

From Land to Sea: The Role of Land Trusts in Marine Protection

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Many policymakers conclude that marine conservation strategies are limited when compared to land protection tools. Limitations are described as resulting from institutional differences between land and sea resources such as the lack of private ownership in the sea, and differences in physical characteristics such as the fluid nature of marine resources. Despite these differences, some trends in land protection are relevant for marine protection, such as the increased role of nongovernmental organizations (NGOs). This article examines how marine protection strategies develop from an NGO's terrestrial experience. I researched marine conservation tools used by three land trusts and point out limitations and opportunities related to their use. Tools these organizations have adapted from their land protection experience are management partnerships, acquisition, strategic planning, zoning, and database development. The extent to which these organizations use previous land experience for marine conservation may depend on geographic location and on institutional and organizational characteristics.

Keywords acquisition, land trusts, marine protected areas, nongovernmental organizations, zoning

Marine ecosystems are highly dynamic and complex in ways that set them apart from land ecosystems. In addition to physical differences, natural marine environments are often considered different from their terrestrial counterparts for social, economic, and cultural reasons. However, despite these differences there are similarities in the history of resource exploitation on land and at sea. It follows that some of the same conservation principles and approaches should apply to both.

As part of a larger work examining the use of specific tools traditionally used for land protection in the marine environment, this research explores how land conservation trusts apply land protection tools to the marine environment. Such knowledge can inform policymakers and stakeholders how to best use what environmental nongovernmental organizations (ENGOS) can offer and will help expand the marine protection “toolbox.” Given current trends in privatization and evolving institutional arrangements, the potential contribution of ENGOS well versed in terrestrial protection strategies, such as land trusts, could be significant.

Received 18 October 2006; accepted 15 October 2007.

The author is grateful to the Quebec Labrador Foundation's Sounds Conservancy Grant and also to the McCormick School of Policy Studies at the University of Massachusetts Boston for financial support provided to conduct this research.

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Using a case study methodology I identified four marine protection tools used by three land trusts that have been adapted from land applications. The use of the tools I analyze generally occurs in near-shore intertidal and subtidal areas within territorial seas rather than the deep sea. *Intertidal* refers to the area between high and low tides and *subtidal* are those areas seaward of low tide. (Both are referred to as “submerged areas” in this article.) Although these tools may be applied mostly or even exclusively in near-shore areas, marine conservationists emphasize the land and sea interface as an area of great ecological concern. This is evidenced by the frequent designation of coastal watersheds as the unit of analysis for conservation assessments (Holland et al. 2004), the focus on loss of open space including submerged lands in the increasingly crowded coastal zone (Beach, 2002), and the emphasis on environmental services provided by varied near-shore habitats such as coastal wetlands, estuaries, and reefs (Costanza 1999).

Background

Environmental policy analysts have frequently compared protection policies on land with those at sea. They claim there is much to be learned from land protection experience, including from past mistakes (Kenchington and Agardy 1990; Barr and Lindholm 2000; Milon 2000; Lindholm and Barr 2001; Duff 2004; Kareiva 2004). As an example, the Pew Oceans Commission Report (2003), one of the first comprehensive reports on the state of U.S. ocean resources published in 25 years, recommends applying two well-known land management tools to the sea: (a) zoning that spatially separates incompatible land uses and provides predictability to land-owners, and (b) the wilderness concept, i.e., the setting aside of areas where natural values of lands are protected for future generations.

Research that addresses the application of traditional land protection tools to the marine environment is limited, but some authors have made extensive comparisons between various aspects of land and marine protection. Agardy (2000) lists the differences between marine and terrestrial systems and concludes that “the random applications of terrestrial models to the marine environment may not succeed in protecting resources and [their] underlying ecology.” She points out the main differences between marine and terrestrial systems: respectively, nebulous versus clear boundaries, large versus small spatial scales, fine versus coarse temporal scales, three-dimensional versus two-dimensional living space, unstructured versus structured food webs, and nonlinear versus linear systems dynamics. In contrast, while acknowledging differences between the physical features of marine and terrestrial systems, Milon (2000) contends that the economic and governance dimensions of the two are more alike than they are different. Exclusion of resource users from areas of the marine environment is necessary to mitigate the excesses of open access harvesting and conventional fisheries management. He advocates the use of marine reserves implemented like other “enclosure” mechanisms on land, such as fences, that demarcate private property rights.

Duff (2004), concerned with wise use as well as protection, relates law and policy concerns in the management of public lands to the management of marine resources. He advocates examining terrestrial management systems to capitalize on successes and avoid pitfalls for managing ocean resources. Duff emphasizes that comparisons are particularly relevant and timely as technological advances improve offshore resource extraction capabilities, especially for fisheries, and for oil and wind-farm development.

Some authors emphasize the lag in marine conservation when compared to land conservation in terms of area protected and in terms of protection success. Lindholm and Barr (2001) surveyed the amount of land versus the amount of marine area protected under federal jurisdiction in the United States and found that significantly less marine area is protected. The Pew Oceans Commission report states that while 4.6% of the land area in the United States is preserved as wilderness, only a small fraction of one percent of the ocean area under U.S. jurisdiction is protected in “marine reserves—where all extractive and disruptive activities are prohibited” (Pew Oceans Commission 2003). Sloan (2002) reviews the history and use of the wilderness concept, defined as the preserving of land areas from human effects, in the sea. Sloan identifies three problems in applying this concept to the sea: (1) protecting large enough areas, (2) defining marine ecosystem states with roles for humans, and (3) addressing society’s underdeveloped marine environmental awareness and ethics.

In regard to conservation science, Irish and Norse (1996) estimate that marine conservation biology lags behind terrestrial conservation by about two decades based on a tally of scientific papers in the journal *Conservation Biology* and on treatment of the two subjects in a highly regarded conservation textbook (Irish and Norse 1996; Murphy and Duffus 1996). While a disparity between land and marine protection is clear, in terms of area protected, knowledge, research, funding, and strategies used for each, work attempting to explain this dichotomy is lacking.

One way to approach this disparity is to examine the differences, or conversely the similarities, between land and marine protection tools and how they are employed. When reviewing approaches to land protection, a clearly identifiable trend in the field of land conservation has been the increasing role played by nongovernmental conservation organizations. Views are changing toward government as the sole owner, manager, and regulator of resources serving public goals. Private and semiprivate land trusts are now owners and managers of a significant amount of land set aside specifically for conservation purposes. By 2001, local and national land trusts had protected approximately 86,000 square kilometers of land throughout the United States (Beach 2002). NGOs, including conservation trusts, advocacy organizations, and many hybrid-type institutions, are becoming the accepted alternative to meet the needs of the public for preservation of terrestrial biodiversity, habitat, and landscape values (Fairfax 2001; Fairfax and Guenzler 2001; Brewer 2003). Many of these organizations accomplish their goals by “owning” rights—either use rights or ownership rights—to land.

As an example, one such tool, the acquisition of property and/or use rights by private entities that has emerged as a significant tool for land protection, may at first glance seem irrelevant for the marine environment because by and large ocean resources are held in the public trust. The concept of public trust is based on the historic Public Trust Doctrine that evolved from Roman civil law and English common law. Two major principles form the basis of this doctrine: (a) The public has fundamental rights and interest in natural resources such as the air, the sea, and the shore; and (b) the state, as trustee of the public interest, has a duty to preserve and enhance these natural resources and to protect the public’s right to use them (Portman 2006). Furthermore, navigational servitude for purposes of commerce and fishing is guaranteed as a public trust right in most common law states (Longstreth 2002). This seems to preclude the cordoning off of marine resources for protection by private, albeit nonprofit, interests. Nevertheless, some underwater resources are available for lease and ownership. Oil and aquaculture business interests have benefited significantly

from such possibilities. “Rentable” ocean resources can include the seabed (intertidal and subtidal land of the continental shelf) as well as other, more amorphous resources such as the water column, fish stocks, and living coral (Marsh et al. 2002; Duff 2004).

As another example, NGOs can contribute to the field of conservation without owning resources by partnering with governmental agencies. Barborak (1995), writing on the increasing variation in institutional arrangements for protected area management, identifies a greater role for NGOs and the private sector in operating, managing, and in partnering with government. He also points out that there are advantages to regionalization and decentralization in protected area system management that can be better achieved by such partnering. Such partnerships can also support the design and management of marine protected areas.

An advantage to involvement of ENGOs in marine conservation is their ability to address large-scale, cross-boundary/jurisdiction problems, often a part of ecosystem-based marine protection. Josiah (2001) researched the expansion of conservation program outreach experiences of 168 NGOs from 42 developing countries. He found that poverty in developing countries coupled with environmental degradation has triggered a search for larger scale solutions and has motivated a number of NGOs worldwide to incorporate what works well on a small scale into large-scale strategies, structures, and systems (Josiah 2001). This experience may be well suited to marine ecosystem protection and a reason why local and regional land trusts may be particularly well suited to apply their experience to the sea.

This article describes how land trusts use their land protection experience in the marine environment. Following an explanation of the methodology in the next section I describe the three case studies. The next section characterizes the protection tools they use that are based on land protection experience. I briefly discuss the opportunities and limitations of these tools and summarize some factors that influence the involvement of land trusts in marine protection. Some suggestions for further research conclude the article.

Methodology

I used a multiple case study design based on Yin (1994) that employs time-series review and explanation building for analysis. The analytical goal for the time-series approach is to compare the observed chronology with that predicted. Explanation building attempts to “explain” a phenomenon by stipulating a set of causal links about it. An initial theoretical statement or proposition begins the process; the researcher compares the findings of an initial case against the statement or proposition and revises it as a result of inconsistencies. The process continues for all cases in turn.

In selecting the cases, I used two general criteria. Organizations had to: (1) use acquisition of land as a conservation strategy (i.e., be considered a land trust), and (2) conduct marine conservation work. If the organization leases or owns land for conservation and is actively involved in marine conservation, I had acquisition as a starting point to test my proposition that ENGOs are using land-based protection techniques in the marine environment. I searched for land trusts operating in the United States, the United Kingdom, the Caribbean, and the Pacific Ocean region to capture organizations working in varying physical environments, dealing with different levels of threats to ecosystems, and working under different political and legal regimes.

To select the cases I surveyed two directories: (1) the Land Trust Alliance (Land Trust Alliance 2005), and (2) the World Directory of Environmental Organizations (California Institute of Public Affairs 2005). I considered only those ENGOs categorized as land trusts using the Land Trust Alliance definition, i.e., “a nonprofit organization that, as all or part of its mission, actively works to conserve land by undertaking or assisting in land or conservation easement acquisition, or by its stewardship of such land or easements” (Land Trust Alliance 2005).

Having chosen the cases, data collection consisted of interviewing key informants, obtaining and reviewing documents, and personal observation. Interviews were open-ended using a scripted battery of questions asked to a total of 17 employees of the case-study organizations. I reviewed the organizations’ web sites, current and past publications, strategic work plans, internal memos, and directives. For each organization, I prepared a case-study report from which I compiled cross-case findings.

The Case Studies

The three selected cases have marine conservation programs each with an innovative strategy employed to protect at least one marine reserve: the Long Island Chapter of the Nature Conservancy (LIC) has acquired significant submerged lands, Dorset Wildlife Trust (DWT) in the United Kingdom has established a “voluntary marine nature reserve,” and the Bahamas National Trust (BNT) operates what it coins the first land and sea park. The three organizations are roughly comparable in years established, staff size, and number of reserves owned and/or managed (Table 1). Laws governing the use of submerged lands and public trust rights in tidelands are similar in each of the countries where these organizations operate. All are based on British colonial and English common law.

LIC consists of the Long Island Chapter and the Shelter Island Chapter, which work together on marine and coastal issues. Long Island, located in the southeastern corner of New York State, lies between Long Island Sound to its north and the Atlantic Ocean to its south and east. It supports a variety of ecological features: maritime grasslands and shrublands, pine barrens and associated coastal plain ponds, coastal dunes, and wide ocean beaches. The two chapters manage nature reserves owned by The Nature Conservancy (TNC) including 13 reserves that are open to the public. To date, LIC has helped to protect some 160 km² that include pine barrens, meadows, streams, salt marshes, ponds, and submerged areas.

Table 1. Comparison of the three cases studied

Land trust	Established	Number of members	Number of staff	Number of reserves	Area of reserves
LIC	1953; 1966 ^a	30,000 ^b	47	38	73
DWT	1961	21,000	40	41	49
BNT	1959	3,000	17	25	2833

Note. Areas in square kilometers.

^aLong Island Chapter was founded in 1953; the Shelter Island Chapter in 1966.

^bThe Nature Conservancy members living on Long Island.

The DWT works throughout Dorset County located along the southwest coast of England. The counties of Somerset and Wiltshire bound it on the north, Hampshire and Devon on the east and west respectively, with the English Channel to the south. Dorset's coastline is 121 km long. Among the county's outstanding ecological features are scrublands, wet and dry heath lands, deciduous woodlands, bogs, unimproved grasslands, and marine habitats. DWT manages nature reserves and operates five wildlife education centers. DWT either owns these reserves or leases them from private landowners. DWT's main goal is to rebuild the diversity of Dorset's wildlife. It leads wildlife monitoring, habitat restoration, and enhancement projects not only in the countryside, rivers, and coastal waters, but also in urban environments, churchyards, and roadside verges.

The BNT is the principal NGO working throughout the Bahamas for resource conservation and preservation. Although BNT is smaller in staff size, membership, and number of reserves than the other two organizations (Bahamas National Trust 2003), it protects a vastly greater area. Geographically, the Bahamas is an archipelago that includes around 700 islands and covers a total land and sea area of 300,000 km² (Buchan 2000). The country has jurisdiction over the largest tropical shallow water (i.e., <20 m deep) expanse of the Western Atlantic. Surrounding reef found throughout the archipelago covers some 1981 km² (Bahamas Environment Science and Technology Commission 2005). Its unique marine geography results in extremely important economic and ecological ocean resources. Its estimated annual gross domestic product (GDP) of \$6.6 billion is generated mostly by tourism, financial and business services, and the harvesting of marine resources. Warm waters, white sand beaches, and proximity to the United States make it a prime tourist destination (Buchan 2000; U.S. Central Intelligence Agency 2008).

Each NGO initiated marine conservation programs some time ago. Both LIC and DWT worked for many years following their establishment only on terrestrial conservation. BNT, however, came into being due to an effort to create the Exuma Cays Land and Sea Park (ECLSP) that has always included some submerged lands. BNT's constant focus on marine conservation issues, mostly in regard to the establishment of marine protected areas (MPAs) and community education, has to do with both its mission (i.e., establishing a parks system that includes submarine areas) and geography, as much of the country's resources exist underwater.

Findings

Applying Yin's two methods of analysis—time-series and explanation building—my original proposition began with the following two-part premise: (1) Some tools used for land protection by the trusts are also used for marine conservation, and (2) these tools were used on land *before* being applied to the sea. While my original proposition was true for LIC, for the most part it was not true for DWT and BNT. The latter organizations used land protection tools and experience of partner organizations for marine conservation work. So adding land-based protection experience contributed by partner organizations was the first revision I made to my proposition. For example, the use of zoning by BNT for its flagstone protected area, ECLSP, taps experience of the U.S. National Park Service staff who are on BNT's Management Planning Team. Other revisions to my original proposition reflect the tools I identified that were used by the land trusts and their partners, first on land and then for marine protection.

Table 2. Marine protection tools used by the organizations studied based on land protection experience with prominent examples

Tools (strategies)	Organization	Prominent examples
Protected area management partnerships	LIC	Bluepoints Bottomlands Council
	DWT	Purbeck Reserve Advisory Committee
	BNT	Parks Partnership Project
Acquisition	LIC	Great South Bay
	BNT	Exuma Cays (submerged areas)
Strategic planning processes	LIC	Conservation by Design
	DWT	Dorset Biodiversity Strategy
Zoning	BNT	Exuma Cays Land and Sea Park Management Plan
Data development (support tool)	LIC	Great South Bay seabed database
	DWT	Digital marine atlas

Study findings confirm that as each of the trusts developed their marine conservation programs, they adopted protection tools used previously for terrestrial conservation (Table 2). The establishment of management partnerships is the most common strategy used by all three organizations. Other marine protection tools used by the organizations adapted from land protection experience are strategic planning tools, acquisition, and zoning. A fifth supporting activity is marine resource database development modeled after terrestrial approaches. The following section details each of the tools, describes how the organizations use them through examples, and briefly points out some of opportunities and limitations generally associated with each tool.

Management Partnerships

As a protection strategy or tool, all three of the organizations studied relied heavily on management partnerships. In his book on the land trust movement, Brewer (2003) writes about a trend among trusts toward de-emphasis of reserve ownership. Although Brewer does not refer to conservation of submerged lands, he contends that a reason for the shift away from acquisition of desirable properties is the cost of management of owned property. He writes:

[P]rotected land is only a nominal asset . . . the land trust will never see the million dollars that a new piece of property is appraised at; it will never be able to borrow or get a return on it. Instead, the land brings with it a set of administrative and stewardship obligations that will require time, energy, and money . . . forever. (132)

Consequently, for land trusts, management partnerships are becoming increasingly important. When protecting submerged lands for which acquisition may not be an alternative for reasons other than cost, most notably public ownership, land trusts are similarly looking to establish management partnerships.

The LIC established a broad coalition of stakeholders to develop a management plan for its Great South Bay property. Shortly after acquiring the large area of submerged land, LIC formalized the Bluepoints Bottomlands Council whose active members include federal, state, county, and local town officials, marine experts from the academic sector, and baymen representing shellfishers' cooperatives.

Although lacking any ownership rights, the DWT leads a similar management committee for the Purbeck Marine Wildlife Reserve that approves and implements management measures as proposed by DWT. Since there is no statutory protection for the reserve, its existence depends on the coordinated efforts of this group for compliance, enforcement, monitoring, and data collection. Partners include upland and foreshore landowners and representatives of the local towns, national environmental agencies, local anglers, recreational users, and academics with backgrounds in marine studies, geology, and archeology.

Recently BNT has created the Parks Partnership Project. This formalized partnership program has three goals: (1) to develop the Exuma Cays Land and Sea Park General Management Plan, (2) to increase and improve the capacity of BNT to manage Exuma Cays Land and Sea Park, and (3) to develop a management planning process that can be replicated for BNT's other parks. The partnership is funded by a private foundation and receives technical support from The Nature Conservancy's Bahamas office. Its Management Planning Team created through the Parks Partnership Project includes, in addition to BNT staff, U.S. National Park Service specialists, marine scientists, local volunteer leaders, a member of the Bahamas Department of Fisheries, and members of other regional environmental NGOs.

Acquisition

Authorities on marine conservation (Chornesky et al. 2001; Marsh et al. 2002; Beck et al. 2005) have written about the leasing and ownership of submerged lands as a new tool for marine conservation. Beck et al. (2004) discusses the assumption that strategies for marine conservation must be substantially different from those for land because marine resources are held in public trust. The article's authors call this assumption "an unfortunate misconception." They found that there is a significant amount of submerged land available for lease and ownership in the United States and in other countries. The authors contend (perhaps with land trusts in mind) that among the conservation benefits of using such tools are opportunities to draw on terrestrial experience in leasing and ownership.

LIC became an owner of submerged lands when it acquired a large tract of upland on Shelter Island. Having completed the purchase, LIC discovered through deed research that in addition to upland, TNC owned subtidal area of significant size. Since 1980, TNC leased this underwater area to the Town of Shelter Island for \$1 annually to allow wild harvest by local shellfishers (Lapsia 2005). In 2002, TNC rescinded its lease to the town in order to create no-take spawner sanctuary areas and to restore ecological processes (Beck et al. 2004). Beginning in 2002, the First Republic Corporation conveyed to LIC submerged land in Peconic Bay (Parsons 2005) and by 2004 had conveyed another 60 km² of submerged land at another site along the bottom of the Great South Bay. The First Republic Corporation, the parent company of Bluepoints Oyster Company, had held this property in private ownership by virtue of colonial patent granted prior to New York statehood.

Of the 25 parks managed by BNT, 8 have marine components. As under British law that preceded Bahamian law, land seaward of high water is publicly owned so BNT annually pays a nominal fee to the government to lease these areas. BNT began leasing submerged areas at Exuma Cays shortly after the organization was founded. Acquisition is promoted in the BNT Act, which authorizes the “holding” of terrestrial and marine areas: “[BNT] may acquire by purchase, gift, or otherwise and may hold lands, buildings and hereditaments and submarine areas” (Bahamas National Trust Act 1959). The organization has increasingly made use of its ability to lease submarine areas; however, it is reluctant to pursue purchase of properties, terrestrial or marine, due to lack of funds but also to avoid setting a precedent whereas the government would view potential transactions as sources of income (Hamilton 2005).

DWT does not lease or own marine areas. Its most important conservation strategy has traditionally been the buying of land, which may explain the slow development of its marine program. The predominant perception is that virtually all submerged land is owned by the Crown and prices are too high for DWT to purchase any foreshore areas that can be privately owned (Tinsley 2005). Ownership and leasing as a marine conservation strategy is not unheard of in the United Kingdom. The National Trust, a national-level private nonprofit organization, together with English Nature leases seabed from an estate at Studland in Dorset. Both English Nature and the National Trust work with DWT as part of the Dorset Biodiversity Partnership.

Strategic Planning

Strategic planning is the process through which land trusts define their missions and set priorities. Strategic planning processes for NGOs focusing on a particular area may build on methods applied elsewhere, be adapted from previous endeavors, or be borrowed from other organizations. I looked for the application of clearly defined processes that stipulated clear organizational directions such as the identification of properties to be acquired, managed, or restored, or the definition of specific conservation targets.

LIC’s conservation mission is directed by a planning process developed by The Nature Conservancy in the 1990s called Conservation by Design. Planning takes place at the level of the ecoregion—regional landscape unit of some uniformity of landform and climate. The organization identifies priority conservation sites based on ecoregional threats and how these threats have affected the quality of the environment. In local and state offices, TNC staff members organize budgets and design work directives to proactively achieve the goals set out in the strategic plan for a conservation site. Staff members evaluate conservation activities on a regular basis and attempt to quantify their impact and contribution to the health of the broader ecoregion. TNC bases its ecoregions on landscape units identified in several forestry-driven projects over the past 20 years. It recognizes 63 ecoregions in the United States, most named for predominant geographic or landform elements and some for the predominant vegetation (Brewer 2003).

The Nature Conservancy’s North Atlantic Coastal Ecoregional Assessment, a strictly terrestrial assessment completed in 1999, has directed LIC’s work. Following completion of this assessment, TNC managers decided that a marine component was needed so northeast regional staff began work on the Northwest Atlantic Coastal and Marine Ecological Assessment. A major goal of the assessment was to create

a Northwest Atlantic coastal and marine conservation target list to be used by LIC, but TNC managers scaled the project back in mid-2005 (Chatwin 2005). [TNC began another assessment in the summer of 2007, the North Atlantic Marine Ecoregional Assessment, which will have a broader focus and will be a resource for conservation organizations in general, not just TNC (The Nature Conservancy 2007).] Without the Northwest Atlantic Marine Ecoregional Assessment, LIC's immediate marine conservation efforts are directed by TNC's Draft Conservation Action Plan for the Atlantic Ocean Beaches and Bays Conservation Site, also developed using Conservation by Design. There are six conservation targets identified in this plan that if restored will aid in the recovery of the entire regional ecosystem: island marshes, mainland marshes, eelgrass, hard clams, beach-dependent species, and barrier islands (Long Island Chapter of the Nature Conservancy 2005).

DWT uses a strategic planning process for marine conservation adapted from terrestrial conservation planning; however, the marine issues are embedded in the broader context of a general strategic plan for protecting biodiversity. A coalition of local governments and ENGOs published the Dorset Biodiversity Strategy (DBS) in 2003 and that implements on a regional level directives developed as part of the UK Biodiversity Action Plan (BAP). The last action plan detailing the BAP, the Maritime Species and Habitats Action Plan, was completed in 1999. It classifies habitats and sets conservation priorities for protecting biodiversity (UK Biodiversity Group 2005). One of the initial tasks of the coastal and marine subgroup charged with developing the national plan was to assess whether criteria, developed for selecting terrestrial priority habitats and species, were appropriate for coastal and marine habitats (UK Biodiversity Group 1999).

Following the structure of the national planning effort, DWT's conservation staff led 35 entities including local district councils, national public agencies, stakeholder groups, professional associations, and private consultants in developing Dorset's county plan. The DBS focuses on four topics affecting biodiversity, tying them into the concept of sustainable development. Marine issues make up the fourth topic as part of the Marine and Coastal Issues Topic Action Plan. This plan recommends actions to be undertaken by various authorities and agencies to protect 10 primary marine habitats such as seagrass beds, mud flats, and maerl beds. It recommends actions to be taken by DWT through its partnership in the Joint Dorset Marine Committee. The committee is a joint working group of the Dorset Coast Forum and the Dorset Wildlife Trust made up of experts in from the marine science, marine education, and coastal policy (Dorset Coast Forum 2005).

Zoning

Zoning is the most common system of land use control in Canada and the United States (Courtney and Wiggin 2002). In its broadest sense, zoning is a spatially explicit system for organizing and regulating activities that involves the segregation of incompatible uses. Zoning was widely adopted in the United States after about 1910; however, many cities had ordinances with zoning-like features in the 19th century (Fischel 2004). Originally used exclusively for town planning, zoning has been applied to conservation areas including biosphere reserves, national parks and forests, fisheries management areas, and more recently to marine protected areas. Two of the best known examples of marine protected area zoning schemes are those of the Great Barrier Reef Marine Park and the Florida Keys Marine Sanctuary, first completed for these parks respectively in 1988 and 1997 (Laffoley 1995; Suman et al. 1999).

BNT has included zoning as a tool to be used in Exuma Cays Land and Sea Park. BNT's Management Planning Team has proposed six zones for the park ranging from zones of complete protection of "exceptional and critical resources" to areas of concentrated use. Team members from the U.S. Park Service infused past experience with terrestrial park zoning for ECLSP zoning design (Bahamas National Trust 2005). The Bahamas National Trust Act (1959) grants the organization broad powers to "make, revoke or alter" bylaws for the preservation of its lands, submarine areas, or property held for public benefit which facilitates the use of zoning by BNT.

Neither LIC nor DWT uses zoning as a tool for marine protection. However, spatially explicit use zones may result from regulatory measures promoted by LIC and from programs the chapters are working on with their partners in the Great South Bay (Bortman 2005). DWT staff cited the lack of statutory authority in their marine park as an obstacle to the use of zoning (Hatcher 2005; Tinsley 2005).

Data Development as a Support Tool

The organizations studied cited the lack of marine data that is comparable to terrestrial data as an impediment to the application of strategic planning and zoning design. While not a conservation tool per se, data on physical elements of the environment can vastly improve the use of many conservation tools (Agardy 2000). Both LIC and DWT are investing in database development to bring marine data up to par with that available for terrestrial resources. At BNT, the data are needed to identify zone boundaries for the Exuma Cays Land and Sea Park Management Plan. BNT has little capacity to generate its own data so it has relied in the past on data available from marine scientists working in the region.

LIC has initiated seabed database development including shellfish surveys, and it participates in remote sensing mapping projects. LIC has a geographic information system (GIS) division responsible for terrestrial data management and, to a lesser extent, marine data management, and mapping. LIC tries to fill in the gaps in marine data available from other sources. For example, the federal government has spent millions of dollars on data for the Peconic Bay, which is a National Estuarine Research Reserve, while data are severely lacking for areas of the Great South Bay. Therefore, LIC focuses its data development efforts on this area (Bortman 2005).

One of DWT's marine projects involves the creation of a digital marine atlas. This is a collaborative project with the Dorset Environmental Records Centre (DERC), which has been collating information on all of Dorset's terrestrial wildlife for about 30 years. The Dorset Marine Biodiversity Database, now maintained at DERC, originated at DWT in June 2000 (Dorset Environmental Records Centre 2005). The aim is to collate data on the marine environment and uses of the sea and coast and to make them accessible to planners and decision makers (Dorset Wildlife Trust 2005). DWT will use this information to help plan conservation targets and to respond to proposed development that can affect marine resources (Tinsley 2005).

Table 3 lists the tools described in each of the above sections. While a full discussion of the opportunities and limitations inherent in the use of these tools by land trusts is beyond the scope of this article, some are presented here. As an example of what is meant by these descriptions: Agardy (2000) mentions how some of the physical challenges of marine environments may impede conservation efforts

Table 3. Marine protection tools used by land trusts with their opportunities and limitations

Tools (strategies)	Opportunities	Limitations
Protected area management partnerships	<ul style="list-style-type: none"> - Taps varied expertise - Taps multiple jurisdictions/authorities - Cost sharing - Facilitates cross-boundary approaches - Facilitates public participation 	<ul style="list-style-type: none"> - Coordination may be complex - Administrative costs - Possible conflicting objectives
Acquisition	<ul style="list-style-type: none"> - Greater control for conservation 	<ul style="list-style-type: none"> - Expense - Limited areas available - Navigational servitude protections - Demarcation challenges - Limited to stationary resources
Strategic planning processes	<ul style="list-style-type: none"> - Systematic - Replicable for networks - Science-based, proven 	<ul style="list-style-type: none"> - Long time frame required - Good data needed
Zoning	<ul style="list-style-type: none"> - Enables varied uses - Enables varied protection levels 	<ul style="list-style-type: none"> - Implementation costs (e.g., enforcement) - Statutory authority necessary
Data development (support tool)	<ul style="list-style-type: none"> - Supports informed decisions - Supports strategic planning 	<ul style="list-style-type: none"> - Expense/technology - Standardization challenges over time and across organizations

Note. Opportunities are advantages to the use of these tools and limitations are aspects that make them difficult to implement.

based on acquisition and exclusion. Resources tend to be more fluid so that while leasing may be of the seabed, as in the case of the BNT, water quality impact generated elsewhere may influence conservation outcomes. Partnership arrangements have significant advantages over ownership or leasing arrangements in this regard because partner organizations may have authority over additional elements of the environment. Further research could better define opportunities and limitations for the application of these tools in the marine environment.

Conclusions

LIC uses land protection experience in developing management partnerships for underwater protected areas, acquisition of submerged lands, adapting terrestrial strategic planning processes, and marine database development. DWT makes use of management partnerships for its long-established voluntary marine reserve, and together with partners, it uses strategic planning methods and database development based on land experience. BNT has recently established a management partnership program aimed at protecting land and sea parks, intends to implement zoning for one of its sea parks, and significantly expanded the “submarine” areas it leases from the national government (acquisition).

Clearly, the land trusts studied are using land protection experience to guide their marine conservation efforts. But what determines whether a land trust will engage in marine conservation and what determines the tools it uses? Geography is important. Land trusts working on islands with limited land protection opportunities may be particularly interested in developing marine programs that apply traditional land protection strategies to the sea. Organizations that have jurisdictional authority may be able to implement zoning mechanisms; others will rely heavily on management partnerships when expanding their activities to include marine protection.

Overall, interviewees cited institutional and regulatory differences between land and sea as factors that limit their organization’s involvement in marine conservation, not physical ones. These differences are: real or perceived differences in ownership regimes, lack of data for developing conservation priorities, lack of member concern for the sea, lack of funds, and insufficient organizational capacity to broaden the scope of their work. Another important difference, especially noted by the DWT staff, is the lack of statutory protection mechanisms such as those available for terrestrial resources, particularly, ineffective national legislation for the establishment of marine reserves comparable to land reserves.

The use of certain tools by land trusts may be related to organizational characteristics. LIC is part of a larger, national organization in existence much longer than BNT and DWT. The tools LIC uses for both marine and terrestrial conservation reflect general trends in its national organization (e.g., use of management partnerships and its strategic planning process Conservation by Design). DWT is a member of the larger, national UK Wildlife Trusts and can draw on that experience as well as that of other well-established partners that incorporate Dorset conservation efforts into larger regional and national initiatives. Finally, the use of these tools presents various opportunities and limitations more or less suited to a particular situation and/or organization.

Land trusts that can tap into larger, broad-scoped organizations with many years of experience protecting a variety of ecosystems and those with statutory authority including acquired property rights in submerged areas will be more

inclined to broaden their scope of work to include marine protection. As they increase their involvement in marine protection, land trusts and other ENGOs will most likely consider the tools described here. This study presents preliminary exploratory research. For the future, it will be important to further identify limitations and opportunities involved in the use of these tools and to examine the degree to which land trusts and other ENGOs achieve success.

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