

## Managing Water Quality in MPAs: How Practitioners Are Handling the Challenges

The quality of water in a marine protected area plays a major role in the health of that site's underwater ecosystems. MPAs near urban centers or agricultural lands can suffer from runoff of wastes, fertilizers, and other materials that degrade or otherwise alter natural systems. Floating garbage can accumulate in protected areas. Oil from drilling and transport carries the chronic problem of leakage and the threat of spills.

While the global MPA discussion often focuses on extractive activities and their management, threats to water quality can pose just as great a challenge for MPA practitioners. This month, MPA News examines the water quality-related challenges faced by four MPAs around the world, and how practitioners are handling them.

### Great Barrier Reef: Setting targets for contaminant reductions

The Great Barrier Reef Marine Park stretches 2000 km along the northeast coast of Australia. Its reef system – the largest in the world – is fed by a watershed dominated by extensive agricultural production, tourism, shipping, and urban and industrial centers. These activities all contribute pollutant inputs to the park. Agricultural activity, which comprises more than 80% of the Great Barrier Reef catchments, accounts for the greatest share.

“The water quality threats to the Great Barrier Reef have long been regarded as elevated nutrient concentrations together with increasing sediment loads,” said Sheriden Morris, director of the park's Water Quality and Coastal Development Issues Group. Nutrients – such as fertilizers from agricultural runoff and livestock waste – can cause blooms of algae on the reef, ordinarily a nutrient-poor environment. Sediment, created by intensive farming and then carried downstream, can bury coral and disrupt its recruitment. Researchers estimate that in the last 150 years, inputs to the reef of two nutrients – nitrogen and phosphate – have increased by up to 400% and 1500%, respectively, and sediment loads by as much as 900%.

The past decade saw significant expansion of the region's agricultural activity, particularly in the production of sugar cane. Sugar cultivation throughout the

state of Queensland increased by nearly a third in the 1990s. Banana production also exhibited rapid growth. From 1990-1999, in the case of two rivers draining to the reef, the presence of dissolved nitrogen from fertilizers doubled.

The effects of these increases have been seen on the Great Barrier Reef, particularly in inshore areas. Rising nutrient concentrations have led to increased seagrass biomass and distribution at two sites, while similar nutrient elevations elsewhere have been linked to reductions in coral growth.

In June 2001, under the directive of the Australian environment minister, the Great Barrier Reef Marine Park Authority (GBRMPA) began work to develop a water quality action plan. The plan, now completed, reviews the data on pollutant runoff into the park, prioritizes catchments according to the risk they present to the reef, and recommends minimum targets for reducing the pollutant loads. Among the targets recommended: a 38% reduction in sediment; 39% reduction in nitrogen; and 47% reduction in phosphorus. Each target is to be met by 2011. (The action plan and supporting documents are available on the GBRMPA website, at <http://www.gbrmpa.gov.au>)

The plan is a big step forward for the park. However, a significant obstacle remains. Under Queensland law, agricultural industries are not accountable for pollutants discharged into the state's catchments. In general, agriculture is exempt from Queensland environmental protection legislation and associated regulatory provisions. As a result, farmers on land that drains to the reef are under no pressure to reduce or otherwise manage their fertilizer inputs. Compliance with the action plan's targets is wholly voluntary.

GBRMPA says Queensland will have to change this. “It is anticipated that Queensland will have to utilize a range of management tools to bring about the changes in land use necessary to reduce current pollution loads,” said Morris. “Queensland has already initiated some reform of both its water and vegetation management legislation. But the primary legislative instruments for environmental planning and management do not recognize agriculture as an environmentally relevant activity. Exploring a

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## Water quality

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range of options for new instruments, or new provisions within existing instruments, is clearly necessary."

If agriculture were a state-regulated activity, GBRMPA would wield some management control over it under the park authority's bylaws. The bylaws allow the park to regulate activities outside the protected area that are harmful to plants and animals inside. Interestingly, GBRMPA invoked this regulation in 1999 to reduce effluent discharge from land-based aquaculture facilities adjacent to the park. Aquaculture, unlike agriculture, is a regulated activity in the state of Queensland. Following pressure by GBRMPA, the facility operators are adopting technologies to treat their effluent before discharging it.

### Monterey Bay: Working with farmers

Like the Great Barrier Reef Marine Park, the Monterey Bay National Marine Sanctuary – in California, US – is another large MPA into which multiple rivers drain. Stretching along 480 km of coast, the sanctuary directly fronts several urban areas. Farther inland, intensive agriculture sends nutrients and other materials downstream.

"There's a soup of contaminants that we're concerned about, both urban-based and agricultural," said Holly Price, resource protection coordinator for the sanctuary. "Street runoff, coliform bacteria, fertilizer, sediment, pesticides – the mix of contaminants provides the greatest challenge. Solving the problem requires the involvement of everyone who lives and works in the area. That becomes a massive task."

In recognition that water quality in Monterey Bay was critical for ensuring protection for all sanctuary resources, a group of eight federal, state, and local government agencies agreed in 1992 to work together to create a Water Quality Protection Program for the sanctuary, newly designated at the time. Today, 26 agencies and other organizations have teamed up to implement it.

The program is based on the concept of integrated coastal management, a process that begins with the direct participation of a region's managers, scientists, businesses, landowners, and other public stakeholders. One primary focus of the program has been to improve integration among the large number of existing water quality management and monitoring programs.

"In 1994-1995, when we started looking at what was being done on water quality, we realized there were already several poorly funded government programs involved, as well as a number of volunteer groups," said Price. Dozens of water quality management programs at all government levels were already in existence, in fact, but acting independently of one another. The sanctuary

pulled these efforts together for training, coordinating and strengthening efforts, and planning to fill critical gaps.

"We started out by identifying other private or public groups in the area that were already active in water quality, then made them our allies," she said. "An MPA can be the catalyst for bringing these groups together, as well as a galvanizing influence on the public to protect water quality." One hallmark of the sanctuary's work has been the involvement of more than 100 volunteers trained to monitor water quality. The volunteers test local water samples for nutrients, bacteria, and other contaminants, and report back to the sanctuary.

The Water Quality Protection Program is divided into four action plans: urban runoff, marinas and boating activities, regional monitoring and data sharing, and agricultural and rural lands. The implementing agencies first addressed urban runoff, with which they thought they might have the most immediate influence. The cities were quick to raise funds and help build community awareness. One year later, monitoring of detergent levels in stormwater runoff – an indicator of urban contamination – showed a decline.

Reducing agricultural runoff has been a longer-term process, says Price. "It takes time to get the agricultural community involved," she said. "It may be contentious at first, but it's worth the effort. Farmers want to be good stewards of the land but they don't want to be told what to do. They also don't want a one-size-fits-all solution. We've been able to set up a framework whereby they can make adjustments that work for them."

The key has been the involvement of farm bureaus – local cooperative organizations of farmers. The farm bureau community has taken a leadership role in organizing its members on the subject of runoff, says Price. As a result, the message is being distributed peer-to-peer in the agricultural community, rather than from agency to farmer. The farm bureaus are able to work with farmers on an individual level – discussing solutions pertinent to specific crops, for example – in a way the sanctuary would not have been able to offer.

"We still have a long way to go," said Price. She estimates it may take 10 years or more for contaminant levels to be reduced to where the sanctuary would like them to be. "It's an ongoing commitment."

### Flower Garden Banks: Surrounded by oil industry

The Flower Garden Banks National Marine Sanctuary, off the coast of the states of Texas and Louisiana in the US, is named for the colorful "gardens" of corals and sponges found 20 to 30 meters below the surface. Located more than 700 km from the next nearest tropical coral reefs, the Flower Gardens provide a regional oasis for shallow-water Caribbean reef species.

What makes the sanctuary doubly-unique is its man-made resident: an offshore gas-production platform. In addition, two-dozen more platforms stand within kilometers of the sanctuary's bounds, drilling for oil and natural gas in the muddy, petroleum-laden bottom. (The platform within the sanctuary predates the latter's 1992 designation.)

"The good news is that the water quality is excellent at this time," said Sanctuary Manager G.P. Schmahl, noting that the sanctuary's remote location – roughly 100 nautical miles (185 km) from land – protects it from terrestrial runoff. "The not-so-good news is that there are lots of threats around."

The biggest threat, of course, is a spill, either from one of the platforms or from a seabed pipeline that transports the oil and gas to shore. The US government has gone so far as to draw a "30% oil spill probability zone" around the sanctuary. That is, if a spill were to occur from an identified platform within that zone, given an average of surface currents, there would be at least a 30% probability that the spilled oil would enter the sanctuary. There are 27 platforms within the zone.

In the case of such an incident, the sanctuary would defer response duties to the US Coast Guard, which has the assets to contain, clean up, or otherwise manage the spill. "The sanctuary's main role in a spill would be to make sure that we could document and quantify impacts," said Schmahl. In order to do that, the sanctuary is working now to measure baselines for a range of physical and biological factors. The sanctuary and the US Minerals Management Service (the federal agency that oversees offshore oil drilling) support an annual contract to conduct water quality analysis and benthic monitoring, including video transects and coral growth stations.

In recent years, the sanctuary has deployed devices to detect the presence of bioaccumulative compounds in the water, such as DDT, PCBs, and heavy metals. Later this year, two permanent stations to measure current through the water column will go online in the 30% oil spill probability zone. In the case of a spill, these stations – paid for by the oil industry – will provide the Coast Guard with clues to which direction the spill is likely to head.

Sanctuary personnel take part in regular oil spill drills conducted by the Minerals Management Service and the Coast Guard. In the drills, says Schmahl, companies that operate nearby platforms are notified that a spill has occurred, and are instructed to respond accordingly. The sanctuary provides realistic information such as might be relevant in a spill – i.e., how the spill has affected a particular reef.

As further precaution, the federal government requires any pipeline that experiences a certain percentage decrease in pressure, such as might occur in a leak, to shut down automatically. For pipelines within four

nautical miles of the sanctuary, the percentage decrease allowed is even stricter.

Thankfully, no major spills have occurred in the area since the sanctuary's designation. "Much of the oil and gas industry has gone out of its way to work with the sanctuary," said Schmahl. "I would never say that it is a good thing to have all this drilling around an MPA. But if you look objectively at the information, I think you have to conclude that it might not be as bad as others make it."

### **Bunaken: Floating garbage and the threat of mercury pollution**

Bunaken National Park is one of six marine national parks in Indonesia. Designated in 1991, it covers 900 km<sup>2</sup> of diverse reefs and some of the largest mangrove stands in the northern hemisphere. With the capital city of North Sulawesi province, Manado, located just 10 kilometers from the park by boat, one might conclude that the main water-quality concern for the park would be urban runoff, namely human waste. In fact, it is not.

"Two major rivers empty into Manado Bay in the vicinity of Manado, and these two rivers are heavily polluted," said Mark Erdmann, marine protected areas advisor for the park. The rivers contain raw sewage, among other materials. "However, Manado Bay drops off quite steeply to 300-500 meters, and the maximum depth between Bunaken Island and Manado is 800-900 meters. Between the depth and the strong currents that flush the bay, the result seems to be that most particulate matter never makes it to Bunaken."

Nonetheless, any material that floats – i.e., plastic garbage, including bags and food packaging – travels straight to the park. This is the principal water-quality problem the park currently faces. "The floating plastic garbage is a major eyesore for tourists," said Erdmann, adding that at times there appear to be more bits of plastic garbage in the water than fish. "Moreover, the shape of Bunaken Island is more or less a crescent, and floating plastic is often entrained in the bay, ending up on the main tourist beach." On the ecological side, the area is a major cetacean thoroughfare and at least three species of sea turtle are common, so the potential for plastic ingestion is real, though not witnessed so far.

The park is working to reduce the flow of plastics. "Stopping the major source of plastic garbage from Manado is the obvious long-term goal, and park management and the tourism community have made this abundantly clear to the local government," said Erdmann. "But this effort is majorly hampered because Manado's dump has been technically 'full' for three years, and the government has been unable to find an acceptable new site." He says the World Bank and the US Agency for International Development have

*continued on next page*

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expressed interest in helping Manado manage its waste problem, but these efforts are very preliminary. In the meantime, the park's multistakeholder Management Advisory Board has made local management of plastic garbage a priority for the board's second year of operation, and has begun a program of weekly beach cleanups funded by the park entrance fee. Dive operators have taken the step of reducing their use of disposable plastics, and have financed a video aimed at locals and tourists to encourage an end to plastic dumping.

Another potential problem for Bunaken has been that of petroleum hydrocarbon damage to some reefs. The vast majority of dive boats visiting the islands use relatively inefficient, two-stroke outboard engines that expel a certain amount of unused fuel oil into surface waters. There has been noticeable damage – including disease, bleaching, and partial death – to the shallow coral colonies that many divers come to see, and park managers suspect this could be a result of damage from fuel oil. “The local dive association has made a verbal commitment to begin switching the fleet over to cleaner-burning four-stroke engines as soon as they become available for sale in Indonesia, hopefully in the next year,” said Erdmann.

What may pose the greatest future threat to the park, he says, is mercury contamination from illegal gold-mining in the mountainous watershed that drains to Manado

Bay. The mining – a widespread practice – uses a mercury-based extraction process. The mercury enters the watershed and flows downstream. Aquatic organisms in the watershed and some marine animals in the estuarine zone are now showing elevated levels of mercury in their tissues. As yet, corals and fish from Bunaken have tested clean.

“It is possible that the deep water and strong flushing will yet again prevent major problems for the park itself,” said Erdmann. “But the potential to destroy the tourism industry from negative publicity, as well as the province's valuable export fisheries, has spurred the park's Management Advisory Board to apply pressure to the provincial government to do something to stop the contamination.” The government, led by environmental agencies that sit on the advisory board, has now initiated a campaign to begin licensing all small-scale miners, who will be required to use a non-mercury extraction process. The tourism industry has also initiated articles in the local newspaper on the dangers of mercury to the general public, building public support for an end to mercury use.

Erdmann says it would be misleading to portray the park management as having its water-quality problems under control. But it is moving forward. “With each of these problems, some successes have been scored and bigger plans are underway,” he said. 📧

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## Notes and News

**Correction** Last month's issue (MPA News 3:6) incorrectly reported the date by which a draft operations plan for the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve would be available for public comment. The draft operations plan is expected to be available in February 2002. Also in February, the US National Marine Sanctuary Program is expected to begin a scoping process to solicit public input on designating the reserve as a national marine sanctuary. For more information, go to the official website of the reserve at <http://hawaiireef.noaa.gov>. 📧

**Representative Areas Program** The Great Barrier Reef Marine Park Authority (GBRMPA), which oversees Australia's Great Barrier Reef Marine Park, is in the process of zoning a network of no-take areas to protect representative examples of habitats and communities within the park. The Representative Areas Program is a multi-phase process; the initial phase identified 70 distinct bioregions in the park. At present, 4.6% of the marine park is off-limits to all extractive activity. For an update on how the program is proceeding, with maps and descriptions of the bioregions, go to [http://www.gbrmpa.gov.au/corp\\_site/key\\_issues/conservation/rep\\_areas/updates.html](http://www.gbrmpa.gov.au/corp_site/key_issues/conservation/rep_areas/updates.html). 📧

**Update on Channel Islands** The process to designate a network of no-take marine reserves within the Channel Islands National Marine Sanctuary (US) continues. The State of California Department of Fish and Game released in January a suite of six alternatives for a reserve network within the sanctuary, ranging in size from 12% to 34% of the sanctuary's waters. The preferred alternative of both the department and sanctuary management would set aside 25% of the sanctuary as no-take. The six alternatives are now open to public comment, and are expected to be voted on in August of this year by the California Fish and Game Commission. Information on the reserve network alternatives is available on the web at [http://www.cinms.nos.noaa.gov/dfg\\_isor.html](http://www.cinms.nos.noaa.gov/dfg_isor.html). 📧

**British Columbia poll shows support for MPAs** In a poll of residents in the Canadian province of British Columbia, 75% of respondents supported the concept of setting aside some territorial waters as off-limits to activities that would “seriously deplete fish or marine life” or damage important underwater habitat. The poll was commissioned by the Canadian Parks and Wilderness Society – British Columbia Chapter (CPAWS-BC). For more information, contact CPAWS-BC, 502-475 Howe Street, Vancouver, BC V6C 2B3, Canada. Tel: +1 604 685 7445; E-mail: [info@cpawsbc.org](mailto:info@cpawsbc.org). 📧

# MPA Perspective: Advice for Promoting Participation of Authorities and Stakeholders in MPA Planning

By Peter J.S. Jones, University College London

- The effectiveness of MPA planning processes in building trust and confidence is strongly related to the specific contexts in which they are carried out. The local characteristics of sites are therefore important, including social and economic activities (both past and present), political culture and existing policy networks, and the physical features and landscape of the area.
- In sites where there are fewer potential stakeholders (i.e., rural areas), there is often a higher expectation and need for participation by stakeholders. In urban sites where there are more potential stakeholders, there is often a lower expectation and need for participation by stakeholders. This should be taken into account when considering the appropriateness of participation techniques.
- It is beneficial if the eventual management structure for the MPA is discussed openly at the outset of the participation of stakeholders. The appropriateness of a two-tier management structure (with government authorities wielding supervisory power) or a flat structure (with authorities and stakeholders holding relatively equal power) may depend on the existing level of trust and confidence between the groups, as well as stakeholders' expectation of participation.
- Where existing trust and confidence among authorities and stakeholders has been generated through a previous resource-management initiative, this is more likely to be maintained and enhanced if the MPA is integrated with the previous initiative through adoption/adaptation of the management structure and approach. Where a previous resource-management initiative has been unsuccessful in generating trust and confidence, the underlying causes for this should be assessed and addressed.
- The skills and competencies of project officers should match the social and political culture of sites. At a site with close-knit human communities – as is the case for many rural areas – interpersonal skills and local knowledge may be particularly important. In contrast, on a complex urban site, political and scientific expertise may be more important. Project officers with appropriate experience of the local political culture should be employed where possible, particularly for sites that are likely to be politically sensitive or contentious.

## Building stakeholder participation

- Involving stakeholders in the initial planning process for an MPA demonstrates confidence in the expertise and knowledge of stakeholders, and builds trust in the commitment to share power and responsibility. Continuing this involvement throughout the management of the MPA, in turn, allows further time to build and strengthen social relations and networks.
- Asking participating stakeholders to suggest other stakeholders who should be involved helps to increase stakeholder representation.
- Restricting the input of stakeholders to discussion, advice, consultation and information provision – with little or no role in decisionmaking – can lead to apathy, a lack of willingness to cooperate with the management scheme, protests, and/or defiance of resulting plans and management.
- Assigning stakeholders specific, tangible responsibilities related to planning can develop trust and confidence and provide for constructive stakeholder participation. (At the same time, assigning authorities specific, tangible responsibilities also helps to generate partnership.)
- Project officers need to be aware of existing, perhaps latent, conflicts among stakeholders and government authorities into which the MPA may be drawn.
- Project officers should avoid making draft documents look too glossy and finalized; such appearances can give stakeholders the impression that it is a *fait accompli*.
- There is a need to achieve a balance between meeting deadlines and keeping the MPA planning process moving forward. It is important not to push the process too quickly, as this may alienate some stakeholders or authorities.
- In the long term, it is critical that initiatives arising from the MPA planning process are seen to be happening on the ground in order to maintain the participation and commitment of authorities and stakeholders. 📧

## For more information

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## Note from the editor:

Peter Jones, author of the perspective piece at left, is a lecturer in coastal and estuarine management at the University College London (UCL), UK. In recent conservation agency funded research, he and colleagues evaluated the effectiveness of participatory planning processes for marine protected areas in the UK. Lessons drawn from these processes may be of general interest to MPA practitioners elsewhere, and reflect the importance of building trust and confidence among participating groups.

Jones adapted the piece at left from a paper he co-wrote with Jacque Burgess and Darren Bhattachary of the Environment and Society Research Unit, UCL ("An Evaluation of Approaches for Promoting Relevant Authority and Stakeholder Participation in European Marine Sites in the UK: Final Report to the UK Marine SACs Project", September 2001. E-mail [p.j.jones@ucl.ac.uk](mailto:p.j.jones@ucl.ac.uk) for a summary of the report).

## From the Editor: Definitions

### Dear Reader:

An article in the December 2001/January 2002 issue of MPA News – “Results from the Reader Challenge: Which MPA is the Oldest?” – sparked responses (including those at right) from readers who questioned the definition the newsletter used for “marine protected area”. They felt the definition was too broad to be useful.

The definition used for the challenge was that of the IUCN (World Conservation Union), which describes a marine protected area as “an area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect all or part of the enclosed environment.” (IUCN, 1992) Based on this definition, MPA News named the Royal National Park, designated in 1879 in New South Wales, Australia, as the oldest existing MPA. The predominantly terrestrial park features some intertidal terrain, from which the taking of mollusks is prohibited.

MPA News used this definition primarily for reasons of clarity. The IUCN definition is probably the most widely used definition in the world for marine protected area.

There is no question, however, that the definition is quite broad. Sites that could fit the definition include temporal fishing closures, single-species protected areas, and even nations’ 200-mile Exclusive Economic Zones (EEZs) – not to mention sites that are primarily terrestrial, like the Royal National Park. To many readers – and particularly those most interested in the sub-category of fully protected marine reserves – the IUCN definition amounts to a distraction. Whereas MPA News had hoped to clarify the question of which MPA was oldest, our definition only clouded the matter for some readers.

Definitions on which everyone agrees are difficult, if not impossible, to create. Nonetheless, the MPA News editorial board agrees that any definition of MPA that could include EEZs probably needs some tightening. Is it time to revisit the IUCN definition?



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## Letters from readers

The letters below are in response to an article in last month’s MPA News, “Results from the Reader Challenge: Which MPA is the Oldest?” The article named the Royal National Park, in New South Wales, Australia, as the oldest marine protected area in the world.

### Dear MPA News:

In New South Wales, there are currently 42 national parks and nature reserves with recognized marine/estuarine components. All, including the Royal National Park, are reserved under the National Parks & Wildlife Act 1974. This legislation provides for protection of animals, terrestrial vegetation and substrata, but does not directly protect fish, marine invertebrates or marine vegetation (these fall under the Fisheries Management Act 1994). The park’s management plan today does not specifically address the management of its “marine protected areas” or the marine biodiversity within them.

Certainly national parks and nature reserves can play an important role in protecting both marine/estuarine and adjacent terrestrial habitat, but it seems to me a misnomer to pronounce an area a “marine protected area” when it cannot directly protect fish. I would therefore argue that calling Royal National Park the world’s oldest marine protected area is drawing a very long bow, and does little to clarify what a marine protected area is or should be.

The fault is not with your competition. Rather, I think the IUCN definition of “marine protected area” [which MPA News used in adjudicating] is too loose. It gives greater importance to permanency – through its phrase “reserved by law” – than to what is actually being protected.

Sincerely,

Jane Frances

Manager, Protected Areas, New South Wales Fisheries

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### Dear MPA News:

I see that your definition of MPA is pretty loose. You include areas that allow for sport fishing. This is like including wildlife refuges that allow for big game hunting in a definition of wild game protected areas.

I would assert that there are all kinds of marine protected areas with varying degrees of protection from a variety of extractive and potentially damaging activities. Standardizing the definitions between MPAs, marine reserves, marine wilderness, etc., would seem to be a key task for all of us involved.

An important component of any system of MPAs is area where all extractive activities including recreational and guided sport fishing are excluded along with other commercial fishing extractions and other commercial activities including various forms of tourism.

In Alaskan waters, we have thousands of square miles of coastal waters closed to various kinds of commercial fishing. Does this mean that they all qualify as marine protected areas? Certainly they merit some recognition, but not the same type of recognition as areas where the real tough decisions to protect the marine area from all extractive, polluting, and damaging activities have been made.

Sincerely,

Eric Jordan

Commercial fisherman

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