

Assessing the Carrying Capacity of MPAs: How Many Visitors Can Your MPA Hold?

The benefits of tourism to MPAs can be significant, including the potential for generating revenue to support management (*MPA News* 2:8). Like other human activity in marine protected areas, though, tourism has environmental impacts. Damage to coral reefs from careless divers, as well as pollution and other ecosystem impacts from recreational vessels, are among the range of tourism effects documented in MPAs worldwide. Controlling these impacts can be as important an element of MPA management as any other. A potential key to such management lies in assessing the number of tourists that an MPA can support sustainably — its carrying capacity.

Assessing the carrying capacity of an MPA involves a number of factors, though some scientists suggest there may be general capacity limits for particular habitat types, like coral reefs. However, actual implementation of these hard limits on numbers of tourists can be politically difficult. For this reason, some experts suggest an alternative way to manage tourism impacts: estimating the “limits of acceptable change” for protected sites instead. This month, *MPA News* examines both methods, and how managers are incorporating them to ensure sustainable tourism for their MPAs.

Carrying capacity

The term *carrying capacity* derives from ecological science, where it indicates the number of organisms the resources of a given area can support over a given time period. Adapted to tourism management, it has a similar meaning: the number of people who can use a given area without an unacceptable alteration in the physical environment. In this case, the concept of an unacceptable alteration has ecological and social aspects. That is, under too much pressure from visitors, a site or ecosystem can degrade, thus making it less attractive as a tourism destination. Delegates to the 2003 World Parks Congress agreed that an action plan for the world’s protected areas should include identification of “the limits of natural systems and their carrying capacity for different activities.”

But how does a manager assess the carrying capacity of an MPA? It is rarely a straightforward process. Carry-

ing capacity can differ from site to site, depending on habitat: a vertical wall of coral reef, in theory, may be able to sustain more divers than a flatter reef, prone to abrasion by divers with buoyancy problems. In addition, a site’s carrying capacity can increase or decrease with visitors’ level of experience and education. Again, the diver with buoyancy problems has a greater impact on habitat than the diver with good buoyancy control. If a park is able to educate visitors to have less impact per person, its carrying capacity increases accordingly.

From guidelines developed in 1992 by the World Tourism Organization and the UN Environment Programme, a basic equation for calculating visitor carrying capacity is:

$$\text{Carrying capacity} = \frac{\text{Area used by tourists}}{\text{Average individual standard}}$$

Here, the *average individual standard* (often measured in square meters per person) is the space a tourist requires for an acceptable experience in the protected area, which will vary depending on the area, activity, and management. Managers who seek to offer a pristine or wilderness-type environment for visitors, for example, would set a higher average individual standard than managers offering more high-traffic experiences. Despite the objective appearance of the square-meters-per-person figure, its calculation is based on subjective factors (e.g., How many visitors in a given area cause a site to be less wilderness-like?).

Another way of setting carrying capacity limits is by examining in hindsight the impact of visitors on MPAs. In other words, when managers observe a level of use above which degradation ensued, that level becomes the carrying capacity. This was the basis for perhaps the most widely cited research on MPA carrying capacity to date. In 1996, biologists Julie Hawkins and Callum Roberts of the University of York (UK) set out to determine a safe level of carrying capacity for recreational diving. They compared damage levels of protected reefs in three regions (Bonaire in the south-eastern Caribbean, Saba in the eastern Caribbean, and Egypt), with each reef subject to known levels of diving intensity. The sites were similar in coral cover and general topography.

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Their conclusion: reefs could sustainably support roughly 5000-6000 dives per dive site per year, but greater levels of use caused a rapid rise in diver damage as measured in broken coral. An MPA with multiple dive sites could sustain many times that figure as a

whole, as long as no site exceeded the 5000-6000 dive limit. (Incidentally, this figure was similar to one found by a World Bank-funded research team that had studied the Bonaire site alone.)

Hawkins and Roberts acknowledged that this was intended to be a general rule, adaptable to particular circumstances of individual MPAs.

Such circumstances could include reef health, number of suitable moorings per site, level of diver experience, and enforcement of regulations, among other factors. (Their paper appears in the *Proceedings of the 8th International Coral Reef Symposium*, 1997, pp. 1923-1928.)

It is unclear how many MPAs have used the 5000-6000 dive figure in setting limits on visitation. In an informal search in July, *MPA News* found relatively few examples of MPAs that had set formal carrying capacity limits at all, whether for diving or other visitor activities. One of the reasons for this is political: it can be difficult for resource managers to limit the number of tourists allowed when local businesses depend on those tourists and, understandably, want to maximize their revenue. Inversely, many less-visited MPAs may not yet be experiencing negative impacts from tourism, so

their management is not yet occupied with carrying capacity concerns. Of course, proactive planning can ease management later in cases of growing tourism pressure.

In the case of Cuba's national system of protected areas, such proactive planning is considered key. Located just 90 miles from the US, the nation is nonetheless largely shut off from US tourists by a trade embargo and travel restrictions the US government has applied to Cuba since the 1960s. Cuba's current tourism level of roughly 1.8 million foreign visitors per year consists largely of Europeans and Canadians. If the embargo and travel restrictions were lifted, Cuba would likely experience a boom in American tourism. Although estimates vary, the number of tourists in Cuba could increase as much as five-fold within a matter of years, according to some experts. This could place a substantial strain on the country's system of coastal and marine protected areas, with 18 sites currently designated and 12 more undergoing final government approval.

In the past decade, the National Center for Protected Areas (CNAP) in Cuba has had that scenario in mind. CNAP has already set general limits on visitor numbers for its "strictly protected" areas — those coastal and marine protected areas in which resource extraction is not allowed. The general limits apply to the number of bathers per beach (100 m²/bather), maximum group size (10 individuals), and number of groups per day per trail or natural option (2 groups), among other factors. MPA managers can adapt these general limits as needed to their site-level management plans.

Reinaldo Estrada, director of CNAP, notes that current visitation levels to these protected areas are well below the general limits. But he is concerned that a future flood of tourists could overwhelm management. "The greater problem of the national protected areas system, and particularly of its MPAs, is that its limited development and capacity would prevent it from effectively and efficiently enforcing the regulations," says Estrada. The MPAs have practically no boats, land transport, communications technology, or buoy systems. "To face this problem, we are looking for external financing to allow us to strengthen these areas," he says. "For our MPAs, we have had some limited support for this, primarily from WWF-Canada." (The US embargo prevents US organizations from providing direct material assistance of this type.) CNAP is also looking to develop better tools for estimating carrying capacity, and is co-sponsoring a workshop with WWF-Canada and Environmental Defense (an international NGO) in November 2004 to address that issue.

Such pressures, still hypothetical in Cuba, are already real for Banco Chinchorro Biosphere Reserve, a coral reef MPA off the southeastern coast of Mexico. As set in the site's management plan, no more than 150 individuals are allowed to visit Banco Chinchorro each

Carrying capacity discussions

There are several examples of MPAs in which limits on tourism, though not set, have been discussed by managers or stakeholders:

Florida Keys National Marine Sanctuary (US): This MPA surrounds the Florida Keys, an archipelago that receives millions of tourists each year, including divers, anglers, and recreational boaters. The management plan for the sanctuary calls on managers to assess impacts of recreational activities and estimate user carrying capacities. Although the sanctuary has not yet conducted these assessments, it does have four research-only areas that were designated partly to serve as control sites for such studies. (Notably, a major inter-agency study in the late 1990s sought to measure carrying capacity for the entire Florida Keys ecosystem, both terrestrial and marine; the study is available online at <http://www.sfrpc.com/gis/fkccs.htm>. A critique of the study, provided by the National Research Council, is also online at <http://www.nap.edu/catalog/10316.html>.)

Stellwagen Bank National Marine Sanctuary (US): Off the coast of New England in the US, Stellwagen Bank is home to several species of large whales and a thriving whale watching industry. The sanctuary is now undergoing a management plan review process in which whale watching activity — both by commercial tour vessels and recreational boaters — will be one among many considerations. Federal guidelines for whale watch vessels in the region, including in the sanctuary, allow only one vessel at a time to be within 300 feet (90 meters) of a whale, and only two to be within 600 feet (180 meters).

Svalbard region (Norway): The arctic archipelago of Svalbard features several marine protected areas, totaling roughly 80,000 km². Cruise tourism has increased significantly around Svalbard in recent years. Although Norway has not yet crafted management plans for its Svalbard MPAs, it has restricted access to some landing sites due to impacts from overvisitation.

day, where there is a designated zone for diving and snorkeling. But in the past decade, coastal development along the nearby mainland has surged: vacation resorts and cruise tourism infrastructure — including a new cruise ship terminal in the town nearest to Banco Chinchorro — are changing the coastline from small fishing villages to a major international tourism destination. One tourism developer has reportedly purchased a large, high-speed catamaran to take visitors from the mainland to Banco Chinchorro, and is proposing to bring 400 individuals per day.

Tomás Camarena, a policy expert with Environmental Defense and former director of the Banco Chinchorro reserve, says that if that site and other MPAs in the region are to be protected — potentially through the court system — their defense may rely on their carrying capacity limits. “The carrying capacity component of the management plan is a key to protecting Banco Chinchorro,” he says.

Limits of acceptable change

As already noted, setting limits on visitors while also satisfying tourism stakeholders can be a challenge. In the cases from Cuba and Mexico, the limits were instituted in the absence of an active private tourism sector to oppose them. (Banco Chinchorro’s limit was set in 2000, before the nearby cruise terminal was completed.) Where tourism is already well-established, the suggestion of a carrying capacity is often interpreted by the private sector as a potential limit on business.

Steve McCool says there is a better way of addressing tourism impacts. A professor of wildland recreation management at the University of Montana (US), McCool says the concept of visitor carrying capacity impels managers to ask the wrong question: How many visitors is too many? He says this treats limits on visitor numbers as an end in themselves, whereas many problems of recreational use are a function not so much of numbers of people, but their behavior. McCool suggests that managers should ask instead what resource and social conditions are acceptable, and how those conditions may be attained. In other words, management should be based on the limits of acceptable change (LAC) for a protected area.

“LAC is not a carrying capacity but a set of conditions — biophysical and social — that managers have deemed to be appropriate,” says McCool. “The limits reflect values, preferences, science, policy, and public input, and can be maintained through a variety of policies, such as education. In the case of a marine protected area, concerns about damage to coral by divers could lead to a rule or guideline about ensuring proper buoyancy control.”

An overview of the LAC framework, authored by McCool, is online at http://www.prm.nau.edu/prm300-old/LAC_article.htm. In short, the framework involves four major components:

- Specification of acceptable and achievable resource and social conditions, defined by a series of measurable parameters;
- Analysis of the relationship between existing conditions and those judged to be acceptable;
- Identification of actions necessary to achieve these conditions; and
- A program of monitoring and evaluation of management effectiveness.

Importantly, the process involves combining the technical expertise of planners and scientists with personal knowledge contributed by public stakeholders. Although the manager retains decisionmaking authority, the public consultation generally leads to greater buy-in from stakeholders and improved chances for successful implementation of management actions. (A carrying capacity approach, in contrast, prioritizes science over public values and interests.) McCool acknowledges that as use increases, a manager may decide that the only option left is to implement a limit on visitor numbers. But he describes such a use limit as not a carrying capacity but a decision that a limit is necessary to prevent any further change. “The strength of the LAC process is that it helps managers work through the process of making such decisions,” he says.

The main criticism of the LAC process is that it can be costly in terms of time and staff, due to its requirement for monitoring. In contrast to a carrying capacity — which, once established, entails little monitoring apart from counting visitors — a LAC system requires regular measurements of changes in resource and social conditions. McCool says he has heard of terrestrial protected area managers choosing to implement carrying capacity limits instead of LAC in order to avoid monitoring — a misunderstanding, he says. “Management requires monitoring,” he says. “To implement any management regime without monitoring implies that we know with certainty the outcomes of our decisions.”

In 1999, McCool participated in developing the first LAC-based management plan for an MPA — the Saba National Marine Park in the eastern Caribbean. (This was the same site featured in the Hawkins/Roberts study mentioned earlier.) The management plan provides standards for multiple factors, including the proportion of damaged branching corals acceptable by zone and the minimum percentage of time that only one dive boat will be present at each dive site. The plan also requires standards for water quality, sedimentation, and fish stocks.

David Kooistra, manager of Saba National Marine Park, says the monitoring requirements, particularly for biophysical data, do pose a challenge for staff. “It is time-consuming,” he says. To handle this, the park uses volunteers as much as possible for the collection of these data. Asked whether LAC has played a role in keeping the park’s reefs “pristine”, as they are described in the management plan, Kooistra says no — or, at least, not

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Saba management plan online


The management plan for Saba National Marine Park, based on limits of acceptable change, is available online in PDF format at http://www.sabapark.org/studies/lac_plan.pdf. (The first two pages of the file are blank.)

yet. “Low dive numbers, limited fishing activities, and no coastal development are more important contributors,” he says. “We expect that LAC will play a more important role once dive numbers increase by at least 50%. With only 20,000 dives made in Saba each year, the highest number of visitors some of the dive sites receive annually is 2500.”

In the Western Pacific, the LAC concept is emphasized as part of workshops for dive tourism operators, provided by the Coral Reef Alliance (or CORAL, a US-based NGO). The free-of-charge seminars, titled “Coral Reefs and Sustainable Dive Tourism: Protect Your Business By Protecting Your Reef”, are provided upon the invitation of local dive operators, government agencies, or other stakeholders. Combining a general course on sustainable dive tourism with discussions of local issues, each workshop asks dive operators to identify stressors to local reefs (including diving-related stressors), and which of these the participants can address. Through 2003 and 2004, CORAL is conducting eight workshops, in Fiji, Indonesia, Palau, and Pohnpei. Each lasts two days.

Alex Brylske of Project AWARE Foundation — the educational and charitable arm of PADI, an international dive certification organization — has co-led three

of these workshops for CORAL. “Dive operators are small-business folks operating on minimal margins,” he says. “When they hear the term ‘carrying capacity’, they don’t like it, even though they may never grow to a size where it would be a limitation on them.” He says the buy-in of dive operators for management actions is essential to the success of virtually all MPAs in coral reef regions. “Once they understand that there are alternatives to the idea of ‘no more than 6000 divers per reef’, they look at the issue very differently. In fact, most become quite supportive of strong management practices once they see the big picture.” A workshop in Palau in June 2004 focused significant attention on carrying capacity and LAC, as the Palauan government is encouraging the dive community to self-regulate visitor numbers at dive sites in lieu of government-imposed rules.

Brylske says education, though an important part of managing acceptable change, is not the solution in itself. In some cases, reefs may simply need some rest, he says, such as by moving mooring buoys or even closing sites down for a while. “Businesses are starting to recognize that some attention needs to be paid to the sheer numbers of people diving in some areas,” he says. “After all, if the resource declines, divers will take their business elsewhere.” 

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Review paper available on coral reef MPAs

The science and use of MPAs in managing coral reefs are examined in a new briefing paper produced by the International Society for Reef Studies, a scientific organization. Released in June at the 10th International Coral Reef Symposium in Okinawa, Japan, the paper assesses the potential uses of MPAs and factors that affect MPA success, based on findings from dozens of research studies worldwide. It also describes conditions under which MPAs are most likely to be effective. The 13-page paper primarily addresses no-take marine reserves rather than multiple-use MPAs. “Marine Protected Areas in Management of Coral Reefs” is available online at <http://www.fit.edu/isrs>.

Notes & News

Scorecard available for management effectiveness

Measuring the success of an MPA in meeting its goals can involve a significant amount of fieldwork and data collection — a challenge for resource-strapped MPAs. A new scorecard, produced by the World Bank, provides a simple, site-level tool to help managers and stakeholders assess their MPAs without additional field level research. It is available online in PDF format at <http://www.mpascorecard.net>.

Called the “Score Card to Assess Progress in Achieving Management Effectiveness Goals”, it is not intended to replace more thorough methods of assessment. Rather, it provides managers with an overview of the progress of their management efforts and illustrates gaps in management that should be addressed. It is designed to be filled in by managers or other site staff, and is adaptable to site and regional needs.

The scorecard was adapted from a similar tool created for terrestrial protected areas by the World Bank and WWF. An early version of the MPA scorecard was tested at various sites in 2003. The new scorecard is available in English, French, and Spanish versions.

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Program raises money for coral reef MPAs

The Coral Reef Alliance (CORAL), a US-based NGO, is enlisting the help of individuals and organizations to raise funds for small-scale conservation projects at coral reef MPAs worldwide. Through its Park Buddies program, CORAL engages divers and community groups to host their own fundraising events: raffles, concerts, dinners, and so forth. CORAL then funnels the raised funds to MPAs that have specific projects in need of financing, like mooring-buoy installation, purchases of patrol equipment, or ranger training. In 2004, the program’s first year, CORAL has raised nearly US\$19,000, which has fully paid for projects at five MPAs in Belize, Bonaire, Mexico, Palau, and the Philippines. Fourteen separate fundraising events across the US contributed to the total.

The participating MPAs will change from year to year, according to CORAL. Each participating site must be an established coral reef park that allows tourism and is in need of small-scale funding for a conservation project. CORAL will announce the MPAs for 2005 this November. The website for the program is at <http://www.coralreefalliance.org/divein/parkbuddy>.

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MPA Profile: Trying to Balance Conservation and Sustainable Development in Russia's Largest MPA

Within the extensive Russian system of protected areas is a network of strictly protected nature reserves, called zapovedniks (zap-o-VED-niks). Dating back to 1916 when the first zapovednik was designated, this network now has 100 terrestrial and marine sites, stretching from the Black Sea to the Bering Sea. Of these, the most easterly is off the coast of Kamchatka: the Komandorsky Zapovednik, two mountainous islands surrounded by a 30-mile no-take zone. With 34,633 km² of marine area, it is Russia's largest MPA.

Designated in 1992, the Komandorsky Zapovednik is home to a diversity of marine mammals, birds, and commercially valuable fish species, as well as a population of about 800 people on the islands. Despite regulations that restrict fishing in the reserve to certain areas and to indigenous residents only, poaching by commercial fishermen (both Russian and foreign) has become common. Poverty among the residents is leading some to assist the illegal activity.

A key to success in managing the site lies in balancing conservation and the sustainable development of the local population. Although management plans exist to pursue that balance, broad federal budget cuts and other factors have hampered their implementation. Below, *MPA News* offers a brief profile of the challenges and opportunities facing Komandorsky Zapovednik, through the eyes of those trying to strengthen the reserve.

Developing legal sources of income

Konstantin Zgurovsky, a biologist with World Wildlife Fund-Russia (WWF-Russia), says helping the indigenous residents of the Komandorsky (or "Commander") Islands is essential to protecting the reserve. "One of the main threats to the reserve is internal: the high level of unemployment and, due to that, the involvement of local people in poaching," he says. "The way out is cooperation with local communities in finding legal sources of income."

The concept of considering local needs in zapovednik management is relatively new to Russia. Historically, these protected areas have been managed as strictly protected research reserves — field laboratories for the nation's scientists. Only recently has the government broadened the role of these sites to be more inclusive of the general public. One of the results of this change was Russia's successful nomination in 2002 of the Komandorsky Islands as a UNESCO Biosphere Reserve. Consistent with UNESCO guidelines, the designation carried a primary goal of improving the socioeconomic conditions of the local residents while developing ecologically sound forms of natural resource use. Zoning of the reserve would feature a core, highly protected area

and a surrounding, multiple-use buffer zone, also consistent with other biosphere reserves worldwide.

Implementation of these plans by the Russian Ministry of Natural Resources, responsible for overseeing the Komandorsky Islands, is off to a weak start. The zapovednik was actually more involved with socioeconomic improvement programs in the 1990s, when it helped install wind turbines on the islands for electricity; now it is no longer directly involved in such programs. In addition, the Ministry of Natural Resources has not yet put in place much of the multiple-use buffer zone, intended to reach 12 miles from shore. Most of the reserve remains no-take.

Zgurovsky blames the poor implementation on a range of factors, including low government prioritization for marine biodiversity conservation in general, made worse by budget cuts. He would like to see involvement of the local population in small-scale processing of natural resources, like a small kelp-processing facility that opened in the islands in 2002, financed by a mainland Russian company. When Zgurovsky and other WWF-Russia personnel visited the reserve in mid-2003, a local fisheries inspector reported that poaching had dropped off since arrival of the processing operation. The business had created jobs, which, said the inspector, had reduced the need to poach.

Sustainable development not the only answer

Jobs for local residents will not end all threats to the Komandorsky Islands. Illegal fishing by outsiders, for example, is likely to continue as long as enforcement of the no-take zone remains inadequate. Zgurovsky points out that the satellite-based vessel monitoring system used for Russian fisheries management in the region has a loophole allowing vessels to turn off their transmitters for up to 10 days at a time, with the effect of enabling boats to fish in no-take areas without the system detecting their location. Fisheries management has also been lax about forbidding the use of black-market software programmable to give false coordinates for a vessel.

WWF-Russia is lobbying the government to address these problems, and is trying to strengthen on-site enforcement. The NGO has donated communications and radio equipment to the reserve and sponsored workshops for rangers and fisheries inspectors on their use. Zgurovsky would like to help establish an inter-agency patrol system for the Komandorsky Islands, with a portion of any collected penalties being retained by the reserve's management.

Vsyevolod Stepanitsky, former deputy director of Russia's Department of Strictly Protected Nature Areas

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within the Ministry of Natural Resources, agrees on the need for inter-agency cooperation on enforcement. (Stepanitsky was deputy director until early 2004, when the Russian government dissolved his department as part of a broad governmental restructuring effort. The government has not yet announced its plan to replace the department, but the zapovedniks remain staffed in the meantime.) Stepanitsky says protection of Komandorsky should involve the federal border service of the Russian Federation, which is equipped with speedboats, planes, and helicopters for combating illegal fishing elsewhere in the nation.

Enforcement is not the only challenge facing the zapovednik, says Stepanitsky. The chronic funding shortage, which affects all aspects of Komandorsky management, needs to be addressed. "It is very important for the zapovednik to develop partnerships with scientific and conservation organizations in the US," he says. Support from such organizations in the form of money or equipment is the best type of direct assistance, he says, although he adds that Russian customs procedures can delay donations of equipment for months in some cases. He suggests that indirect support, such as through staff exchanges with US parks and refuges, could provide effective training opportunities for Komandorsky personnel. Such exchanges could also build the potential for greater connections among

conservation efforts in the two nations. "We think prospects for developing an international transboundary protected area — that would include several refuges in the Aleutian Islands (US) as well as our Komandorsky Zapovednik — are very real," says Stepanitsky. He points out that the Ministry of Natural Resources appointed a new manager for the reserve this year who is fluent in English and has professional contacts with conservationists and scientists in the US — important elements for building an international partnership.

The reserve faces the additional challenge of oil pollution. Margaret Williams, editor of *Russian Conservation News*, a magazine published by World Wildlife Fund-US, cites the growth of offshore petroleum exploration in the region, and the need for management to put a spill-response system in place. "This is an urgent priority," she says. She describes a 2003 incident in which a container ship passing nearby lost a 20-ton container filled with a toxic chemical used in construction. The container, which grounded near a fur seal rookery in the reserve, ended up leaking most of its contents during improvised removal attempts by locals. Although this was not an oil spill, it illustrated the danger associated with having no coordinated response from government authorities. "Luckily it ended fairly well," says Williams, noting limited deaths of wildlife. "But that was only luck." 

Letter to the Editor

Dear MPA News:

I would like to comment on the article "MPA Perspective: Lessons for MPAs from Terrestrial Conservation" by Peter Kareiva (*MPA News* 6:1). Although the observations offered by the author are, on balance, well made, I wonder why parks dominated by "snow and rock", and more generally, those similarly perceived as of "little economic value" would necessarily make them the "wrong place" for a protected area. Sub-alpine and alpine areas may have less complex ecosystems, but are no less valuable to the species that live there, and are potentially important elements of terrestrial parks, certainly worthy of preservation, especially as part of representative systems of protected areas. While they may be less complex, and less diverse in terms of species, they can be sensitive to disturbance, and active management of human activities — or protection as wilderness — might be very necessary and appropriate. Similarly, it would be very difficult to justify ignoring high-latitude areas, dominated by snow and ice, because of their lack of ecosystem complexity and relatively low biodiversity. Both of these types of ecosystems are at greatest peril from the impacts of climate change, and I would argue that both deserve protection on that basis alone.

Without question, the economic value of an area will be a consideration in the establishment of any protected area, and this does, as the author suggests, have the tendency to dominate discussions of potential designations on both the land and at sea. However, we should be considering the full suite of values of these areas when considering any protected area related both to use and non-use. Option value (reserving the option for use and non-use in the future), bequest value (preserving for future generations), and existence value (the inherent value of simply knowing an area of the land or sea is preserved) are all economic values of protected areas that should be factored into our evaluation. Resources economists are just beginning to develop

more broadly accepted methodologies for calculating these values, but we remain a long way from making such an approach fully operational. The public policy process, done effectively, is quite robust and many of the non-use economic values will be articulated to some degree in these deliberations when all sectors of the public actively participate. I would hope that when an MPA or terrestrial park is being considered, we do the best job possible identifying the economic implications of the management actions being proposed, but not allow this to be the sole determinant of whether or not to implement these actions.

For most of US history, wetlands were called "swamps" and filled indiscriminately because they were perceived as of little value in their natural state. Many valuable ecological services derived from wetlands were lost as a result of this perception. Some of my most memorable wilderness experiences have involved both "snow and rock", and I would hope that we don't make the same mistake with these areas as we did with "swamps".

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