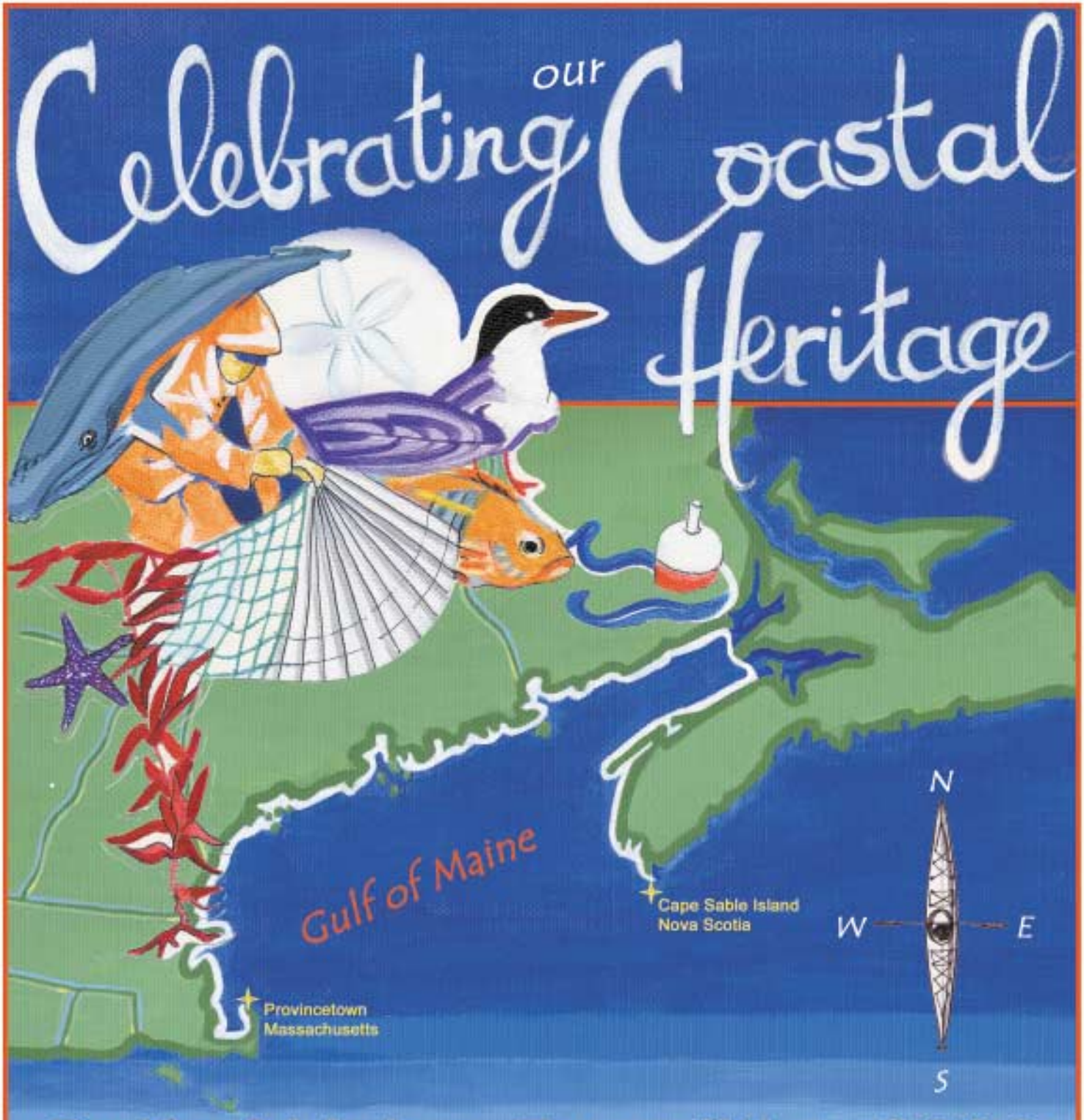
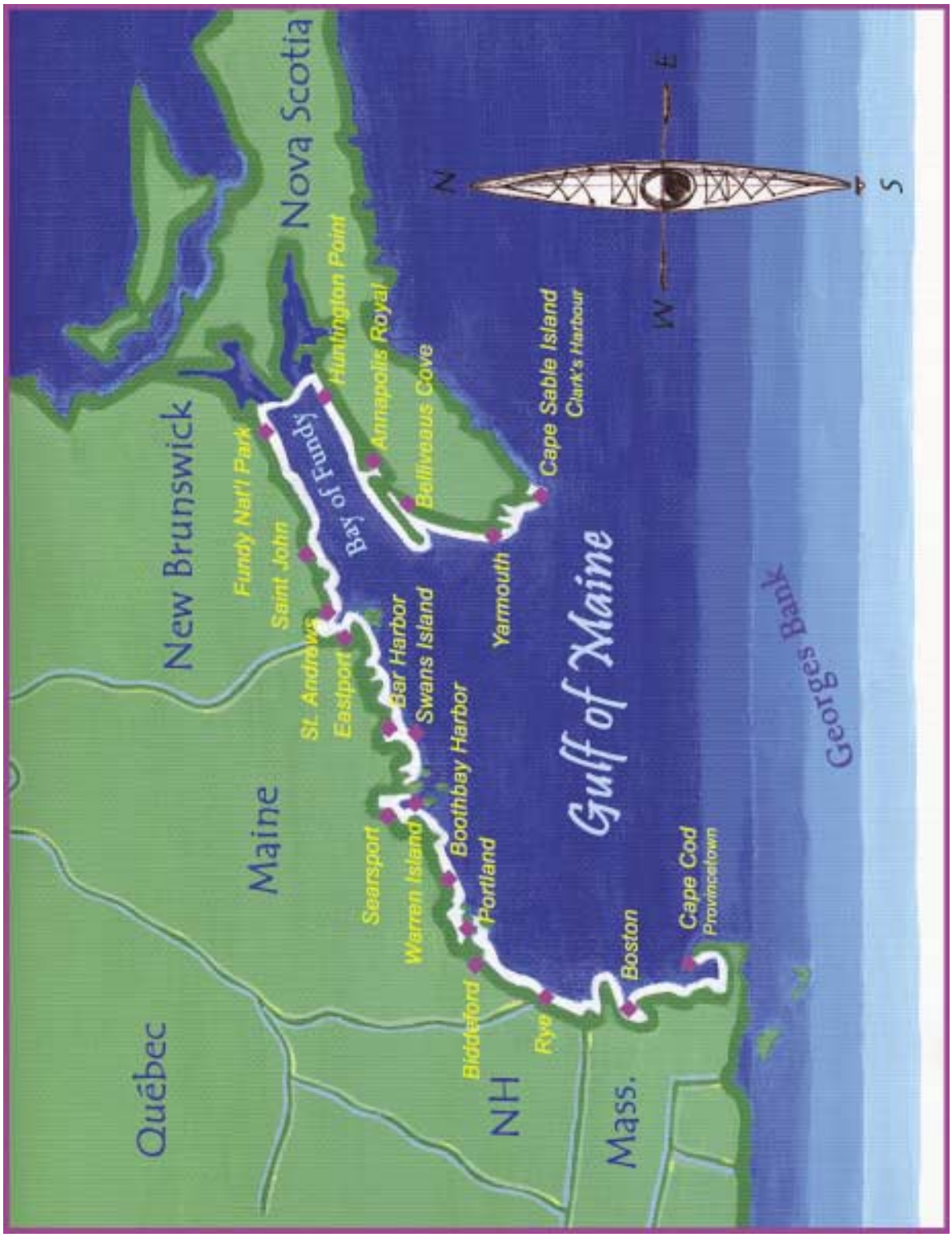


Gulf of Maine Expedition 2002

Final Report



From west to east, the white line in the map above represents the route of the Gulf of Maine Expedition; diamonds represent major community events. Cover art and above map designed by Heather Sisk, 2002.

Gulf of Maine Expedition 2002

Final Report

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July 2003

Expedition logo designed by Natalie Springuel.

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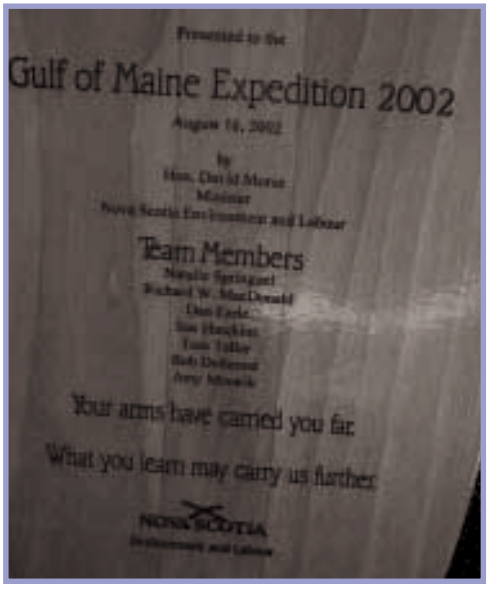
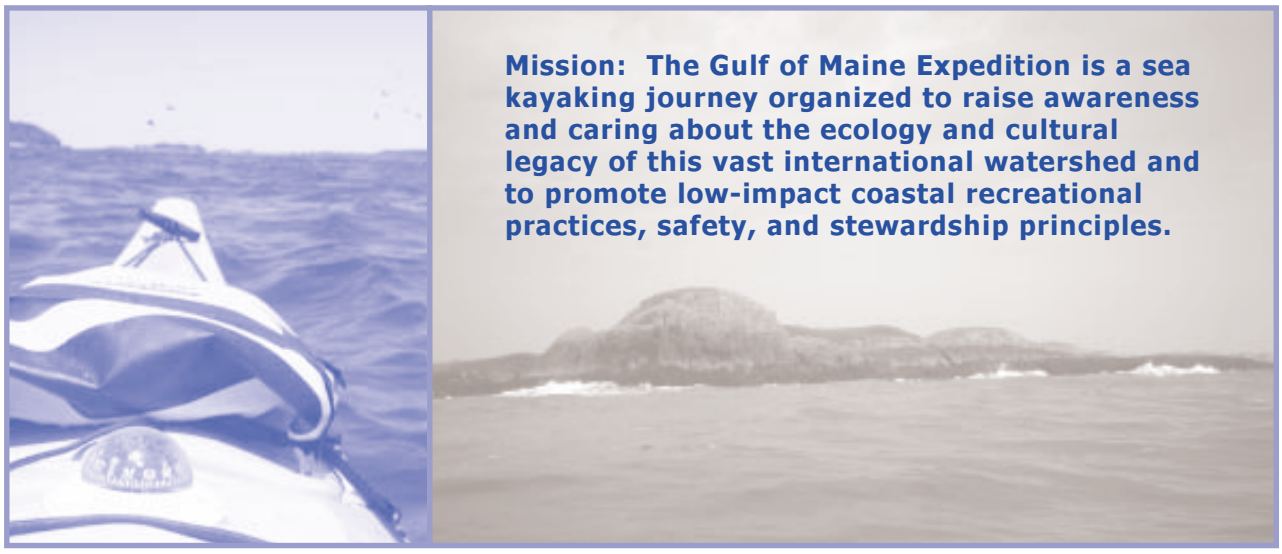
Methods: Conducting the Gulf of Maine Expedition

Appendices



This engraved paddle was presented to the Gulf of Maine Expedition team by Nova Scotia's Minister of Environment and Labour, the Honourable David Morse. The engraving reads, "Your arms have carried you far. What you learn may carry us further."



Left: North Shore, MA. Right: Brothers Islands, Englishman Bay, ME.

Introduction

Purpose of this Report

After nearly five months, over 1,200 nautical miles, 23 community events, and meeting countless people, it is clear that the Gulf of Maine Expedition achieved its goal of changing how people look at this vast landscape. With the significant effort that went into undertaking the Gulf of Maine Expedition, as well as the tremendous reception we received every step of the way, we hope to leave a lasting legacy. One step toward achieving a lasting legacy is this report.

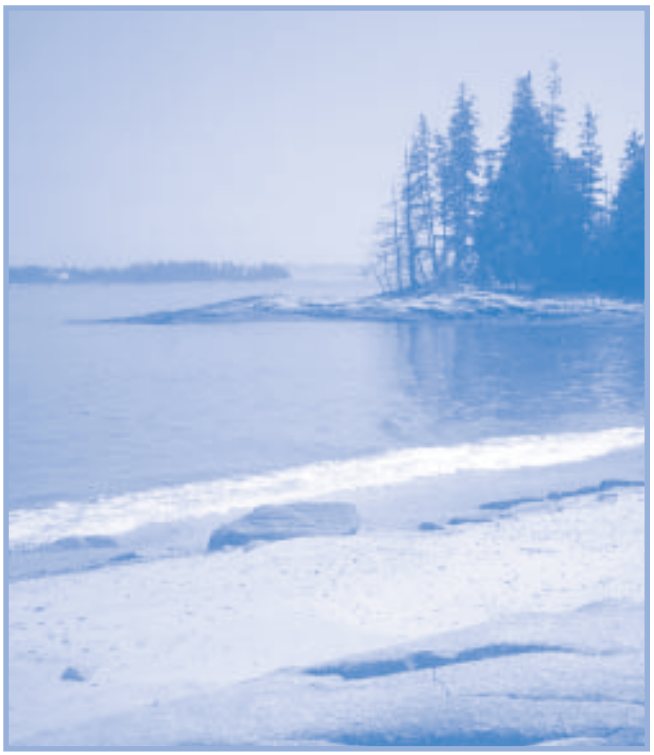
People within the Gulf of Maine watershed generally associate with political boundaries, whether hamlet, village, town, city, county, state, province, or country. An important aspect of our journey was to help people see the Gulf of Maine as part of an international watershed that includes portions of Massachusetts, New Hampshire, New Brunswick, Nova Scotia, and Québec, as well as the entirety of Maine. We hoped to foster an understanding that regional geography is not necessarily tied to political boundaries; that whatever enters the waters of flanking watersheds may ultimately be transported to the Gulf of Maine: Airborne pollutants do not stop at state or provincial boundaries, floating debris can drift great distances, and actions in one part of the Gulf can have an impact on other parts. It is our hope that by fostering an understanding and appreciation of the Gulf of Maine, those living within this watershed will begin to change the way they think about their homes, businesses, communities, and actions.

Another goal of the Expedition was to develop a "snapshot" of the Gulf of Maine during the summer of 2002. We hope that this report will provide a baseline of information about the status of the Gulf in the summer of 2002, and that it will be useful in five, 10, 20, or 50 years, to track the changing character of this vast land- and seascape. To achieve this goal, we set forth an ambitious regime of documentation, following in the footsteps of great naturalists such as Henry David Thoreau and Rachel Carson.

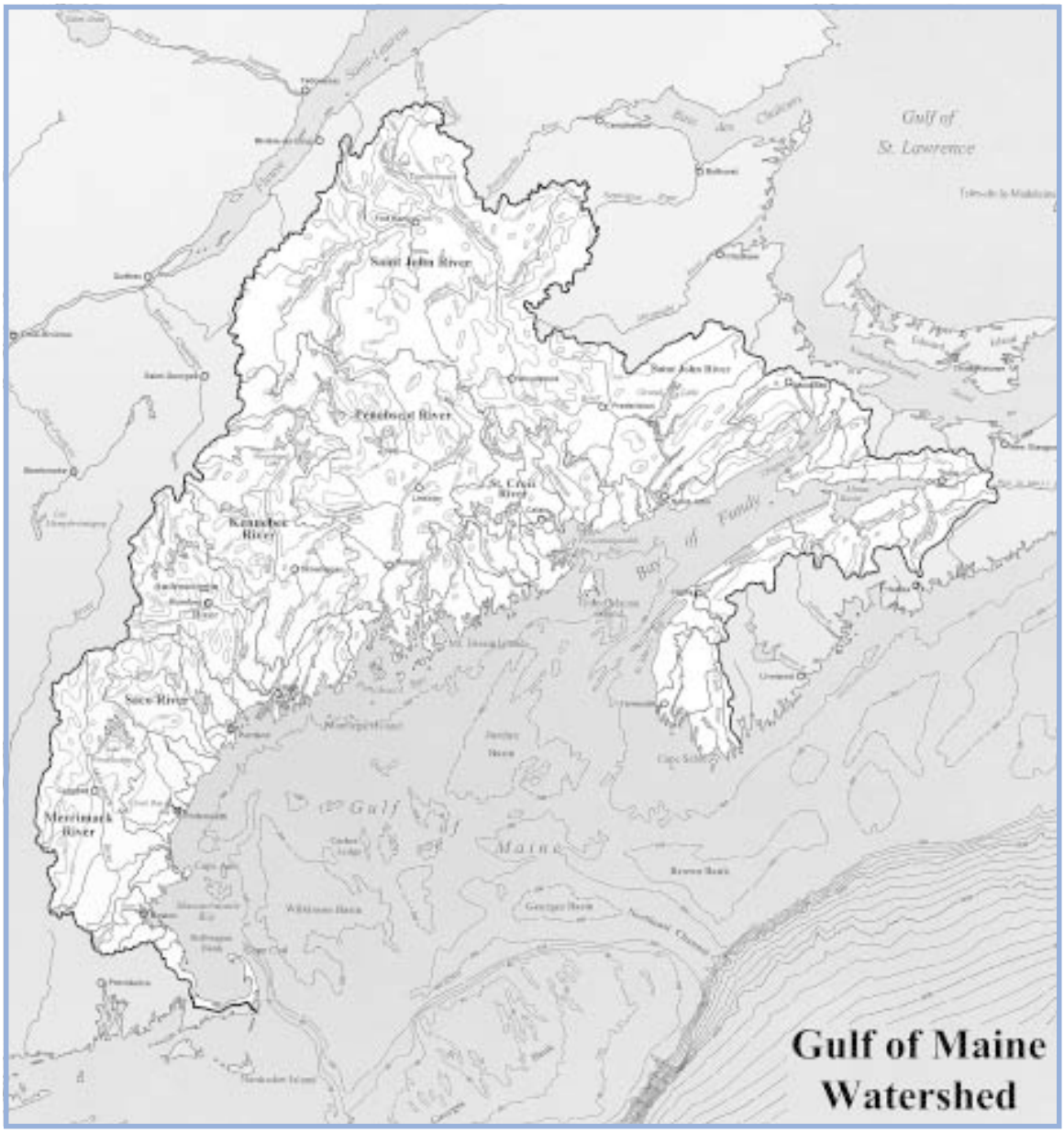
We employed digital photography and videography, 35-mm photography, artwork, and copious note-taking. We documented the botany, zoology, and landscape ecology. Specific observations were made on the flowering plants, birds, intertidal zone, phytoplankton, ozone, and all marine life we encountered. Shoreline use and coastal debris were carefully documented. Stories shared by locals were scribbled in journals. And finally, serendipitous observations played an important part of our efforts at documenting the Gulf of Maine. As we learned about issues of concern, we did our best to probe deeper into those issues and to relate our findings to future audiences. This report is a compilation of that documentation.

The report is divided into two sections. The first covers our observations, ranging from natural history to shoreline development and access issues to fisheries and tourism. The second section details how we conducted the Expedition, including our educational events, the safety and stewardship protocols we employed, and the nuts and bolts of our safety and technological equipment. Appendices include species lists, data tables, and a list of media coverage.

Our Web site (www.gomexpedition.org) tracked the Expedition while we were underway and continues to serve as a tool for future programming.



Penobscot Bay, ME.



Map by Richard D. Kelly, Jr., Maine State Planning Office, 1991; revised 1999.

What is the Gulf of Maine?

On the land side, the Gulf of Maine watershed encompasses 69,115 square miles (165,185 square kilometers), with seven major rivers pouring 250 billion gallons (948 billion liters) of fresh water into the Gulf each year. On the ocean side, the Gulf of Maine is a semi-enclosed sea in its own right, bounded by the hook of Cape Cod to the south, the Bay of Fundy—with the world's highest recorded tides—to the north, and Georges Bank (one of the world's greatest fishing grounds) extending 200 miles (322 kilometers) into the Atlantic Ocean. The Gulf of Maine is one of the most biologically productive bodies of water. It harbors breeding sites for endangered seabirds and marine mammals, as well as a globally significant plankton population sustaining an ecologically complex food chain.

In geologic time, the Gulf of Maine as we know it today is quite young, largely a product of the last period of glaciation 10,000 years ago. Over 430 million years ago, the greater Gulf of Maine region was part of a super-continent named Pangea. For hundreds of millions of years, a series of mountain-building periods formed the granite bedrock that dominates our region. The breakup of Pangea about 190 million years ago created rift valleys (*e.g.*, what became known as the Bay

of Fundy). About 15 million years ago, the Gulf region was exposed as dry land, subject to erosional processes for thousands of years.

Everything changed dramatically between 20,000 and 13,000 years ago when a mile-thick glacial sheet advanced and retreated over the landscape, scouring out softer rocks to create the deep Georges, Jordan, and Wilkinson Basins. The glaciers also deposited sediments forming the drumlins of Boston Harbor and western Nova Scotia and the moraines of Cape Cod and Georges and Brown Banks. As the glaciers melted in their final retreat, they released huge amounts of freshwater that scoured out riverbeds and flowed down Northeast Channel (the great sluice at the mouth of the Gulf of Maine between the banks, which serves as the primary pathway to the open Atlantic Ocean). Then, the sea began to rise high enough that it covered the banks and flooded the valleys. Simultaneously, the land began the slow process of rebound as it was released from the weight of the glaciers, a process that is still occurring today.

The Gulf of Maine has long been one of the world's most fertile fishing grounds. Its cold waters are rich in plankton that sustains the base of a complex food chain supporting species ranging from filter-feeding Blue Mussels (*Mytilus edulis*) to the endangered North Atlantic Right Whale (*Eubalaena glacialis*). So thick were these waters with sea life that early fishermen claimed one could walk from ship to shore atop schools of fish without falling in. American Lobster (*Homarus americanus*), too, were so plentiful that they were considered "poor-man's food," fit only for servants and prisoners. Indeed, the Gulf of Maine's human population developed and grew as a region because of the very richness of its waters.

Beginning in the second half of the 20th century, communities along the rim of the Gulf of Maine began facing dramatic changes in their traditional seafaring culture. Many fisheries have been exhausted, including the great Cod (*Gadus callarias*) fishery (which is now severely limited), causing people to explore alternatives with creativity and resilience. As a result, new fisheries have emerged from previously unmarketed species. Aquaculture farms are sprouting up in many bays and coves. The Internet is giving the economy an added boost. And tourism, the world's fastest growing industry, has hit the scene on a grand scale.

The lure of nature-based tourism brings more and more people to the coast of the Gulf of Maine, its islands, beaches, and salt marshes. Both in this region and the world over, ecotourism and outdoor recreation are increasing at a rate faster than any other form of tourism. Tourists and outdoor enthusiasts, by their sheer numbers, have the potential to cause the greatest ecological crisis, or the greatest conservation opportunity, for the Gulf of Maine.

*Background photo: St. Andrews, NB. Left inset: Moon Jellies (*Aurelia aurita*), Boothbay Harbor, ME. Right inset: Sea Harvester, Stonington, ME.*

What is the Gulf of Maine Expedition?

The Gulf of Maine Expedition was both a sea kayak-based fact-finding journey and an educational program. The term “expedition” conjures images of remoteness or getting there by traveling higher, faster, further, deeper, longer. In this way, our expedition was vastly different than others. The Gulf of Maine Expedition was deliberate in planning a route that would combine elements of coastal wilderness and civilization. We wanted to meet the people of the Gulf of Maine and to experience firsthand this environment that both we, and they, call home.

Scusset Beach, MA.

As we paddled along the shoreline of the Gulf of Maine, we had one overarching principle: Adherence to a policy of non-advocacy and non-confrontation. In order to generate as complete and as comprehensive a view of the Gulf of Maine as we could, it was important to not be judgmental. Thanks to this policy, everyone we met was friendly, eager even, in their willingness to engage in discussion.

Early on, the Expedition developed a mission statement to guide our actions as we paddled through the Gulf of Maine:

> **The Gulf of Maine Expedition is a sea kayaking journey organized to raise awareness and caring about the ecology and cultural legacy of this vast international watershed and to promote low-impact coastal recreational practices, safety, and stewardship principles.**

Having such a broad mission was a deliberate decision, but for the sake of simplicity, it can be broken down into four equally important components that we explored extensively, documented copiously, lived by, and taught: Ecology, culture, safety, and stewardship.

Ecology

The coast of the Gulf of Maine spans a wide variety of natural systems, such as sand dune complexes, estuaries, rocky shorelines, islands, and boreal forests. The intertidal zone hosts an astonishing variety of algae and invertebrates. The botany is diverse, with some species well-adapted to the harsh coastal environments unique to the Gulf of Maine and others with a much broader geographic range. Over 300 species of birds breed on or near its shores. The zoology is a wealth of diversity, especially when considering that habitats range from the depths of the Gulf of Maine to the forested uplands.

Culture

Interspersed throughout the whole Gulf of Maine Expedition was the human element. The Gulf of Maine has been settled by people of European descent for over four hundred years and by Native Americans since long before that. Human influence on the natural landscape was observed at every level, sometimes with positive effects and sometimes not. Daily we met the people of the Gulf of Maine: People from all walks of the fishing industry, foresters, construction workers, business people, retirees, tourists, and more. Everyone had a story to tell. And everyone cared about this place they called home.

Safety

As we explored the Gulf of Maine via sea kayaks, it goes without saying that we encountered a vast range of weather, tides, and currents. Given the rapid growth of sea kayaking and the inevitable attention our journey would bring to the sport, our team was committed to leading by example. Safety was paramount and took many forms. The paddling members of the Gulf of Maine Expedition were long-time kayakers, with many years experience as instructors. All wore clothing appropriate to the conditions. Our kayaks were equipped with an assortment of safety gear ranging from bilge pumps and paddle-floats to flares and fog horns. We paid very close attention to weather patterns and lived according to the theory that on any given day, our team was only as strong as our weakest member. We used VHF radios and radar reflectors. We gave workshops on sea kayak safety. And we ALWAYS wore our personal flotation devices (PFDs), better known as life jackets.

Stewardship

To teach stewardship, we again practiced what we preached. This meant minimizing the impacts our presence had on the environment—for example, whenever possible, pitching our tents on durable surfaces, such as shingle beaches. We did our best to avoid disrupting wildlife. We kindled no campfires. We packed out our solid human waste. Our stewardship principles were modeled on Leave No Trace (for more information on Leave No Trace, visit their Web site at www.LNT.org). We attempted to teach these principles in as many settings as possible.

History of the Gulf of Maine Expedition

The idea for expedition-based learning about the Gulf of Maine was spawned in 1996. As part of her graduate research, Natalie Springuel, along with friend Pam Price, spent 10 weeks sea kayaking from Yarmouth, Nova Scotia, to Ingonish, on Cape Breton Island. The purpose of that expedition was to compare recreational impact on coastal ecosystems in Nova Scotia and Maine. During that trip, Natalie began thinking about an expedition to focus attention on the watershed in which she lived: The Gulf of Maine. During subsequent years the idea of a Gulf of Maine Expedition was continuously in the back of her mind and the subject of occasional discussion within her community of friends and colleagues.

In the summer of 2000, Natalie shared the idea of a Gulf of Maine Expedition with Rich MacDonald. An enthusiastic response by Rich and a pledge that he would help at all levels, including paddling the whole Gulf of Maine, was the impetus needed to begin planning. And thus the Gulf of Maine Expedition was born.

It soon became apparent that organizing a sea kayak-based educational expedition of this magnitude would require additional help. A cast of long-time educators and sea kayak guides from Bar Harbor, Maine, were convened to begin the planning process. Megan Gahl, Darrin Kelly, and Ron Wanner, along with Natalie and Rich, comprised the Core Planning Team; however,

Barnstable Harbor, MA.

North Shore, MA.

many other people cycled through to provide assistance as needed.

As the project moved forward, Natalie approached her employer, the University of Maine's Sea Grant Program, to ask for advice, assistance, network connections, and possibly a leave of absence, in order to make this project work. The Sea Grant management team, led by Director Paul Anderson, mulled over the idea and its timing in the development of future Sea Grant programs. Sea Grant's plan to address sustainable tourism and coastal access issues, combined with funding allocated from the National Sea Grant Office to create a coastal community development program, enabled Sea Grant to change Natalie's job description to marine extension associate. Natalie's first task would be to lead the educational Gulf of Maine Expedition as a sort of needs assessment of Gulf-wide issues related to tourism and access. This was the beginning of the close relationship between Maine Sea Grant and the Gulf of Maine Expedition. Sea Grant soon emerged as the Expedition's most valued sponsor and supporter, providing the team with technological equipment, volunteers at countless events, and in-kind support of all kinds.

The Core Planning Team soon decided there was need for an Advisory Committee to help shape the Expedition's educational goals. Stakeholders and professionals from communities along the Gulf of Maine were invited to provide input on the Gulf of Maine Expedition. They convened in Bar Harbor in December 2001 for a daylong retreat, and subsequently, they provided guidance throughout the project.

In this the age of the Internet, the Team identified the need for an extensive Web site that could be regularly updated from the water with a laptop computer and cell phone. The computer was provided by Maine Sea Grant. Kirk Holbrook, of Penobscot Bay Media, developed the Web site. Kirk became involved after he learned about the Expedition in a U.S. Power Squadron newsletter. Intrigued by the mission, and a paddler himself, Kirk volunteered to design and update our Web site at a substantial discount from his usual fee. The Web site (still up and running at www.gomexpedition.org) became one of the Expedition's most important communications tools.

The following people served on the Advisory Committee or provided significant guidance:

- Paul Anderson, director of Maine Sea Grant, based at the University of Maine in Orono;
- Ken Fink, retired professor of oceanography at the University of Maine, and owner of Poseidon Kayaks, Walpole, Maine;
- Megan Gahl, environmental educator, Bar Harbor, Maine;
- Al Johnson, recreation & safety specialist with the 1st U.S. Coast Guard District in Boston, Massachusetts;
- Darrin Kelly, environmental educator, Bar Harbor, Maine;
- Dorcas Miller, writer, paddler, and outdoor educator from Maine;
- Rachel Nixon, trail manager for the Maine Island Trail Association, Portland, Maine;
- Ted Regan and Aaron Frederick, executive director and program manager, respectively, for Portland-based Rippleffect, an adventure-based youth-development organization (Rippleffect was an early supporter, providing the Expedition with fiscal sponsorship to facilitate grant applications);
- Steve Spencer, recreation specialist with the Maine Bureau of Parks & Lands in Augusta;
- René Springuel (father of Expedition Leader, Natalie), a consultant with the International Law Institute, Bethesda, Maryland;
- Theresa Torrent-Ellis, senior planner with the Maine Coastal Program in Augusta;
- Ron Wanner, director of kayaking, Coastal Kayaking Tours, Bar Harbor, Maine; and
- Dick Wheeler, educator and boater from Cape Cod, paddled from Newfoundland to Cape Cod in 1991 to educate people about the demise of the Great Auk (*Pinguinus impennis*) and other important coastal issues.

Drake's Island Beach, southern ME.

Bold Coast of Maine.

The Team Develops

Among the many people Expedition Leader Natalie Springuel met during her 1996 Nova Scotia expedition was Kendrick d'Entremont, who ran Seaclusion Kayak Adventures in West Pubnico, Nova Scotia. In August 2001, Kendrick launched the day-long West Pubnico Sea Kayak Rendezvous. Natalie was invited as keynote speaker and both she and Rich MacDonald were invited as instructors. Local paddlers Dan Earle and Sue Hutchins played host to the two visitors, providing ample time for brainstorming about the Expedition and potential Canadian partners. Following the Rendezvous, Natalie and Rich talked extensively with the Core Planning Team. It was clear Dan and Sue would be assets to the Gulf of Maine Expedition: They would round out the team by including Canadians and, being retired educators, they brought a lifetime of experience. The decision was made to invite Dan and Sue as members of the Expedition Core Team. During the six months leading up to the May 4th launch of the Expedition, Dan and Sue made many scouting trips, driving around the Bay of Fundy seeking potential campsites and making local contacts.

In September 2001, *Atlantic Coastal Kayaker*, ran a story about the then upcoming Gulf of Maine Expedition. One of the people that responded to that article was Tom Teller, an avid paddler and college professor. Tom, much like Dan and Sue, liked the educational mission and approach and expressed interest in volunteering his services in whatever capacity was needed. During subsequent correspondence and meetings, we learned that Tom offered many skills as an experienced paddler and Wilderness Emergency Medical Technician. As the most southern member of the Expedition, he planned the first part of the journey, from Provincetown, Massachusetts, through Portland, Maine.

During the winter of 2002, Theresa Torrent-Ellis, of the Maine Coastal Program (State Planning Office), asked Natalie what piece was missing to achieve the Expedition's educational goals. The team lacked a central communications person to coordinate media relations. In response, Theresa offered the services of AmeriCorps volunteer Amy Minarik. Amy soon

averaged 10 hours per week on Gulf of Maine Expedition-related activities, including creating a comprehensive media contact database for the Gulf of Maine. During the course of the Expedition, Amy disseminated 33 press releases and media advisories, as well as serving as liaison for all manner of press. As a result of Amy's extensive work, the Expedition's mission was covered in over 50 media outlets.

Another pressing need for the Gulf of Maine Expedition was an Education & Outreach Coordinator. Shortly before departure, a grant came in allowing the hiring of Bob DeForrest for that role. Bob, long-time guide and friend of Natalie's, had been involved in discussions about the Gulf of Maine and an expedition to explore this water body since the birth of the idea in 1996. As Education & Outreach Coordinator, Bob wore many hats: He worked with local contacts in coordinating community events and Gulf of Maine Days, worked closely with Amy crafting press releases and communicating with the media, served as an instructor in our kayak safety workshops, and drove countless miles shuttling the paddling team between events.

These seven people—Natalie, Rich, Dan, Sue, Tom, Amy, and Bob—comprised the Expedition Core Team. Natalie, Rich, Dan, and Sue paddled the whole coast of the Gulf of Maine and represented the Paddling Team. Tom joined us on the water for the six weeks it took to paddle from Bar Harbor, Maine, to Alma, New Brunswick, and then again for the last week of the Expedition from West Pubnico, Nova Scotia, to Clark's Harbour. Amy and Bob, although not on the water, played roles every bit as crucial as that of the paddlers.

Northern Penobscot Bay, ME.

Planning the Gulf of Maine Expedition

On September 28th, we arrived in Clark's Harbour, Nova Scotia, completing the paddling portion of the Gulf of Maine Expedition. However, this was not the end of our efforts. Planning a five-month sea kayak-based educational expedition is a monumental task. From the earliest stages of planning, we acknowledged that there were three phases to the Gulf of Maine Expedition:

- Phase 1: Planning;
- Phase 2: The journey itself; and
- Phase 3: Documenting the journey and presenting our findings.

Although the idea had been incubating since 1996, the planning phase, as discussed previously, began in earnest during the summer of 2000 and ended when we launched our sea kayaks.

Phase 2, the journey itself, began on May 4th, 2002, as we launched our kayaks from Provincetown, Massachusetts, and ended 149 days[1] and 1.3 million paddle strokes[2] later, on September 28th, with our arrival in Clark's Harbour, Nova Scotia. The focus of this report will be on the paddling phase of the Gulf of Maine Expedition.

Phase 3, documenting the journey and presenting our findings, began upon completion of the Expedition. This report marks a significant milestone in post-Expedition wrap-up. Slideshows have been given to school, community, and professional groups both within and outside the Gulf of Maine watershed and more have been planned. All members of the Expedition will be involved in issues at all levels throughout the Gulf of Maine.

The Gulf of Maine Expedition served as a pilot project for the new, non-profit Gulf of Maine Expedition Institute, based in Bar Harbor, Maine. In addition, a parallel organization, the Gulf of Maine Expedition Association, has been created with a base in Yarmouth, Nova Scotia. These organizations are both aimed at carrying the mission of the Gulf of Maine Expedition forward: Continuing to raise awareness about coastal ecology, teaching safe recreational boating practices, and promoting responsible stewardship of coastal resources. Future programming will range from daylong to multi-week events, targeting people of all ages.

[1] *From beginning to end, the Gulf of Maine Expedition had a duration of 149 days. However, when factoring weather days, scheduled breaks, and community events, there were only 86 days of actual paddling on the water. See the "Travelogue" section beginning, page 63, for a daily breakdown of our itinerary.*

[2] *The number of paddle strokes per person is approximated based on an assumed estimate of 50 strokes per minute, with an average of five hours paddling each of the 86 days we were actually on the water.*

"Wonderful. Your experiences, images, and impressions surrounding the GOM, coupled with your ability to communicate the impressions from this expedition, are more significant toward preserving this environment than countless scientific studies. Excellent work!"

Paul Waterstrat
Maine Department of Marine Resources scientist

NOTE: In a report such as this, decisions are ultimately made on categorization. We acknowledge that some issues either transcend specific categorization or fit equally well in multiple categories. For the sake of brevity, we generally mention subjects once with additional page references where necessary. In the end, all of our work was interconnected.

The Gulf of Maine as Observed by the Gulf of Maine Expedition

The Gulf of Maine Expedition's mission "to raise awareness and caring about … ecology and cultural legacy" meant that team members served as both educators and students. We were not on a mission to impart a particular viewpoint. Rather, we made observations of the ecology, people, and issues of the Gulf of Maine and shared what we learned.

Our observations came in many forms, ranging from what we saw (such as wildflowers, birds, or storm-water runoff pipes) to what we collected or analyzed (such as phytoplankton, ozone, or coastal debris). When we talked to people, whether we met them serendipitously on shore or in an organized forum, we wanted to know what was important to them, to their livelihoods, to their quality of life in the Gulf of Maine. We also passed along what we had learned from others. This two-way dialog helped deepen our understanding of the Gulf of Maine.

In this section, we document our wide-ranging observations of the ecology, people, and issues of the Gulf of Maine.

Ecology

The Gulf of Maine is a vast and dynamic landscape that includes both the terrestrial watershed and the marine environment. There are numerous ways to view such natural landscapes.

Watersheds are one measure. Simply put, a watershed is the area of land where every drop of water has the potential to flow downhill into the target water body, in this case, the Gulf of Maine. The Gulf of Maine watershed is 69,115 square miles (165,185 square kilometers) and includes portions of Massachusetts, New Hampshire, New Brunswick, Nova Scotia, and Québec, as well as the entirety of Maine.

Work by the U.S. Forest Service and The Nature Conservancy[1] looks at natural landscapes from the ecosystem perspective. An ecosystem is a community of organisms—bacteria, algae, plants, and animals—all interacting, and the environment in which they live. Ecosystem boundaries do not necessarily coincide with watershed boundaries. There are numerous ecosystems within the terrestrial and marine environments of the

[1] *Bailey, Robert G. 1997.* Map: Ecoregions of North America (rev.). *Washington, DC: USDA Forest Service in cooperation with The Nature Conservancy and the U.S. Geological Survey. 1:15,000,000. See also Bailey, Robert G. 1998.* Ecoregions Map of North America: Explanatory Note. *Misc. Publ. 1548. Washington, DC: USDA Forest Service. 10 pp.*

Left to right: Cape Porpoise region, ME; boulder beach in NS; Downeast ME.

Gulf of Maine. Depending on the desired level of detail or methodology, the coast of the Gulf of Maine can be considered one ecosystem or may be broken down into many.

From the perspective of a sea kayak, the most significant ecosystem transition along the shore of the Gulf of Maine is in the Boothbay region of Maine, where the oceanic broad-leaved forests to the south transition into the mixed deciduous-coniferous forests to the north.

Both approaches—watershed and ecosystem—are valuable. By briefly describing the watershed and ecosystem approach to delineating natural landscapes, we hope to foster interest in further investigation on the part of the reader.

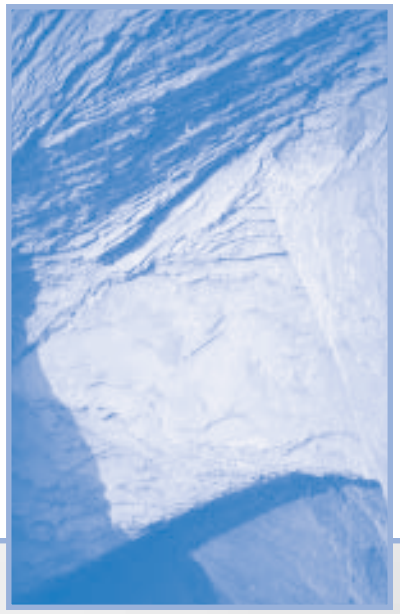
In this section our observations are limited to the vicinity of the shoreline of the Gulf of Maine—primarily that which we saw during our travels.

Landscape Ecology

The seascapes of the Gulf of Maine are varied and impressive with caves into which you can paddle, island passageways, waterfalls, dramatic sedimentary and volcanic rock formations, fantastically carved sandstone cliffs, booming thunder holes, vast sand beaches, tidal river mouths, and dense forests alternating between hardwood and softwood. During the Gulf of Maine Expedition, from Cape Cod, Massachusetts, to Cape Sable Island, Nova Scotia, we observed six general landscape types.

On Cape Cod, the landscape is dominated by **sand dune/cliff** formations with a beach edge. This sandy landscape is dynamic: Sand is continually deposited and removed through natural processes of accretion and erosion by storm activity and rainfall. However, erosion is exacerbated by development and recreation practices—simply walking on a dune can inflict significant damage. The dynamic nature of this landscape generally precludes development of a towering forest canopy. Instead, vegetation is often limited to grasses and forbs (herbaceaous plants, other than grasses, growing in meadows and fields).

This sand dune/cliff zone gradually gives way to a **headland/beach** landscape that extends into southern Maine. Rocky headlands protrude into the sea; between



Top right: Shale from Pendleton Island, NB. Bottom right: Petit Manan Point, MA. Bottom left: A beach in NH.

them are sand beaches. The beaches vary from small, isolated pockets of sand to large, intensively used commercial strips. Rocky headlands offer better protection from erosional processes, lending themselves to more permanent floral communities. Northern hardwoods, such as oak (*Quercus* sp.), root where there is better soil; salt-tolerant softwoods, such as pine (*Pinus* sp.) and spruce (*Picea* sp.), grow in the sandier soils and closer to the water. Sand dune/cliff complexes reappear in places like Plum Island and Crane Beach, Massachusetts.

From the headland/beach formations there is a transition into the offshore **island** landscape of Maine. While the islands of Massachusetts are generally sheltered and their forest structure is more representative of the southern New England climate, with stands of hardwoods (largely oak), the rugged islands of mid-coast Maine are largely made up of exposed granitic bedrock. These islands are generally either forested in spruce and Balsam Fir (*Abies balsamea*) or have been cleared for decades, largely for the rearing of livestock, particularly sheep. For kayakers, the island landscape is prime paddling territory. It draws people from around the world to experience the beauty of travelling among, and camping on, this landscape.

East of Machias, Maine, and extending up the coast of New Brunswick, is a bold coast of **high cliffs** of volcanic basalt or sedimentary sandstone, with fewer and fewer offshore islands. The sandstone is carved into dramatic shapes: Caves, keyholes, natural arches, and sea stacks are common features. The formations are occasionally broken by deep coves and steep river valleys. Cape Chignecto and Cape Split, both in Nova Scotia, fit this category.

The west coast of Nova Scotia, bordering the Bay of Fundy, is dominated by North Mountain and Digby Neck, a **low cliff** formation of basaltic rock and ancient lava flows. The cliffs are cut by steep-sided hanging valleys and faced with narrow and steep shingle beaches. The beach at Sandy Cove, on Digby Neck, is an exception to the general pattern.

The southwest tip of Nova Scotia, where we ended our trip, is dominated by landscapes of **glacial till**. The landforms are lower in elevation, and partially eroded drumlins of sand and gravel are seen frequently. The Tusket Islands and the islands of Lobster Bay are largely emergent drumlins.

At a much broader scale, and immediately visible on shore, boreal forests are the primary constituent of the landscape north of Boothbay Harbor, Maine. By the time you reach the high cliffs of the Bold Coast of Maine and New Brunswick, the forest changes little until southern Nova Scotia. While spruce and fir generally predominate, there are significant stands of birch (*Betula* sp.) representing the hardwoods. The fact that boreal forests predominate much of this northern landscape is to be expected: Rocky and sandy glacial till comprises much of the surficial geology of this region; poorly drained and low in nutrients, this environment requires vascular species tolerant of this habitat.

Botany

The botany along the coast of the Gulf of Maine is diverse. Many species of flora, especially flowering plants, can serve as indicators both of the health of a landscape and of the history of land-use. A list of flowering plants (*see Appendix I*) observed during the Gulf of Maine Expedition was developed.

For each plant, the first observed location of a species in flower or fruit was recorded. The list includes flowering plants found on the beach, among back beach dunes, and in coastal edge woodlands or disturbed lands near the places where we camped or stopped for breaks.

*Top to bottom: Iris (*Iris sp.*); shucking Beach Peas in NB; Harebell.*

The most consistently observed flowering plant was Beach Pea *(Lathyrus japonicus)*. It seemed to prefer the stony, exposed upper beach shelves. During a two-week window in late summer we harvested enough Beach Peas to add variety to our evening meals. Other common edible plants encountered included Mountain (*Vaccinium vitis-idaea*) and Small Cranberry (*V. oxycoccos*), Sea Rocket (*Cakile edentula*), wild strawberries (*Fragaria* spp.), Orach (*Atriplex patula*), and glasswort (*Salicornia* sp.).

The low, spreading Sea Lungwort (*Mertensia maritima*) was a regularly found beach plant. One of the most dramatic of plants was the tall, large-leaved Cow Parsnip (*Heracleum maximum*). Harebell (*Campanula rotundifolia*) was frequently found, holding tenaciously onto rocky cliff faces. These are but a few of the botanical highlights we encountered along the coast of the Gulf of Maine.

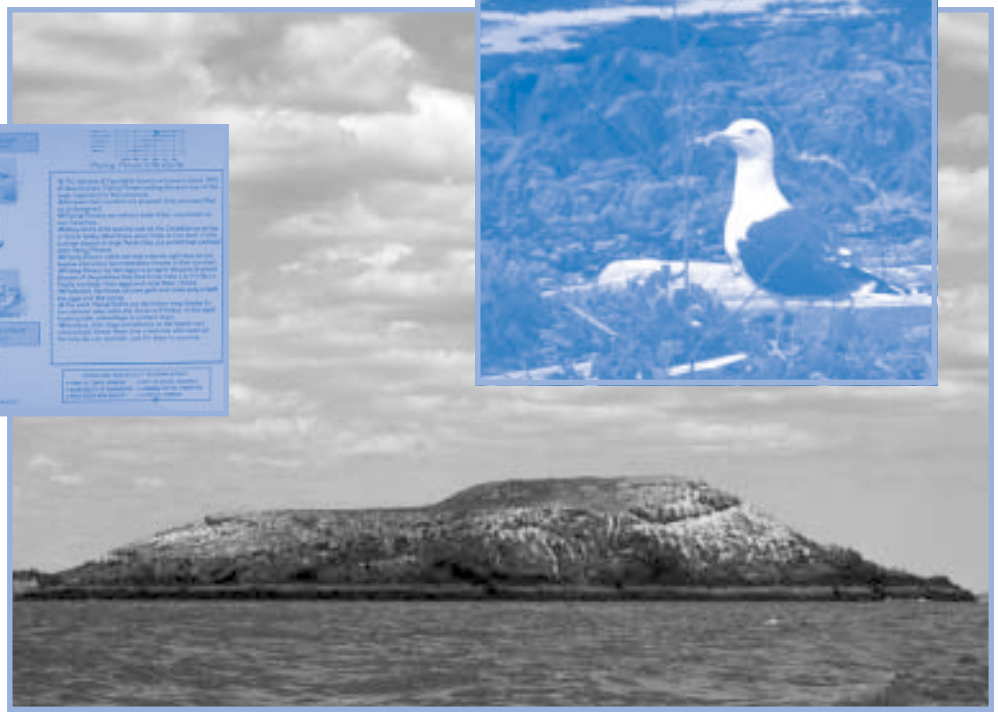
For a field guide, *Newcomb's Wildflower Guide* was our primary reference. As a supplement, we also used *A Field Guide to the Wildflowers of Northeastern and North Central North America*.

Our approach to documenting the flowering plants of the Gulf of Maine was simple. In retrospect, our documentation would have been more complete and useful if we had conducted an inventory at each campsite. This approach would have given a much better picture of the distribution of wildflower species and a more complete notation of density, habitat, and exposure.

Ornithology

Birds are one of the most regular and easily identifiable features of the natural landscape of the Gulf of Maine. Many studies use birds as ecological indicators. During the Gulf of Maine Expedition, we documented avian diversity by conducting two censuses each day we paddled: One on the water and one on shore.

During each day of paddling, all species were documented from the time we left our campsite in the morning until we reached the next campsite in the afternoon. A second list was started from the time we arrived at our campsite until our departure the next morning. This process was repeated each day. By the end of the Gulf of Maine Expedition, we had developed a comprehensive snapshot of avian species distribution along the coast of the Gulf of Maine. As our observations spanned five months, progressing from Provincetown to Cape Sable Island, temporal inconsistency is a factor when comparing observations from one part of the journey to another.



*Top: Piping Plover (*Charadrius melodus*) are protected throughout the Gulf. Center: Egg Rock, in Boston Harbor, is a nesting island. Right: The Great Black-backed Gull (*Larus marinus*) is the world's largest gull.*

During the course of the Expedition, 199 species were observed (see *Appendix II*). Of these, 36 species were observed in every state and province during the journey; 22 species were observed in four states and provinces; 37 species were observed in three states and provinces; 47 species were observed in two states and/or provinces; and 57 species were observed in only one state or province.

Many common species were observed, such as Common Loon (*Gavia immer*), Double-crested Cormorant (*Phalacrocorax auritus*), Great Blue Heron (*Ardea herodias*), Common Eider (*Somateria mollissima*), White-winged Scoter (*Melanitta fusca*), Semi-palmated Sandpiper (*Calidris pusilla*), Yellow-rumped Warbler (*Dendroica coronata*), Song Sparrow (*Melospiza melodia*), and American Goldfinch (*Carduelis tristis*).

Some species were observed at either end of the migration season, such as Northern Gannet (*Morus bassanus*), which were observed in the vicinity of major peninsulas along the Massachusetts, Maine, and Nova Scotian coasts.

Our first avian surprise were the storm-petrels. Both Wilson's (*Oceanites oceanicus*) and Leach's Storm-Petrels (*Oceanodroma leucorhoa*) were observed among the outer islands of Maine. Professor John Anderson, of College of the Atlantic in Bar Harbor, Maine, believes that Leach's Storm-Petrel is far more prevalent than most people realize and that this swallow-sized bird is generally overlooked and under-counted. Certainly the frequency with which we observed this species bears out this statement.

Two Glossy Ibis (*Plegadis falcinellus*) were observed on a single island off southern Maine. Their behavior suggested they had a nest on the island, which was densely populated with nesting Herring Gull (*Larus argentatus*) and Common Eider.

A pair of Ruddy Duck (*Oxyura jamaicensis*) on a pond in Fundy National Park (New Brunswick) was as surprising to team scientist Rich MacDonald as it was unexpected to local birders, who searched in vain for this uncommon transient.

Raptors were generally uncommon during the course of the expedition. Red-tailed Hawk (*Buteo jamaicensis*) was noteable in its near-absence. In retrospect, this makes sense considering that it is generally a bird of open country and not coastal margins. Merlin (*Falco columbarius*), scarcely seen during most of the Expedition, suddenly were abundant south of Yarmouth,

*Below: Bear Island, in Annapolis Basin, NS, is a Double-crested Cormorant nesting island. Right: Common Murre (*Uria aalge*).*

Nova Scotia, as they concentrated on southward peninsulas during the fall migration.

Peregrine Falcon (*Falco peregrinus*) were regularly found on the cliffs of the Bay of Fundy. Some of the most exciting Peregrine observations were at Mary's Point, New Brunswick. As we watched a flock of 60,000 shorebirds (mostly Semipalmated Sandpiper) congregate on the windy beach, waiting for the tidal flats to be exposed with the outgoing tide, a Peregrine flew in. To watch such a flock of shorebirds take flight and bank back and forth is a sight that will not quickly be forgotten.

Pelagic birds are always a treat. A Parasitic Jaeger (*Stercorarius parasiticus*) off Saint John, New Brunswick, was unusual to see from a sea kayak. A Dovekie (*Alle alle*) following a Razorbill (*Alca torda*) was also an unusual sight near Canada Creek, Nova Scotia. What was more unlikely was seeing the (presumably) same two birds three nautical miles down the coast the next day.

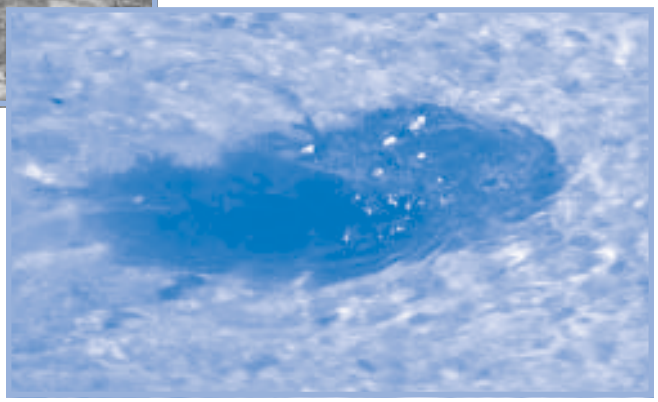
Birdwatchers at Mary's Point, NS.

Woodland birds made a respectable showing, including seven members of the thrush family and 22 species of warbler.

Boreal birds were generally less common until the islands of Downeast Maine and the Bay of Fundy. The more northerly latitudes and harsh coastal environment foster the spruce/fir landscape associated with boreal habitat. Boreal Chickadee (*Poecile hudsonica*) were found in the mature, wind-blasted conifers. One flock of over 50 Rusty Blackbird (*Euphagus carolinus*) was most certainly beginning fall migration. Small flocks of Red (*Loxia curvirostra*) and White-winged Crossbill (*L. leucoptera*) were observed several times, always in flight.

Intertidal Zone

Upon the launch of the Expedition, we intended to study the intertidal zone at each campsite with the lofty goal of documenting all species observed. However, it soon became apparent that our relationship with the intertidal zone was not at all scientific. We only had the luxury of making observations when we landed early and on a low tide. So, rather than study the intertidal zone, we lived in it. It formed the backdrop for our day-to-day life: We landed, launched, loaded and unloaded our kayaks, cooked, cleaned, walked, took pictures, and bathed in it; we enjoyed sunsets, lunch spots, and pee breaks, all in the intertidal zone. It became our living room, foyer, kitchen, and bathroom—a platform for any occupation needed. As a result, we got to know the intertidal zone better than many other habitats in the Gulf of Maine. Tracing the shoreline from west to east, highlights included the following observations.



Horseshoe Crab in the shallows of Wellfleet Bay, MA.

Cape Cod Bay had shifting sand bars dominating the intertidal zone. It had such a gradual grade it was hardly noticed, sometimes extending the intertidal zone for several miles off shore. Horseshoe Crab (*Limulus polyphemus*) were regularly observed. In this sandy environment, Horseshoe Crab provided the requisite substrate many sessile species need to survive: A hard surface to which barnacles and algae can adhere. Another species observed only in Cape Cod Bay was the Oyster Drill (*Urosalpinx cinerea*). These small gastropods littered the ocean floor in some shallow areas, such as Wellfleet Bay.

Cape Cod Canal to Cape Elizabeth, Maine, is laced with a diverse intertidal zone, mixing crescent beaches, rocky outcroppings, and edge habitat beneath swaths of developed shores. People have vacationed and lived along the Massachusetts coast for hundreds of years. The beach is the only transportation route for locals to get to and from their homes on Sandy Neck and Saquish Head. At Brant Rock, the most obvious rocky outcropping emerged with a type of zonation more regularly seen further north. In northern Massachusetts and New Hampshire, jetties, such as at the mouth of the Merrimack River, separate mainland communities and funnel rivers. Here the intertidal zone creeps up the built rock walls, featuring prolific mussel growth.

Casco Bay to the Bold Coast of Maine is dominated by islands, rocky outcroppings, peninsulas, shoals, and submerged ledges, with seemingly countless rivers and streams feeding into the Gulf of Maine. Intertidal species come alive on the coast of Maine.

Zonation runs horizontally down the shore. Starting at the top of the intertidal zone, blue-green algae is dampened by salt spray at high tide and is only submerged for a few hours at the highest spring tides. Next down is the "white zone," where Acorn Barnacles (*Balanus balanoides*) form vast sharp sheets. The "brown zone," where brown seaweeds (*e.g.*, Rockweed, *Fucus* spp. and *Ascophyllum nodosum*) hang or float in thick mats, serves as a nursery for many other species. The "red zone," the lowest level of the intertidal zone, is only occasionally exposed, and protects more fragile animals such as Asteriid Sea Star (*Asterias vulgaris*), Green Sea Urchin (*Strongylocentrotus droebachiensis*), Sea Anemone (*Metridium senile*), and tunicates.

The Bay of Fundy hosts the world's most extreme tides—spring tides as high as 57 feet (17 meters) have been recorded. As such, it can be a difficult environment presenting unique ecological challenges for intertidal life. Cliffs and cobble beaches are the dominant landform. Many of the species dominant along the Maine coast are prevalent. The upper reaches of the Bay of Fundy provide a unique habitat, reminiscent of Cape Cod Bay, but more extreme in the volume of water exchanged on each tide. Short-browed Mud Shrimp (*Callianassa atlantica*) colonize the immense mudflats in populations large enough to feed massive flocks of migrating shorebirds.

From **Digby Neck to Cape Sable Island** the intertidal zone is comprised variously of bands of cobble and shingle or outcroppings of basalt and granitic rock. Cliffs begin to decrease in size. South of Yarmouth, the intertidal zone occasionally serves as an intermittent land-bridge between islands and the mainland. Some of the more remote islands get entirely covered with spray and waves during storms, washing away any chance for woody vegetation, leaving instead hardy grasses and shrubs. Finally, at Cape Sable Island, shifting sand bars form the eastern tip of the Gulf of Maine, in an intertidal zone reminiscent of Cape Cod Bay.

Left: Asteriid Sea Star. Right: Packing the kayaks on Rockweed beds.

Center and top photo: A water sample is gathered using a phytoplankton net;, wind speed and direction is measured.
Bottom two photos: A field microscope is used to analyze phytoplankton species in the water sample.

Phytoplankton species observed:

Ceratium lineatum
Chaetoceros socialis
Chaetoceros sp.
Cocinodiscus sp.
Ditylum sp.
Eucampia sp.
Gonyaulax spinifera
Gymnodinium sp.
Leptocylindrus sp.
Melosira sp.
Navicula sp.
Nitzschia sp.
Odontella sp.
Pleurosigma sp.
Protoperidinium sp.
Prorocentrum micans
Pseudonitzschia sp.
(an HAB species)
Rhizosolenia sp.
Scripsiella sp.
Skeletonema sp.
Thalassionema sp.

Phytoplankton

Phytoplankton are microscopic plants floating in the surface zones of the ocean. They are the basis of the marine food chain, with unimaginably vast populations occurring wherever there is adequate sunlight to drive photosynthesis.

In the Gulf of Maine there are two dominant phytoplanktonic forms: Diatoms and dynoflagellates. Diatoms are an abundant, single-celled or chained, phytoplankton that drifts undirected. Dynoflagellates are solitary, rather than chained, and are equipped with two flagella which help propel them. Their bioluminescence is evidenced on summer nights when any movement in the sea seems to trigger an explosion of light.

Small herbivores (*e.g.*, zooplankton and copepods) and invertebrates (including sea squirts, sponges, barnacles, bryozoans, and mollusks) eat phytoplankton. These then become prey to yet larger animals. This process is repeated up the food chain to top level predators.

In the spring, as daylight lengthens, phytoplankton increase their rate of photosynthesis enabling them to divide and multiply. When the population grows beyond a certain point, it is known as a phytoplankton bloom. Some blooms can be harmful to humans and other species high on the food chain. A harmful algal bloom, or HAB, is commonly known as red tide. As filter-feeding mussels and clams ingest HAB species, toxins accumulate. Although not harmful to invertebrates, species higher on the food chain (such as birds or people) can be affected.

Volunteers throughout the Gulf of Maine monitor phytoplankton species to help resource managers sound the alarm when shellfish beds may be contaminated by a HAB. The Gulf of Maine Expedition joined this network by monitoring phytoplankton along our entire journey. Monitoring equipment and training was provided by the University of Maine's Sea Grant and Cooperative Extension programs.

Procedure

Twice weekly we took water samples and analyzed the contents for phytoplankton. While sitting in our sea kayaks, one person collected a water sample while the other stabilized both kayaks, measured water temperature and wind speed, and recorded the data. The phytoplankton trawl net had a sample-collecting bottle at the tapered end, was dropped in the water, and towed up and down the water column for three minutes. Depth of sample, water temperature, current, wind speed and direction, and latitude and longitude were all recorded. The sample was then stowed for later identification on land. Tows were generally undertaken in the afternoon; identification was usually carried out that same day before nightfall.

Mink, Tusket Islands, NS.

To identify phytoplankton in our water sample, we used a Swift® field microscope to examine a total of six fields of view. To the extent possible, all species were identified and recorded, including their relative abundance. Had we found a significant harmful algal bloom, we would have reported it to the Maine Department of Marine Resources, or its equivalent in other Gulf of Maine states and provinces.

Zoology

The zoology of the Gulf of Maine is diverse, ranging from microscopic zooplankton to such charismatic megafauna as whales. During the Gulf of Maine Expedition, our zoological observations were largely based on serendipity. Even so, we observed a diversity of species.

Our first notable observation was on the second day of the Expedition. A Northern Diamondback Terrapin (*Malaclemys terrapin*) in the shallows of Wellfleet Bay, Massachusetts, was at the northern extreme of its range. The only other reptiles observed were Eastern Garter Snake (*Thamnophis sirtalis*) and an unidentified black snake on Bois Bubert Island, Maine, that may simply have been a highly melanistic Eastern Garter Snake.

Sightings of terrestrial wildlife were generally sparse. Of those, mammals were by far the most numerous. As is to be expected, Whitetail Deer (*Odocoileus virginianus*) were our most frequently observed terrestrial mammals. From the beaches of Cape Cod to the Nova Scotian islands near the end of the journey, we routinely saw Whitetails or their tracks. The only sign of Moose (*Alces alces*) was a single set of tracks in the vicinity of Alma, New Brunswick. Raccoon (*Procyon lotor*) were surprisingly absent. The one exception to this was on a private island in Downeast Maine, where Raccoon footprints were all over our kayaks in the morning—clearly they were looking for food. Fortunately no damage was done. A pair of Mink (*Mustela vison*) on Owls Head Island, Nova Scotia, were a delight to watch as they crawled in and out of crevices on the cobble shore. Mink were also observed near the Kennebec River (Maine) and on the shores of the Bear River (Nova Scotia).

Eastern Gray Squirrel (*Sciurus carolinensis*), found in the forested shorelines of the southern Gulf of Maine, were largely replaced by Red Squirrel (*Tamiasciurus hudsonicus*) with the transition to a more boreal forest in the Boothbay, Maine, region. Other rodents were abundant, if by no other means than their tell-tale signs. Bats were rarely observed; when they were, it was always after dusk and impossible to identify the species.

Marine mammals were readily observed and identified through much of the Expedition. Five species of whale and two species of seal were observed. Our first whale sighting was of a Minke Whale (*Balaenoptera acutorostrata*). This whale was observed near the mouth of the Saco River (Maine) in unusually shallow water (approximately 19 feet or 5.8 meters). Over the next several days, this sighting became personalized as we heard broadcasts on the VHF radio of an entangled

whale in the vicinity of our sighting. A few days later, the caretaker on Eagle Island told us local news reported the whale had been successfully freed.

Harbor Porpoise (*Phocoena phocoena*), the smallest Gulf of Maine whale, and Harbor Seal (*Phoca vitulina*) were routinely sighted once we reached Maine waters. Gray Seal (*Halichoerus grypus*) were particularly abundant along Nova Scotia's Digby Neck. Although our policy was to avoid disturbing wildlife, they often came to us. All three of these species were observed readily from Casco Bay, Maine, well into the Bay of Fundy. As we paddled through the upper reaches of the Bay of Fundy, our marine mammal sightings dwindled to nearly zero, but picked up again on the Nova Scotian shore.

Three other whale species were sighted in Nova Scotia. We observed one North Atlantic Right Whale near Canada Creek. This whale was heading up into the Bay of Fundy and surfaced twice as it passed us. A Marine Environmental Research Institute (Blue Hill, Maine) scientist later told us this sighting was unusually far into the Bay of Fundy. The North Atlantic Right Whale is an endangered species with an estimated 350 individuals remaining, and most of them summer in the Bay of Fundy. Collisions with ships and entanglement in fishing gear are some of their greatest threats. Efforts to protect the population range from detachable fishing gear to redirecting fishing and shipping lanes. Whale sightings are routinely reported on the marine radio, warning mariners to be on the lookout and avoid collision.

Several Finback Whale (*Balaenoptera physalus*) were observed, all between Canada Creek and Brier Island, Nova Scotia. With the steep shores and the relatively deep inshore waters, many of these sightings were from our campsites. A two-day detour to Brier Island to go whale-watching added Humpback Whale (*Megaptera novaeangliae*) to the Expedition's faunal list.

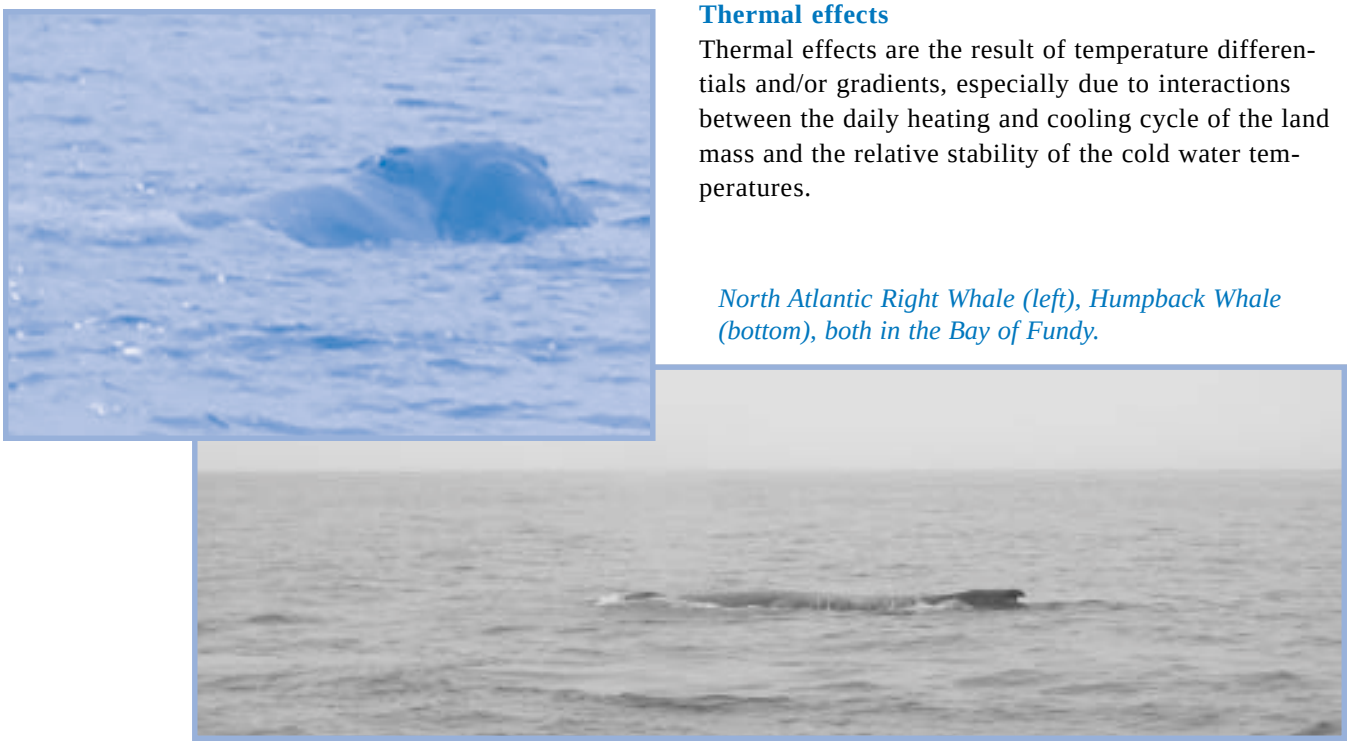
Micrometeorology

The Gulf of Maine is generally under the influence of the same mid-latitudes continental airmass systems as the rest of New England. As a result, it shares many of the same large-scale weather patterns: A steady parade of low pressure systems and associated fronts, interspersed with the welcome fair-weather breaks typical of high pressure systems. The cold waters of the Gulf of Maine, driven by the powerful pumping action of the Bay of Fundy, often produce atypical localized weather conditions—formally known as *micro*meteorology—including winds (especially the familiar patterns of sea and shore "breezes"), instability leading to localized showers and storms, and several distinct types of fog.

Two primary micro-effects are at work: *Thermal effects* and *mechanical effects*.

Thermal effects

Thermal effects are the result of temperature differentials and/or gradients, especially due to interactions between the daily heating and cooling cycle of the land mass and the relative stability of the cold water temperatures.



North Atlantic Right Whale (left), Humpback Whale (bottom), both in the Bay of Fundy.

Those who live and work on coastal waters are accustomed to the regular cycles of sea breezes (day) and shore breezes (night), along with the odd weather that sometimes accompanies them.

On sunny days, the sun warms the landmass. As the land warms, it slowly heats the overlying air mass, which eventually percolates up into rising air currents called *thermals*, often marked by puffy white fair weather cumulus clouds. As the thermals rise away from the surface, cooler air from surrounding areas—especially from adjacent waters—are drawn into the flow, producing the typical daytime sea breeze pattern. If it affects the prevailing winds, the result can often be fairly strong, localized wind gusts. Add also a moist air mass, and these effects may be substantially strengthened.

As the heat of the day passes by, this condition will begin to reverse, giving rise to complementary nighttime shore breezes. If the night is clear, the land may give up the heat of the day very quickly, cooling the overlying air mass, often producing a radiation fog that may then extend seaward.

Mechanical effects

Mechanical effects are the result of interactions between wind and surface terrain features, such as bluffs and islands.

The shore of the Gulf of Maine is often marked by dramatic local topography (*e.g.*, tall bluffs or cliffs, heavily striated geology from centuries of wind and water, coastal islands). These terrain features interact in some very dynamic ways with moderate or stronger winds, producing strong localized gust conditions, large wind "rotors," and even occasional wind-devils or their aquatic cousins, waterspouts.

In mild weather conditions, these effects can provide occasional surprises to those along the edge of the sea, but will not generally constitute a weather hazard. However, under prevailing stormy conditions, these mechanical effects, especially if accompanied by significant heat energy, and/or significant moisture in the air mass, will produce very strong, potentially violent storms.

Those who live and work on the Gulf of Maine must learn to watch the weather carefully, not simply trusting the general forecast to tell the full story of the potential weather challenges the day may offer.

Ozone

Ozone is a compound consisting of three oxygen atoms (written O_3). It occurs in both the upper atmosphere (the stratosphere) and the lower atmosphere (the troposphere—the one mile of atmosphere in which all life lives). In the stratosphere, high concentrations of ozone reflect harmful ultraviolet radiation, effectively

Left: Annisquam River, MA. Background: Storm in outer Casco Bay, ME.

shielding the Earth. Tropospheric ozone is a major constituent of air pollution, especially smog.

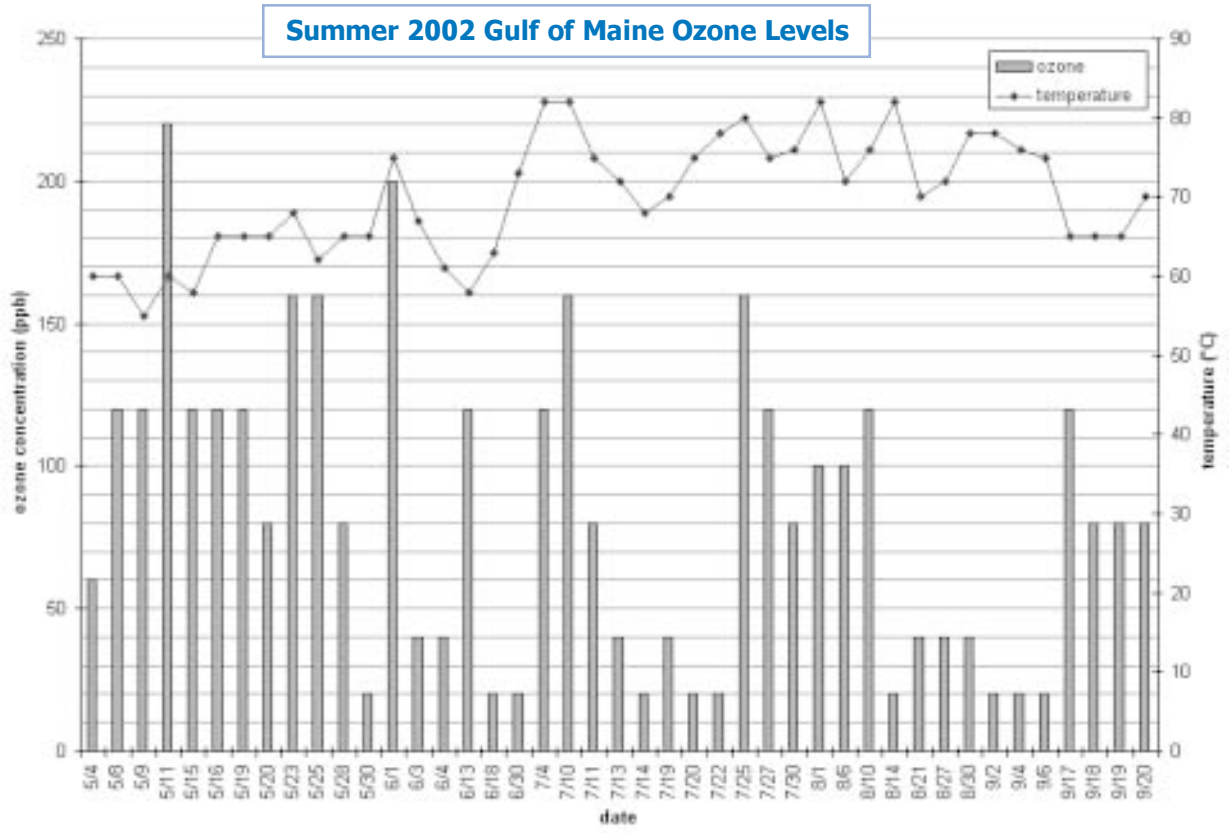
While ozone is important to many industries (*e.g.*, it is an effective disinfectant in water purification and meat packing), when released into the lower atmosphere, it is harmful to the health of plants and animals. Ozone is created in many different ways: In the troposphere it largely results from incomplete combustion of fossil fuels. Sunlight acts upon the hydrocarbons and nitrogen oxides, emitted by such varied sources as industry, automobiles, gas stations, and oil refineries, to produce ozone. Ozone is also a by-product of such things as commercial printing facilities, welding machines, photocopiers, and laser printers. Temperature is a factor in ozone production: Higher temperatures are more conducive to creation of ozone. As would be expected, ozone concentrations increase near urban and industrial centers. In the United States, more than 130 million Americans live in areas where ozone levels regularly exceed recommended standards. Elevated ozone levels can cause or aggravate respiratory problems in people. Excessive levels of ozone have been shown to cause cellular damage to plants.

The Gulf of Maine Expedition monitored ozone following a simple procedure, using a device called an "Eco Badge®" (for more information, browse www.vistanomics.com). The Eco Badge® is a form of litmus test. Exposing it to the ambient environment for one hour causes a chemical reaction resulting in a change of color. This color is then compared to a chart to give an indication of the ozone level (ozone is measured in parts per billion). We did this test in the late afternoon, twice a week. As would be expected, higher ozone readings corresponded to proximity to urban areas, or they reflected that we were downwind of urban centers.

The interpretive information accompanying the Eco Badge® breaks down the readings into five categories:

0-60 ppb – Good
61-125 ppb – Moderate
126-204 ppb – Unhealthy
205-409 ppb – Very Unhealthy
410+ ppb – Hazardous

Of 43 ozone measurements made during the course of the Expedition, more than half (26) were in the moderate to very unhealthy range. Readings on 18 days fell within the good range.



People

The Gulf of Maine Expedition would have been very different without the kindness, support, curiosity, and interactions of the many people we met during the course of this five-month journey. It is impossible to adequately acknowledge all of the people we met; however, many fall into one or more of the following categories:

- Concerned citizens;
- Conservationists;
- Fishermen;
- Hospitable locals;
- Public representatives;
- Sea Grant staff; and
- Paddlers, sea kayak guides & outfitters.

Many of the people of the Gulf of Maine were also supporters. For contact information, refer to the Sponsors, Supporters & Members section of this report, beginning on page 68. For information on additional people of the Gulf of Maine, please visit our Web site at www.gomexpedition.org.

Concerned Citizens

Most everyone we met during the course of the Expedition likely falls into the category of concerned citizen. However, it was the *Stop the Quarry* folks on Digby Neck, Nova Scotia, that stand out. We had the pleasure of meeting many of them during the course of several stops. The people in this area are concerned with a proposed basalt quarry. Ultimately, their concerns are about the impact of the proposed quarry on the environment and their quality of life (for more information, see page 46).

The U.S. and Canadian Coast Guards and U.S. Coast Guard Auxiliary offered the Expedition support at several events, and also kept an ear to the radio to make sure we were safe during our journey.

Mary Majka once owned Mary's Point, New Brunswick. This is a coastal area in the Bay of Fundy that is a significant feeding stop for shorebirds migrating south. Mary donated her land so that it could become a protected park. Chances are you will see Mary if you go to Mary's Point—she will be the gregarious matriarch with a German accent pointing out the bird behaviors being displayed. The best time to see the shorebirds is within two hours of high tide from mid-August through September. When we were there in mid-August, we saw vast numbers of shorebirds; one flock included 60,000 Semipalmated Sandpipers.

Conservationists

The number of people working in the field of environmental conservation, environmental education, and land protection within the Gulf of Maine and its watershed is impressive. In particular, it was encouraging to witness the number of local, grassroots river and watershed associations. Several of these organizations reached out to the Gulf of Maine Expedition offering their support.

Pine Dubois is executive director of the Jones River Watershed Association in Plymouth, Massachusetts. During the course of several days, as we were grounded by a nor'easter, Pine spent time with us talking about some of the challenges and successes of watershed conservation and gave us a tour of the Jones River watershed, including a demonstration storm-water purification project (for more information, see page 43).

Cindy Mom, of the Essex County Greenbelt Association, met us at our campsite on their property on the Little River (Massachusetts). ECGA is a land trust preserving open spaces in this region. Cindy provided local land-use maps, and discussed issues relating to access and open space.

Linda Scotland coordinates the Cape Neddick River Association (Maine). This community group came together when they noticed a persistent, unpleasant odor emanating from the river. The odor seemed to coincide with the installation of a new, underwater sewage outfall beyond the mouth of the Cape Neddick River. This group has initiated a community-run water-quality monitoring program.



Left to right: Linda Scotland; Loretta Tatton; Sean Brillant.

Rachel Nixon, trail manager for the Maine Island Trail Association, as well as her colleagues and MITA volunteers, provided support from the beginning, both in enthusiasm and in action. MITA wrote a support letter to help us apply for grants, provided us with information about the Maine coast, provided a support boat at our Warren Island Gulf of Maine Day, and surprised us with a friendly visit and pie at one of our campsites in New Brunswick (MITA was coordinating an island cleanup in the area). We also encountered MITA staff and volunteers several times along the Maine coast.

Lee Sochasky is the executive director of the St. Croix International Waterway Commission, based in St. Andrews-by-the-Sea, New Brunswick. This organization is involved at the local, regional, and national level, addressing environmental issues that span the St. Croix River. Lee coordinated two presentations of our slideshow: One at the St. Andrews Biological Station, attended by 28 science and support staff who engaged us in a two-way discussion of some of the issues surrounding the Gulf of Maine; and one at Sunbury Shores Arts & Nature Centre.

Lorretta Tatton is program director of Eastern Charlotte Waterways, which is based in St. George, New Brunswick. While hosting our stay in her Saint John, New Brunswick, home, she spent long hours discussing her work, some of the environmental issues and challenges facing New Brunswick, and several of the strategies for dealing with these problems. (Lorretta supplied the Eco Badges® we used to monitor ozone.)

Sean Brillant, executive director of Atlantic Canada Action Programme – Saint John, spent a day giving the Gulf of Maine Expedition a tour of Saint John and presenting many of ACAP's conservation projects in and around the city. The breadth of their work is impressive: Shoreline conservation, stream cleanups, projects to abate non-point source pollution runoff from parking lots, and water-quality monitoring, just to name a few.

All of the people we met had an important guiding philosophy in common: Accentuate the positive. Rather than portraying an industry as "evil" for polluting, publicly acknowledge it for its efforts to clean up. This positive approach, a philosophy shared by the Gulf of Maine Expedition, leads to constructive relationships with all stakeholders.

Bottom: Lee Sochasky (3rd from right) and St. Andrew's town councilor, Alan Golding (far right), welcome the Expedition. Right: MITA's New Brunswick island cleanup crew ready to launch after a supirse visit.

Fishermen

To be a successful fisherman requires many long hours, and one must be the proverbial jack of all trades. Not only must you know your particular fishery inside out, but you may need skills in navigation, electronics, mechanics, business, finance, leadership, politics, and more. The number of different fisheries is equally broad and many fishermen work more than one fishery. The Gulf of Maine Expedition managed to have significant conversations and experiences with some fisherman.

Dan Sullivan is a lobsterman out of St. George, Maine. Dan was the first member of the working waterfront with whom we had an opportunity to talk. He spoke of his years of experience fishing and diving; and was particularly concerned about the models used for lobster population forecasts. Based on his diving experience, he felt that the models grossly under-predicted lobster populations.

Lobsterman Bill Anderson, of Moose Cove, Maine, spent an evening talking to us over his dining room table. Many of our questions about the physical operation of lobstering were answered. We also learned about the "Gray Zone," an area of international dispute in the vicinity of Machias Seal Island—both the United States and Canada claim this territory.

After four days of high winds, and with a schedule to keep, Martin Collins, a lobsterman out of Alma, New Brunswick, ferried us to Refuge Cove on Cape Chignecto, Nova Scotia. During this ride, Martin talked about the art and science of lobstering and the differences between the lobster fisheries in the United States and Canada. He also gave us an overview of the electronic navigation technologies used on a typical lobster boat.

Kemp Stanton is from a long line of fisherman. [Kemp's brother, Stanley, owns the last remaining Herring (*Cluppea harengus*) weir on Digby Neck, Nova Scotia. For details, see page 40.] Kemp visited us and talked about fishing as a livelihood and a way of life. Kemp drove us around Digby Neck, providing a tour as only a local fisherman could. He spoke at length about local fisheries and how they all change with time. Kemp was particularly concerned about the quarry proposed for Digby Neck (for more information, see page 46) and the effects blasting for basalt would have on marine species.

Left: Martin Collins demonstrates radar operation to Dan and Sue. Right: Kemp Stanton.

Hospitable Locals

There is a tradition of hospitality among the people of New England and the Maritimes. The experiences of the Gulf of Maine Expedition demonstrated that this tradition is alive and well. Wherever we travelled, people opened their doors to us.

Tom McIntyre.

Before the May 4th launch of the Expedition, Elaine Young lodged us at her Cape Cod home. This was a great assistance for final preparations and served as a gathering place for those seeing us off. Several days later, in a region with limited camping options, Arne and Sarah Ojala opened their home to us in Barnstable, Massachusetts, after first meeting us at the town launch with a fresh pot of homemade seafood chowder and a bucket of local Littleneck Clams.

We were originally scheduled to spend just the night of May 11th at the Jenness family cottage on Saquish Head, Massachusetts, but the first of several nor'easters blew in, grounding us there for three days. Estella Jenness telephoned with explicit instructions that we were not to leave until the storm passed. Neighbors Bill and Joyce Durnin provided water, hot coffee and tea in the mornings, and showers. All of this hospitality at Saquish Head would not have been possible without the efforts of Pine DuBois.

After reading about the Expedition in the *Gulf of Maine Times*, Tom McIntyre, of Nashua, New Hampshire, offered to meet us at Salisbury Beach State Park (Massachusetts). After settling into a designated campsite, with our sea kayaks in the site's parking space, an Isuzu Trooper pulled over, the driver asking if we were the Gulf of Maine Expedition. He then backed into our site, opened the back doors of his vehicle, and proceeded to set up a folding table and chairs, a linen tablecloth, chilled wine, and a fabulous dinner buffet, followed by dessert. A suitable time after the meal, Tom packed up and left us for the evening. [A footnote to this event: Tom is a teacher and a pilot. The next day, as we were paddling past Hampton Beach, New Hampshire, Tom flew over us, dipping his wings in salute.]

After our stay in Boston Harbor, we continued paddling up the coast. In Nahant, Cherry Fitch and Don Angle allowed us to camp on their lawn. Joe Mahoney, a local resident, came upon us as we were landing, and offered to take us to a grocery store, an offer eagerly accepted.

New Hampshire proved a logistically challenging section. Unable to find publicly accessible camping in

The Annapolis Royal community event (coordinated by Andi Rierden, editor of the Gulf of Maine Times*) was a warm example of Nova Scotian hospitality. (Photos by John Daigle.)*

the vicinity of Rye, we cold-called John Hoyt, of Hoyt's Lodges. He liked the novelty of having us camp on the lawn of his establishment. With our arrival came inclement weather. John made available to us an unused cabin for the duration of our stay, which ended up being several days.

In southern Maine, up to Cape Elizabeth, access to campsites continued to be a challenge. Several people—including Dick Balkite, Mary Weaver Parkhurst, and Linda Scotland—allowed us to camp on their land, or helped with camping arrangements. Nancy Schmid shuttled us to Coastal Ridge Elementary School where we gave a presentation to Maureen Goering and Pat Coffey's 2nd grade class. The owner of a private island in Muscongus Bay gave us free reign of his island during a two-day storm. Bill Ginn let us take over his guest house on Eagle Island (Penobscot Bay). Bill Anderson, of Moose Cove, allowed us to camp in one of his fields, right next to our landing.

The tradition of hospitality comes alive in the Canadian Maritimes.

In Huntington Point, Nova Scotia, our local hosts, Ray and Clara Jefferson, provided refreshments upon our arrival at their shore-side home. We stayed next door in the famous Blue Cottage, an architectural wonder made of concrete, courtesy of the Charles Macdonald House of Centreville Society. Neighbor Myrna Murray provided phone and Internet access. Local artists John Neville and Joyce Martin, along with friends Greg and Kathleen Sanford, took us on a powerboat trip to see majestic Cape Split and its well-known tidal rips. As our stay at Huntington Point came to an end, many people from the community gathered to send us off with a chorus of "for they are jolly good paddlers."

In the Annapolis Basin (Nova Scotia), Andi Rierden, editor of the *Gulf of Maine Times*, and husband Steve, opened their home to us. We were piped in to Annapolis Royal, Nova Scotia, by a bagpiper. Our stay was capped by an evening potluck and a presentation at the Granville Ferry Community Hall.

At Mavillette Beach, Nova Scotia, we were grounded by Hurricane Gustav, which forced us to take a break from paddling and head to Yarmouth earlier than expected. Linda Coakley put us up on her lawn during our stay and opened her home to us. On the day of our officially scheduled arrival into

Top to bottom: The Honourable David Morse with Natalie; Tim Surette; the Honourable Robert Thibeau with Expedition members; Chris Bartlett. Above: Jim O'Connell.

Yarmouth, we were greeted by the band members and flag corps of the Memorial Club and announced by the town crier.

On September 28th, the final day of the Expedition, we were heralded into Clark's Harbour by the town crier. This, our last community event, was filled with local entertainment and ceremonies organized by fellow paddler, Pat Hudson.

We will be forever grateful to these, and all of the other people who were so generous to the Expedition, spread around the Gulf of Maine.

Public Representatives

As the Gulf of Maine Expedition progressed, we garnered a tremendous amount of acknowledgement and recognition. One way in which this was manifested was by the number of elected and appointed officials who interacted with us in some way.

The New Brunswick communities of St. Andrews-by-the-Sea and Saint John, as well as the Nova Scotian communities of Huntington Point, Annapolis Royal, Belleveaus Cove, Yarmouth, and Clark's Harbour each had elected officials greet us as part of their local community events. The Honourable David Morse, minister of the Nova Scotia Department of Environment and Labour, was the key speaker at an event recognizing the Expedition in Huntington Point. The Honourable Robert Thibeau, minister of the Canadian Department of Fisheries and Oceans, spoke at a Belliveaus Cove ceremony dedicating the new farmer's market and welcoming the Expedition to town. Tim Surette, Southwest Nova Scotia area director for the Canadian Department of Fisheries and Oceans, opened his home to us and spoke about commercial fisheries and the regulatory process. Larry Peach, then tourism director for Municipalité de Clare (Nova Scotia), joined us on the water for a day, engaging us in discussions about tourism and sustainable development. Clark's Harbour Mayor Leigh Stoddart emceed a ceremony formally bringing the Gulf of Maine Expedition to a close.

Sea Grant Staff

The University of Maine Sea Grant (our biggest sponsor) and Cooperative Extension programs were important resources throughout the Gulf of Maine Expedition. Maine Sea Grant Director Paul Anderson began our close relationship by suggesting Natalie represent Maine Sea Grant as an extension associate, rather than leaving her employ with Sea Grant. Paul also served as one of our advisors. Sarah Gladu provided training in phytoplankton monitoring. Esperanza Stancioff provided leadership and support on many aspects of marine ecology and water quality. She also helped coordinate our Searsport and Warren Island community events. Chris Bartlett arranged our Gulf of Maine Day at Washington County (Maine) Technical College. The Bartlett family generously opened their home to the Expedition team during our three days in Eastport, Maine, and introduced us to a cross-section of people from this coastal community bordering New Brunswick. Chris organized a tour of a local salmon farm which greatly enhanced our understanding of this important aquacultural industry. At every level, Maine Sea Grant staff provided support to the Gulf of Maine Expedition.

Top: Maine Sea Grant staff. Bottom: Bruce Smith (center right in white kayak) greets the Expedition at the ME/NB border.

Left: FreshAir Adventures base of operation in Alma, NB. Above: Hantford Lewis.

Jim O'Connell, a coastal processes specialist with Woods Hole Oceanographic Institution Sea Grant (Massachusetts), was the first of many marine scientists we met during the Gulf of Maine Expedition. Jim spent a morning paddling with us along the shore of Cape Cod and was an indispensable source of knowledge on the physics of sea/shore interactions, especially as pertains to seawalls.

Paddlers, Sea Kayak Guides & Outfitters

Sea kayaking is often touted as the fastest growing watersport in North America. This fact is clearly evident throughout the Gulf of Maine. From Provincetown, Massachusetts, to Clark's Harbour, Nova Scotia, there are numerous kayak guides, outfitters, instructors, and retailers. The Gulf of Maine Expedition had the good fortune to meet many of these. They paddled, shared local knowledge, fed, and lodged our team.

Ted Regan and Aaron Frederick, both of Rippleffect, a Portland-based youth development organization, offered invaluable advice on the U.S. portion of the Expedition, as well as serving as a sounding board for discussions on group dynamics. Rippleffect also served as fiscal sponsor, generously processing grants for the Expedition, which opened up a number of funding opportunities for the project. And they hosted the Expediton in Portland, Maine.

With Cape Cod having so little public access and virtually no water-accessible camping options, Dick Hilmer and Richard Rodman, of Goose Hummock Outfitters (Orleans, Massachusetts) provided important logistical support. Richard also paddled with us during the first day of the Expedition, highlighting some of the cultural and natural history of Cape Cod.

The Expedition traveled through Maine before the kayak guiding season was really underway. However, members of the Maine Association of Sea Kayak Guides and Instructors (of which Natalie was president at the time) provided significant information about various regions of the coast, and contributed financially to the Expedition's educational program.

Most of the sea kayak guides, instructors, and outfitters we met were in the Maritimes. This is logical considering the fact that we were in the U.S. portion of the journey early in the paddling season.

In New Brunswick, we encountered paddlers representing four different outfitters, all of whom provided invaluable logistical advice. Bruce and Malena Smith, of Seascape Kayak Tours, provided a guide for a day's "paddle with the Expedition" around Navy Island, part of our St. Andrews-by-the-Sea community event. They also hosted the Expedition team on Deer Island, replete with an evening barbeque. Bob and Deanna Vlug, of Eastern Outdoors, have an ideal location: You can paddle right up to their backyard in Dipper Harbour, where they are setting up a campground. Mike Carpenter and Jeff Martin, of River Valley Outfitters in St. Martins, spent a day paddling and teaching us about local issues. Joe Miller and Alan Moore, of FreshAir Adventures in Alma, hosted us for several days as we waited for a weather window to make the crossing to Cape Chignecto.

In Nova Scotia, Hantford Lewis, of Hinterland Adventures & Gear, offered free paddling clinics for the day we were at Belliveaus Cove, in conjunction with the grand opening of the farmer's market. He also paddled with us for the next two days. Kendrick d'Entremont, of Seaclusion Kayak Adventures in West Pubnico, is an old friend, having met Natalie during her 1996 Nova Scotia sea kayak expedition, and introduced Dan and Sue to Natalie and Rich, thereby contributed to the formation of the team.

Issues

A combination of our observations of the coast and conversations with its people enabled us to explore complex current issues facing the Gulf of Maine. It is our hope that documenting these issues will lead to greater dialog and foster development of solutions for some of these complex problems.

Coastal Development

The coast of the Gulf of Maine is changing from a landscape once dominated by natural forms and processes to one increasingly dominated by human use. Stretches of coastline that appear to be "untouched" are decreasing, particularly along the shoreline from Provincetown, Massachusetts, to Bar Harbor, Maine.

Coastal resource use and development is certainly not new. In many areas, the coast is dominated by abandoned buildings and wharves that are in a state of disrepair, which speak of past times of economic vitality. Finding new uses, or renovating solid, old buildings, is a major challenge for communities. It appears that only in urban centers is extensive reuse occurring as the shortage of land and the economic return on redevelopment is so high.

The dominant coastal use outside of urban centers is residential development. Upon leaving Provincetown, we became immediately aware of the insatiable drive for waterfront property and development with a view. General patterns became evident. Older houses tended to be of a smaller scale than new ones. Larger homes were often built on the highest elevations. Rocky headlands, in contrast to lower-lying beach areas, were occupied by older homes and larger mansions. Homes with beach frontage were evolving from older cottages to larger homes through renovation or rebuilding on the footprint of an old structure.

The coasts of Massachusetts and New Hampshire are the most densely developed. With the exception of a few national parks (Cape Cod National Seashore, Boston Harbor Islands National Park, and Parker River National Wildlife Refuge) and short stretches of privately-protected land (such as Crane Beach), virtually the whole coast was developed.

The Maine coast is developed, but in a less dense pattern. North of Boothbay Harbor, it has more stretches of open space and more space between houses. Residential development is much more limited from Bar Harbor to the Canadian border and around the Bay of Fundy. Here, development is mostly concentrated in communities, with the coastline in between largely forested. However, the occasional new home appearing at the water's edge indicates that the building pressures and development patterns of the lower Gulf of Maine are extending their reach.

Hand-in-hand with coastal development is the concern for erosion. The trend is particularly prevalent in portions of the coast where the surficial geology is sandy or has any other unconsolidated substrate. This includes most all of the coast from Provincetown, Massachusetts, through the beach areas of southern Maine. The problem of coastal erosion in these areas is epidemic. By their very nature, dune and beach coastlines are inherently changing landscapes, whereas lot lines and buildings are fixed. High-energy coastal storms have the power to destroy most man-made constructions. Our observations of erosion control

Mansions in the area of Cape Neddick, ME.

measures ranged from simple use of vegetation to extensive engineering projects, which are expensive and generally do not provide a permanent solution. Buildings on rocky headlands and those set back behind preserved dune complexes tended to fare better than those competing with the sea for dominance of that precarious edge.

While coastal erosion exists as a natural process around the entire Gulf of Maine, it only becomes a problem when it conflicts with human uses of the shore. Erosion control projects on the more rocky coastlines of Maine, New Brunswick, and Nova Scotia are more localized and of a smaller scale than we observed in the southern portion of our journey. These more northern areas also have a much lower level of development; however, we saw clear signs that this is changing.

Coastal Access & Coastal Use

Access to the Gulf of Maine has long been vital to local economies and it has determined land use. Cod attracted settlers to Gulf of Maine shores from Cape Cod to Cape Sable Island. Clams, fish, and seabird eggs were important sustenance. Place names such as Cape Cod, Dry Island, Egg Rock, Rum Key, and Thrumcap are evidence that coastal communities were marine-based. Slowly, widespread abandonment of island habitation shifted focus to the mainland. Land-use for much of the 20th century was still marine-based: Docks, diesel shops, boatyards, bait sheds, lobster co-ops, and marine stores continue to grace the shores of the Gulf of Maine.

In recent decades there has been a change in coastal land-use trends,

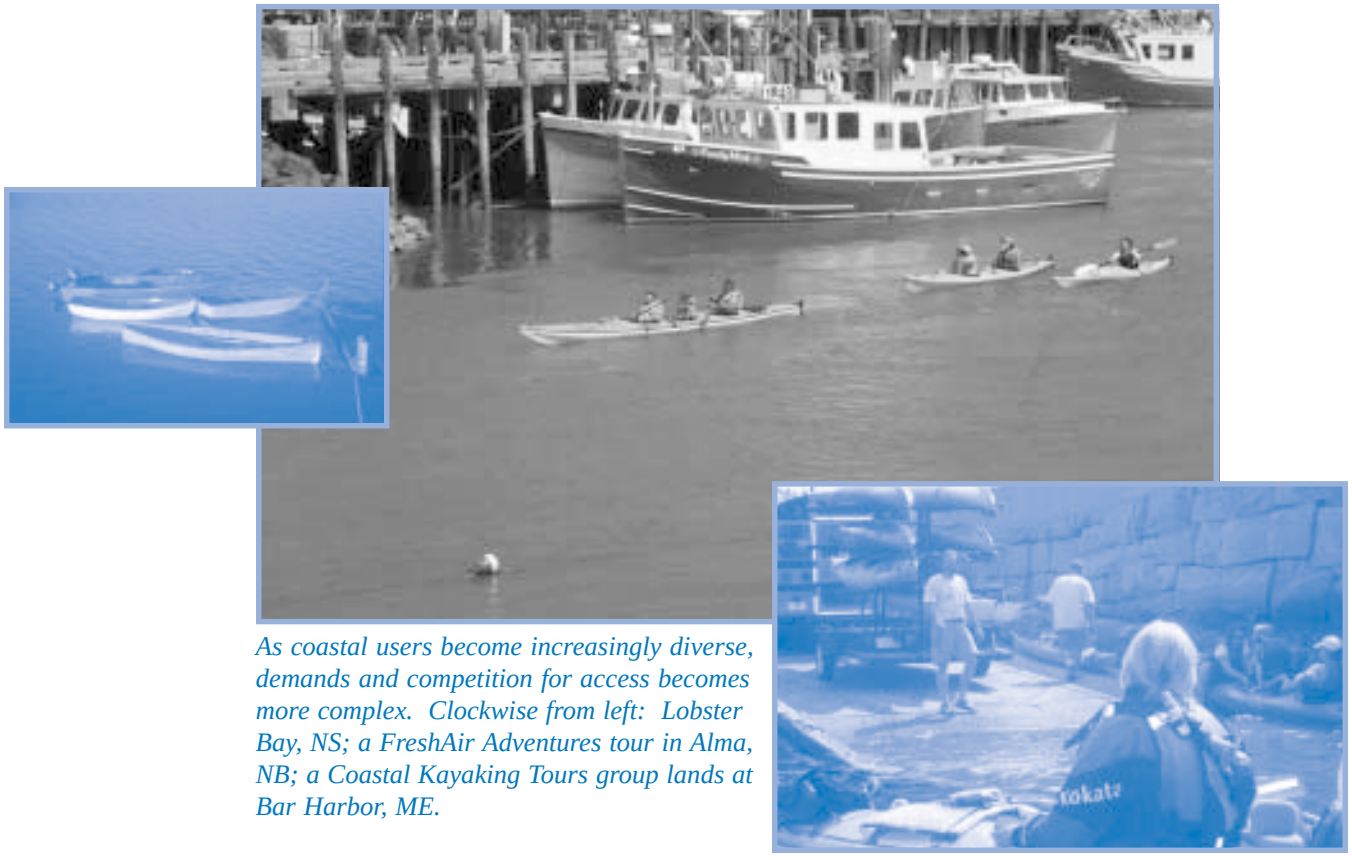
Top to Bottom: Efforts at erosion control in developed coastal areas, south of Boston, MA; Eastport, ME; Cape Cod, MA; dense private development along the MA shore leaves little public access.

changes that were in evidence throughout our journey. Many residents spoke of steadily climbing property values and taxes that are forcing them inland, away from shore. In Massachusetts and New Hampshire, this issue is largely a *fait accompli*; it is still a dramatic issue in many parts of Maine; and it is slowly and steadily occurring throughout the Bay of Fundy. Traditional users of the coast are increasingly less able to own the shorefront so vital to their livelihood. We regularly found areas where landowners, having no economic or cultural ties to marine resources, had only recently purchased their land and built their homes, signaling a change in property ownership trends. Southwest Nova Scotia was an exception to this trend, where the lobster fishery continues to provide adequate incomes for locals to own shorefront property. This contrasts significantly with most of the United States portion of the Gulf of Maine.

Fishermen in Jonesport, Maine, reported the cost of shorefront land as too high to keep property and businesses in the family. Increasingly, they find themselves having to commute to the coast from inland towns—their day-to-day cultural heritage is decreasingly tied to the shore. This creates a need for centralized public access to the water for boats and gear, concentrating users at a limited number of access points, mixing fishermen with recreational boaters, sailors, cruise ships, and kayakers, all in competition for diminishing public access.

The nature of marine-based industries is changing as a result: Whereas fishing dominated for four centuries, tourism (the world's fastest growing industry) has now entered the scene as an important industry. Outfitters, innkeepers, restaurateurs, and retail business owners are examples of people from the recreation and tourism industries now relying on the shore. In communities such as Boothbay, Maine, and St. Martin, New Brunswick, the economy is now driven by tourism. Cape Cod and the southern Massachusetts shore are a combination of tourist-based economies and suburbia, concentrating more people into smaller plots of land. In Downeast Maine and the Bay of Fundy, undeveloped plots of coastline are increasingly going to people "from away" seeking a summer home.

Privatization of the coast had a direct effect on our team as we traveled. Private property extends to the low tide line in Massachusetts and Maine. This fact makes it difficult to launch and land wherever you would like. In Massachusetts, we found virtually no public shores allowing water-accessible camping. In Maine, the sheer length of the coast, with all its islands and bays,



As coastal users become increasingly diverse, demands and competition for access becomes more complex. Clockwise from left: Lobster Bay, NS; a FreshAir Adventures tour in Alma, NB; a Coastal Kayaking Tours group lands at Bar Harbor, ME.

ensured vast expanses of shore that, although it may be privately owned, is not necessarily developed. The Canadians we met were surprised by the concept that shorefront could be owned to the low tide line.

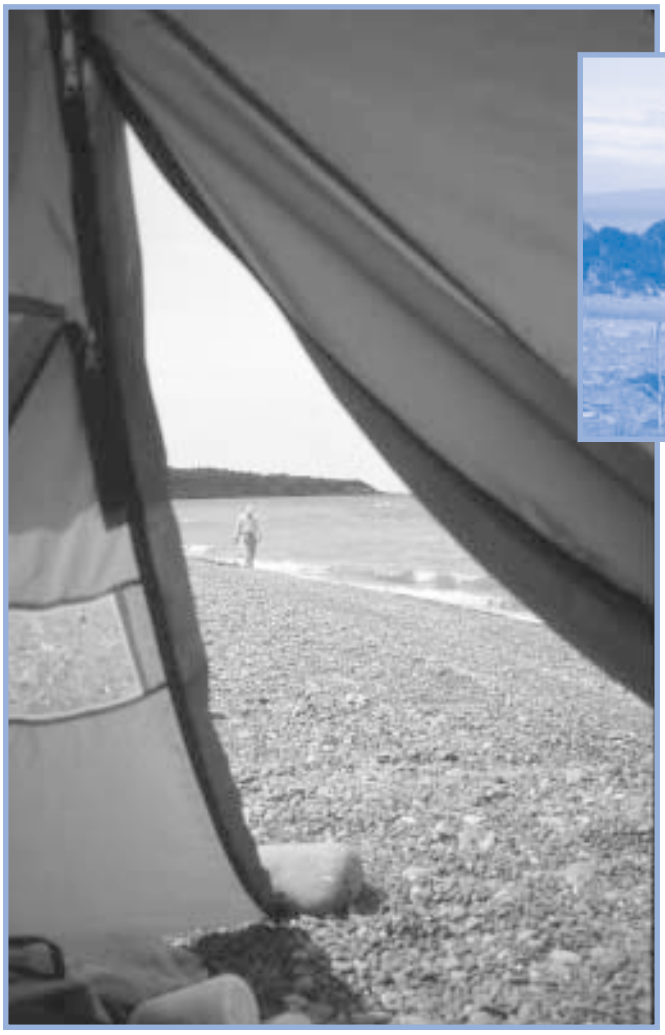
With changes in landownership come different perspectives on land-use. Permissive use—an age-old tradition of allowing the public to pass freely so long as they leave no trace of their passage—is a tradition that itself is passing. Although this tradition is still alive in the Maritimes, we heard stories from many locals where people from the United States bought property and posted it, just as they would back in the U.S. This fact did not sit well with the people we spoke with.

In Canada, we found the trend toward coastal development at an earlier stage. Large tracks of shoreline remain open and available for public access. We heard local concerns about changing landownership patterns. Big, new, second homes are beginning to fragment the shore. Our initial reaction was disappointment at seeing what, earlier in the Expedition, we had come to refer as "McMansions." This complex issue took a more personal note when our team met a friendly developer in the Annapolis Basin. This man was genuinely proud of his home and of the shoreland plots he is actively subdividing. He said he was boosting the local economy by bringing people here; he felt he was doing the right thing.

Recreational Coastal Use

The Maine Island Trail Association (MITA) distributes a standardized form (Coastal Island Use Log) to members and volunteers for the purpose of tracking use of sites on the Trail and to collect comments about the status of the islands. The Gulf of Maine Expedition adopted these forms with a slight change in name and purpose. Rather than focusing exclusively on islands, we kept "coastal use logs" with the following goals:

1. To document each of our camping sites in detail; and
2. To provide baseline information for a potential Gulf of Maine Trail.



In Nova Scotia (left) and New Brunswick (above) the public is still permitted to camp on almost any shore.

The first goal was simply in keeping with our overall objective of developing a description of the Gulf of Maine that was as comprehensive-as-possible, during the summer of 2002. These logs were also intended to contribute to MITA's coastal use database. As a result, our Maine dataset is more complete than most.

The second goal was to explore the feasibility of expanding the Maine Island Trail beyond the boundaries of Maine. A Gulf of Maine Trail has been proposed at MITA conferences and through newsletters. Although it is a young idea whose time is far from coming to fruition, our logs were a first step toward gathering

information necessary to create such a trail, including identifying key obstacles. Comments in our coastal use logs revealed that the most striking obstacle was access.

The Gulf of Maine can be divided into three regions. The southern Gulf incorporates Massachusetts, New Hampshire, and southern Maine to Cape Elizabeth. The central Gulf runs from Casco Bay, Maine, to Grand Manan, New Brunswick. The northern Gulf includes the whole of the Bay of Fundy and the Nova Scotian shore through Cape Sable Island.

Monitor Skipper Henri Gignoux monitors recreational use on the Trail's private and public islands in Moosabec Reach (ME).

In the southern Gulf, we paddled more than 190 miles of the Massachusetts coastline in the first 19 days of the journey and camped at 16 different locations, including the only two publicly accessible coastal campsites (Scusset Beach State Park and Salisbury Beach State Park). All other overnight campsites were by special arrangement or permission of property owners and managers, including state agencies, municipalities, private individuals, conservation organizations, land trusts, and even a YMCA camp. This was the only region where private property ownership has such a significant impact on public access. (This section would have been impossible for the Gulf of Maine Expedition to explore without the incredible generosity of all the landowners who provided us permission to camp.)

Tally of Coastal Use Logs from Gulf of Maine Expedition:

16 logs from MA
1 log from NH
32 logs from ME
11 logs from NB
24 logs from NS
84 total logs

The coast of Massachusetts has been under intense population pressure for more than a century, resulting in a quilt of private properties and environmentally sensitive protected lands. Very few locations support public recreational access. As a result, the few public access points experience heavy use, suffering problems typically associated with other "urban wilderness" locations: Heavy traffic on land and water, lack of parking, and crowded launches, to name a few. On Cape Cod, many popular access points are facing serious use restrictions or even outright prohibitions.

Nearly the entire 18-mile New Hampshire coast is publicly owned and under the management of the New Hampshire Division of Parks and Recreation. Use of these public lands is heavily restricted, operating almost exclusively as daytime access for swimming and other beach-based activities. The one publicly accessible camping area does not allow tents, only recreational vehicles such as motor homes and trailers. There are few publicly accessible boat launches.

The level of public access in Maine greatly alleviated this problem. For over 10 years, both the Maine Bureau of Parks and Lands and MITA have worked tirelessly to establish a strong base of publicly accessible islands. With increased usage of Maine's coastal islands, these two organizations are beginning to include mainland sites in attempts to distribute recreational pressures. We visited and completed coastal use logs for 18 properties on the Maine Island Trail, including three mainland campgrounds.

The northern Gulf of Maine is altogether different. Here we found use patterns to be comparatively low. Private property is not an issue for recreational boaters seeking a place to land. Instead, access is limited more by topography than property ownership. Although there are few designated recreational lands, the tradition of permissive use is still the norm.

Later in the Expedition, when enjoying the less-frequented waters of Downeast Maine and the virtually unrestricted access of the Maritimes—even at the height of the summer season—it was easy to see why

Above: Boston Harbor, MA.
Left: Cape Neddick ("Nubble") Light, ME.

recreational access pressures have steadily migrated northward. One conclusion is certain: Access issues of the southern Gulf of Maine should be a top priority for an expanded Maine Island Trail.

Our 84 completed coastal use logs have been delivered to MITA. Team members have been in regular discussions with MITA since the September 28th end of the Expedition.

Tourism

Tourism in the Gulf of Maine is often touted as the antidote to a declining marine economy. Nature-based tourism and coastal recreation are on the rise throughout the entire region. These newer industries have become an important part of the local economy. From whale-watch boats to cruise ships, sailboats to kayaks, beach combers to campers, people are enjoying the Gulf of Maine in increasing numbers. As we traveled by sea kayak, it became apparent that current increases in recreation on the coast hold challenges, as well as promise, for the region.

Cape Cod

Provincetown sets the tone for tourist towns in the Gulf of Maine. It is a seasonal town that survives on summer tourism. Inhabitants are fortunate to have the Cape Cod National Seashore surround them in protected lands open to day activities such as hiking, bird-watching, and strolling the beach. Dick Hilmer, of Goose Hummock Outfitters, and partners are creating a Cape Cod Water Trail to increase paddling opportunities in this region. An organized trail would provide local information for day use and, perhaps in the long run, for overnight excursions, too.

Boston Harbor

Boston wins the good news award for providing a pristine urban experience. The Boston Harbor Islands National Park provides a respite from development. It was the first place in our journey where we found camping options convenient for paddlers. The challenge for the new park will be to manage people once they discover this treasure at the doorstep of millions. For now, the number of users of the island system is still low enough that the Park Service is doing organized events to raise awareness about the islands and harbor.

North Shore of Massachusetts Through Portland, Maine

This shore is stunning but almost entirely developed. Although there are pockets of less developed shorefront (*e.g.*, Parker River National Wildlife Refuge and Rachel Carson National Wildlife Refuge), by the time we reached them, the reality set in that nearly the entire southern portion of the Gulf of Maine was rimmed by development. Amazingly, although this region is heavily developed, it is surprisingly free of litter. Coastal debris is conspicuous in its absence. People, however, are not rare. In order to have a more remote coastal experience, many coastal tourists go north to Maine.

Maine Coast From Casco Bay to Frenchman Bay

The Maine Island Trail and network of public islands provides options throughout this region. Of the whole Gulf of Maine, this was the most intensively used recreational area, although use is more spread out. This coast lends itself to exploration with its islands, peninsulas, and bays. Much of the Maine coast feels wild, attracting increasing numbers of people who want a wilderness experience. That is a challenge for managers: How to provide access to the coast while maintaining its wilderness character. We met outfitters who actively teach the Leave No Trace recreational ethic to clients in an effort to protect the very resource they rely on for business. The state of Maine is home to the Gulf of Maine's most active sea kayak guide's association (Maine Association of Sea Kayak Guides and Instructors, www.maineseakayakguides.com), which is leading the way in setting stewardship and safety standards.

Downeast Maine to Saint John, New Brunswick

Jonesport, Cutler, and Eastport, Maine, are still, by and large, fishing towns and only slowly being noticed by tourists. However, as we paddled by large new houses every few miles, many of them still in construction, it became apparent that coastal development has reached Downeast Maine ahead of drastic increases in recreational boating. Crossing into New Brunswick, we found an active recreational industry. We met several people making their living as kayak guides, outdoor equipment retail store owners, and outfitters. One guide told us there are now 17 kayak-related businesses along the New Brunswick shore of the Bay of Fundy.

Upper Bay of Fundy

The upper Bay of Fundy links New Brunswick and Nova Scotia. This is a region where tides reign supreme, coastal towns are small, and people are few and friendly. On the New Brunswick side, government agencies and coastal towns are promoting the Fundy Trail—a series of scenic roads and hiking trails—as "the ultimate Bay of Fundy eco-experience." Further up in the Bay of Fundy, thanks to the far-reaching tidal mud- and sandflats, bird-watching is an important activity, especially with the fall shorebird migration which begins mid-August. Nova Scotia has recently protected Chignecto Point and Cape Split as provincial parks dedicated to land conservation and recreational use. They are both dramatic landforms with some of the Bay's largest cliffs dropping into a sea boiling with tidal currents. Hiking trails and camping areas (some remote, some not) are available. Small Nova Scotian communities punctuate the cliffy shoreline and some towns, such as Halls Harbour, are heavily reliant on tourism.

Digby Neck, Nova Scotia

Digby Neck stands out in the Gulf of Maine as a prime ecotourism destination. Brier Island is home to several whale-watching ventures, the big attraction here being the chance to see endangered North Atlantic Right Whales. There are estimated to be 350 remaining of these slow-movers and the Bay of Fundy provides important feeding and breeding grounds for them. Digby Neck also boasts basalt columns to rival Northern Ireland's Giant's Causeway. These columns are currently under threat as a New Jersey company has applied for quarrying permits to turn them into gravel for roads. Locals seem nearly unanimous in their opposition to this project, stating possible ramifications on the local ecotourism industry as one of their many concerns (for more information, see page 46).

Water-based recreation and tourism are important throughout the Gulf of Maine. Left: Penobscot Bay, ME. Below: Halls Harbour, NS.

The Cat, *a high-speed ferry, leaves Yarmouth, NS.*

French Shore to Yarmouth

The French Shore is where Acadians resettled in large numbers after their tragic grand deportation in the 18th century. The Acadians are a resilient people who have held on to their heritage with pride. Many people in this region recognize that tourism can help keep Acadian culture alive. Tourism is taken seriously. In Belliveaus Cove, for example, the municipality hired a tourism and recreation staff, was granted funding to repair the town wharf, and started running interpretive tours of the coastline's Acadian and natural history.

To the south, predominantly English-speaking Yarmouth is a gateway to Nova Scotia. This is the Canadian harbour of both the *Scotia Prince* and *The Cat*, the high-speed ferry that crosses the Bay of Fundy twice daily during the summertime. Nova Scotians, like folks in Maine, are mixed in their review of *The Cat*. It brings tourists to their province, which helps boost the economy, but few forget the death of a fisherman in a collision with the ferry during its inaugural summer. As sea kayakers, we steered as clear as possible from the vessel, noting with some trepidation its fast approach and large wake as we crossed the harbour.

Yarmouth to Cape Sable Island

From Yarmouth to Cape Sable Island, villages are small and marine-based industries predominate. Tourism is less of an industry. Small museums and information centers are dedicated to both the Acadian culture and fisheries. Local outfitter Seaclusion Kayak Adventures is helping paddlers recognize this region as one of the Maritime's undiscovered gems. A common theme reported by local tourism professionals involves the challenges of encouraging visitors arriving on *The Cat* to stay in southwest Nova Scotia. Most tourists skip this region, visiting instead better-known destinations such as Cape Breton Island. Were these tourists to stay, they would find welcoming communities eager to share their rich cultural heritage.

Tourism and Protected Shorelines

From the perspective of the kayak, we found a direct correlation between protected shorelines and the tourist experience. Shoreline protection in the Gulf of Maine ranges from small parcels managed by land trusts to whole landscapes, such as Fundy National Park. Land protection does not necessarily equate to recreational access, as in the case of protected bird nesting islands. However, despite limited access, the protection afforded sensitive areas is significant to the recreational experience. For example, although we could not land on it due to the nesting season, we found the Parker River National Wildlife Refuge, in northern Massachusetts, provided a welcome respite from the wide-scale development so common throughout that region.

Sustainable tourism initiatives are on the rise throughout the Gulf of Maine. Individuals, businesses, and organizations are starting to offer travelers alternatives to traditional tourism. Sea kayaking, in particular, is growing in popularity on both sides of the border. The paddlers we met are to be commended for their work promoting safe and responsible recreation. The vigor of these businesses is directly dependent on protected bays, mainland, and islands. Increased regional land protection efforts would benfit the emerging tourist-based economy.

Island protection provides habitat while also enhancing visitor experience. Boothbay Harbor region, ME.

Marine Resources

For centuries, the Gulf of Maine has attracted fishermen. Oceanic, tidal and river outflow currents, coupled with water temperature, chemistry, and topography of the ocean bottom all contribute to the diverse habitat. The Gulf of Maine and outlying banks are considered to be among the richest fishing grounds in the world.

During the Expedition, we spoke to fishermen and people in many communities. Our on-the-water observations, coupled with media reports, seems to confirm that fishing-based economies are in a state of flux. Only lobstermen reported a vibrant fishery. Due to the nature of the Expedition, we only saw fisheries that were in season or visible from our nearshore vantage point (*e.g.*, we saw virtually no fishing boats until Gloucester, Massachusetts). The greatest fishing industry diversity was observed in Maine, where we saw mussel draggers, scallopers, and various other trawlers.

While the fishing industry remains vital to communities on both sides of the border, we met more fishermen as we moved east. In the Maritimes, the people we met strolling the shoreline were likely to be involved in the fisheries, a direct contrast to the U.S. side where we were more likely to meet tourists and summer people.

The following is a summary of some of the important marine resource industries we observed.

Lobster

Of all commercial fisheries, lobster was by far the most readily apparent. It was also the only species that fishermen universally agreed still had a healthy population, consistently reporting stable or rising catches. Southwest Nova Scotia particularly stands out: In some areas, the local economy is booming due to the robust lobster industry.

Lobstering was most apparent as an industry as we traveled through the island-speckled shores of Maine. The region around Pemaquid, New Harbor, Bristol, Georges Islands, Port Clyde, and Tenants Harbor is often considered the heart of the Maine lobster industry. Here we found the largest and most diverse concentrations of lobster buoys—clear signs of a vibrant, if not competitive, industry.

Sometimes competition turns into conflict. This was the case along the Maine/New Brunswick border. Much of the conflict stems from the fact that the international border in the vicinity of Machias Seal Island has never been officially determined. In Downeast Maine we first heard of the controversy over this "Gray Zone." As we heard it, since jurisdiction is up for debate, boats from Cutler, Maine, regularly fish well into waters claimed by Canada. The Canadian government was considering allowing a one-time summer lobster fishery—which

Top: The Fishermen's Statue *in Gloucester, MA.*
Right: Lobster fishing boat, Moose Cove, ME.

they did several weeks later—in the Gray Zone, a territory that has traditionally been fished by Americans. Before we left the Grand Manan Channel, one fisherman expressed his concern about the situation. According to him, the Cutler lobstermen made money in the last few years by fishing the Gray Zone during the summer when there is no Canadian competition—now they are trying to pay off new trucks and boats by fishing into disputed waters during the summer months when the Canadian season is closed. Lobstermen and regulators on both sides of the border were extremely concerned about this issue.

Unlike the year-round season in Maine, the Maritimes have a designated six-month season spanning the winter. The lack of lobster buoys made it readily apparent that we paddled through the Canadian portion of the Gulf of Maine during the off-season. From the paddler's perspective, the closed summer lobster season gives the Bay of Fundy shores a more remote, wilderness feeling.

Karl Nickerson, a Yarmouth, Nova Scotia, lobsterman, shared some illuminating insights on what it means to lobster there. He talked of his new 50-foot boat, stating that boats are getting bigger because lobstermen are going further out, some going to the U.S. border (he was not aware of the Gray Zone issue). He explained that in the first month of the season the catch typically equals that of the remaining five months combined. Eagerness to fish after being grounded for six months, coupled with the fact that lobster populations have had a chance to recover, are contributing factors. "You go out into the bay here now, and you'll find lobsters stacked deep up to 10 feet!" he said when we spoke in September. Also, in Nova Scotia, less than 1,000 lobster licenses are allowed, so they are highly competitive, valuable commodities—one lobsterman recently sold a license for $600,000.

Shellfish

Throughout the Gulf of Maine, we observed shellfish being harvested in a number of different ways, ranging from handpicked periwinkle (*Littorina* spp.) in Passamoquoddy Bay, to mussel draggers in Moosabec Reach, Maine. Handpicking continues to be an important harvest method. Cherrystone Clam (*Mercenaria mercenaria*), periwinkle, Blue Mussel, and Bar Clam (*Spisula solidissima*) are all species harvested by hand.

On Cape Cod, locals harvest Cherrystone Clam, Little-necked Clam, and Quahog (all three are the same species at different developmental stages) for personal consumption. Periwinkle are picked for market sale in Downeast Maine and throughout the Bay of Fundy.

In Belliveaus Cove, Nova Scotia, we were invited to join the age-old local tradition of digging for Bar Clam. This happens twice a month with the full or new moon tides—these tides are lower than usual, exposing sand flats that are home to Bar Clam. According to Tim Surette, southwest Nova Scotia area director for the Canada Department of Fisheries and

Digging for Bar Clam with Tim Surrette in Belliveaus Cove, NS.

Left: Mussel dragger near Jonesport, ME.
Below: Purse seiners in Yarmouth, NS.

Oceans, they are similar to the Quahog found in Cape Cod. A local woman, who has been digging Bar Clam her whole life, said expanding Eel Grass (*Zostera marina*) beds are crowding them out. Indeed, the collective harvest was quite low that morning.

Jonesport, Maine, had what appeared to be one of the most diversified fleets of any harbor we visited. In addition to lobster boats, we saw scallopers and mussel draggers at anchor. Digby, Nova Scotia, famous for its Digby scallops, is home to a large fleet of scalloping vessels. These boats work day and night. Near St. Martin, New Bunswick, we observed scallopers rafted up in pairs, floating a few hundred yards out from the cliffy shore, shucking their catch.

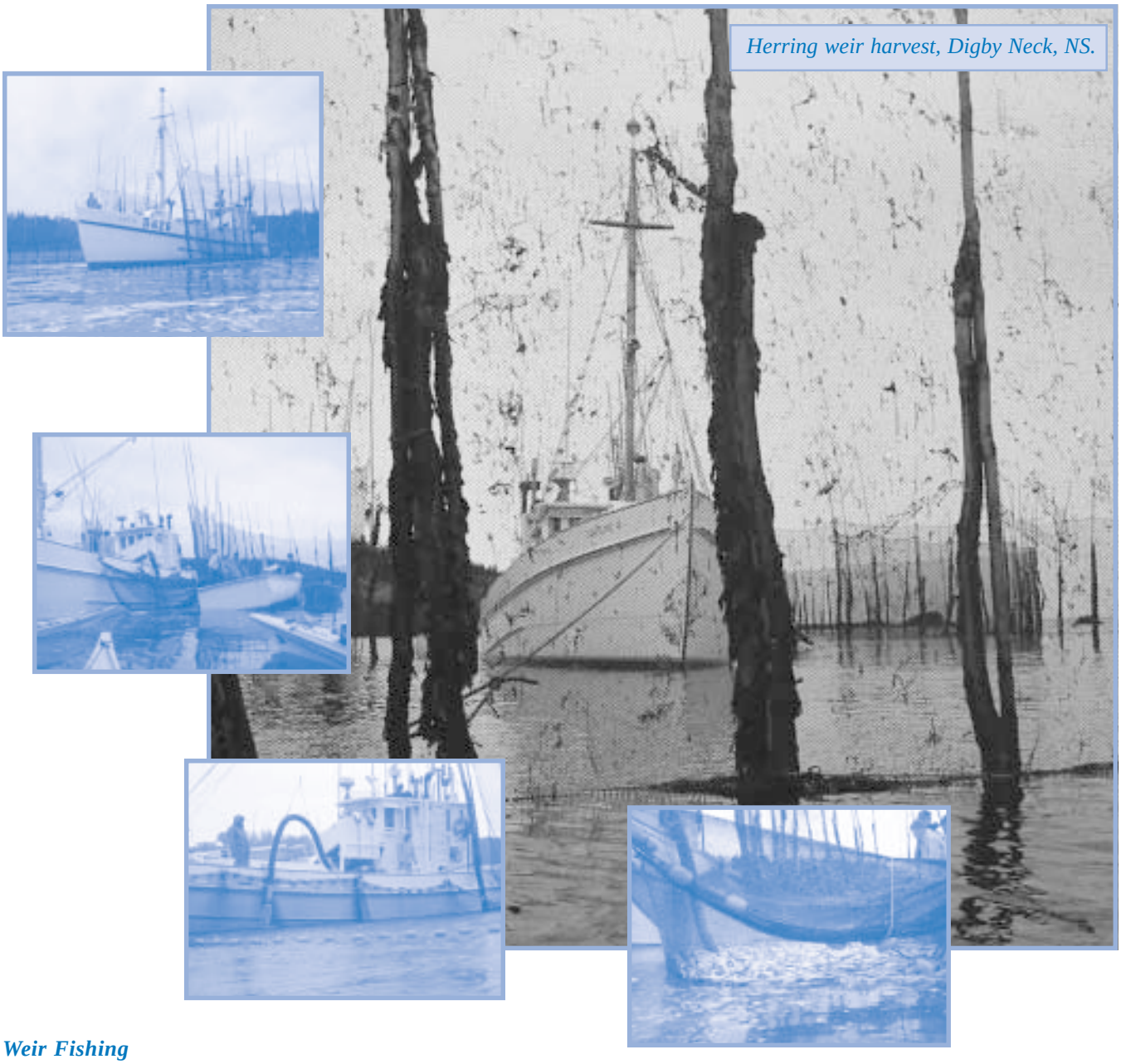
Urchins

We saw surprisingly few Green Sea Urchins and did not encounter any people harvesting these invertebrates. Urchins are reported to be on the decline throughout their range.

Finfish

While finfishing represents an important industry, its offshore nature meant we had no interaction with it. Finfisheries are going through dramatic changes in the Gulf of Maine. Lawsuits brought against the U.S. National Marine Fisheries Service by conservation organizations have resulted in stringent regulations or outright moratoriums to afford stocks time to rebound.

It was not until the last day of the Expedition that we were truly exposed to the finfish industry. In Clark's Harbour, the community that hosted our final community event, fishermen and dock workers were actively involved in processing a recent catch. That night we feasted on locally caught fish.



Herring weir harvest, Digby Neck, NS.

Weir Fishing

The weir fishery uses stationary nets, fixed on poles, radiating out from shore, targeting Herring. On Digby Neck, Nova Scotia, we happened upon the last active weir at the very moment they were beginning to harvest the catch. Weir owner Stanley Stanton was eager to share this dying industry with the public; he invited us onto his 23-foot punt where he carefully spent the next two hours explaining the process of fishing and harvesting a weir. He was so saddened by the seriously declining catches that he has warned his 15-year-old son away from the business. Stanley said that previously, there had been up to 31 weirs on Digby Neck. Today, his was the sole remaining active weir. He attributed the decline of Herring stocks to the indiscriminate dragging and seining of larger vessels out in the Bay of Fundy.

Seaweed

New industries are emerging, such as Rockweed harvesting. Rockweed has many uses, including as an ingredient in horse feed and in cancer research. We first heard about extraction of this particular resource in Eastport, Maine, where local conservationists were concerned that this new industry would strip the intertidal zone of vital nursery habitat. It was not until we crossed the New Brunswick border that we saw the first evidence of this industry. Rockweed is harvested with a long, specialized rake. Harvesters are required to leave enough stipe (the base, or stalk) for the patch to regrow. The height of cut does not seem to be consistent: In parts of New Brunswick and Nova Scotia,

we found mats of Rockweed razed to a height of two inches. Generally, over-harvesting did not seem to be widespread as the industry itself was not widespread.

Rockweed harvesting, Deer Island, NB.

Aquaculture

Aquaculture is growing throughout the Gulf of Maine. We saw our first shellfish rafts on the coast of Massachusetts. Although there are aquaculture sites dotting the Maine coast, it was not until east of Millbridge that we saw our first salmon operation. Atlantic Salmon (*Salmo salar*) farming is the most evident form of aquaculture, taking place in large floating pens. Shellfish farming is often much less visible, with rafts, cages, or ropes suspended below the surface.

Passamaquoddy and Cobscook Bays are centers of salmon aquaculture, where swift tidal currents flush waste products and the geography affords shelter from the sea. In Eastport, Maine, we were given an in-depth tour of a salmon farm. Operation manager, Dave Gibbs, walked us through the complexities of a salmon farm. He described such things as automated feed systems, how scuba divers clean the pens and sea-bottom, and the industry's relationship with the Maine Department of Marine Resources.

Opinions about aquaculture seem fairly divided concerning the positive and negative impacts of the industry. For example, we heard support for aquaculture, particularly citing its significant influence on local economies. On the other hand, some weir fishermen claimed that the concentrated presence of salmon chases Herring away (salmon are Herring predators). We also heard claims that fish-farming degrades water quality.

Above: Feeding tubes extend from a workboat to salmon aquaculture pens in Downeast ME.
Left: Close-up of a salmon pen in Downeast ME.

Marine Infrastructure

In Nova Scotia, we saw elaborate wharves where multiple piers create enclosed, protected harbours at the hearts of small coastal communities. Between harbours, we regularly saw access ramps for fishing boats to be hauled in and out of the water. Historically, the Canadian government maintained and operated wharves; however, in recent years, they have been transfering title to local communities or co-operative entities. Still, we were left with the distinct impression that the government of Canada invests much more heavily into marine-based infrastructure than does the U.S. government.

This further became apparent as we saw far greater numbers of fish- and seaweed-processing plants scattered through the Bay of Fundy than we saw in the U.S. These plants are vital to local economies. In fact, these plants are such local landmarks that we noticed they appear on topographic maps.

Pollution

Pollution is one of the critical threats to the Gulf of Maine, coming in an infinite variety of forms, both point and nonpoint source. To the casual observer, the Gulf appears largely pristine, with generally clear waters, lush intertidal communities, and vibrant shoreside vegetation. Interestingly, we encountered no visual signs of pollution, such as oil slicks on the water or on the beaches; however, we did encounter coastal debris (see the following section on "Coastal Debris"). Saint John was the only locale where we clearly encountered sewage.

Sewage disposal and storm-water runoff are significant issues. Three examples of sewage control stand out: Boston, Massachusetts; Saint John, New Brunswick; and Bear River, Nova Scotia.

Boston Harbor is a well-publicized success story. The story of how the city improved its reputation as one of the most polluted harbors in the United States is well documented. Perhaps the most apparent signs of cleanup efforts are the massive Deer Island Sewage Treatment Plant and the Boston Harbor Islands National Park. The harbor is now increasingly used for recreation.

Saint John is reputedly the most polluted harbour on the Bay of Fundy, with industrial wastes and raw sewage discharged untreated. Our stop on Partridge Island, at the mouth of the Saint John River, confirmed the pollution concerns. All man-made structures, rocks, and seaweed were coated with a foul residue with which

Left top: A NS harbour protected by significant pier construction.
Left: Discharge pipe into Cape Cod Bay, MA.
Below: Deer Island Sewage Treatment Plant, Boston, MA.

Saint John, NB.

we al1 avoided contact. In the city, we observed raw sewage discharged into a creek running into the harbour. Sean Brillant (Atlantic Canada Action Programme – Saint John) told us hospital waste was also discharged, untreated, into the tributary.

Fortunately, the city of Saint John is concerned about the problem of harbour pollution and is working toward solutions. Waste from approximately half of the city undergoes treatment and the remainder is scheduled for completion in the next few years. The city's shifting focus to appreciate its waterfront includes plans for new commercial development and projects such as a pedestrian boardwalk connecting downtown to the famous Reversing Falls. Saint John is a success story in the making.

Bear River is a small town on a river sharing the name and runs into the Annapolis Basin near Digby. The town has taken an innovative approach to treating its sewage: They installed a unique system known as the Bear River Solar Aquatics Wastewater Treatment Facility (for more information, visit collections.ic.gc.ca/western/bearr) as an alternative to traditional chemical-based systems. Harmful biological constituents and nutrients are extracted as wastewater passes through tanks containing naturally occurring organisms and plants inside a greenhouse. At the river end of the system, pure water is discharged. The whole system is driven by solar energy. It is in the center of town and also serves as a tourist attraction.

Paddling along the coast we became aware of the occasional storm drain outfall. These protruded from shoreside banks where runoff could be dumped on beaches, rocks, or directly into the ocean. These pipes typically collect water from urban nonpoint sources such as roads, parking lots, rooftops, lawns, and farms; and they can carry vehicular exhaust waste, herbicides, pesticides, fertilizers, and roadside debris. This runoff is generally nitrogen-rich, increasing nutrient loads, and can cause algae blooms, which, in turn, can deplete oxygen and suffocate marine life. All too frequently, non-target organisms are adversely affected by herbicide or pesticide residue.

We visited several places around the Gulf of Maine that have initiated programs or projects to deal with this source of pollution.

Runoff treatment, Jones River watershed, MA.

The Jones River (Massachusetts) Watershed Association, working in a 30-square-mile area, has instituted a demonstration storm-water purification project. A system of collection tanks and wetland plants have been used to provide passive purification of runoff. According to Executive Director Pine duBois, the system removes 90% of the waste material that might have reached the estuary if left untreated.

In Portland, Maine, we encountered an innovative program to reduce the impact of lawn runoff on the water quality of Casco Bay. At issue is the cumulative effect of the residues of products applied to lawns in the region. The BayScaper program, a project of the Friends of Casco Bay, encourages homeowners to take individual responsibility to assist in solving lawn runoff problems. To earn BayScaper certification, homeowners must meet six criteria for lawn care practices and pass a written checklist. These criteria include using alternative approaches to lawn-care, watering, mowing, soil treatment, fertilization, and pest control; and if

using professional lawn-care services, homeowners are encouraged to make sure BayScaper principles are being followed.

In Saint John we were taken on a tour of a pilot storm-water management project. The Atlantic Canada Action Programme – Saint John is working with a local shopping center to send storm-water from roof and parking lot surfaces through a linear marsh system. Cattails (*Typha* sp.) and other aquatic plants filter sediment and absorb pollutants before the water is ultimately released into Saint John Harbour. This is a relatively low-cost, low-maintenance, space-efficient pilot program with potential to be easily applied throughout the region.

Our observations concerning water quality in the Gulf of Maine were quite limited. We were able to make basic observations of water quality in association with our phytoplankton sampling; however, we were not equipped to conduct chemical analyses to get a more definitive profile of water quality and pollution levels.

Coastal Debris

No matter where you travel in the Gulf of Maine, there is always some telltale reminder of human presence. Even on the seemingly wildest stretches of coastline, sea-transported litter is ever-present. During the Gulf of Maine Expedition, we routinely made quantified observations of coastal debris in order to establish a baseline of the shore's cleanliness. Without exception, every time we undertook observations, there was always some manner of refuse.

In order to systematically document our observations of coastal debris, we modified International Coastal Cleanup Data Cards (used by volunteers of the Maine Coastal Program and The Ocean Conservancy in their annual fall cleanups) into International Coastal Debris *Observation* Data Cards. These modified forms consolidate 67 countable items into seven categories. Countable items include such debris as balloons, plastic beverage bottles, 6-pack holders, buoys, lobster traps, cigarettes, 55-gallon drums, and tampon applicators. The seven categories are:

1. Shoreline and recreational activities;
2. Ocean/waterway activities;
3. Smoking-related activities;
4. Dumping activities;
5. Medical/personal hygiene;
6. Debris items of local concern; and
7. Miscellaneous debris items.

We completed 39 Coastal Debris Observation Data Cards: 21 were in the United States, 18 were in Canada. We tallied 2,762 separate debris items: 684 in the U.S. and 2,078 in Canada (see Appendix IV for summary results). Actually, our tallies are much higher than reported: We commonly encountered situations where there was too much debris in one or more categories to count. Although we were using the same form to document debris at each location, the absolute numbers can be misleading until normalized over the distance observed. In some cases, our observations were limited to a 100-foot-wide hanging beach; in others, our observations spanned the entire perimeter of an island. Even so, a significant amount more coastal debris was observed on Canadian shores than on those of the United States.

This aspect of our Expedition clearly demonstrated that long-standing impressions do not necessarily hold up in light of good data. The general notion that Canada is cleaner than the United States, at least in terms of litter, was definitely not the case on the shores of the Gulf of Maine. Nine of the 10 highest debris counts were on Canadian shores. As soon as we crossed from Eastport, Maine, to Deer Island, New Brunswick, we were struck by the amount of debris. It was here that we saw our first salmon farm feedbags floating. Seemingly innocuous woodchips were observed on both sides of the Bay of Fundy. Eventually, we learned that woodchips are shipped across the Bay between New Brusnwick and Nova Scotia on uncovered barges. Windrows of woodchips, blown off the barges, are readily observed throughout the Bay of Fundy. Two days later, our campsite at Pendleton Island was one of the three most debris-strewn sites encountered by the Expedition—the others, being Johns Island and Owls Head Island, both in Nova Scotia.

Pendleton Island, NB.

Category	Items collected		
	U.S.	CA	Total
Shoreline and recreational activities	155	527	**682**
Ocean/waterway activities	521	1,473	**1,994**
Smoking-related activities	0	8	**8**
Dumping activities	6	44	**50**
Medical/personal hygiene	1	5	**6**
Debris items of local concern	0	1	**1**
Misc. debris items	1	20	**21**
Totals	**684**	**2,078**	**2,762**

The most frequently observed coastal debris items demonstrated the commercial nature of the Gulf of Maine. Eight debris items had total counts exceeding 100 over the course of the Expedition. They are, in descending order: Buoys/floats, rope, plastic beverage bottles less than two liters, lobster traps, strapping bands, oil/lube bottles, bleach/cleaner bottles, and crates.

Boothbay Harbor region, ME.

Some of our results raised questions that we could not answer. Does the fact that nearly three times as many buoys and floats and that nearly twice as many lobster traps were found on the shores of Maine than the rest of the Gulf give credence to stories we heard about the intense rivalries among lobstermen there? Perhaps this is more a testimony to the significantly higher number of lobster licenses in Maine. Or are fishermen in the Maritimes more likely to retrieve buoys and traps that have washed ashore? Meanwhile, bleach or cleaner bottles, oil or lube bottles, strapping bands, and crates were all ten times as abundant on the Maritime shores. Is there some difference in Canadian fisheries that accounts for this trend?

So why the stark contrast between the comparatively refuse-free U.S. shores and the littered shores of Canada? Although we do not know the answer, our observations attest to the fact that the shores from Cape Cod to Eastport are more densely populated and are much more heavily used for recreation. Is the recreating public more likely to pick up trash as they walk the shore? Since more miles of the New England coast is privately owned and actively managed, are landowners more likely to keep their own shores clean? Following a different line of thought, do prevailing winds push debris against the counter-clockwise currents into the Bay of Fundy? These are all good questions for future research.

Land-based Resource Management

As observed from the water, extraction of terrestrial resources appears to represent a minor use of the shoreline of the Gulf of Maine. While discrete stretches of shoreline are subject to forest management, mining, quarrying, or grazing, currently these activities encompass a very small percentage of the coastline.

Trees were long the most significant terrestrial resource throughout the region. Historically, sustainable management of forest resources was minimal; instead, the landscape was clear-cut for one-time extraction of this valuable commodity during the eras of colonialism, settlement, island farming, and shipbuilding. Today, although regenerated coastal forests often appear in near pristine condition, most are only now maturing. Forest management, for the sake of the harvesting of trees, was an infrequently observed practice. We did observe small-scale cutting on some of the islands of Maine and along the shores of New Brunswick and

*Island logging in midcoast ME. [Note the Osprey (*Pandion haliaetus*) nest left undisturbed atop tree second from right in the foreground.]*

Nova Scotia. However, the heightened interest in developing shoreside properties for second homes currently appears to have a more significant impact on today's coastal forests than logging.

Mining and quarrying were infrequently observed industrial uses of the coast. Stonington, Maine, is one area where granite mining is still an important industry. Its mining and quarrying heritage is in clear evidence. Recently, quarrying has become an issue on Nova Scotia's Digby Neck. The coast from Digby Neck through North Mountain is essentially one large basaltic formation (basalt is a hard, brittle, and durable rock that has excellent properties as construction material). Plans to blast, crush, and ship the rock to the United States are being resisted by local people who fear its negative impact on the tourism and fishing economy. They see the permitting of one mine as an open door to the massive destruction of the character and quality of life for the entire region. They are particularly concerned that, should the quarry be allowed, the North Atlantic Free Trade Agreement (NAFTA) will be in force and that, as a result, it would be difficult, if not impossible, to deny future quarrying permits. No other single issue seemed to so nearly unanimously unite a community as the proposed quarrying of basalt at Whites Cove on Digby Neck, Nova Scotia.

The topography and surficial geology of much of the coast of the Gulf of Maine generally makes grazing impractical. What limited grazing we observed was almost exclusively limited to sheep on islands. Islands have long been used for grazing livestock: They required no fences and little maintenance. Livestock—primarily cattle and sheep—were landed on the islands in the spring and rounded up in the fall. All summer they could graze on the islands, with no threat from predators and little oversight required. The only

mainland grazing we observed was south of Yarmouth, Nova Scotia. To anthropomorphize, the Yarmouth cows seemed surprised at these funny creatures paddling past—apparently these cows are not accustomed to sea kayaks in that area.

An increasingly important terrestrial resource management tool is land protection. Protection tools range from non-binding management agreements, to deed restrictions, to conservation easements, to outright fee title acquisition of properties. While we made no effort to quantify protected lands, qualitative analyses indicate that Maine has the greatest footage of protected coastline. We regularly encountered lands with signs indicating ownership by the state or federal governments, by local land trusts, or by conservation organizations such as The Nature Conservancy.

As discussed previously, in the southern Gulf of Maine, development is so extensive that protected lands are essential to maintain coastal access and wildlife habitat. Landowners are far less likely to sign or post their lands in the Maritimes, so it is more difficult to gauge ownership. However, conversations led us to many local and provincial parks. Perhaps the best-known example of protected land in the Maritimes is Fundy National Park, New Brunswick. This enormous park encompasses many kilometers of shoreline.

Opportunities abound for wilderness recreation. Cape Chignecto and Cape Blomidon, both in Nova Scotia, are among the newest provincial parks. Recent protection of these sites will ensure their current recreational use and open space character for generations to come.

Top: Whites Cove, NS.
Left: Stonington, ME.

Industrialization

The primary industrial uses we observed along the Gulf of Maine are fisheries (see the previous discussion under "Marine Resources"), forestry (see the previous section on "Land-based Resource Management"), shipbuilding, energy generation, and shipping. Most industrial development is concentrated in the harbor areas of cities and larger towns. However, any place where there is a port, we found a concentration of wharves, docks, and warehouses related to goods exchange, fisheries, and shipbuilding and repair. (Harbors offer an interesting contrast to the open seas and exposed coastlines.)

Historically, shipbuilding was an important industry throughout the Gulf of Maine. Today, shipbuilding is relegated to just a few locales, such as the Bath Iron Works in southern Maine. Smaller boatbuilding operations, such as the world-famous Hinckley Yachts in Southwest Harbor, Maine, or any of the numerous businesses churning out boats for the thriving lobster fishery, dot the coast from Cape Cod to Cape Sable Island.

Power stations are significant features on the landscape and serve as monuments to our demand for energy. Situated right on the edge of the sea, they have massive water-intake structures for cooling. Power generation structures are major landmarks, visually over-power the rugged coastlines on which they sit, which also makes them excellent navigational waypoints. The oil-fired Canal Electric Power Plant, on the Cape Cod Canal (Massachusetts), hove into sight within the first week of the Expedition. It was followed by the massive Pilgrim Nuclear Power Station in Plymouth, Massachusetts; and Hull Wind, the innovative community wind generation station near Boston, in Hull, Massachusetts. It generates clean energy for the entire community. Next we observed the Point Lepreau Nuclear Generating Station, followed by the oil-fueled Coleson Cove Generating Station, both in New Brunswick.

Leaving Saint John, New Brunswick, we paddled within sight of the massive Irving refinery. The refinery and oil storage tanks are major structures on the coastal scene. Of particular interest is the offshore oil port connected with this facility. Paddling out of Saint John Harbour and around Cape Spencer, we became aware of a line of oil tankers waiting to off-load their cargo at a

Top to bottom:
Coleson Cove Generating Station, NB;
Hull Wind generation turbine, Hull, MA;
Irving oil tanks, Saint John, NB.

specialized mooring buoy. As each ship neared the buoy it was maneuvered into place by tugboats so oil could be pumped to shore.

Shipping is concentrated in a few port areas and is generally restricted to identifiable shipping lanes. We had to be particularly careful of large, commercial vessels at places such as Cape Cod Canal, Boston, Portland, Rockland, and Saint John. Careful monitoring of VHF channel 16, the international hailing frequency, coupled with searching our nautical charts for designated shipping channels, kept us safe and well-appraised of the anticipated location of large vessels.

Ferries were our most regularly encountered commercial ships. In Saint John, New Brunswick, we had a close encounter with the ferry arriving from Digby, Nova Scotia. Apparently, in Canadian waters, large vessels approaching a dock are not required to announce their intentions on VHF radio, nor are they required to sound their horns. [In the U.S., vessels are required to announce their approach to harbors.] Imagine our surprise when we looked over our shoulders and saw the ferry bearing down on us. *The Cat*, the high-speed seasonal ferry that runs between Bar Harbor, Maine, and Yarmouth, Nova Scotia, creates a substantial wake, even near shore. This is a significant concern for recreational boaters. Regularly scheduled vessels, such as ferries, generally have the right-of-way. Knowing ferry schedules is the responsibility of all coastal mariners. Regardless of the right-of-way, paddlers should strickly adhere to the law of gross tonnage.

Overall, the coast of the Gulf of Maine is not highly industrialized. Living or traveling in urban centers may leave an impression of greater industrialization than is actually there. In the southern Gulf of Maine, we were more aware of the presence of residential development than industrial. In northern Maine and throughout the Bay of Fundy, the natural landscape far exceeds industrial presence. The concentration of industrialization to a few urban centers may provide opportunity to better control pollution and take economic advantage of existing infrastructure.

Invasive Species

In 1999, President Clinton signed Executive Order 13112, establishing the National Invasive Species Council, an interdepartmental effort to address this increasingly important and complex issue. Invasive species are those that are non-native and likely to cause environmental or economic damage. During the Gulf of Maine Expedition, we did not witness landscapes blanketed with invasive species. This may be a result of our route. However, we did observe non-native species that have had an impact on both the terrestrial and marine landscapes. Even though invasive species were not regularly observed, their threat to the environment merits additional concern.

The Common Reed (*Phragmites australis*) grows readily in areas of moist soils, especially wetlands. Commonly referred to by its Genus name, it tends to grow in dense, monodominant stands, crowding out native species such as Cattails. *Phragmites* stands tend to be unsuitable nesting habitat for native avian species such as Virginia Rail (*Rallus limicola*) and Red-winged Blackbird (*Agelaius phoeniceus*). It readily enters areas of disturbance, whether a roadside ditch or mown field.

Left: Ferry arriving at Saint John, NB.
Bottom: Boston, MA.

The *Phragmites* we observed was entirely around urban areas such as Cape Cod, Portland, and Saint John.

The Browntail Moth (*Euprocitis chrysorrhoea*), a European native, was first found in Massachusetts in 1897. Initially, its range expanded to much of the eastern seaboard. Today, it is relegated to a few islands of Casco Bay, Maine, and Cape Cod. According to U.S. Department of Agriculture publication NA-PR-01-93, "Caterpillar hairs can cause a skin rash on humans, similar to that caused by poison ivy. The rash can be severe and persistent on sensitive individuals." The moths can also defoliate hardwoods. The only Browntail Moths observed by the Expedition were on Eagle Island, in Casco Bay, where the island caretaker was careful to point them out to us.

Green Fleece (*Codium fragile*) is a green algae that was accidentally introduced from Japan. Green Fleece, with no natural controls, has expanded its range in the Gulf of Maine, where it can displace native green algae. When cut off from the main plant, this species will seal the wound and continue photosynthesizing until it eventually settles at a new location. Most of our observations of Green Fleece were in the Cape Cod area.

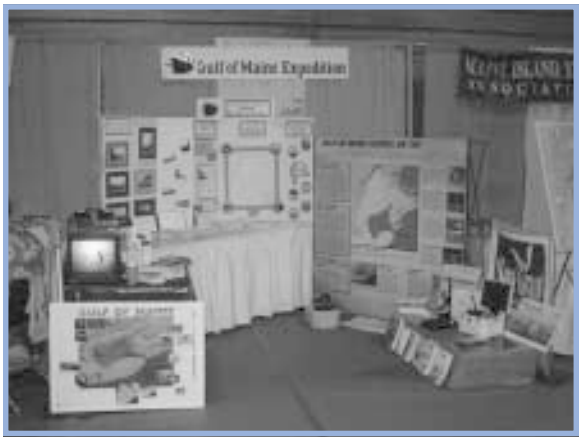
The European Green Crab (*Carcinus maenas*) is a voracious predator, eating a wide variety of invertebrates, including the commercially-important Green Sea Urchin. Introduced in the 19th century, it was not until the end of the 20th century that it became well established along the Maine coast. Today, this species can be found throughout the Gulf of Maine. This crab, long considered a nuisance species, often is effective at out-competing native species. Efforts to develop a market for the European Green Crab are underway as a means to reduce their population, and thus, decrease competition with native species. It would be ironic if efforts to develop a commercial market for the European Green Crab were so successful that people involved in the fisheries ended up seeking a sustainable population.

*The Luna Moth (*Actias luna*), a native species found in the Gulf of Maine, can grow up to 7 in. (18 cm) long.*

Methods: Conducting the Gulf of Maine Expedition

Education & Outreach

Education and outreach was a fundamental goal of the Gulf of Maine Expedition, beginning long before our May 4th launching date and continuing long after our September 28th arrival in Cape Sable Island. Our educational mission gained us the respect of many sponsors, supporters, members, and volunteers. It was

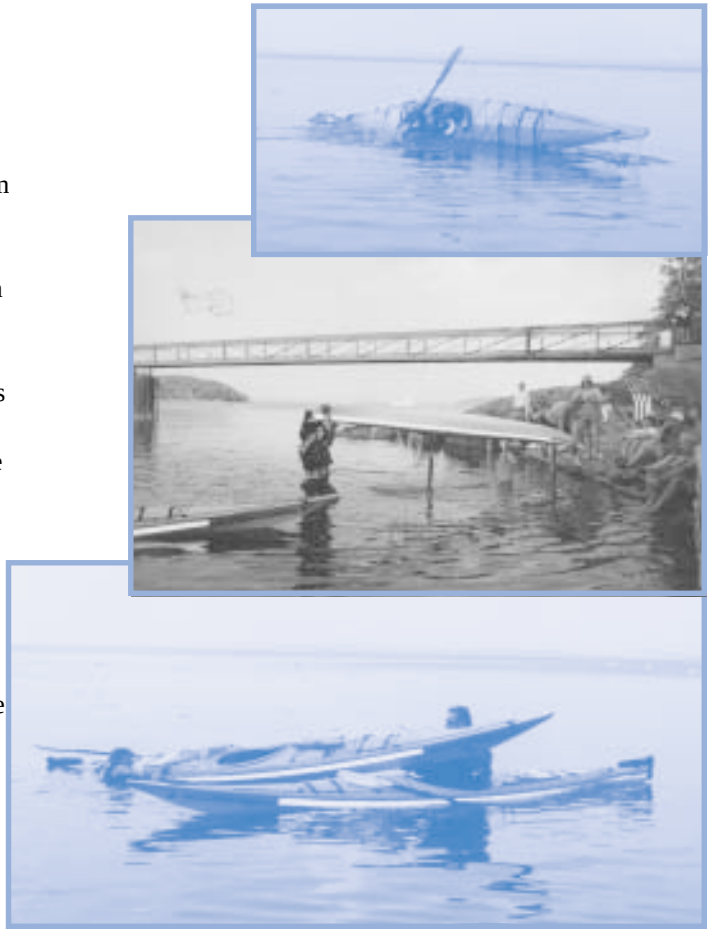


the educational mission that also attracted our own team members, enabling us to solidify as a cohesive unit.

Without this educational mission, ours would have been an expedition like so many others, dedicated primarily to the enjoyment of the participants. Instead, we used the journey—that, of course, we enjoyed immensely—as a vehicle to capture the public's imagination about the Gulf of Maine and to teach people about the importance of this international watershed. Given our mode of travel (by kayak), we also felt a responsibility and commitment to teach safety and stewardship for recreational boaters.

While teaching others, we simultaneously considered ourselves to be students of the Gulf of Maine. Everyone we encountered throughout the journey, formally or informally, adults or children, had stories of their own to share. We lived by the philosophy that the best teachers are often those who listen the most attentively. The result of that listening lies in the stories and issues we have included in this report.

To achieve our education and outreach goals, we employed several methodologies including formal and informal education, developing and disseminating communications materials, and working with the media. Bob DeForrest, of Bar Harbor, Maine, our education and outreach coordinator, was able to coordinate many aspects of the program while the paddling team was on the water.



Above: Our educational display was erected at most of our community events.
Right: Sea kayak safety and rescue workshop in Bar Harbor, ME.
(Bottom right three photos by Philip Springuel.)

Formal Education

Formal educational programs were coordinated with the help of local volunteers and supporters who hosted the Expedition in their communities and helped organize community events. Rather than develop a standardized approach to our programs, we worked with each community to develop programs for its audience. Although our slideshow was repeated in nearly every community, digital technology allowed us to update each show as we progressed along the coast.

During the U.S. portion of the Expedition, our day-long community events (also known as "Gulf of Maine Days") included representation and support from local organizations and individuals. Workshops at Gulf of Maine Days were presented both by our team and representative stakeholders, with sessions including phytoplankton monitoring, bird-watching, intertidal ecology, kayak safety, navigation, and Leave No Trace ethics. Interested organizations and government agencies who had displays at these events included Friends of Acadia, Friends of Casco Bay, Maine Coastal Program, Maine Island Trail Association, Maine Sea Grant, and the U.S. Coast Guard Auxiliary.

On the Canadian side of the border, community events were hosted by groups such as the St. Croix International Waterway Commission, East Charlotte Waterways, Municipalité de Clare, and Highland Cove Centre for Canadian-American Cultural Communication.

A highlight of our formal educational program was the occasion to visit schools at the end of the academic year in Maine and at the beginning of the academic year in Nova Scotia. This presented an opportunity for a dialog with students about the Gulf of Maine.

Post-Expedition Formal Education and Outreach

During the months between the end of the paddling portion of the Gulf of Maine Expedition and publication of this report, team members gave 24 presentations to a total audience of 1,115 people.

Informal Education

Serendipity, our passion for the Expedition, having "Gulf of Maine Expedition" emblazoned on the bows of our kayaks, brochures featuring a map of the Gulf of Maine, and the URL for our Web site all played an important role in our informal education and outreach efforts. We met 779 people during the course of the journey on beaches, at docks and piers, on islands, in

For a complete overview of our formal education programs, please refer to our travelogue starting on page 63. The following list summarizes the communities in which we had formal programs (the number of new participants is in parentheses, people who attended multiple presentations were only counted once):

Provincetown, MA (33)
Rye, NH (73)
York, ME (48)
Biddeford, ME (185)
Portland, ME (112)
Boothbay Harbor, ME (23)
Searsport, ME (38)
Warren Island, ME (24)
Swans Island, ME (24)
Bar Harbor, ME (122)
Eastport, ME (44)
St. Andrews, NB (96)
Saint John, NB (20)
Alma, NB (141)
Huntington Point, NS (34)
Annapolis Royal, NS (120)
Belliveaus Cove, NS (51)
Yarmouth, NS (459)
Clark's Harbour, NS (120)
Total: 1,767 participants

Left: Homeschooled family at Scusset Beach State Park, MA. Below: Coastal Ridge Elementary School, ME.

boats on the water, at Laundromats, in restaurants, and at campgrounds.

People were often initially attracted by our sea kayaks. Sometimes people found us camping in surprising places and would be drawn to find out who we were and what we were up to. Wherever we went, at sea or on land, we were armed with a stack of Expedition brochures, ready to show the map and discuss the Gulf of Maine. Each encounter became both a teachable moment and a chance to learn about the local region.

We met several home-schooling families during the first month of the Expedition, including four sisters beachcombing at Scusset Beach State Park (Massachusetts) with their mother. Although the children were taking a day off, plans immediately changed as the Gulf of Maine became this family's instant ocean unit. A Sand Dollar (*Echinarachnius parma*) found in the intertidal zone also made for an impromptu lesson on invertebrate ecology. As we parted, they said the curriculum for the rest of the summer would included learning about the Gulf of Maine by logging onto the Expedition Web site to track our progress.

Gulf of Maine Expedition Web site homepage: www.gomexpedition.org. Web site designed by Kirk Holbrook.

Communications Materials

We created a number of print and electronic communications materials to help us reach a wider audience. Some materials (such as the cover of this report and the map inside the cover) included artwork created and donated by Bar Harbor, Maine, artist Heather Sisk.

Communications materials included:

- Six newsletters spanning the planning phase through to the end of the Expedition. Newsletters were distributed electronically to a constantly growing e-mail list. The final newsletter was sent to 409 individuals, not including media contacts. Newsletters were also printed and distributed upon request.
- A Gulf of Maine Expedition brochure. Over 1,500 brochures were distributed.
- Gulf of Maine Expedition posters announcing Gulf of Maine Days and community events.
- www.gomexpedition.org, the Expedition's Web site. A counter was installed on the Web site July 8, 2002, two months after the Expedition's launch and three months after the Web site's launch. The Web site had approximately 2,000 visitors in the remaining three months of the journey.
- Articles written by Expedition team members appeared in *Gulf Stream* (the newsletter of the Gulf of Maine Marine Educators Association), *Island News* (the newsletter of the Maine Island Trail Association), *Shunpiking* (Nova Scotia's Discovery Magazine), and *Atlantic Coastal Kayaker*, among others.
- Links to the Gulf of Maine Expedition on Web sites of other organizations, including Maine Sea Grant, Maine Shore Stewards, Necky Kayaks, Plattsburgh State University, USA Canoe/Kayak, and Tusket River Environmental Protection Association.
- Fundraising materials, such as visors with our logo, notecards with photographs from the Gulf of Maine, and stickers of our logo.

Media

Thanks to Americorp volunteer Amy Minarik, working 10 hours per week on Expedition-related activities (an in-kind donation from the Maine Coastal Program), the Gulf of Maine Expedition was widely covered in all manner of media, including local and regional newspapers, magazines, newsletters, local and national radio, television and the Internet. Amy prepared and distributed 35 press releases and media advisories and developed what may be the most comprehensive media

contact database for the entire Gulf of Maine region. The Expedition has collected a bibliography of approximately 65 media clips (although we suspect there were many more). Refer to Appendix V for a list of our print media coverage.

Stewardship

Stewardship suggests concern for, managing, or taking care of, something for the benefit of others. Used in an environmental context it encourages taking care of the Earth and its resources for the benefit of future generations. It is in this context that the Gulf of Maine Expedition mission statement uses the phrase *to promote stewardship principles*.

Our interest in promoting stewardship stems from a belief that lasting ecological health takes personal and political actions at all levels. Promoting stewardship means equipping people with the necessary information and principles. As a team, our actions were guided by core stewardship principles relating to care of the Gulf of Maine, care of the people of the Gulf of Maine, and an ethic of sharing.

Many organizations throughout the Gulf of Maine are dedicated to stewardship of this international watershed. By working with, and learning from, these groups, we hoped to provide them with a conduit to get their efforts heard by new audiences. Our premise was that increased networking and communications about local stewardship efforts throughout the Gulf will help achieve a region-wide stewardship ethic.

Care of the Gulf of Maine

We promoted care of the Gulf of Maine by following low-impact recreational and camping practices. At each lunch stop and campsite we attempted to do as little damage as possible, hopefully leaving sites with no sign of our passage. To this end, we set up tents on durable surfaces, refrained from having campfires, cut no trees, and carried out our trash and solid human waste. Whatever traces we left at our camps, such as footprints on the beach, were soon erased by time, tide, and weather. We stressed these practices in our presentations to bring them into common awareness. As these practices were fundamental to our team, both in action and in outreach, they will be covered in more detail under “Leave No Trace,” beginning on the next page.

Care of the People of the Gulf of Maine

The people of the Gulf of Maine are a distinct and special community. While diverse, the community can be viewed as a cultural and economic unit that maintains a common spirit and fosters a strong self-reliance. For people living around the Gulf of Maine, it is not a large conceptual jump to view its waters as a whole, rather than as a division between political entities. Maps were used to advantage in depicting the Gulf of Maine and its watersheds as an important bioregion for which we all share concern.

An Ethic of Sharing

The concept and practice of sharing is an important component of stewardship. It involves the sharing of labor, food, goods, and information to promote care of place and people. The Gulf of Maine Expedition received significant caring and sharing from inception of the idea through completion of the journey. Along the way we used every opportunity to give back to communities what we had gathered from our travels and observations. In this report, in other publications, and in future presentations, we hope we can continue to give back even a small measure of the generosity we received.

Portland (ME) Press Herald *article, June 6, 2002.*

Leave No Trace

In preparing to set out on the Expedition, we hoped and imagined we would live immersed in the natural and cultural environment of the Gulf of Maine. However, to do so meant we must travel through, and live on, precious coastal habitats, fragile island ecosystems, and pristine wilderness, as well as urban environments. Clearly we wanted to make a significant statement by leaving an insignificant trace of our passage. We used the phrase *to promote low-impact coastal recreational practices* in our mission statement with the goal of espousing these ethics, as well as demonstrating them to others.

To that end, one of the Expedition's earliest and easiest decisions was to commit to a strict observance of Leave No Trace principles. [Leave No Trace, Inc., is a well-established organization with roots in the National Outdoor Leadership School, the U.S. Park Service, and other management agencies, founded on a long-standing assumption that outdoor adventurers should strive to minimize the impact of their activities on the environment. See www.LNT.org for more details.] The concept of Leave No Trace started as a code of backcountry ethics and continues to spread. At an outfitter's shop in Saint Martins, New Brunswick, we found a Leave No Trace brochure produced by the Canadian Ministry of Natural Resources. Although specific tenets differ according to the landscape or seascape traveled, the premise remains the same: Protect the destinations through which you travel for the enjoyment of future generations, as well as the long-term ecological health of that place.

The Gulf of Maine Expedition adapted this well-established outdoor ethic to fit our mission. The seven principles we used to guide our behavior were:

1. Plan Ahead and Prepare
2. Travel and Camp on Durable Surfaces
3. Dispose of Waste Properly
4. Leave What You Find
5. Minimize Campfire Impacts—Kindle No Fires
6. Respect Wildlife
7. Be Considerate of Others

1. "Plan ahead and prepare" includes acquiring permission to camp when necessary; planning safe routes for travel (including safety evacuation plans); packing appropriate food, water, and gear; and making decisions that prevent ecologically impactful behavior.

2. "Travel and camp on durable surfaces" meant setting up kitchens, tents, and other camping activities on rocks or sand, often below the high tide line, so that even our footsteps were soon erased.

3. "Dispose of waste properly," including packing out solid human waste, can be accomplished safely and cleanly with this portable toilet system provided by GTS, Inc.

Countless decisions, both in the planning phase and while on the journey itself, were dictated or influenced by these values. Examples of this include the size of our on-the-water team (usually four or five paddlers but never more than eight), kindling no campfires for five months, and packing out all solid waste (the little trash we generated included food waste, packaging, and solid human waste). When on heavily-used beaches or on pristine island habitats, these choices seemed appropriate. However, when we were on remote coastlines of Atlantic Canada—often surrounded by the discards of working boats and fish farms and other coastal debris too numerous to count—the impact of our Leave No Trace practices seemed questionable.

Despite the seven neatly outlined principles, our experience was that Leave No Trace is an extremely subjective, personal, and place-specific code of ethics. It has everything to do with personal lifestyles and habits which, when operating as a team, means finding common ground and developing group norms. We can now report on five months of rigorous and usually comfortable adherence to Leave No Trace—a mature insight, tempered by difficult day-to-day choices and sometimes punctuated by silly paradoxes (*e.g.*, in Saint John, New Brunswick, driving 15 miles to empty our human waste systems in an appropriate pump-out station while approximately half of the city's sewage is discharged untreated into the harbour posed an interesting conundrum—we subsequently learned that sewage from the pump-out station does undergo primary treatment).

4. "Leave what you find." Flowers, rocks, marine organisms, historic shell middens, and any other naturally occuring object should be left in place for the enjoyment of future visitors.

5. "Minimize campfire impacts." Campfires leave ugly scars, such as this one, found on on a Nova Scotian shore. They pose a fire threat to fragile coastal ecosystems and require organic material that would be better left to decompose and recycle back into the natural system. Our team chose to kindle no fires.

6. "Respect wildlife" by maintaining a suitable distance from nesting or rafting seabirds, seals hauled out on ledges, and other animals. Using binoculars enables wildife viewing with minimal impact.

7. "Be considerate of others" by recognizing that many people use coastal areas for their work; stay out of the way both on the water and land (especially at launching ramps), as well as in working harbors.

Skills & Safety

Operational Planning & Decision Making

The Gulf of Maine Expedition was an ambitious sea kayaking journey of more than 1,200 nautical miles, much of it through waters considered challenging, occasionally even dangerous. Given our core mission, it was essential we not only complete the journey safely, but that we provide a model of safety that could serve as an example to others who set out to enjoy the Gulf of Maine, even if only in their own neighborhoods.

Safety does not happen by accident, the old adage goes. In fact, safety is far more than simply the absence of accidents or serious incidents: It is commitment to, and practice of, the disciplines of safety as much as a product of expert knowledge, skill, and judgment, honed through years of experience and tempered always by certain potential for real danger.

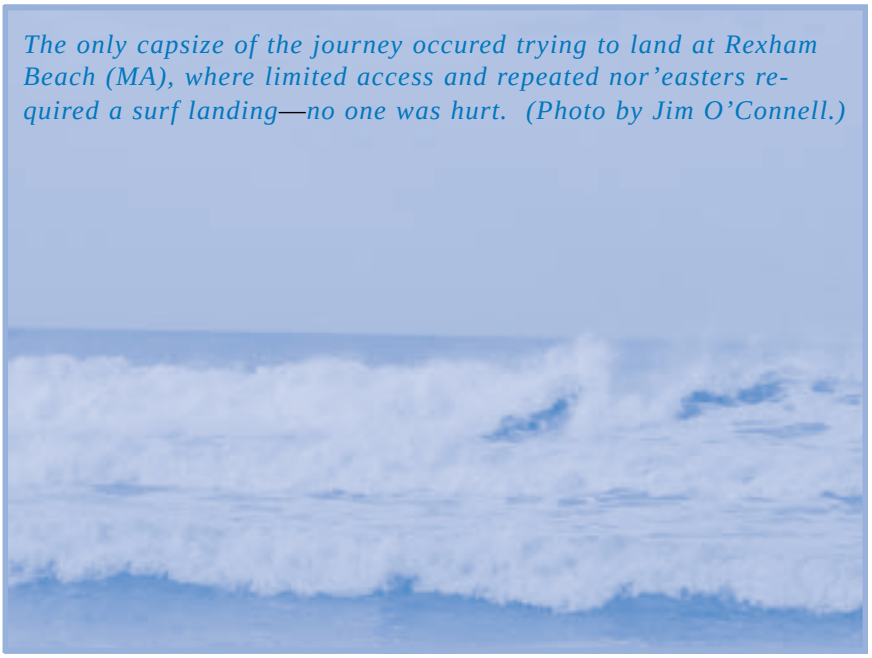
The Expedition was well equipped for the journey. We were seasoned paddlers who collectively brought decades of paddling and guiding experience, expert knowledge, and skills. Most importantly, all were naturally inclined to, and of a temperament for, excellent team planning and decision-making. The Expedition later discovered that these same disciplines closely paralleled the "best practices" of flight deck management from the world of professional flying, adopting a core principle as our unofficial motto of safe paddling:

Superior paddlers
exercise superior judgment
to avoid unnecessary tests
of their superior skills.

While safety does require excellent skills and preparation, it is ultimately more the result of effective management of human error through planning and implementation of operational routines that are error-resistant and error-tolerant; rigorous challenging of operational assumptions about the weather, winds, water conditions and the "state of the team;" and rigorous trapping, correction, and mitigation of errors before they can blossom into accidents.

Background photo: Muscongus Bay in stormy weather (the Expedition had approximately 15 weather days where we opted not to paddle). Clockwise from top: Walking a kayak through the surf line in zero-visibility fog along a rocky southern Maine beach; carrying heavy equipment as a team prevents back injuries; sea kayaking requires constant weather monitoring.

After five months on the water, we can report that the Expedition was equal to the challenge. We are able to reconfirm the wisdom of these core disciplines through both our successes and our occasional lapses. We successfully coped with several severe storms (including one very unseasonable snowstorm, two nor'easters, and two hurricanes); several infamous hazardous points and passages; long stretches of inhospitable coastlines, strong current, and tidal surges; and countless carries over hazardous rock- and seaweed-covered shores. Our most notable lapse resulted in a cold and frightening immersion in breaking surf on an exposed beach south of Boston, Massachusetts.



The only capsize of the journey occured trying to land at Rexham Beach (MA), where limited access and repeated nor'easters required a surf landing—no one was hurt. (Photo by Jim O'Connell.)

Several Core Safety Disciplines Merit Specific Mention:

• **Set and adhere to realistic goals that allow flexibility in dealing with challenges that may arise. Preserve adequate reserves of supplies and team endurance.** The Expedition was planned on a relatively modest paddling schedule—an average of 10 nautical miles per day—with built-in provision for weather days, rest days, and other down days between scheduled commitments. In addition, the Expedition committed and adhered to the principle to never sacrifice safety for expediency or schedule. By journey's end, we had aborted on four separate occasions, preferring to "shuttle" rather than "scuttle" when facing severe or unknown conditions in high-risk situations.

• **Stay together as a team . . . always.** The Expedition was planned and conducted as an interdependent team rather than independent individuals. Though individually capable and very well equipped for the challenges of the Expedition, we realized that we were far safer and more capable together than we could ever be separately, and we were always in a position to provide mutual assistance in the event of a mishap.

• **Set and adhere to firm bottom lines, beyond which the team would not continue.** Often one might venture into danger inadvertently simply by continuing on, expecting or hoping to make a few more miles before camping, or that conditions are improving, or a better landing may be just ahead, or the storm might "blow over." This discipline protects from impulsive decisions, usually made under operational stress and time pressures. This principle was put to a significant test on our last day of paddling, when the team aborted 4½ nautical miles short of our final destination due to the untimely arrival of Hurricane Isadore.

• **Gather and assess operational information (weather, navigation, water conditions, hazards, etc.) to achieve excellent situational awareness and active sharing of information to ensure all were in agreement and confident in our shared assessment.** As a basis for setting our goals and plans for the day ahead, the Expedition began and ended each day on the water by gathering and assessing operational information, listening to VHF marine weather reports and forecasts, and reviewing charts and notes, tides and currents. When possible, we would actively solicit local knowledge from mariners and other paddlers to better anticipate conditions, planning routes and timing to avoid trouble spots.

• **Develop synergistically and debug paddle plans and strategies, including planned alternatives for contingencies, and disciplined monitoring of the results.** It is in this discipline that one can find the most obvious confirmation that "many heads are better than one," as well as the most blatant examples that "many can go wrong faster than one." The former is consistently achieved by combining very interactive idea generation, very assertive testing and debugging of the plan, and careful monitoring of the plan after implementation.

• **Take time for an interactive briefing of paddle plans and strategies and for regular follow-up debriefing to review results and capture lessons learned for future use.** Having invested the time and energy to develop a good plan with thought-out contingencies, it is important to take the final step to conduct an interactive summary briefing, to ensure that all are clear on the details of the plan and their individual roles in accomplishing it. Later, it is important to take the time to debrief the experience, to critically review the outcome, both positive and negative aspects, and capture lessons learned for future use.

• **Pause, regroup, and cross-check with each other prior to critical tasks and challenges.** Once the team is in the midst of a challenging or critical task, it is too late to ensure that the team is ready for it and difficult or impossible to regroup, rethink, or redirect the team's planning. For this reason, the Expedition took a few moments prior to these challenges to check in with one another and to ensure that all were ready, that conditions were as expected, and that our plans still seemed right for the moment.

• **Plan and provide backups for all critical tasks and functions.** Most observers can easily and readily understand the need for backup gear, such as extra paddles, in the event of loss or damage. It is much less obvious, but equally important, to plan and provide backups for critical jobs or functions (*i.e.*, navigation, paying attention to weather and conditions, etc.). Of course, most team members enjoyed these tasks and took care to stay on top of things throughout the day. Still, it is critical to ensure that there is planned backup to these critical functions to guard against simultaneous "holidays" to enjoy the day, take note of the many beautiful sights, or abundant wildlife.

In summary, these disciplines, combined with thorough preparation and the experience, knowledge, skills, and judgment of the Expedition, resulted in a safe and accident-free journey.

Navigating in the fog is a never-ending process.

Safety Gear Carried by the Gulf of Maine Expedition Team

Each member of the Expedition carried a supply of safety equipment and was experienced in its use. Unless otherwise noted, each member of the team carried all the following:

Kayak, appropriate for conditions, with watertight bulkheads.
Clothing appropriate for conditions, including dry-suits; dry-tops; wet-suits; rain gear; hats for rain, sun, and cold; warm layers (fleece and other synthetics); paddling gloves and/or pogies (a type of paddling mitt); neoprene booties and/or sandals.
Life jacket (PFD or Personal Flotation Device) equipped with safety equipment: Whistle, emergency strobe, flares, signal mirror, energy food, and tow rope.
Spray skirt.
Paddle and **spare paddle.**
Paddle float.
Bilge pump.
Sponge.
Drinking water.
Snack/energy food.
Sun protection: Sun hat, sunscreen, lip protection, and sunglasses with safety strap (and spares).
Flares (each paddler carried at least 3).
Fog horn.
VHF marine radio.
Two-way radio.
Headlamp.
Deck compass.
Nautical charts.
Topographic maps (the Bay of Fundy has few nautical charts of a scale useful to kayakers).
Tide and current tables.
Handheld compass.
Multi-purpose repair tool.
Thermos.
Drybags for personal gear.
First aid kit (each paddler carried personal first aid items; two comprehensive kits were included among group gear).
Repair kit (each paddler carried some repair items; a comprehensive repair kit was included among group gear).
EPIRB (Emergency Position Indicator Radio Beacon was carried by one paddler).

Health and Medical Planning

The health and medical plan for the Gulf of Maine Expedition placed primary emphasis on preventative measures, with provisions made for response to illness or injury should they occur despite these precautions. Medical forms were completed and reviewed by each member of the Expedition.

The team recognized that our most recurrent and routine proactive health measures would consist of ensuring adequate and nourishing food and water, as well as careful attention to our personal hygiene. Food selection and preparation was heavily influenced by ensuring that we could safely store, carry, handle, and prepare our food in the challenging environmental conditions presented by the Expedition. Carrying adequate food supplies was relatively easy to accomplish. We were limited most often by ensuring adequate supplies of safe drinking water. Though we frequently camped at or near freshwater sources, we could not, and did not, assume that these water sources were clean and safe. Instead, we relied on known safe drinking water, estimating one gallon per person per day, with at least a one-day reserve supply at all times.

It was often impractical to bathe (beyond quick washing of "critical areas" of our bodies) between our town visits. As a result, our personal hygiene emphasized appropriate measures around food preparation and cleanup, bathroom functions, and routine dental hygiene. One Expedition sponsor provided an ample supply of *Sea Savon* soap, a biodegradable cleaning agent designed for use in saltwater. We used this agent, with very good results, for splash baths, handwashing prior to preparing food and eating, and for cleanup after eating. In addition, a diluted bleach solution was used as a sanitizing agent for kitchen cleanup, following a hot seawater wash and cold seawater rinse.

The Expedition used the SK Boombox, provided by GTS, Inc., as our human waste pack-out system. Each unit was shared between two or three users. Careful cleaning of the Boombox and one's body was essential after use. Following each use, the Boombox was carefully wiped down and surfaces were disinfected as necessary with a diluted bleach solution. Purell® hand sanitizer and baby wipes were used for immediate cleanup until a more thorough soap and water washing could be performed. Each team member was responsible for his or her own used toilet paper, kept in a sealed Ziploc® bag. These health and sanitation measures proved adequate, as there was zero instance of illness or other indications of improper food handling or personal hygiene.

Planning for the Expedition also included pre-trip medical checkups to ensure a healthy start, and evaluations of medical histories to ensure that we were properly prepared for any reasonable contingency, given the particular needs of the Expedition members.

Two compact medical kits were prepared specifically for the Expedition: A medical kit and a trauma kit. Both kits provided essential supplies for the treatment of common injuries and ailments. The kits were carried in different boats to provide backup in case of the loss of one. In addition to providing essential supplies for common injuries and ailments, the medical kits included additional supplies for the treatment of more serious problems. The medical kit included extra supplies for the treatment of illness, including medications. The trauma kit included supplies such as additional bandaging and emergency splinting materials.

Two members of the Expedition with medical histories of mild asthma and allergies carried two sets of appropriate medications: One set kept with the individual, and the other carried by another team member in a different boat to provide backup in case of mishap. All team members carried a small personal kit that included vitamins and routine medications of their choosing for minor aches and pains.

At the conclusion of the Expedition, an inventory of the medical kits showed that we used a few BAND-AIDS®, a substantial quantity of sun protection and sunburn preparations, and the tape and bandaging necessary to treat the Expedition's one noteworthy injury: A mild ankle sprain incurred while walking on an uneven path in Nova Scotia.

Sanitary cooking practices was step one for preventing illness on the Expedition.

Equipment & Food

Deciding what equipment, supplies, and personal items to bring on a five-month sea kayak expedition can be arduous. Adding a mission such as that of the Gulf of Maine Expedition adds another layer of requisite items. And meal planning takes on a whole new level for an extended journey such as this. So, what gear should be taken on such an expedition?

Weather is a key factor in planning. It is important to have appropriate clothing for the range of temperatures encountered, including water temperature. Shelter needs to be suitable and functional for such an extended endeavor. Ground pads and sleeping bags are equally important. A Moss Parawing tarp provided additional shade and rain protection.

The real limiting factor is space and the size of storage compartment hatches. Bow and stern hatches on all of our kayaks were fairly standard among today's sea kayaks. The large center hatch (18½" x 23" or 47cm x 58cm) offered by the tandem Necky Nootka Outfitter provided an opportunity to bring larger items, such as a Coleman two-burner stove and propane cylinder. It is critical to use every available space: Bow and stern compartments, the center hatch (in the case of the tandem sea kayak), decks, behind and beside seats, or strapped to a PFD. A modification was made to all kayaks so that gear could be stowed inside the cockpits hanging below the bow deck.

Food and Cooking

With a trip of this duration, we were not interested in pre-planning and pre-measuring each and every meal. Shopping for food was done much as we do at home: Grocery lists prepared and food bought for later menu decisions. We bought no freeze-dried foods. Grocery stores were readily accessible. We typically stocked two to three weeks worth of groceries in our sea kayaks. It was up to the cook to decide upon the meal. And anyone who was hungry could eat at any time.

All food was removed from original packaging, repackaged and labeled in Ziploc® bags (we learned not to purchase Ziploc® bags with "Easy zipper" as they fail under the rigors of an expedition) or NALGENE® bottles. Fresh foods such as fruit and vegetables were packed in mesh bags to avoid mold; and eggs were packed in plastic "egg safes"—available from many outfitters—and flipped daily to keep interior membranes moistened so they would not spoil.

Meals were generally cooked on a two-burner Coleman stove fueled by a four-pound propane tank. An MSR stove and two fuel bottles served as a backup. A four-quart Mountain Equipment Co-op pressure cooker sped cooking times for staples, such as pasta and rice, and required less water.

We developed a rotating schedule with two people responsible for dinner and the following breakfast. After cleanup from the evening's meal, the "kitchen" was packed away in the center hatch of the tandem kayak in order to discourage raids by nocturnal visitors. In the morning, after breakfast, lunch options such as breads, crackers, cheese, peanut butter, jam, salami, hummus, raw vegetables, fruit, and dessert, were packed in easily accessible deck bags.

Water was a limiting factor. The rule of thumb is one gallon of water per person per day. With the eight 2½-gallon water bladders we carried—which we took every advantage to refill—we could travel five days. The reality is that we used far less water than this.

Left: Provincetown, MA; Right: Gooseberry Cove, NB.

Technology

Technology played an important part in the Gulf of Maine Expedition. From our composite sea kayaks to our synthetic long underwear, from journals made of waterproof paper to Palm Pilots, from whistles to our Web site, every aspect of the Expedition relied on some modern technology. In this section, we focus on the electronic and imaging technologies used to advance our mission.

Electronic Technology

A 12-volt powerpack, regularly recharged by a small solar panel, allowed charging of batteries for cameras, cell phones, flashlights, and VHF radios.

A Dell Latitude C400 laptop computer and cellular modem allowed us to transmit images and text to webmaster Kirk Holbrook, who would then post the new content to the Gulf of Maine Expedition Web site (www.gomexpedition.org). One shortcoming of this system was the laptop's power requirements; it drew more power than could be recharged by our solar array. To conserve the laptop's batteries, we had three Palm Pilots and folding keyboards (these require only two AAA batteries which provide power for over 15 hours). Text was then transferred from the Palm Pilots to the laptop for uploading to the Web site.

Imaging Technology

The Expedition team had a combination of cameras. Among the team, we had four 35-mm cameras, one digital camera, and one digital video camera. Thousands of still images and 30 hours of video footage were captured during the Expedition.

The 35-mm cameras were all automatics, two were waterproof, two were not. All were shooting slidefilm. The waterproof cameras were a new Pentax Espio and an older Minolta Weathermatic. A Canon PowerShot S110 Digital ELPH was in a Canon AW-PS200 All Weather case. This rigid case eliminated the worry of water or salt spray getting into the electronics. The Canon Elura 20 Digital Video Recorder was in an EWA Marine waterproof camera bag.

It is important to know the physical limitations of the technology being used. For example, Dan and Sue found learned that the shutter mechanism slowly became stiffer and stiffer, eventually seizing altogether, on their waterproof Pentax Espio (which hung around one of their necks while paddling each day), . We later learned that an accumulation of dried salt interferred with the shutter mechanism. The solution was simply to rinse the camera with freshwater every day. The clear plastic waterproof housings of the digital camera and the digital video camera both served as greenhouses. The solution here was to keep the cameras out of direct sunlight whenever possible and to use moisture-absorbent silica gel packets. A solo sea kayak is not necessarily the best platform for shooting video footage: It is quite difficult to paddle and film simultaneously; however, the tandem sea kayak proved a much better platform, one person can paddle while the other is filming.

Clockwise from top: Sue using her Palm Pilot on an island in eastern ME; Dan using a cell phone, Advocate, NS; Natalie working on the laptop, Nahant, MA.

Budget

The budget for the Gulf of Maine Expedition was $170,142.88. In order to represent the actual cost of the Gulf of Maine Expedition, items provided by team members (*e.g.*, clothing, camping equipment, food) or in-kind donations (*e.g.*, space to conduct programs or slideshows) are included. By representing the actual cost of conducting the Gulf of Maine Expedition, we hope to serve as a guide for others interested in similar undertakings, in addition to meeting our fiduciary responsibilities to sponsors, supporters, and members.

Gulf of Maine Expedition Budget Summary:

	expenses	receipts	balance
Programmatic subtotals:			
Education, outreach & promotion	$24,449.98	$24,449.98	$0.00
Electronics & imaging technology	9,642.00	9,642.00	0.00
Science equipment	1,390.00	1,390.00	0.00
Equipment subtotals:			
Safety equipment	4,138.50	4,138.50	0.00
Navigation tools	3,342.00	3,342.00	0.00
Kayaks	9,950.00	9,950.00	0.00
Paddling equipment	5,088.00	5,088.00	0.00
Paddling clothing	7,070.00	7,070.00	0.00
Camping gear	2,932.00	2,932.00	0.00
Human Resource subtotals:			
Salaries, stipends, and overhead	80,750.00	80,750.00	0.00
Support	6,500.00	6,500.00	0.00
Food & kitchen items	14,890.00	14,890.00	0.00
TOTALS:	$170,142.88	$170,142.88	$0.00

Receipts:

	receipts
Membership	$971.40
Donations from individuals & businesses (US)	$7,637.00
Donations from individuals & businesses (CA)	$300.00
Contributed products	$14,802.38
Grants	$52,200.00
In-kind donations	$13,575.00
In-kind provided by Expedition members	$80,657.10
TOTAL:	$170,142.88

(All figures are in U.S. dollars.)

Travelogue

From the Gulf of Maine Expedition's May 4th launching in Provincetown, Massachusetts, to its September 28th conclusion at Clark's Harbour, Nova Scotia, we traveled through the Gulf of Maine for 148 days. Due to the nature of our journey—having a schedule to follow; sometimes needing permission to camp on private lands; being weather-bound; having to slow down in order to time our arrival in communities; setting an example of safety—we had to forego completing a day's paddle on three occasions. There were other times when we would paddle ahead, then have to be shuttled back to an event (Maine) or be shuttled ahead to an event, then return to continue paddling (Nova Scotia).

North Shore, MA

The following timeline provides an overview of our journey. Unless indicated otherwise, entries with a beginning and ending location indicate paddling days. Out of consideration to private landowners, we have set a policy of not specifically naming those camping sites.

May 4th – Provincetown, MA, to Bound Brook I. (Cape Cod National Seashore, CCNS)
May 5th – CCNS to Wellfleet Bay Wildlife Sanctuary (WBWS)
May 6th – WBWS to Brewster (Cape Cod Museum of Natural History, CCMNH)
May 7th – CCMNH to Barnstable
May 8th – layover in Barnstable
May 9th – Barnstable to Scusset Beach State Park
May 10th – Scusset Beach State Park to Manomet Beach
May 11th – Manomet Beach to Saquish Head
May 12th-13th – weather days at Saquish Head
May 14th – Saquish Head to Rexham Beach
May 15th – Rexham Beach to Egypt Beach[1]
May 16th – Egypt Beach to Peddocks I.
May 17th – Peddocks I. to Thompson I.
May 18th – layover on Thompson I.; "Island Splash," our first Gulf of Maine Day, conducted in partnership with the Boston Harbor Islands National Park, was cancelled due to severe weather
May 19th – Thompson I. to Nahant
May 20th – Nahant to Childrens I.
May 21st – Childrens I. to Little River
May 22nd – Little River to Crane Beach
May 23rd – Crane Beach to Salisbury Beach State Park
May 24th – Salisbury Beach State Park, MA, to Rye, NH (Hoyt's Lodge)
May 25th-26th – layover at Hoyt's Lodge; Gulf of Maine Day at Sea Coast Science Center, Rye; programs included bird walk, kayak safety equipment demonstrations, and slideshow
May 27th – Rye, NH, to York, ME; presentation to Pat Coffey's and Maureen Goering's 2nd grade class at Coastal Ridge Elementary School
May 28th – York to Cape Neddick River
May 29th – Cape Neddick River to Drakes I.
May 30th – Drakes I. to Vaughn I.
May 31st – weather day on Vaugh I.
June 1st – Vaughn I. to Wood I.
June 2nd – Wood I. to Richmond I.
June 3rd – Richmond I. to Jewell I.
June 4th – Jewell I. to Hermit Island Campground (HIC)
June 5th-6th – weather days at HIC
June 7th-9th – 1st L.L. Bean Paddlesports Show in Biddeford; we offered an exhibit and two slideshows
June 10th – HIC to Boothbay Harbor (Gray's Homestead Campground, GHC); slideshow at Department of Marine Resources Aquarium
June 11th-12th – weather days at GHC
June 13th – GHC to Black I.
June 14th – Black I. to Burnt I.
June 15th-16th – weather days on Burnt I.

[1] *Due to a combination of surf conditions and our schedule, we were shuttled from Rexham Beach to Egypt Beach.*

June 17th – Burnt I. to South Thomaston (Lobster Buoy Campground, LBC)
June 18th – LBC to Monroe I.
June 19th – layover on Monroe I.
June 20th – Monroe I. to Lincolnville
June 21st – shuttle back to Portland
June 22nd – Rippleffect Kayak Rendezvous; this was a series of educational events, run by Rippleffect and Maine Audubon, which included a day-paddle to Cow Island
June 23rd – Gulf of Maine Day at Southern Maine Technical College, Portland; programs included a kayak safety equipment demonstration and slideshow
June 24th – shuttle to Searsport Shores Campground
June 25th – Maine Sea Grant educational event at Searsport Shores Campground; workshops and presentations by several Maine Sea Grant staff and colleagues; Expedition programming included an on-the-water kayak safety workshop
June 26th – return to Lincolnville; paddle to Warren I.; Gulf of Maine Day at Warren I.; programs included a group paddle, bird walks, kayak safety and science equipment demonstrations, and slideshow
June 27th – Warren I. to Eagle I.
June 28th – Eagle I. to Buckle I.
June 29th – Buckle I. to Hen I.
June 30th – layover on Hen I.; slideshow at Swans I. Public Library
July 1st – Hen I. to Crow I.
July 2nd – Crow I. to Bar Harbor
July 3rd – Gulf of Maine Day in Bar Harbor; programs included intertidal zone and bird walks, navigation workshop, kayak safety demonstration, and slideshow
July 4th-8th – scheduled break in Bar Harbor
July 9th – Bar Harbor to Birch Harbor (Ocean Wood Campground, OWC)
July 10th – OWC to Bois Bubert I.
July 11th – Bois Bubert I. to Pomp I.
July 12th – Pomp I. to Jonesport (Henry Point Campground, HPC)
July 13th – HPC to Halifax I.
July 14th – Halifax I. to Cross I.
July 15th – weather day on Cross I.
July 16th – Cross I. to Moose Cove
July 17th – Moose Cove to Quoddy Head
July 18th – Quoddy Head to Eastport
July 19th – tour of salmon farm, Eastport
July 20th – Gulf of Maine Day at Washington County (Maine) Technical College, Eastport; programs included a bird walk, navigation workshop, phytoplankton identification, and slideshow
July 21st – Eastport, ME, to Deer I., NB
July 22nd – Deer I. to Pendleton I.
July 23rd – Pendleton I. to St. Andrews-by-the-Sea
July 24th – St. Andrews-by-the-Sea community event; slideshows at St. Andrews Biological Station and Sunbury Shores Arts and Nature Centre
July 25th – St. Andrews-by-the-Sea to Morans I.
July 26th – Morans I. to Orange Cove
July 27th – Orange Cove to Dipper Harbour
July 28th – Dipper Harbour to Gooseberry Cove
July 29th – layover at Gooseberry Cove
July 30th – Gooseberry Cove to Saint John (Irving Nature Park, INP)
July 31st – INP to Saint John
August 1st-2nd – layover in Saint John; slideshow; tour of Atlantic Canada Action Programme – Saint John project sites
August 3rd – Saint John to Beveridge Beach
August 4th – Beveridge Beach to East Head
August 5th – East Head to St. Martins
August 6th – weather day at St. Martins
August 7th – St. Martins to Cradle Brook
August 8th – Cradle Brook to Goose River

Paddlers head accross Penobscot Bay, ME, towards Warren Island, for a Gulf of Maine Day.

August 9th – Goose River to Alma (camping on the lawn of FreshAir Adventures)
August 10th-12th – layover and weather days at Alma; slideshow at Fundy National Park
August 13th – Alma, NB, to Refuge Cove, NS
August 14th – Refuge Cove to Huntington Point
August 15th-18th – layover at Huntington Point
August 16th – ceremony welcoming the Expedition to NS, the Honourable David Morse presiding
August 19th – Huntington Point to Bear Brook
August 20th – Bear Brook to Bishop Brook
August 21st – Bishop Brook to Keatings Sand Beach
August 22nd – layover at Keatings Sand Beach
August 23rd – Keatings Sand Beach to Hogan Brook
August 24th – Hogan Brook to Parkers Cove
August 25th – Parkers Cove to Charlies Brook
August 26th – Charlies Brook to McWhinnies Beach
August 27th – McWhinnies Beach to Bear I.
August 28th – Bear I. to Annapolis Royal
August 29th-30th – layover at Annapolis Royal; side trip to Brier Island to go on a whale-watch
August 31st – community event and slideshow, Annapolis Royal
September 1st – Annapolis Royal to House Cliff Cove
September 2nd – House Cliff Cove to Lower Shelburne Cove
September 3rd – Lower Shelburne Cove to Sandy Cove
September 4th – Sandy Cove to Whites Cove; community picnic
September 5th – Whites Cove to Long Pond Beach
September 6th – layover at Long Pond Beach
September 7th – Long Pond Beach to Belliveaus Cove
September 8th – community event and slideshow, Belliveaus Cove
September 9th – Belliveaus Cove to Meteghan River
September 10th – Meteghan River to Mavillette Beach
September 11th-12th – grounded by Hurricane Gustav at Mavillette Beach
September 12th-16th – weather days, slideshow, and presentations to local schools in Yarmouth
September 14th – ceremony welcoming the Expedition to Yarmouth, NS
September 15th – community event and slideshow at the Yarmouth Arts and Resource Center
September 16th – presentations at two Yarmouth area schools: Meadowfields Community School (5th and 6th grades) and Maple Grove Education Center (8th and 9th grades)
September 17th – Mavillette Beach to Goose Flats
September 18th – Goose Flats to Kelleys Cove
September 19th – Kelleys Cove to Owls Head I.
September 20th – layover on Owls Head I.
September 21st – Owls Head I. to Wilsons I.
September 22nd – Wilsons I. to McKinnon Neck
September 23rd – McKinnon Neck to Lower Argyle
September 24th – layover at Lower Argyle
September 25th – Lower Argyle to Johns I.
September 26th – layover on Johns I.
September 27th – Johns I. to Prospect Point[1] (Shag Harbour)
September 28th – Official Expedition end with ceremony and slideshow at Clark's Harbour, NS

[1] *Due to the deteriorating weather preceding Hurricane Isadore, we finished the paddling portion of our five-month journey four nautical miles from Clark's Harbour.*

Cape Sable Island, NS, marks the eastern edge of the Gulf of Maine. The island's town of Clark's Harbour gave the Expedition team a warm welcome at the end of the five-month journey.

What Comes Next?

The Gulf of Maine Expedition officially ended in Clark's Harbour, Nova Scotia, on September 28th, 2002. While that date marked the end of the paddling phase of the Expedition, there were still several months of post-Expedition activities. From then until publication of this report, team members gave 24 slideshows to a total audience of 1,115 people. Letters of thanks were written to many of our partners, sponsors, supporters, and members.

It is rewarding to evaluate the Gulf of Maine Expedition and see that we were successful in achieving our goals. How successful we were may best be captured by the comments of Bill Wallace, a Nova Scotian marine engineer we met first at Annapolis Royal, and then again on the water in the middle of St. Marys Bay. Bill said, "I can't explain how you have done it, but you [the Gulf of Maine Expedition] have changed the way I look at the Gulf of Maine."

Another rewarding acknowledgement of our efforts came on December 4th, 2002, when we were presented with a Special Recognition Award by the Gulf of Maine Council on the Marine Environment in Boston, Massachusetts. Each year, the Council presents two Visionary Awards to people from each of the three states and two provinces bordering the Gulf of Maine. They felt that the Gulf of Maine Expedition deserved an award, but that we did not fit into their categories, so they created a Special Recognition Award.

Continuing forward, the mission of the Gulf of Maine Expedition has been so well received that we have created two new organizations: the Gulf of Maine Expedition Institute, based in Bar Harbor, Maine, and the Gulf of Maine Expedition Association, based in Yarmouth, Nova Scotia. Both organizations will carry forward the mission of the Gulf of Maine Expedition.

2002
Gulf of Maine Council on the Marine Environment
Special Recognition Award

"Natalie Springuel and Rich MacDonald from Maine and Dan Earle and Sue Hutchins from Nova Scotia, set out in kayaks in early May with a mission: To educate the public about the ecological and cultural legacy of the Gulf of Maine and its interconnection to each and every resident living within its watershed. And educate they did. By the time the team paddled from Cape Cod to the southern tip of Nova Scotia some 1,200 miles later, they had spoken to thousands of individuals including grade school children, politicians, fishers and local residents through random encounters and scheduled presentations. The Gulf of Maine Council applauds the enthusiasm and endurance of this team that educated and inspired many along their journey. Their observations will live on as they create a permanent record of the current conditions of the Gulf, from journals of observations and interactions, photographs, and recorded weather and water conditions."

(Inscription on Special Recognition Award.)

Left: Sea kayak safety lesson, Searsport, ME. (Maine Sea Grant photo.)
Right: Welcoming ceremony by the Memorial Club, Yarmouth, NS.

Gulf of Maine Expedition Institute

The Gulf of Maine Expedition Institute will use expedition-based environmental education to teach and learn about the natural and cultural history of the Gulf of Maine. As the organization develops, it will offer programs in Massachusetts, New Hampshire, Maine, New Brunswick, and Nova Scotia. Educational programs will encompass the mission of the Gulf of Maine Expedition, using sea kayaks as a vehicle to experience the environment where learning opportunities will take place. The Gulf of Maine Expedition Institute will offer programming spanning all age groups, with a special focus on providing training for future expedition leaders and tour operators in the Gulf of Maine.

The Gulf of Maine Expedition Institute will become involved in issues facing the Gulf of Maine, linking partners, raising awareness about the natural history, and helping to interpret scientific research for the public. It will also continue observations of coastal access, shoreline conditions, and coastal debris. An early program will be developing a site-based monitoring program to develop baseline data on site integrity to aid in future management.

Gulf of Maine Expedition Association

The Gulf of Maine Expedition Association is incorporated and registered in Canada. The Association has a community-based educational and recreational orientation. Its specific objective is to actively support the Gulf of Maine Expedition 2002 mission, that is, to raise awareness and caring about the ecology and cultural legacy of the Gulf of Maine and to promote low-impact coastal recreational practices, safety, and stewardship principles.

The Association works toward development and funding of programs to support its mission through cooperation with sea kayaking outfitters; Gulf of Maine Institute; Gulf of Maine Expedition Institute; Highland Cove—A Centre for Canadian-American Cultural Communication; Tusket River Environmental Protection Association; and Southwest Paddlers Association; among others. While having an interest in all age groups, the primary target audience is teens and young adults.

Sponsors, Supporters & Members

The Gulf of Maine Expedition would not have been possible without the generous support of our sponsors, supporters, and members. ***Sponsors*** provided grants and/or equipment donations; S***upporters*** provided significant logistical assistance; and ***Members*** are individuals or businesses who made cash contributions ranging from $15 to $500. We would like to acknowledge these organizations and people. We have done our best to include everyone that should be listed here; however, any omission is an oversight on our part and should in no way be taken as intentional.

Sponsors

Maine Sea Grant
5715 Coburn Hall
University of Maine
Orono, ME 04469
207/581-1435
www.seagrant.umaine.edu

The mission of Maine Sea Grant is to play a leadership role in marine science and education and to promote their use in the development, management, and stewardship of marine and coastal resources. Maine Sea Grant provided the Expedition with grants, equipment, logistical and technical support, and paid the salary of Expedition Team Leader Natalie Springuel.

Maine Coastal Program
State Planning Office
38 State House Station
Augusta, ME 04333
207/287-3261
www.mainecoastalprogram.org

MCP is a partnership among local, regional, and state agencies, collaborating with many private organizations, undertaking or supporting projects that promote sustainable economic development, encourage environmental stewardship and education, conserve and manage marine fisheries, reduce coastal hazards, and improve public access. MCP provided the Expedition with a $7,000 grant and provided in-kind staff support.

Gulf of Maine Council on the Marine Environment
c/o NH DES
P.O. Box 95
Concord, NH 03302
603/796-2615
www.gulfofmaine.org

The Council fosters cooperative actions within the Gulf of Maine watershed to preserve our common heritage and encourage sustainable resource use for present and future generations. The Council provided the Expedition with a $5,000 grant.

New England Biolabs Foundation
32 Tozer Rd.
Beverly, MA 01915
978/927-2404
www.nebf.org

NEBF is an independent private foundation supporting grassroots organizations working with the environment, social change, the arts, elementary education, and science. NEBF provided the Expedition with a $5,000 grant.

Rippleffect
P.O. Box 441
Portland, ME 04112
207/791-7870
www.rippleffect.net

Rippleffect is a community-based youth development organization specializing in adventure and wilderness experiences that build confidence and self-esteem. Rippleffect provided leadership support and fiscal sponsorship, allowing the Expedition to apply for grants and equipment support.

Necky Kayaks
P.O. Box 5003
Ferndale, Washington
98248
866/632-5987
www.necky.com

Necky donated two Kevlar® *Looksha IV HV* sea kayaks.

Kokatat
5350 Ericson Way
Arcata, California 95521
800/225-9749
www.kokatat.com

Kokatat donated clothing, including GORE-TEX® dry-suits, paddling jackets, pants, and spray skirts.

Activa Performance Wear
1465 Kebet Way
Port Coquitlam, BC V3C 6G1
604/552-2930
www.norco.com/activa_02/index.htm
Activa Performance Wear donated bicycling gloves.

Adirondack Council
103 Hand Avenue, Suite 3
Elizabethtown, NY 12932
877/873-2240
www.adirondackcouncil.org
The Council donated a complete set of *Burrelle's Media Directory 2001*.

The Badd Sisters
RR #1
Holstein, ON N0G 2A0
519/323-1380
www.baddsisters.com
The Badd Sisters donated Ulta-Visors, headwear made from all-natural materials.

Cadillac Mountain Sports
26 Cottage Street
Bar Harbor, ME 04609
207/288-4532
www.cadillacsports.com
Cadillac Mountain Sports donated $300 and provided a substantial discount on Expedition-related gear purchases.

Chota Outdoor Gear
P.O. Box 31,137
Knoxville, TN 37930
865/690-1814
www.chotaoutdoorgear.com
Chota donated Mukluk footwear.

Eastern Mountain Sports
Cape Cod Center
1513 Iyanough Road
Hyannis, MA 02601
508/362-8690
www.ems.com
EMS donated a tent and assorted camping items to the Expedition.

GTS, Inc.
4037 E. English
Wichita, KS 67218
316/682-4037
www.eco-safe.net
GTS donated three Boomboxes, their 20-use human waste pack-out systems.

Imported Car Service
1552 State Highway 102
Bar Harbor, ME 04609
207/288-1013
importedcarsvc@acadia.net
ICS donated repairs to our Expedition support vehicle and a $500 grant.

L&N Signs
54 Hawthorne Street
Yarmouth, NS B5A 1M9
902/749-1500
www.chotaoutdoorgear.com
L&N donated a Gulf of Maine Expedition banner.

Maine Association of Sea Kayak Guides & Instructors
P.O. Box 705
Bar Harbor, ME 04609
207/942-0702
www.maineseakayakguides.com
MASKGI made a $500 grant to the Expedition, as well as provided logistical and technical support.

Maine Island Trail Association
328 Main Street
Rockland, ME 04841
207/596-6456
www.mita.org
MITA donated five memberships to their organization which allowed us to camp at sites under their jurisdiction.

Mountain Equipment Co-op
1550 Granville Street
Halifax, NS B3J 1Z7
902/421-2667
www.mec.ca
MEC donated $700 (CDN) worth of equipment.

MTI Adventurewear
P.O. Box 890,178
East Weymouth, MA 02189
800/783-4684
www.mtiadventurewear.com
MTI donated an assortment of outerwear products to the Expedition.

Orion Safety Products
RR 6, Box 543
Peru, IN 46970
800/851-5260
www.orionsignals.com
Orion donated pyrotechnic signaling products.

Otter Products
316 S. Link Lane
Fort Collins, CO 80524
888/695-8820
www.otterbox.com
Otter Products donated an assortment of 14 waterproof containers.

Sea Savon
P.O. Box 22,580
Seattle, WA 98122
800/788-2049
www.seasavon.com
Sea Savon donated biodegradeable saltwater soap.

Swiss Herbal Remedies Ltd.
35 Leek Crescent
Richmond Hill, ON L4B 4C2
www.swissherbal.ca
Swiss Herbal Remedies donated an assortment of vitamins and supplements.

TD Friends of the Environment Foundation
TD Tower, 16th Floor
55 King Street West
Toronto, ON M5K 1A2
416/308-5047
www.fef.ca
TD Friends of the Environment Foundation provided the Expedition with a $200 (CDN) grant.

Tusket River Environmental Protection Association
P.O. Box 103
Tusket, NS B0W 3M0
www.trepa.com
TREPA provided the Expedition with a $200 (CDN) grant.

Daniel Webster College
20 University Drive
Nashua, NH 03063
www.dwc.edu
DWC provided a development grant which enabled participation by Expedition member Tom Teller.

Supporters

The following businesses and organizations provided the Expedition with a wide range of support. In parentheses following each listing is their location and a brief description of their support.

Atlantic Canada Action Programme – Saint John (see pages 23 and 44 for more information)

Boston Harbor Islands National Park (provided camping opportunities and helped coordinate our Boston Gulf of Maine Day, which was canceled due to weather)

Canadian Coast Guard (provided secure storage space for Expedition kayaks during our Saint John, NB, stay)

Cape Cod Museum of Natural History (Brewster, MA; provided a campsite on Cape Cod)

Cape Cod National Seashore (Wellfleet, MA; provided a critical campsite for the first night of the Expedition)

Charles Macdonald House of Centreville Society (Centreville, NS; provided several days of lodging at the Blue House in Huntington Point)

College of the Atlantic (Bar Harbor, ME; hosted our Bar Harbor Gulf of Maine Day)

East Charlotte Waterways (NB; provided Eco Badges® for our ozone monitoring; see page 23 for more information)

Eastern Outdoors (Dipper Harbour and Saint John, NB; provided a campsite and logistical assistance)

Essex County Greenbelt Association (Essex, MA; provided a campsite on the Little River; see page 22 for more information)

FreshAir Adventures provided logistical support (see also page 28 for more information)

Friends of Casco Bay (Portland, ME; sponsored Portland Gulf of Maine Day)

Fundy National Park (Alma, NB; hosted a slideshow)

Gulf of Maine Times (Annapolis Royal, NS; provided regular coverage in their publication)

Highland Cove Centre for Canadian-American Cultural Communication (Yarmouth, NS; helped coordinate events and provided lodging during our Yarmouth stay)

Hoyt's Lodge (Rye, NH; see page 26 for more information)

International Development Training Institute (Betheseda, MD; provided significant guidance during the planning phase of the Expedition)

Irving Nature Park (Saint John, NB; provided a campsite)

L.L. Bean Paddlesports Festival (Biddeford Pool, ME; provided exhibit space and lodging during their Paddlesports show)

Maine Office of Tourism (Augusta, ME; arranged for a freelance writer to travel with the Expedition)

Maine Shore Stewards (coastwide, ME; sponsored Searsport Gulf of Maine Day; provided phytoplankton monitoring equipment and support)

Municipalité de Clare Tourism (Belleveaus Cove, NS; provided a campsite and coordinated our Belleveaus Cove events)

St. Croix International Waterway Commission (St. Andrews-by-the-Sea, NB; see page 23 for more information)

Seacoast Science Center (Rye, NH; coordinated a Gulf of Maine Day)

Stop the Quarry (Whites Cove, NS; provided a potluck dinner and a picnic lunch)

The Nature Conservancy, Adirondack Chapter (Keene Valley, NY; provided guidance during the planning phase of the Expedition)

Thompson Island Outward Bound (Boston, MA; provided camping opportunities and helped coordinate our Boston Gulf of Maine Day, which was canceled due to weather)

Trustees of Reservations (Beverly, MA; provided a campsite on Crane Beach)

U.S. Coast Guard (provided guidance during the planning phase of the Expedition; provided escorts during the first day of the Expedition and again at Eastport, ME; provided regular check-ins and technical assistance throughout the U.S. portion of the Expedition)

U.S. Coast Guard Auxiliary (provided technical assistance throughout the U.S. portion of the Expedition)

U.S. Power Squadron (provided technical assistance throughout the U.S. portion of the Expedition)

University of Maine Cooperative Extension (Waldoboro, ME; sponsored our Searsport Gulf of Maine Day; provided phytoplankton monitoring equipment and support)

Wellfleet Bay Wildlife Sanctuary (South Wellfleet, MA; provided a campsite for the second night of the Expedition)

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Members

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Selected Gulf of Maine References

This report is drawn largely from the observations and interactions of the Gulf of Maine Expedition; however, reference to existing published material, materials that provide in-depth information on the Gulf of Maine, is inevitable. During the five-month Gulf of Maine Expedition, we relied upon an array of references—from natural history field guides to sea kayak guidebooks—that we carried in our sea kayaks. The following is a list of references we used in the compilation of this report: Texts that we felt might further enhance the reader's understanding of the Gulf of Maine or field guides and guidebooks that we carried with us.

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Selected Web sites for the Gulf of Maine

Gulf of Maine Aquarium: www.gma.org

Gulf of Maine Council on the Marine Environment: www.gulfofmaine.org

Gulf of Maine Ocean Observing System: www.gomoos.org

Maine Coastal Program: www.mainecoastalprogram.org

Maine Sea Grant Program: www.seagrant.umaine.edu

Snag on a Muscongus Bay, ME, island.

Appendix I – List of Flowering Plants of the Gulf of Maine

Common name	Latin name	habitat	MA	NH	ME	NB	NS
American Mountain Ash[a]	*Pyrus americana*	woodland			6/14		
Beach Pea[b]	*Lathyrus japonicus*	beach edge		5/25			
Beach Plum	*Prunus maritima*	back dunes	5/15				
Bearberry	*Arctostaphylos uva-ursi*	upland edge	5/6				
Beggar Ticks	*Bidens frondosa*	high beach					8/26
Birdsfoot Trefoil	*Lotus corniculata*	meadow					8/18
Bittersweet Nightshade	*Solanum dulcamara*	steep bank			7/3		
Black-eyed Susan	*Rudbeckia serotina*	field					8/15
Bluebell	*Capanula rotundiflora*	high beach terrace			7/10		
Bluets[c]	*Houstonia caerulea*	island meadow			7/10		
Blunt-leaved Sandwort	*Arenaria lateriflora*	beach edge			5/31		
Bunchberry	*Cornus canadensis*	woodland edge				7/22	
Bush Honeysuckle	*Diervilla lonicera*	woodland				7/27	
Butter-and-eggs	*Linaria vulgaris*	roadside				7/29	
Canada Mayflower	*Maiantheum canadensis*	woodland			6/16		
Canada Thistle	*Cirsium arvense*	roadside				7/29	
Caraway[c]	*Carum carvi*	field			6/14		
Chokeberry	*Pyrus* sp.	field			6/14		
Chokecherry	*Prunus virginiana*	upland edge			5/29		
Cleavers[d]	*Galium aparine*	high beach terrace			7/13		
Coltsfoot	*Tussilago farfara*	beach banks					8/20
Common Blue Violet	*Viola papilionacea*	woodland			6/13		
Common Blue-eyed Grass	*Sisyrinchium montanum*	woodland edge			6/19		
Common Burdock	*Arcticum minas*	wooded area					8/22
Common Dandelion[c]	*Taraxacum officinale*	field	5/16				
Common Evening Primrose	*Oenothera biennis*	roadside			7/17		
Common Mullein[d]	*Verbascum thapsus*	high beach terrace			7/10		
Common Plantain[c]	*Plantago major*	field	5/16				
Common St. Johnswort	*Hypericum preforatum*	field				7/21	
Corn Speedwell	*Veronica arvensis*	cliff edge			6/16		
Cow Parsnip[c]	*Heracleum maximum*	upland edge			6/13		
Creeping Wood Sorrel	*Oxalis cornuta*	beach edge			5/27		
Curled Dock	*Rumex crispus*	beach bank					8/18
Dock	*Rumex* spp.	roadside				8/12	
Dusty Miller (Beach Wormwood)	*Artemisia stelleriana*	dry beach top				8/8	
Dwarf Glasswort	*Salcornia bigelovii*	mainly beach			7/16		
Early Low Blueberry	*Vaccinium angustifolia*	meadow			7/10		
English Plantain	*Plantago lanceolata*	marsh edge	5/24				
Eyebright[d]	*Euphrasia americana*	high beach terrace			7/10		
Fall Dandelion	*Leontodon autumnalis*	meadow			7/13		
Field Hawkweed	*Hieracium pratense*	field			6/14		
Fireweed	*Eplilobilum angustifolium*	island meadow			7/13		
Flat-topped Aster	*Aster umbellatus*	woodland opening					8/22
Goldenrod	*Solidago* spp.	roadside				8/12	8/18
Gray Goldenrod	*Solidago nemoralis*	meadow					8/24
Hairy Solomon's Seal	*Polygonatum pubescens*	woodland			6/3		
Hedge Bindweed[d]	*Convolllvulus sepium*	high beach terrace			7/13		
Hedge Mustard	*Sisymbrium officinale*	field			5/27		
Hemp Nettle	*Galeopsis tetrahit*	rocky shelf				7/25	
Indian Mustard[d]	*Brassica juncea*	high beach terrace			7/13		
Iris	*Iris* spp.	woodland edge			6/20		
Japanese Barberry[e]	*Berberis thunbergii*	woodland			6/3		
Labrador Tea	*Ledum groenlandicum*	cliff edge				7/26	
Lance-leaved Goldenrod	*Solidago graminifolia*	meadow					8/25
Larger Blue Flag	*Iris versicolor*	high beach terrace			6/30		
Leafy Spurg	*Euphorbia esula*	back dunes		5/25			
Lesser Stichwort	*Stellaria graminea*	field			7/17		
Low Hop Clover	*Trifolium procumbens*	roadside				8/12	
Marsh Scullcap	*Scutellaria epilobiifolia*	pond shelf edge				7/26	
Meadowsweet	*Spiraea latifolia*	high beach terrace			7/9		
Morrow's Honeysuckle[f]	*Lonicera morrowi*	beach edge			5/27		
Mountain Cranberry	*Vaccinium vitis-idaea*	cliff edge			7/15		
Mouse Ear	*Hieracium pilosella*	field			6/14		
Multiflora Rose	*Rosa multiflora*	cliff edge			6/16		
Narrow-leaved Vetch	*Vicia angustifolia*	field			7/16		
One-flowered Pyrola	*Moneses uniflora*	woodland			6/27		

Common name	Latin name	habitat	MA	NH	ME	NB	NS
Orach	*Atriplex patula*	high beach			7/16		
Orange Hawkweed (Devil's Paintbrush)	*Hieracium aurantiacum*	field			6/26		
Oxeye Daisy	*Chrysanthemum leucanthemlum*	field			6/14		
Pasture Rose	*Rosa carolina*	field				7/22	
Pearly Everlasting	*Anaphalis margaritacea*	cliff base				8/4	
Pink Corydalis	*Corydalis sempervirens*	roadside				7/21	
Pink Lady's Slipper	*Cypripedium acaule*	woodland			6/11		
Poison Ivy[c]	*Rhus radicans*	beach edge			5/31		
Red Clover	*Trifolium pratense*	roadside			7/17		
Red-stemmed Plantain	*Plantain rugelii*	beach terrace			6/30		
Rugosa Rose[c]	*Rosa rugosa*	beach edge			5/27		
Sea Lungwort (Oysterleaf)[d]	*Mertensia maritima*	high beach terrace			7/12		
Sea Milkwort	*Glaux maritima*	rocky edge			6/4		
Sea Rocket[c]	*Cakile edentula*	beach edge			7/9		
Seaside Angelica[c]	*Coelopleurum lucidum*	beach edge			6/1		
Seaside Goldenrod	*Solidago sempervirens*	field					8/13
Seaside Plantain	*Plantago juncoides*	beach edge			5/31		
Selfheal	*Prunella vulgaria*	meadow			7/14		
Sheep Sorrel[c]	*Rumex acetosella*	field			6/14		
Shepherd's Purse	*Capsella bursa-pastoris*	field			6/16		
Shinleaf	*Pyrola elliptica*	woodland				7/21	
Silverweed	*Potentilla anserina*	marsh edge			5/31		
Slender Glasswort	*Salcornia europaea*	high beach				7/29	
Small Cranberry	*Vaccinium oxycoccos*	woodland edge				7/26	
Small White Aster	*Aster vimineus*	woodland opening					8/22
Smooth Rose	*Rosa blanda*	field				7/25	
Spotted Touch-me-not	*Impatiens capensis*	cliff base				8/4	
Starflower	*Trientalis borealis*	woodland			6/3		
Storksbill	*Erodium cicutarium*	cliff edge			6/16		
Tall Buttercup[c]	*Ranunculus acris*	field			6/26		
Tall Goldenrod	*Solidago altissima*	field					8/15
Tall Meadow Rue	*Thalictrum polygamum*	field				7/29	
Tall Rattlesnake Root	*Prenanthes trifoliata*	field				7/26	
Tyrol Knapweed	*Centaurea vochinensis*	field					8/15
Wild Carrot (Queen Anne's Lace)	*Daucus carota*	field					8/15
Wild Columbine	*Aquilegia canadensis*	field			6/2		
Wild Indigo	*Baptisia tintoria*	roadside					8/22
Wild Madder	*Galium mollugo*	field			7/17		
Wild Radish	*Raphanus raphanistrum*	high beach					8/28
Wild Red Raspberry[c]	*Rubus idaeus*	field			6/14		
White Clover[c]	*Trifolium repens*	field			5/23		
Wood Strawberry	*Fragonia vesca*	woodland edge			7/14		
Yellow Clintonia	*Clintonia borealis*	woodland			6/13		
Yellow Rattle	*Rhinanthus cristsa-galli*	high beach terrace			7/13		
Yarrow	*Achillia millefolium*	field			6/16		

[a] found on cliff edges of many islands
[b] found at almost all stops
[c] common
[d] found on rocky beaches
[e] related to human settlement
[f] non-native; invasive

Appendix II – List of Birds of the Gulf of Maine

Common name	Latin name	GOM	MA	NH	ME	NB	NS
Red-throated Loon	*Gavia stellata*	x	x	x	x	x	
Common Loon	*Gavia immer*	x	x	x	x	x	x
Horned Grebe	*Podiceps auritus*	x				x	
Greater Shearwater	*Puffinus gravis*	x					x
Sooty Shearwater	*Puffinus griseus*	x					x
Manx Shearwater	*Puffinus puffinus*	x					x
Wilson's Storm-Petrel	*Oceanites oceanicus*	x			x		x
Leach's Storm-Petrel	*Oceanodroma leucorhoa*	x			x		x
Northern Gannet	*Morus bassanus*	x	x		x		x
Double-crested Cormorant	*Phalacrocorax auritus*	x	x	x	x	x	x
Great Cormorant	*Phalacrocorax carbo*	x	x		x		x
American Bittern	*Botaurus lentiginosus*	x					x
Great Blue Heron	*Ardea herodias*	x	x	x	x	x	x
Great Egret	*Ardea alba*	x	x		x		x
Snowy Egret	*Egretta thula*	x	x		x		
Little Blue Heron	*Egretta caerulea*	x	x			x	
Black-crowned Night-Heron	*Nycticorax nycticorax*	x			x		
Glossy Ibis	*Plegadis falcinellus*	x			x		
Turkey Vulture	*Cathartes aura*	x	x	x	x		x
Canada Goose	*Branta canadensis*	x	x	x	x	x	x
Brant	*Branta bernicla*	x	x	x	x		x
Mute Swan	*Cygnus olor*	x	x	x	x		
American Black Duck	*Anas rubripes*	x	x	x	x	x	x
Mallard	*Anas platyrhynchos*	x	x	x	x	x	x
Blue-winged Teal	*Anas discors*	x					x
Green-winged Teal	*Anas crecca*	x					x
Common Eider	*Somateria mollissima*	x	x	x	x	x	x
Surf Scoter	*Melanitta perspicillata*	x	x	x	x		x
White-winged Scoter	*Melanitta fusca*	x	x	x	x	x	x
Black Scoter	*Melanitta nigra*	x	x		x		x
Long-tailed Duck	*Clangula hyemalis*	x	x				
Common Merganser	*Mergus merganser*	x	x				
Red-breasted Merganser	*Mergus serrator*	x	x	x	x	x	
Ruddy Duck	*Oxyura jamaicensis*	x				x	
Osprey	*Pandion haliaetus*	x	x		x	x	x
Bald Eagle	*Haliaeetus leucocephalus*	x			x	x	x
Northern Harrier	*Circus cyaneus*	x	x		x	x	x
Sharp-shinned Hawk	*Accipiter striatus*	x			x	x	x
Cooper's Hawk	*Accipiter cooperii*	x			x	x	x
Northern Goshawk	*Accipiter gentilis*	x				x	
Red-shouldered Hawk	*Buteo lineatus*	x					x
Broad-winged Hawk	*Buteo platypterus*	x			x	x	x
Red-tailed Hawk	*Buteo jamaicensis*	x			x	x	
American Kestrel	*Falco sparverius*	x	x		x		x
Merlin	*Falco columbarius*	x			x	x	x
Peregrine Falcon	*Falco peregrinus*	x			x	x	x
Ring-necked Pheasant	*Phasianus colchicus*	x	x				x
Ruffed Grouse	*Bonasa umbellus*	x			x		x
Wild Turkey	*Meleagris gallopavo*	x			x		
Northern Bobwhite	*Colinus virginianus*	x	x				
Black-bellied Plover	*Pluvialis squatarola*	x	x		x	x	x
American Golden-Plover	*Pluvialis dominica*	x	x		x	x	
Semipalmated Plover	*Charadrius semipalmatus*	x	x		x	x	x
Piping Plover	*Charadrius melodus*	x	x	x			
Killdeer	*Charadrius vociferus*	x	x	x	x	x	x
American Oystercatcher	*Haematopus palliatus*	x	x				
Greater Yellowlegs	*Tringa melanoleuca*	x	x	x	x	x	x
Lesser Yellowlegs	*Tringa flavipes*	x			x		
Willet	*Catoptrophorus semipalmatus*	x	x		x	x	x
Spotted Sandpiper	*Actitis macularia*	x	x	x	x	x	x
Whimbrel	*Numenius phaeopus*	x			x	x	x
Hudsonian Godwit	*Limosa haemastica*	x					x
Ruddy Turnstone	*Arenaria interpres*	x			x	x	x
Sanderling	*Calidris alba*	x	x			x	x
Semipalmated Sandpiper	*Calidris pusilla*	x	x	x	x	x	x
Least Sandpiper	*Calidris minutilla*	x	x	x	x	x	x

Common name	Latin name	GOM	MA	NH	ME	NB	NS
White-rumped Sandpiper	*Calidris fuscicollis*	x				x	x
Purple Sandpiper	*Calidris maritima*	x	x		x		
Short-billed Dowitcher	*Limnodromus griseus*	x				x	
Long-billed Dowitcher	*Limnodromus scolopaceus*	x			x		
American Woodcock	*Scolopax minor*	x	x	x			
Red-necked Phalarope	*Phalaropus lobatus*	x					x
Parasitic Jaeger	*Stercorarius parasiticus*	x				x	
Laughing Gull	*Larus atricilla*	x	x		x	x	
Black-headed Gull	*Larus ridibundus*	x			x		
Bonaparte's Gull	*Larus philadelphia*	x	x			x	
Ring-billed Gull	*Larus delawarensis*	x	x	x	x	x	
Herring Gull	*Larus argentatus*	x	x	x	x	x	x
Great Black-backed Gull	*Larus marinus*	x	x	x	x	x	x
Black-legged Kittiwake	*Rissa tridactyla*	x	x				
Caspian Tern	*Sterna caspia*	x	x				
Roseate Tern	*Sterna dougallii*	x			x		x
Common Tern	*Sterna hirundo*	x	x	x	x	x	x
Arctic Tern	*Sterna paradisaea*	x					x
Least Tern	*Sterna antillarum*	x	x	x	x		
Dovekie	*Alle alle*	x					x
Common Murre	*Uria aalge*	x				x	x
Razorbill	*Alca torda*	x			x		x
Black Guillemot	*Cepphus grylle*	x			x	x	x
Atlantic Puffin	*Fratercula arctica*	x			x		x
Rock Dove	*Columba livia*	x	x	x	x	x	x
Mourning Dove	*Zenaida macroura*	x	x	x	x	x	x
Eastern Screech-Owl	*Otus asio*	x					x
Great Horned Owl	*Bubo virginianus*	x	x				x
Barred Owl	*Strix varia*	x					x
Northern Saw-whet Owl	*Aegolius acadicus*	x			x		x
Common Nighthawk	*Chordeiles minor*	x			x		x
Chimney Swift	*Chaetura pelagica*	x	x	x	x		x
Ruby-throated Hummingbird	*Archilochus colubris*	x		x	x	x	x
Belted Kingfisher	*Ceryle alcyon*	x	x	x	x	x	x
Yellow-bellied Sapsucker	*Sphyrapicus varius*	x			x		
Downy Woodpecker	*Picoides pubescens*	x					x
Hairy Woodpecker	*Picoides villosus*	x			x	x	x
Northern Flicker	*Colaptes auratus*	x			x	x	x
Pileated Woodpecker	*Dryocopus pileatus*	x			x	x	
Eastern Wood-Pewee	*Contopus virens*	x	x	x	x		
Yellow-bellied Flycatcher	*Empidonax flaviventris*	x				x	x
Alder Flycatcher	*Empidonax alnorum*	x				x	
Least Flycatcher	*Empidonax minimus*	x			x	x	x
Eastern Phoebe	*Sayornis phoebe*	x	x	x	x	x	x
Great Crested Flycatcher	*Myiarchus crinitus*	x	x		x		
Eastern Kingbird	*Tyrannus tyrannus*	x			x		x
Blue-headed Vireo	*Vireo solitarius*	x	x		x	x	x
Warbling Vireo	*Vireo gilvus*	x			x		
Red-eyed Vireo	*Vireo olivaceus*	x		x	x		x
Blue Jay	*Cyanocitta cristata*	x	x	x	x	x	x
American Crow	*Corvus brachyrhynchos*	x	x	x	x	x	x
Fish Crow	*Corvus ossifragus*	x	x	x	x		
Common Raven	*Corvus corax*	x			x	x	x
Tree Swallow	*Tachycineta bicolor*	x	x	x	x	x	x
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	x			x	x	
Bank Swallow	*Riparia riparia*	x			x	x	
Cliff Swallow	*Petrochelidon pyrrhonota*	x			x	x	
Barn Swallow	*Hirundo rustica*	x	x	x	x	x	x
Black-capped Chickadee	*Poecile atricapilla*	x	x	x	x	x	x
Boreal Chickadee	*Poecile hudsonica*	x				x	x
Tufted Titmouse	*Baeolophus bicolor*	x	x		x		
Red-breasted Nuthatch	*Sitta canadensis*	x	x		x	x	x
White-breasted Nuthatch	*Sitta carolinensis*	x	x		x		
Brown Creeper	*Certhia americana*	x	x		x		
Carolina Wren	*Thryothorus ludovicianus*	x		x	x		
House Wren	*Troglodytes aedon*	x	x	x	x		
Winter Wren	*Troglodytes troglodytes*	x			x	x	
Golden-crowned Kinglet	*Regulus satrapa*	x			x	x	x
Ruby-crowned Kinglet	*Regulus calendula*	x			x		
Blue-gray Gnatcatcher	*Polioptila caerulea*	x					x

Common name	Latin name	GOM	MA	NH	ME	NB	NS
Eastern Bluebird	*Sialia sialis*	x					x
Veery	*Catharus fuscescens*	x			x		
Bicknell's Thrush	*Catharus bicknelli*	x	x				
Swainson's Thrush	*Catharus ustulatus*	x			x	x	x
Hermit Thrush	*Catharus guttatus*	x			x	x	
Wood Thrush	*Hylocichla mustelina*	x	x		x		x
American Robin	*Turdus migratorius*	x	x	x	x	x	x
Gray Catbird	*Dumetella carolinensis*	x	x	x	x	x	x
Northern Mockingbird	*Mimus polyglottos*	x	x	x	x	x	x
Brown Thrasher	*Toxostoma rufum*	x			x		
European Starling	*Sturnus vulgaris*	x	x	x	x	x	x
Cedar Waxwing	*Bombycilla cedrorum*	x		x	x	x	x
Tennessee Warbler	*Vermivora peregrina*	x					x
Nashville Warbler	*Vermivora ruficapilla*	x			x	x	x
Northern Parula	*Parula americana*	x	x	x	x	x	x
Yellow Warbler	*Dendroica petechia*	x	x	x	x	x	x
Chestnut-sided Warbler	*Dendroica pensylvanica*	x		x			
Magnolia Warbler	*Dendroica magnolia*	x		x	x		x
Cape May Warbler	*Dendroica tigrina*	x					x
Black-throated Blue Warbler	*Dendroica caerulescens*	x	x	x	x	x	
Yellow-rumped Warbler	*Dendroica coronata*	x	x	x	x	x	x
Black-throated Green Warbler	*Dendroica virens*	x	x		x	x	x
Blackburnian Warbler	*Dendroica fusca*	x					x
Pine Warbler	*Dendroica pinus*	x			x	x	
Palm Warbler	*Dendroica palmarum*	x			x		x
Bay-breasted Warbler	*Dendroica castanea*	x					x
Blackpoll Warbler	*Dendroica striata*	x			x		x
Black-and-white Warbler	*Mniotilta varia*	x				x	x
American Redstart	*Setophaga ruticilla*	x					x
Ovenbird	*Seiurus aurocapillus*	x	x		x		
Northern Waterthrush	*Seiurus noveboracensis*	x	x		x		
Mourning Warbler	*Oporornis philadelphia*	x	x		x		
Common Yellowthroat	*Geothlypis trichas*	x	x	x	x	x	x
Canada Warbler	*Wilsonia canadensis*	x			x	x	
Scarlet Tanager	*Piranga olivacea*	x			x		
Eastern Towhee	*Pipilo erythrophthalmus*	x	x				
Chipping Sparrow	*Spizella passerina*	x			x		x
Savannah Sparrow	*Passerculus sandwichensis*	x	x		x	x	
Grasshopper Sparrow	*Ammodramus savannarum*	x			x		x
Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	x				x	
Saltmarsh Sharp-tailed Sparrow	*Ammodramus caudacutus*	x	x				
Seaside Sparrow	*Ammodramus maritimus*	x	x				
Fox Sparrow	*Passerella iliaca*	x	x				
Song Sparrow	*Melospiza melodia*	x	x	x	x	x	x
Swamp Sparrow	*Melospiza georgiana*	x			x		
White-throated Sparrow	*Zonotrichia albicollis*	x	x		x	x	x
Dark-eyed Junco	*Junco hyemalis*	x			x	x	x
Northern Cardinal	*Cardinalis cardinalis*	x	x	x	x		x
Bobolink	*Dolichonyx oryzivorus*	x	x		x		
Red-winged Blackbird	*Agelaius phoeniceus*	x	x	x	x		x
Rusty Blackbird	*Euphagus carolinus*	x					x
Common Grackle	*Quiscalus quiscula*	x	x	x	x		x
Brown-headed Cowbird	*Molothrus ater*	x	x	x	x		
Orchard Oriole	*Icterus spurius*	x	x				
Baltimore Oriole	*Icterus galbula*	x	x	x	x		
Purple Finch	*Carpodacus purpureus*	x			x		x
House Finch	*Carpodacus mexicanus*	x	x	x	x		
Red Crossbill	*Loxia curvirostra*	x					x
White-winged Crossbill	*Loxia leucoptera*	x					x
Pine Siskin	*Carduelis pinus*	x			x		x
American Goldfinch	*Carduelis tristis*	x	x	x	x	x	x
Evening Grosbeak	*Coccothraustes vespertinus*	x	x				x
House Sparrow	*Passer domesticus*	x	x	x	x	x	x
totals:		**199**	**103**	**63**	**142**	**95**	**127**

Appendix III – Daily Ozone Measurements

date	location	ozone (ppb)	temperature
04-May-02	Provincetown, MA	60	60
08-May-02	Barnstable Harbor, MA	120	60
09-May-02	Scusstt Beach State Park, MA	120	55
11-May-02	Manomet Beach, MA	220	60
15-May-02	Egypt Beach, MA	120	58
16-May-02	Peddocks Island, MA	120	65
19-May-02	Nahant, MA	120	65
20-May-02	Children's Island, MA	80	65
23-May-02	Salisbury Beach State Park, MA	160	68
25-May-02	Rye, NH	160	62
28-May-02	Cape Neddick River, ME	80	65
30-May-02	Vaughn Island, ME	20	65
01-Jun-02	Wood Island, ME	200	75
03-Jun-02	Jewell Island, ME	40	67
04-Jun-02	Hermit I. Campground, ME	40	61
13-Jun-02	Black Island, ME	120	58
18-Jun-02	Monroe Island, ME	20	63
30-Jun-02	Swans Island, ME	20	73
04-Jul-02	Bar Harbor, ME	120	82
10-Jul-02	Bois Bubert Island, ME	160	82
11-Jul-02	Pomp Island, ME	80	75
13-Jul-02	Halifax Island, ME	40	72
14-Jul-02	Cross Island, ME	20	68
17-Jul-02	Quoddy Head, ME	40	70
20-Jul-02	Eastport, ME	20	75
21-Jul-02	Deer Island, NB	20	78
24-Jul-02	St. Andrews, NB	160	80
26-Jul-02	Orange Cove, NB	120	75
30-Jul-02	Irving Nature Park, NB	80	76
01-Aug-02	Saint John, NB	100	82
06-Aug-02	St. Martins, NB	100	72
10-Aug-02	Alma, NB	120	76
14-Aug-02	Huntington Point, NS	20	82
21-Aug-02	Keatings Sand Beach, NS	40	70
27-Aug-02	Bear Island, NS	40	72
30-Aug-02	Annapolis Royal, NS	40	78
02-Sep-02	Lower Shelburne Cove, NS	20	78
04-Sep-02	Whites Cove, NS	20	76
06-Sep-02	Long Pond Beach, NS	20	75
17-Sep-02	Goose Flats, NS	120	65
18-Sep-02	Kelleys Cove, NS	80	65
19-Sep-02	Owls Head Island, NS	80	65
21-Sep-02	Wilsons Island, NS	80	70

Appendix IV – Coastal Debris Data

The Gulf of Maine Expedition conducted 39 coastal debris surveys producing the following results.

	US items observed	CA items observed	Total items observed
SHORELINE/RECREATIONAL ACTIVITIES	**155**	**527†**	**682†**
bags/food wrappers	18	74†	92†
balloons	14	15	29
beverage bottles (plastic), 2-liters or less	58	165†	223†
beverage bottles (glass)	2	19	21
beverage cans	13	44	57
caps, lids	6	66	72
clothing, cloth	7	22	29
cups, plates, forks, spoons, knives	10	44	54
diapers	0	0	0
fast-food containers	3	8	11
other food containers	0	27	27
6-pack holders	0	1	1
pull tabs	0	0	0
shotgun shells/wadding	20	36†	56†
straws, stirrers	0	1	1
toys	4	3	7
propane canister	0	2	2
OCEAN/WATERWAY ACTIVITIES	**521†**	**1,473†**	**1,994†**
bait containers/packaging	20	46	66
bleach/cleaner bottles	7	114	121
buoys/floats	326	123	449
crab/lobster/fish traps	103	71	174
crates	6	104	110
fishing line	0	35	35
fishing lures	0	0	0
fishing nets	0	18	18
light bulbs/tubes	0	0	0
oil/lube bottles	14	122	136
pallets	5	9	14
plastic sheeting/tarps	3	30	33
rope	30†	208†	238†
strapping bands	3	170†	173†
aquaculture pens/parts of pens	0	10	10
bottles/aerosol cans, aquacultural/fisheries	0	7	7
feed bags and other packaging	0	81	81
gloves, rubber	2	16	18
lobster claw rubber bands	0	92†	92†
milled lumber	0†	43†	43†
pieces of foam	0	83†	83†
pieces of plastic	0	63†	63†
5-gal. plastic buckets/lids	2	28	30

	US items observed	CA items observed	Total items observed
SMOKING-RELATED ACTIVITIES	**0**	**8**	**8**
cigarettes/cigarette filters	0	0	0
cigarette lighters	0	8	8
cigar tips	0	0	0
tobacco packaging/wrappers	0	0	0
DUMPING ACTIVITIES	**6**	**44†**	**50†**
appliances (refrigerators, washers, etc.)	0	1	1
batteries	0	0	0
cars/car parts	0	1	1
construction materials, large (>100 lbs.)	1	8†	9†
construction materials, small (<100 lbs.)	0	22	22
55-gal. drums	2	3	5
tires	3	9	12
MEDICAL/PERSONAL HYGIENE	**1**	**5**	**6**
syringes	0	0	0
condoms	0	0	0
tampons/tampon applicators	0	4	4
other medical/hygiene bottles	1	1	2
DEBRIS ITEMS OF LOCAL CONCERN	**0**	**1†**	**1†**
fire pits	0	1	1
ATV tracks	0	0†	0†
MISC. DEBRIS ITEMS	**1**	**20**	**21**
coat hangers	0	1	1
garden hoses	1	0	1
hockey sticks	0	1	1
life jackets (PFD)	0	1	1
paint cans/caulking tubes	0	8	8
paper/cardboard	0	5	5
rugs	0	1	1
shovels	0	1	1
telephone wire	0	1	1
wooden wire spools	0	1	1
TOTALS:	**684†**	**2,078†**	**2,762†**

†*Tallies are higher than reported. For each of these flagged observed values, there was at least one location that had so many debris items for this category that it was impractical to count. In cases where the flagged value is 0, every location where items in this category were found had too much debris to count.*

Appendix V – Media Coverage

During the past year, the Gulf of Maine Expedition garnered a tremendous amount of media coverage. Radio coverage included the Canadian Broadcast Corporation, Maine Public Radio, and WERU (Maine). TV and Internet coverage spanned the Expedition. And the Expedition appeared in over 30 different publications as well, some repeatedly. The following is a list of our print coverage.

- *Atlantic Coastal Kayaker*[1]. September 2001, pp. 31-32. "The Gulf of Maine Expedition."
- *The Semaphore*[2]. January/February 2002, p. 3. "Operation GOMEX."
- *Canoe Kayak Nova Scotia*[3]. February 2002, pp. 3 and 14. "Gulf of Maine Expedition: Cape Cod to Cape Sable ~ 200[2]."
- *The Semaphore*. March/April 2002, p. 3. "Operation GOMEX – departure nears," by Natalie Springuel.
- *The Coastal Society Bulletin*[4]. **24**(2): 7. "Sea kayaking for stewardship and safety in the Gulf of Maine."
- *The Bar Harbor (Maine) Times*. April 18, 2002, p. B5. "1,000-mile kayak expedition to teach about Gulf of Maine," by Laurie Schreiber.
- *Gulf of Maine Times*[5]. Spring 2002, p. 4. "Gulf-wide kayaking expedition to launch May 1," by Lee Bumsted.
- *Gulf Stream Newsletter*[6]. Spring/summer 2002. pp. 1-3.
- *Adirondack Sports & Fitness*[7]. May 2002, p. 4. "Gulf of Maine Expedition 2002."
- *Cape Cod (Massachusetts) Times*. May 3, 2002, p. C2. "Five-month, 1,000-mile Gulf of Maine trek starts tomorrow," by John Leaning.
- *Portland (Maine) Press Herald*. May 4, 2002, p. B1. "Team to paddle 1,000 miles for science," by John Richardson.
- *Shunpiking: Nova Scotia's Discovery Magazine*. May 8, 2002, p. 25. "Gulf-wide kayaking expedition launched," by Lee Bumstead.
- *Provincetown (Massachusetts) Banner*. May 9, 2002, p. 14. "Kayak expedition launches at West End," by Sue Harrison.
- *Portsmouth (New Hampshire) Herald*. May 25, 2002, p. A3. "Team aims for five months, 1,000 miles by kayak," by Jesse J. DeConto.
- *Gulf of Maine Times*. Summer, 2002, p. 10. "Gulf log."
- *The Island Trail*[8]. Summer 2002, p. 20. "MITA schedule: Gulf of Maine Presentation."
- *Boothbay (Maine) Register*. June 6, 2002, Sec. II, p. 7. "Gulf of Maine Expedition presentation."
- *Portland (Maine) Press Herald*. June 6, 2002, p. B1. "Kayakers cruise Maine coast on voyage of a thousand miles," by Ted Cohen.
- *(Kennebunk, Maine) Tourist News*. June 6, 2002, p. 20. "Gulf of Maine Expedition will go ashore in Biddeford Pool on June 7," by Caroline Fitzgerald.
- *The (Brunswick, Maine) Times Record*. June 21, 2002, p. 18. "Coastal kayak expedition seeks to document and educate," by Scott Andrews.
- *The Bar Harbor (Maine) Times*. June 27, 2002, p. B5. "Thousand-mile kayakers to host Gulf of Maine Day."
- *Mount Desert (Maine) Islander*. June 27, 2002, p. 5. "Kayak explorers."

- *The (Belfast, Maine) Waldo Independent*. June 27, 2002, p. 14. [Photo spread]
- *Atlantic Coastal Kayaker*. July 2002. [Cover photo]
- *Paddler Magazine*. July/August 2002, p. 28. "Gulf of Maine Expedition."
- *Mount Desert (Maine) Islander*. July 4, 2002, p. 6. "Being a mindful kayaker," by Charlie Lyons.
- *The Bar Harbor (Maine) Times*. July 11, 2002, pp. A1 (photo) and B1 (article). "Paddle-happy kayakers share journey," by Laurie Schreiber.
- *Quoddy Tides (Eastport, Maine, and St. Stephen, New Brunswick)*. July 12, 2002, p. 8. "Kayak expedition to give presentations."
- *Bangor (Maine) Daily News*. July 22, 2002, p. B3. "Gulf expedition kayakers off to St. Andrews," by Diana Graettinger.
- *New Brunswick Telegraph-Journal*. July 24, 2002, p. A5. "'Round the gulf kayakers land in New Brunswick," by Chuck Brown.
- *(St. Stephen, New Brunswick) Courier Weekend*. July 26, 2002, p. 1. "Gulf of Maine Expedition arrives," by Barb Rayner.
- *(Eastport, Maine, and St. Stephen, New Brunswick) Quoddy Tides*. July 26, 2002, p. 11. "Gulf of Maine kayakers visit in Eastport," by Edward French.
- *Saint John (New Brunswick) Telegraph-Journal*. August 1, 2002, p. A3. "Kayakers bring environmental message to Saint John," by Michael Caissie.
- *The (Kentville, Nova Scotia) Regional*. August 27, 2002, pp. 1 and 12. "Gulf of Maine expedition to visit Annapolis Royal," by Katie Tinker.
- *Westford (Massachusetts) Eagle*. August 29, 2002, pp. 1 and 11. "The journey is the reward," by Sonia Sharigan.
- *The (Kentville, Nova Scotia) Advertiser*. August 30, 2002, p. 7. [Two photos]
- *Gulf of Maine Times*. Autumn 2002, pp. 1 and 8. "Gulf of Maine Expedition: The final stretch," by Lee Bumsted.
- *The Island Trail*. Fall 2002, pp. 1 and 6-7. "Logs from the Gulf of Maine," by Natalie Springuel.
- *The Island Trail*. Fall 2002, p. 20. "MITA schedule: Gulf of Maine Expedition presentation."
- *The (Halifax, Nova Scotia) Sunday Herald*. September 1, 2002, p. A4. "Gulf of Maine kayakers paddle with a mission," by Ian Fairclough.
- *The Digby (Nova Scotia) Courier*. September 11, 2002, p. 1. "Kayakers raising awareness of Bay," by Jeff Sunderland.
- *The Yarmouth (Nova Scotia) Vanguard*. September 13, 2002, p. 2. "Gulf of Maine Expedition arriving this weekend," by Andrea Rondeau.
- *The (Shelburne, Nova Scotia) Coast Guard*. September 24, 2002, p. 6A. "Sea kayak expedition ending in Clark's Harbour," by Kathy Johnson.
- *Le Courrier de la (Pointe-de-l'Église) Nouvelle-Écosse*. September 27, 2002, p. 2. "L'Expédition du Golfe du Maine 2002," by Annie Serrano.
- *The (Shelburne, Nova Scotia) Coast Guard*. October 1, 2002, p. 1. [Cover photo by Kathy Johnson]
- *The (Shelburne, Nova Scotia) Coast Guard*. October 8, 2002, p. 20. "Gulf of Maine Expedition: Observations their legacy," by Kathy Johnson.
- *The Bar Harbor (Maine) Times*. October 24, 2002, p. B4. "Bridging the gulf," by Laurie Schreiber.

- *(Belfast, Maine) Northern Sky News*. November 2002, p. 2. "Northern notes," by Murray Carpenter.
- *Gulf of Maine Times*. Winter 2002, pp. 1 and 6-7. "Wind, rain and tides aside, kayakers' journey eased by apple pies and common concerns," by Andi Rierden.
- *The Ellsworth (Maine) Eagle*. December 5, 2002, sec. II, pp. 4-5. "Gulf expedition explores past, present and future," by Craig Crosby.
- *Mount Desert (Maine) Islander*. December 5, 2002, pp. 1 and 6. "Explorers see Gulf past, present and future," by Craig Crosby.
- *Bangor (Maine) Daily News*. December 14-15, 2002, p. D6. "Planning therapeutic for kayaker," by Jeff Strout.
- *Maine Coastline*[9]. Winter 2003, p. 3. "View from the water: reflections from the Gulf of Maine Expedition."
- *Soundings*[10]. January 2003, p. 8. "Kayakers spend five months exploring," by JoAnn W. Goddard.
- *The Yarmouth (Nova Scotia) Vanguard*. February 25, 2003, p. 2. "Gulf of Maine Awards to be presented."
- *The Island Trail*. Spring 2003, p. 1 and 7-8. "Logs from the Gulf of Maine. Part II: Bay of Fundy," by Natalie Springuel.

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[1] *Atlantic Coastal Kayaker* is a regional paddlesports magazine publishing 10 monthly issues March through December. For more information, visit their Web site at www.shore.net/~ack.

[2] *The Semaphore* is the newsletter of Southern Maine Division 2 U.S. Coast Guard Auxiliary. For more information, write SO-PB 2, P.O. Box 809, Raymond, ME 04071.

[3] *Canoe Kayak Nova Scotia* is the name of the organization and their newsletter. For more information, write P.O. Box 3010 Park Lane Centre, Halifax, NS B3J 3G6, or visit their Web site at www.ckns.ca.

[4] *The Coastal Society Bulletin* is the newsletter of The Coastal Society. For more information, write P.O. Box 25408, Alexandria, VA 22313, or visit their Web site at www.thecoastalsociety.org.

[5] *Gulf of Maine Times* is a publication of the Gulf of Maine Council on the Marine Environment. For more information, visit their Web site at www.gulfofmaine.org.

[6] *Gulf Stream Newsletter* is the newsletter of the Gulf of Maine Marine Educators Association. This 20-page issue is devoted to the Gulf of Maine and the Gulf of Maine Expedition. For more information, visit their Web site at www.gommea.org.

[7] *Adirondack Sports & Fitness* is a regional monthly publication covering outdoor sports and adventure in northern New York State. For more information, visit their Web site at www.adksportsfitness.com.

[8] *The Island Trail* is the newsletter of the Maine Island Trail Association. For more information, visit their Web site at www.mita.org.

[9] *Maine Coastline* is the newsletter of the Maine Coastal Program. For more information, visit their Web site at www.mainecoastalprogram.org.

[10] *Soundings* is "The Nation's boating newspaper." For more information, visit their Web site at www.soundingsonline.com, or call 860/767-3200.

Team Biographies

As the Expedition's Team Leader, **Natalie Springuel** (Bar Harbor, Maine) was "on the clock" as a coastal community development extension associate for Maine Sea Grant, where her focus is sustainable nature-based tourism. She has been a registered Maine Recreation and Sea Kayak Guide since 1991, has served as president of the Maine Association of Sea Kayak Guides and Instructors, and in 2001 coordinated the inaugural Maine Coast Seminar (an educational program for sea kayak guides and outdoor educators). In 1996, Natalie paddled 10 weeks and 850 miles around Nova Scotia studying recreational impact on coastal ecosystems. A Wilderness First Responder, Natalie is contributing editor for *Paddler Magazine* and *Shunpiking, Nova Scotia's Discovery Magazine*. Natalie is a graduate of College of the Atlantic and Antioch New England Graduate School.

Richard MacDonald (Bar Harbor, Maine), a long-time resident of New York's Adirondack Mountains, came to the Expedition with a background in natural sciences, hence his role as science & technology coordinator. Since 1986, he has studied acid rain, ornithology, and ecology in the Adirondacks. In 1999, he co-founded the Lake Champlain Sea Kayak Institute at Plattsburgh State University and serves as one of the lead instructors. A paddler since childhood, Rich discovered kayaking in 1982, and has been a New York State Licensed Guide since 1987. He regularly writes about environmental and ecological issues, ornithology, and sea kayaking. Rich is a graduate of Plattsburgh State University of New York.

Dan Earle (Yarmouth, Nova Scotia) is a retired professor of landscape architecture from Louisiana State University. He has also been a design consultant with a sustainable design and permaculture focus. Dan now lives in Yarmouth, Nova Scotia, with wife and Expedition member Sue Hutchins, where they restored an 1860s farmhouse. Dan is active on the boards of the Tusket River Environmental Protection Association and the Gulf of Maine Institute. He has 50 years of paddling experience, 10 of those in sea kayaks. Dan has a B.S./M.L.A. in Landscape Architecture and a Ph.D. in Marine Sciences focusing on coastal zone management.

Sue Hutchins (Yarmouth, Nova Scotia) is a retired high school business teacher from Toronto now living in Yarmouth, Nova Scotia. Sue has diverse experiences as a Canadian outdoor educator, paddler (she has kayaked in Greenland, Scotland, Maine, the Great Lakes, and Florida), spelunker (she has caved in Hungary, Wales, New Mexico, and West Virginia), and world traveler (recent trips include Scotland, Africa, Thailand, Nepal, and Tibet). Sue is also an avid photographer.

Tom Teller (Westford, Massachusetts) is a professor of aeronautics at Daniel Webster College in New Hampshire, Tom is a Renaissance man with degrees in both Aero and Human Factors Engineering, as well as Theology. He has a strong medical background as a Massachusetts EMTB and Wilderness EMT. An "aging Boy Scout" and scout leader for more than 10 years, he is the 2nd of three generations of Eagle Scouts and has led numerous paddling expeditions on wilderness rivers.

Bob DeForrest (Bar Harbor, Maine) was the Expedition's education & outreach coordinator, thanks largely to a grant from New England Biolabs Foundation. A Registered Maine Guide with over 10 years experience, Bob has led trips in Maine and Baja California, and has studied birds in the Gulf of Maine and Hawaii. Last winter he spent four months in New Zealand traveling and working on organic farms. Bob has recently joined the staff of Maine Coast Heritage Trust in Somesville, Maine.

Amy Minarik (Brunswick, Maine) came to us from the Maine Coastal Program, at the State Planning Office in Augusta, where she was an Americorps volunteer. MCP donated 10 hours per week of her time to help with press relations, serve as a point-of-contact, and to develop a database of media contacts from throughout the Gulf of Maine. Originally from Texas, Amy graduated from Rutgers University with a degree in International Environmental Studies, concentrating on wildlife conservation and environmental sustainability.

Back cover photo: Dipper Harbour, New Brunswick.