management

- UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities www.gpa.depiweb.org/home.html
- "Human deforestation outweighs future climate change impacts of sedimentation on coral reefs", Nature Communications (open access), published 4 June 2013. www.nature.com/ncomms/2013/130604/ncomms2986/full/ncomms2986.html
- Watershed Management: Putting EBM into Practice, Upstream from the Marine Environment", MEAM 1:4, <https://meam.openchannels.org/meam/issue/june-august-2008-14>

BOX: In October: Second Global Conference on Land-Ocean Connections

The Second Global Conference on Land-Ocean Connections (GLOC-2) will take place 2-4 October 2013 in Montego Bay, Jamaica. The conference will identify approaches to address current and emerging issues in the marine and coastal sector, with a focus on nutrients, wastewater, and marine litter. UNEP and the Government of Jamaica are co-organizers. For more information, go to www.gpa.unep.org/index.php/gloc-2. The first GLOC was held in Manila, Philippines in January 2012.

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