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Damariscotta River Estuary: a Management Plan

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Damariscotta River Estuary Project

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Damariscotta River Estuary: A Management Plan



Sustaining the Estuary's Resources through Cooperation and Education

Damariscotta River Estuary Project

December 1995

Table of Contents

Vision Statement	1
Introduction	4
The Damariscotta River Watershed	8
Management Recommendations	12
References	41
Appendix A: Overview of Local Comprehensive Plans	Appendix-1
Appendix B: Public Opinion Survey	Appendix-4
Appendix C: Damariscotta River Estuary Access Sites	Appendix-6
Appendix D: Estuarine Habitat Classifications	Appendix-8
Appendix E: Soft-shell Clam Data	Appendix-10
Appendix F: Natural Plant Communities of the Damariscotta River Watershed	Appendix-12
Appendix G: Overboard Discharges	Appendix-16
Appendix H: Damariscotta River Association Damariscotta River Bird/Wildlife Survey	Appendix-17
Appendix I: Islands of the Damariscotta Region	Appendix-22
Appendix J: Geographical Information System (GIS): Databases and Map Information	Appendix-24
Appendix K: Economic Indicators of the Damariscotta River Estuary	Appendix-25
Appendix L: Census Data from Estuary Towns	Appendix-26

Acknowledgements

This report is the result of two years of effort by the Steering Committee of the Damariscotta River Estuary Project. Committee members over the course of the project included Andy Abello (Edgecomb), Alan Bellows (Boothbay), AJ Campbell (Boothbay), Ken Coombs (Bristol), Regina Davey (Nobleboro), Nick Dean (Edgecomb), George Freeman (Damariscotta), Chris Gistis (Edgecomb), Don Holmes (Newcastle), George Parker (Damariscotta), Don Piersol, (Newcastle), Bob Pratt (Lincoln County Planning Office), Bob McLaughlin (South Bristol), Ed Myers (Walpole), Fred & Stephanie Nelson (Edgecomb), Pete Noyes (Damariscotta River Association), Dan Schick (Newcastle), Barb Scully (Edgecomb), Toni Simmons (Waldoboro), Arthur Webster (Boothbay Region Land Trust), and Philip Wright (Newcastle). We especially thank the persistent core of Steering Committee members who stuck with the project from beginning to end.

Many area residents contributed to the project, among them: Ron Aho, Tom Arter, Bob Brown, Paul Bryant, Sam Chapman, Dick Cline, Lucy Craib, Chris Davis, George Dow, Chris Gistis, Bruce Hartford, Bill House, Paul Joyce, Dawn Kidd, Peter Knauss, Bernie McAlice, Terry Mitchell, Bill Mook, Carter Newell, Steve Nichols, Ralph Norwood, Don Stanley, Mark Stover, Barbara Tudor, Les Watling, and Dale Wright. Many others also contributed.

This report was written collaboratively by Fran Rudoff and Jenny Ruffing of the Maine State Planning Office and Tom Ford of the Damariscotta River Estuary Project. The majority of the photographs were taken by Tom Arter of South Bristol with additional photography provided by Tom Ford and Pictorial Studio of Newcastle. Layout assistance was provided by Nancy Terrell Hall of Moonlighter Graphics, Bremen.

Financial assistance for this report was provided by the Coastal Management Program of the Maine State Planning Office through funding from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of Ocean & Coastal Resources Management, under the Coastal Zone Management Act of 1972 as amended.

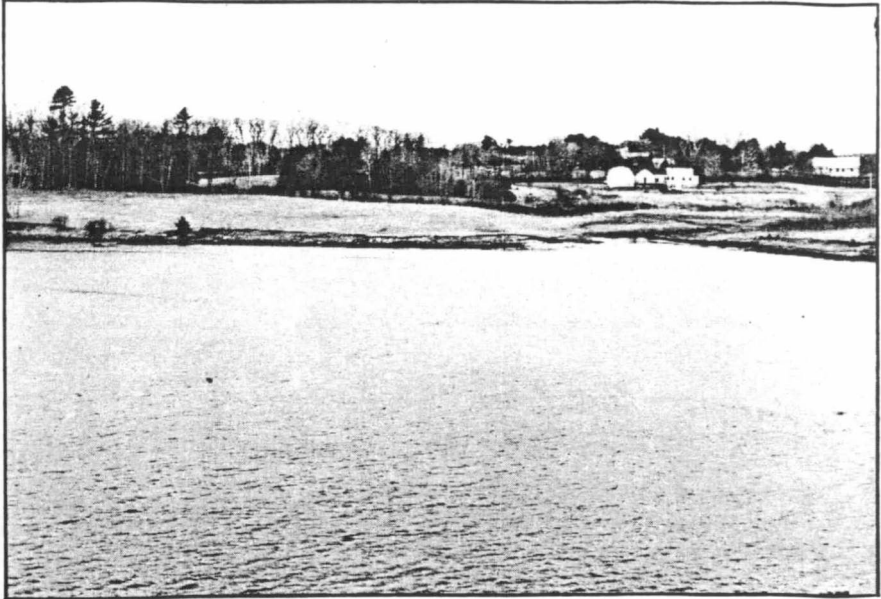
Vision Statement

Compiled from public comments received during meetings held in the summer of 1994.

Great Salt Bay

(Head of Tide at Damariscotta Mills to Damariscotta/Newcastle Village Bridge)

In the year 2000, the landscape around the Great Salt Bay will be very much like it is today, with open fields, a densely settled village area at Damariscotta Mills, and sparse residential development along the remainder of the shore. Walking and bicycle trails will allow safe travel along the bay shores and into Damariscotta/

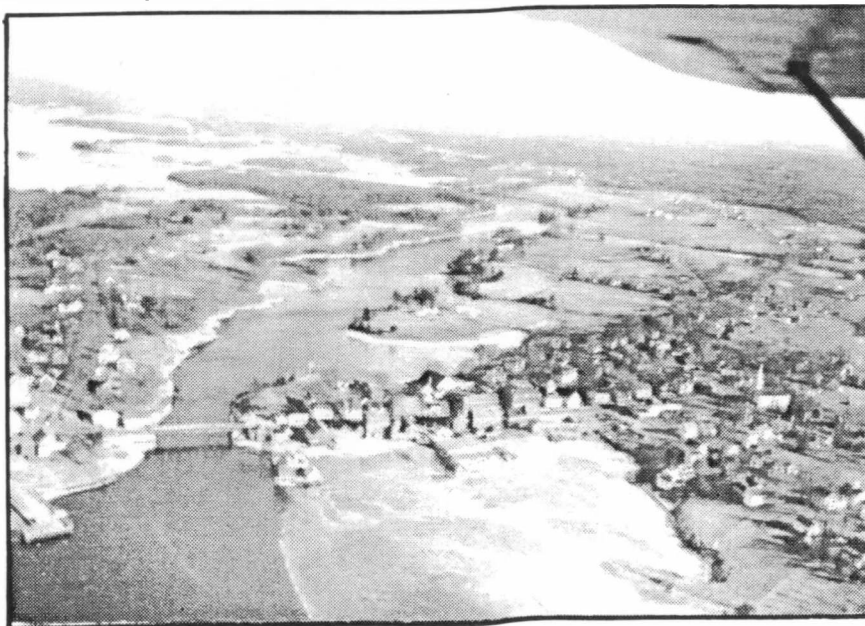


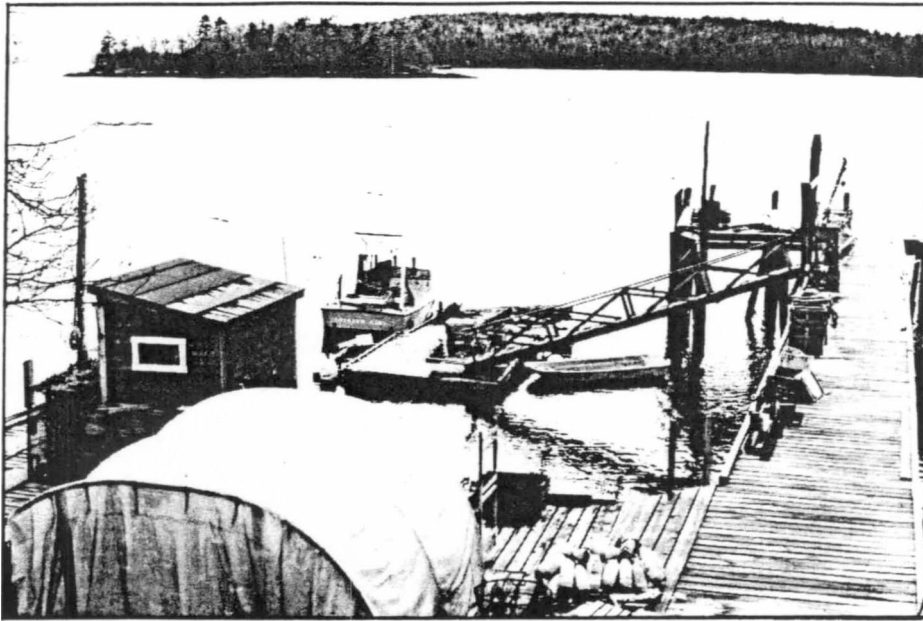
Newcastle. Water quality in the bay will continue to improve allowing the harvest and culture of shellfish. The alewife fishery will be restored to historical levels and alewives, smelt and eel will be harvested on a sustainable basis.

Damariscotta/Newcastle Village Area

(Main Street Bridge to Days Cove)

In the year 2000, the Damariscotta/Newcastle village area will continue to be a commercial hub for the area. A pedestrian/bicycle route will connect the village area with Damariscotta Mills, conservation areas along the river, nearby schools and shopping districts. The scenic vistas down river will remain as they are today, and a riverside park will attract residents and visitors to the commercial district. Alternative parking arrangements will allow easy access to downtown businesses and the public launching area.





Middle River

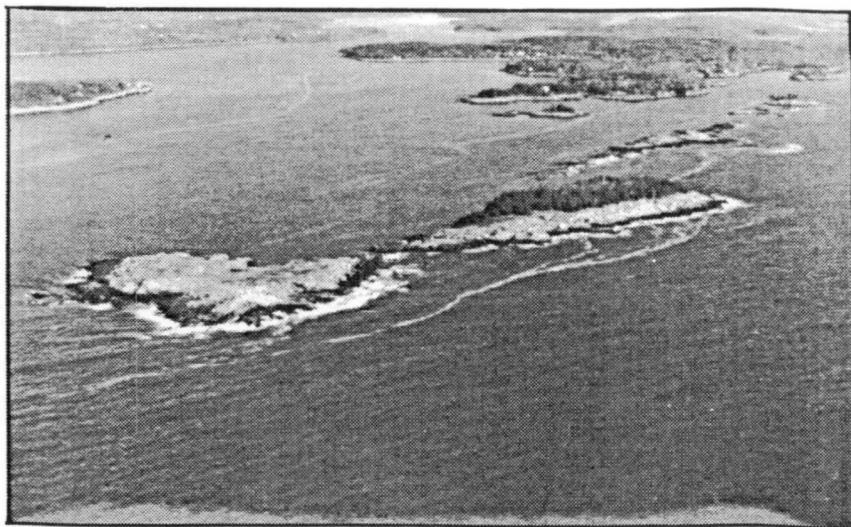
(Days Cove to Fort Island)

In the year 2000, the middle section of the river will support a balance of commercial fishing, aquaculture, marine research and recreational activities. The river and watershed will continue to be a place characterized by clean water & exceptional biodiversity, scenic beauty and low density settlement.

Outer River

(Fort Island to the Damariscove Island)

In the year 2000, the outer river will have improved harbor and access facilities in East Boothbay and South Bristol villages which support thriving commercial fishery and aquaculture industries. The islands will continue to provide refuge for nesting seabirds, wildlife and summer visitors. Residential and commercial development will occur in less environmentally sensitive areas. The character of the villages and scenic beauty of the area will continue to attract seasonal visitors.



DAMARISCOTTA RIVER ESTUARY PROJECT

Study Area



Produced by: Damariscove Island
Maine Mapping
Damariscotta, ME 04543
(207)563-1558
Sept. 1995 overv2

Introduction

Centuries ago, the Abenaki people called the river ‘damariscotta’, meaning ‘an abundance of fishes.’ Today, the river continues to support a variety of wild commercial fisheries and is the center of a thriving shellfish aquaculture industry. Hundreds of local people make their living directly or indirectly from resources harvested from the river. This harvest provides millions of dollars to the local economy.

The 1970’s and 80’s brought a new wave of growth and development to this special region of Maine’s coast. Unlike earlier patterns of land use — with homes and businesses in small village centers surrounded by farms and scattered development along roads — residential subdivisions along shorefronts or on former farmland became more common.

In the lower Damariscotta River watershed, from Damariscotta Mills to the ocean, there were approximately 106 major subdivisions initiated from 1980 to 1992, increasing the number of land parcels by 34 percent. U.S. Census figures show that 1,639 new housing units were added from 1980 to 1990 in the seven estuary communities of Boothbay, Bristol, Damariscotta, Edgecomb, Newcastle, Nobleboro and South Bristol (see table below). Despite a

temporary downturn in the economy, most communities project growth rates of between ten percent and fifteen percent over the current decade.

In light of these changes, local citizens have asked important questions about the estuary’s future:

- How does new development impact the river’s high water quality?
- Are important nursery grounds for fish and other wildlife and plant habitats being altered or destroyed?
- Is the river becoming more crowded, with increasing conflicts between commercial and recreational users?
- Are traditional public access sites being lost to private development?
- Will the river continue as the economic backbone of the region?

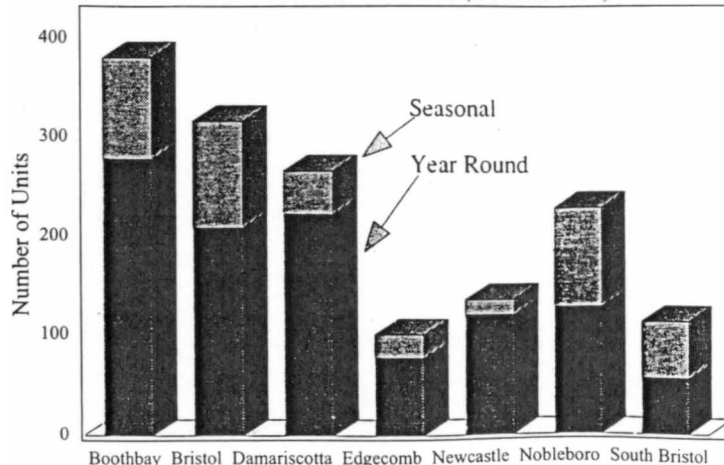
One purpose of the Damariscotta River Estuary Project has been to ask and answer these and other questions. A second and equally important purpose of the Project has been to help the seven estuary communities improve communication and the ability to coordinate land and water use decisions to ensure the future good health of the estuary’s resources.



Ed Myers, aquaculturist and writer, South Bristol. *“Preserving water quality for every species is the lifeblood of the estuary. Human effort must concentrate on that preservation. That is the quintessential task before us.”*

New Housing Units Built in Damariscotta River Estuary Towns (1980-1990)

Source: U.S. Census Data, (Benson, 1993)



The Damariscotta River Estuary Project

At the State level, too, there was growing concern in the mid-1980s about the impact of Maine's development boom. Amid cries about the loss of rural character and strip development, the need to control rising property taxes and the inability of towns to cover the costs of municipal services, Maine's Growth Management Program was enacted by the legislature in 1988. The Program offers funding to municipalities for preparing and implementing local comprehensive plans according to ten state goals. To date, all but one of the seven estuary communities have received state funds to develop comprehensive plans and several have moved into the Program's second phase and are working on land use ordinances and other implementation projects.

To supplement these local planning initiatives, the Maine Coastal Program of the State Planning Office, was awarded a federal grant from the National Oceanic and Atmospheric Administration to look at ways of encouraging towns to work together to improve the management of shared coastal resources, such as estuaries. The intent of this new "regional" approach was to look at the natural resource issues and growth pressures facing an estuary as a whole, pulling together and building on information and goals already contained in individual comprehensive plans. (See Appendix A for summary of river-related goals in town comprehensive plans.)

Estuary

An estuary is a semi-enclosed body of water, connected to the sea, and measurably diluted by freshwater. A place where fresh and salt waters meet.

Watershed

A watershed includes all lands that drain into a lake, river, estuary or other water body. The Damariscotta River Estuary Watershed includes all the lands that eventually drain into Damariscotta Lake as well as all the lands that drain into the Damariscotta River.

The Damariscotta River Estuary was selected as the site for a pilot project for a number of reasons: local municipal officials expressed an interest and commitment to participate in the project; evidence of public concern about the resource was demonstrated by strong membership in local land trusts; the estuary watershed was a relatively small geographic area including a manageable number of towns; most of the towns had or were about to complete comprehensive plans; and, most important, the Damariscotta River Estuary was considered to have significant marine resource value and contribute substantially to the local economy.

In the fall of 1992, representatives from the seven towns, local land trusts, individuals who relied on the river for their livelihood, and other interested citizens formed a Steering Committee for the Damariscotta River Estuary Project. The Damariscotta River Association agreed to provide grant administration services for the Project.

An early effort of the group was to develop a list of major issues and concerns to be addressed by the Project. Generally, these areas included water quality, fisheries conservation, important natural resource areas, public access and harbor management, and overall growth and shoreland development patterns. An informal public survey was also conducted through local newspapers and towns to find out what issues were most pressing to local citizens. (See Appendix B for a summary of survey results.)

Developing a mission statement and defining the geographic scope of the project were also important tasks for the Steering Committee. After much discussion, it was decided to limit the project initially to the seven towns bordering the estuarine portion of the river's watershed, since land use practices in the upper watershed around Damariscotta Lake have a significantly greater impact on the lake's water quality than on the tidal portion of the river. With this scope in mind, the Steering Committee approved the following mission statement in February, 1993:

MISSION STATEMENT

The Goals of the Damariscotta River Estuary Project

- To encourage cooperation on resource concerns among the citizens of the seven towns within the Damariscotta River Estuary watershed.
- To reach agreement on the use of the Damariscotta River resources so that the River continues to contribute to the local economy and improve the quality of life in the area for years to come.

The Damariscotta River Estuary Project accomplished the above goals by:

- Supporting efforts to inventory and monitor the natural systems of the estuary watershed.
- Identifying threats to water quality, health of the fisheries and other natural systems.
- Developing, along with people and their town governments, recommendations for regional land and water management that sustain the use and promote thoughtful stewardship of the River and watershed.
- Educating the regional community to balance conservation with natural resource use and encourage public participation in all aspects of the project.

The work of the Estuary Project began in earnest during the spring of 1993. The Steering Committee hired Tom Ford as the project coordinator and established an office on Main Street in Damariscotta. A project work plan was developed around the major issue areas noted above. One of the first priorities was to complete natural resource and land use characterizations and demographic/economic profiles of the estuary watershed (see next page for a list of completed studies) and to assemble a computerized database of land and water use information which could be displayed on maps.

Numerous public education activities sought to increase awareness of the river's resources: boat trips, forums on fisheries, and educational programs sponsored in area schools were among the events sponsored by the Project. Specific projects were also undertaken — expanding water quality monitoring of the river; training local officials on the use of Best Management Practices to control runoff and soil erosion; addressing trash issues associated with winter smelting on Great Salt Bay; and initiating studies to remove malfunctioning septic tanks near the outfall of Damariscotta Lake.

Management recommendations for the Damariscotta River estuary were developed during the fall of 1994 and spring of 1995. Regional public meetings were held around the estuary to present the findings of the characterization studies and solicit ideas for ways of addressing current and future problems. Representatives from the seven municipal planning boards also met several times to figure out how they could communicate more effectively and coordinate planning activities.

* * * * *

What follows in this document is a summary of what is known about the estuary's natural resources and their economic value as well as a series of recommendations for future management of these precious resources.

The Steering Committee and staff of the Damariscotta River Estuary Project offer the ideas contained in this plan to serve as an important guide for subsequent activities of the seven municipalities, area land trusts, schools, and other organizations and individuals.

***Characterization Studies completed by the
Damariscotta River Estuary Project***

- Demographics of the Damariscotta River Estuary Towns
Preliminary Data from US Census Files, Compiled by the Maine State Planning
Office, November 1993
- Trend Analysis Project, Changes in Land Use and Growth Patterns from 1980-1992,
B. Pratt, Lincoln County Planning Office, October 1993
- Damariscotta River Habitats: A Field and Literature Study,
A Report to the Damariscotta River Estuary Project, S. Chaves, L. Watling and B.
McAlice, April, 1994
- The Damariscotta River Estuary: What is it Worth?
An estimate of the economic value of marine-related activities associated with the
Damariscotta River Estuary. R. Bertaska, May 1994
- Damariscotta River Smelt Survey
S. Chapman, May 1994
- Damariscotta River Bird/Wildlife Survey
Damariscotta River Association, November 1994
- The Damariscotta River Estuary: What is it Worth? An Analysis of Property Values
D. Rowland, August 1994
- The Damariscotta River Estuary Project: Upland Characterization,
J. Weber and S. Rooney, November 1994
- Upland Characterization Forest Study
W. Armstrong, March 1995
- Management Recommendations for the Damariscotta River Estuary,
J. Quintrell and G. Wippelhauser, March 1995
- A Brief Survey of Damariscotta River Fisheries
S. Chapman, May 1995
- Sustainable Economic Community Development in the Damariscotta River Estuary
Watershed, R. Bertaska, October 1995

The full text of these studies can be found in the Damariscotta River Estuary Project
Characterization Studies, available in municipal offices, public libraries, and schools in
the Damariscotta River Estuary region.

The Damariscotta River Watershed

The Damariscotta River Watershed covers an area of 103 square miles, stretching from the headwaters of Damariscotta Lake in Hibberts Gore and Cunningham Mountain, Washington southeast to the Damariscotta River estuary and the Atlantic Ocean. The upper watershed includes 56.8 square miles which drain into Damariscotta Lake, a deep, cold water lake fed by springs, Davis Stream and other small streams.

Compared to other lake watersheds in Maine, relatively few surface streams feed into Damariscotta Lake. Pine and hardwood forests dominate 82% of the lake watershed area (excluding the lake acreage.) Approximately 8% (2,636 acres) of the watershed is in agricultural use such as orchards, pasture, blueberries or Christmas trees. Approximately 4% is in residential use and the remainder includes roads, wetlands and other areas.

Historically, residences and farms lined the roads along the ridges on either side of the lake; seasonal dwellings were clustered along the lake shore. In the past twenty years, much of the lakefront lands have been subdivided and developed and many cottages converted to year-round residences. There are approximately 633 camps and 77 year-round homes within the shoreland zone of the lake.

The lower watershed includes the lands that drain directly to the estuary waters from the foot of the falls at Damariscotta Mills to the Atlantic Ocean. The entire Damariscotta River is an estuary since the influence of tide extends to the base of the falls at the head of the Great Salt Bay. The land cover along the estuary uplands is predominately woods and overgrown fields, with pockets of village development in Damariscotta Mills, the Damariscotta-Newcastle commercial area, East Boothbay, South Bristol Gut and Rutherford Island. Roads parallel both sides of the estuary on the ridges above the estuary valley. Originally, homes were built along these roads and fields sloped down to the river. Within the past twenty years, many

roads have been built to the shore to accommodate development.

There are no undisturbed uplands along the estuary; the lands have been in human use for generations. The forest on the two peninsulas bordering the Damariscotta River was logged extensively in the early 1800's and by the Civil War, the landscape was virtually treeless with expansive panoramic views. In general, the area of farmland has decreased and area of developed land has increased.

A 1988 study of the Town of Damariscotta, found farmland acreage to have decreased by 1000 acres (from 16.3% to 6.7% of the total land base) over a period of thirty years from 1953 to 1984. The acreage of forest land remained virtually constant during this period (approximately 60%) and developed area increased by approximately 500 acres from 3.5% to 9.6% of the towns's land base (J. Arbuckle and M. Lee 1987).

Upland Habitats

The Damariscotta River estuary basin has flat and rolling terrain. Long thin peninsulas extend down either side of the estuary and reflect the northeast/southwest trend of the underlying bedrock. Centuries of intensive logging, farming activities and residential development in the watershed have resulted in a markedly fragmented landscape (Weber and Rooney 1994, Armstrong 1995).

Some lands along the river have been planted in pine, in particular, sections of Dodge Point and areas along the Salt Bay. The 500-acre forest on Dodge Point, is one of the few pockets of woodland within the watershed that still performs the functions of an intact forest because of its size and absence of significant logging activity over the past fifty years (Weber and Rooney 1994).

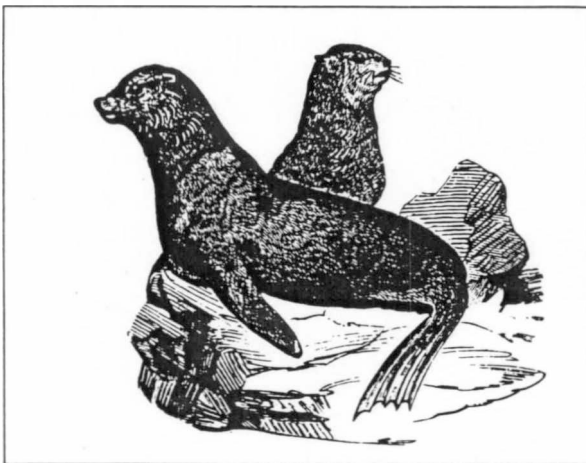
The Damariscotta River watershed is at the edge of two ecological regions, the Midcoast Region (which extends from Cape Elizabeth to Pemaquid Point and inland approximately 20 miles from the coast), and the Penobscot Bay

Region (which extends from Pemaquid Point to the west and Brooklin to the east.)

The summer temperatures are cooler, seasonal rainfall higher and fog more frequent in the river area than in interior regions of the State and this climate influences the vegetation in the river watershed. The Damariscotta River watershed and other areas of the Midcoast Region have more kinds of woody plants than other areas of the state (approximately 191 species). Mixed woods with red oak, balsam fir, white pine and other species blanket the headlands along the middle and upper shores of the estuary. South of Fort Island, the shores support patches of maritime spruce-fir forest amid residential development.

Overall, the area has abundant wildlife including a multitude of small mammals such as beaver, fox, otter, and raccoon as well as deer and moose. Numerous deer wintering areas have been mapped by the Department of Inland Fish & Wildlife in the watershed. A large wetland east of Route 130 in Bristol has high value as habitat for waterfowl and as settling area for sediments and nutrients (MDIF&W 1989).

Vernal pools occur in woodlands throughout the watershed. Vernal pools are seasonal forest pools that fill with water in the spring and fall and dry up in the summer. Marked by shrubby vegetation and often pockets of sphagnum moss, vernal pools are used as breeding areas for amphibians (salamanders and frogs) and insects.



Seal haul-outs identified in a 1994 Survey: Glidden Ledge, ledges southeast and southwest of Goose Ledges, ledges north of Pleasant Cove, Seal Ledges in Seal Cove, ledges west of Fort Island Narrows, ledges at entrance to Long Cove. (Damariscotta River Association 1994)

Stretches of the river, in particular, from the Great Salt Bay south to Salt Marsh Cove and Wentworth Point are frequented by a variety of waterfowl and wading birds. The Great Salt Bay is an important shorebird staging and feeding area. Bald Eagle nesting sites are located on Damariscotta Lake in Damariscotta Mills and downriver on Hodgsons Island and the Boothbay shore. There is also a historical nesting site for the endangered roseate tern on Thrumcap Island. Other ledges and islands in the River are used as seal haul-outs and nesting sites for colonial seabirds.

The River Environment

Adapted from a summary prepared by Bernie McAlice, Les Watling and Sara Chaves

The Damariscotta River is an estuary, a region where fresh and marine waters mix and where fresh water dilutes the salt. The volume of fresh water into the estuary, mainly from Damariscotta Lake at Damariscotta Mills, is so much smaller than the difference in volume between low and high tides (the tidal prism) that recognizable estuarine conditions are rarely found seaward of Fitch Point.

The Damariscotta River dynamics are dominated by the tides, and the tides are impeded, but not controlled by the bedrock structure. The river might be likened to a sausage of four links which become progressively smaller landward, each separated from its neighbors by a place where the river shoals and narrows. The seaward link runs from Inner Heron Island to the constriction at Fort Island, and the next from the Upper Narrows at Fitch Point to Fort Island. A shoaling link extends from Fitch Point to the long constriction which comprises the Falls, Johnny Orr, and the Indraft, and final link is the Great Salt Bay.

The Damariscotta River is still nearly pristine in its lower reaches, and little vexed by human activity even along the thickly settled shorelines of Newcastle and Damariscotta. From Fort Island seaward, the temperature and salinity ranges are essentially the same as those in nearshore coastal waters. Intertidal hard substrates are dominated by rockweed and knotted wrack with kelps important in the lower intertidal.

Subtidal, vertical rock ledges at East Boothbay are occupied by big sea anemones, encrusting bryozoans, hydroids and colonial tunicates. Acorn barnacles and blue mussels share prominence with the algae and common periwinkles are ubiquitous. The soft subtidal bottoms here support a mixed suite of crustaceans and polychaetes along with bivalves, gastropods, sea cucumbers and starfish, an assemblage through which lobsters and finfish move seasonally.

From Fitch Point to Fort Island, the range of temperature and salinity are greater, particularly during spring freshets. The area within a half-mile of either side of Fort Island is subject to very strong tidal currents. The substrate here is rocky ledge or boulders and its inhabitants are animals adapted to life in fast currents.

At the upper end of this segment, a wide range of substrates are found which allow a great diversity of bottom dwellers to flourish. This area supports the highest level of faunal diversity in the Damariscotta. Areas south of Miller Island and Lowes Cove have been studied in detail.

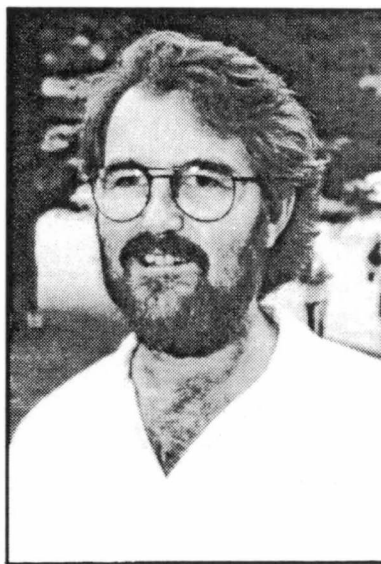
Several small salt marshes occur in this segment, mostly high marsh dominated by salt hay and black grass. All the species found in the seaward end are still present and are joined by a great variety of larval forms produced by many benthic invertebrates and also by the estuarine component from upriver. It appears that the number of intertidal and immediate subtidal fish species is high in this segment too, possibly because of the habitat variety and scattered beds of eelgrass. Dominant small fishes are silversides, alewives, mummichogs, sculpins, sticklebacks, rock gunnels and winter flounder.

The section from the Twin Villages to Fitch Point is the most variable in the river. Depending on the tide and the season, the water column is typically stratified in this area with the denser saline sea water on the bottom and lighter freshwater on top. Knotted wrack is still the dominant seaweed, but sea lettuce and filamentous green algae is found in landward reaches.

The average summer flushing time (the time required to replace all the resident water with new water) for the Salt Bay is about 5 days, for the segment between Business Route 1 and Fitch Point 12 days and for the section between Fitch Point and Fort Island nearly 18 days.

High salt marsh is prevalent in most coves. Summer occurrences of red tide, caused by dinoflagellate blooms, some toxic, some not, are not uncommon north of Perkins Point. The diversity of bottom-dwellers remains high here and in the Salt Bay.

Even in the Salt Bay, the area of the river most diluted by fresh water, the salinities are relatively high, in the range of 15 to 25% (32-35% is the usual salinity range of seawater.) Oysters, which were once incredibly abundant here, are gone, but other species, which were part of the same post-glacial warm period invasion, remain. Notable among these are the horseshoe crab, the red-beard sponge, and a very abundant estuarine copepod. Approximately 40 acres of the bay bottom is covered by eelgrass. Alewives, silversides, and sticklebacks are dominant among the resident fishes of the eelgrass meadows. The bay is the last salt water stop for spring migrations of spawning stocks of smelt and alewives. (See Appendix D, Estuarine Habitat Classifications.)



Les Watling, marine scientist, South Bristol
"The Damariscotta River is one of the few nearly pristine marine habitats that can be found in the United States. Humans share this river with about 1,000 other species. In order to maintain the general good health of the ecosystem and have it continue to provide food and support recreational activities, it is important that we not fatally disrupt the lives of too many of our co-inhabitants."

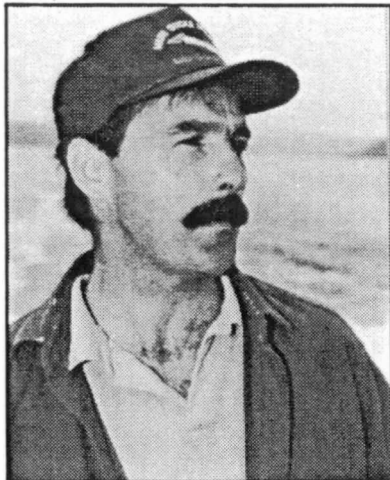
What are the River Resources Worth?

The combined value of fisheries and businesses associated with the Damariscotta River Estuary is estimated at about \$13 million annually, according to a study by the Damariscotta River Estuary Project (Bertaska 1994).

This figure includes an estimate of the value of fish and shellfish harvested from the river by commercial and recreational harvesters and aquaculturists as well as the payroll and employment of businesses identified as dependent on the estuary or providing products or services. Statistics for Boothbay Harbor were not included.

Total annual value of the wild, aquaculture & recreation fishery harvests, based on 1991-1992 figures, is estimated between \$3.6 and \$4.8 million. At least \$2.54 million of wild product was harvested from the River by commercial fishermen in 1991. Although 787 harvesters are licensed for commercial fishing in the communities around the estuary, it is estimated that only 243 actually fish in the Damariscotta either full or part-time.

In 1992, aquaculture operations reported \$1.1 million in gross sales per year and employment of 41 people. In addition, recreational anglers



Jim Cosgrove, planning board chairman, Nobleboro. "Marine related activities associated with the Damariscotta River contribute more than \$13M annually to the local economy. We cannot afford to ignore an enterprise this important, which provides a livelihood for many residents of our region."

Is the Damariscotta River Estuary an important nursery area for fish?

This was a question often asked during the Damariscotta River Estuary Project. Estuaries in the southern states are important nursery areas for offshore fishstocks, however, some researchers suspect that in Maine, bays and coves are used as nursery areas more than river estuaries.

One researcher set fish seines for small fish in various coves along the Damariscotta River in an effort to inventory species of juvenile fish. The following is a list of fish species, mostly estuarine species rather than oceanic, caught during the summer and fall of 1994: alewife, fourspine stickleback, American eel, longnose sucker, Atlantic herring, lumpfish, mummichog, threespine stickleback, Atlantic tomcod, white perch, striped bass, Atlantic silverside, golden shiner, ninespine stickleback, winter flounder, and bluefish (G. Wippelhauser, unpublished).

and smelters harvest fish from the river and contribute to the local economy with purchases of bait and tackle.

Local marine research institutes rely in large part on the river for teaching and research and contribute substantially to the local economy. The Ira C. Darling Center, marine research center for the University of Maine, and the Bigelow and Department of Marine Resources labs provide employment opportunities for approximately 130 people and have an estimated combined payroll of \$3.25 million.

At least fifty-eight businesses depend wholly or in part on the river to provide products and services primarily associated with the estuary. The businesses include tackle shops, boat yards, marinas, seafood wholesalers and processors. In 1993, these firms employed approximately 518 people and had an estimated payroll of \$3.94 million.

A study of the value added to waterfront properties because of their location on the Damariscotta River, as compared with identical properties not on the water, found that location on the estuary added more than \$94.4 million in total property value, a premium which contributes significantly to the property tax base valuation in the river municipalities (Rowland 1994).

Management Recommendations

Most residents and users of the Damariscotta River Estuary will tell you, without hesitation, that protecting the high quality of water is of primary importance to them. Good water quality is the key to economic success, with tourism, aquaculture, clamming, and lobstering as prime examples of this linkage in the region. Clean water is also essential for the rich and varied wildlife habitat provided by the estuary, and it certainly enhances the value of the river for marine research. For the people who live in the seven communities surrounding the Damariscotta River, this body of water and the resources it sustains contribute significantly to the quality of their lives and character of their towns.

Is the Damariscotta River threatened by present land and water use activities? Relative to other coastal estuaries in Maine and New England, the Damariscotta wears its three and a half centuries of European occupation well. Conditions are probably better now than they were a century ago, when 5,000 cords of wood

burned each year along the river to fire bricks, when wood-based commercial enterprises were discharging sawdust and chemicals into the estuary, and when runoff from farmland carried sediment and animal waste to the river.

Present land and water uses are generally benign. Residential development pressure continues to increase, but is not yet a major problem. The river supports a variety of commercial and recreational fisheries and a healthy aquaculture industry. Some significant portions of the shoreline are protected from development by conservation interests, but not from public use for recreation or education. Recreational boating is important and the commercial and residential fleets sustain several service businesses.

Yet, it is possible to envision changes to the quality and intensity of water and land use activities that could adversely impact water quality and important habitat areas, and, in turn, regional industries that depend on these resources. Actions that can be taken now, by the

Developing Recommendations for the Damariscotta River Estuary

Summary of Public Outreach

Monthly since Fall 1992	Project Steering Committee meetings with representatives from towns, local land trusts and interested citizens.
Fall 1992	Public Opinion Survey. Distributed at polling places during the November elections and printed in area newspapers. More than 200 responses. (Appendix B)
Spring 1993	Public Forums on aquaculture, fisheries of the Damariscotta River, and alewives.
Fall 1993	Boat Trip on the river cosponsored by local land trusts and Chambers of Commerce.
November 1993	Municipal Officials Conference. Review of project's progress and discussion of major issues and future projects.
Spring 1994	Public Forum on the smelt fishery.
Summer 1994	Boat Trip on the river cosponsored by land trusts.
Summer 1994	Public Meetings. Meetings to discuss major issues and projects held in Newcastle, South Bristol, Nobleboro and Boothbay.
September 1994	Planning Board Forum. Representatives of the seven planning boards met to identify ways of improving communication and coordination and identifying issues of common interest.
Winter 1994/1995	Small discussion groups with local fishermen and other interest groups to discuss specific management recommendations.
March 1995	Planning Board Forum. Meeting to discuss the Planning Alliance

seven estuary communities **working together**, to better anticipate and manage these changes are described on the following pages. At the same time, small incremental steps can also be initiated to further enhance the economic viability of existing recreational and commercial activities in and around the estuary. These too are outlined below.

Management Recommendations: Four Themes

These management recommendations are offered in the spirit of helping the region to prosper and realize the vision expressed on the opening pages of this document. They are the result of over two years of discussions and meetings with municipal officials, area land trusts, users of the estuary's resources, and other concerned citizens. Specific recommendations follow four important themes identified by citizens of the region in local comprehensive plans and during the course of this project.

The four themes are as follows:

1. Improve Coordination and Communication Among the Towns and Citizens within the Estuary Watershed.

Communities are interested in working together to maintain high levels of water quality, encourage sound economic uses of the

Damariscotta River, balance commercial and recreational uses, and protect special places and scenic qualities. New ideas are needed for fostering closer working relationships between planning boards and other municipal officials from estuary communities without substantial costs and administrative burdens.

2. Maintain High Water Quality.

Estuary residents want to keep the river watershed in its current unpolluted state. People want to clean up existing problem areas.

3. Balance Sustainable Economic Opportunities with Environmental Quality.

Estuary residents and users want to maintain the current level and mix of commercial and recreational uses of the Damariscotta River. "Sustainable" economic activities are desired. Over the course of the project, a consistent theme has been that the region should "make better economic use" of the river's resources.

4. Protect Special Places and Scenic Qualities of the Estuary.

Visually, estuary residents want the river to stay the same. People like the mix of fishing boats, recreational uses, and wildlife (shorebirds, seals) seen along the Damariscotta River. Residents want places to walk and enjoy the natural beauty of the river and they want to protect important habitat areas.



Aerial view of the upper river and Great Salt Bay

GOAL: Improve coordination, communication, and education among the towns and citizens of the Damariscotta River Estuary Watershed.

In the autumn months of 1994, a series of meetings were held with representatives of the Planning Boards of the seven Damariscotta River towns—Boothbay, Bristol, Damariscotta, Edgecomb, Newcastle, Nobleboro, and South Bristol—to discuss options for improving coordination and communication.

The discussion followed two paths. One path focused on ways of sharing information of mutual interest and training programs, while the other explored whether it made sense for planning boards to set up a mechanism for commenting on development proposals which might impact more than one town and the river's resources. Although consensus was not reached on the latter concept, there was broad support for regular joint meetings of area Planning Boards.

From these discussions, the concept for a 'Planning Alliance' evolved. During the spring and early summer months of 1995, the Planning Boards agreed to create an informal group comprised of representatives from each Board. It was agreed that the purpose of the Planning Alliance would be to help towns **work together** on projects of mutual interest, and would in no way interfere with the sovereign rights of each town.

These recommendations refer to this new Planning Alliance as a logical coordinator of various projects and activities. Over the coming months, and hopefully years, the Planning Alliance will work with other interested groups in the region to set priorities and choose among the many excellent ideas outlined below.

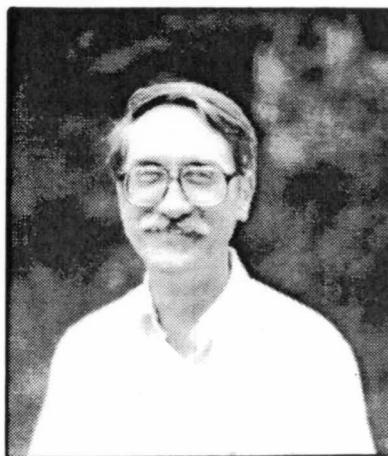
But the actions of the Planning Alliance and other groups will only succeed if there is public understanding of both the economic and ecological value of the estuary's resources. For this reason, broad-based educational activities that reach out to a wide-range of audiences are an essential component of these management recommendations.

#1 Recommendation: Establish a 'Planning Alliance' to oversee coordination between towns and other groups on estuary-related issues.

Why? Rivers and their watersheds do not follow political boundaries. The watershed of the tidal portion of the Damariscotta River is shared by seven towns. Decisions about land and water use activities made by one community can have far reaching implications for others. To ensure that the river and its resources remain healthy and continue to contribute to the local economy, proactive planning by estuary communities and area residents is essential.

Examples of situations that would warrant communication between the river towns include the decision by one town to allow a marina on one side of the river that might cause shellfish flats on the other side of the river in another town to be closed or an oil spill or sewer malfunction that impairs water quality in several towns.

How? In the spring and summer of 1995, planning board representatives of the seven towns met with the Damariscotta River Estuary Project Steering Committee to discuss formation of an inter-town advisory committee. The group, the Planning Alliance of the Damariscotta River Estuary (PADRE) intends to continue to coordi-



George Parker, Planning Board member, Damariscotta. "Discussions of planning between towns have been non-existent. Efforts toward improving this situation can only be positive."

nate planning efforts between the towns, particularly as they relate to the Damariscotta River.

Initial funding for this group will be provided by the Maine State Planning Office with federal Coastal Zone Management funds to support a part-time staff person to initiate priority projects and seek additional financial support.

#2 Recommendation: Establish annual or semiannual forums for planning board members of all the estuary towns.

Why? At meetings with planning board members over the course of the Estuary Project, one of the most frequently heard comments was that planning board members from area towns need to get together on a regular basis and exchange information.

How? On a regular basis (in October and April, possibly), planning board members of area towns would be invited to attend a meeting where information could be exchanged between town boards. These meetings would be convened by the Planning Alliance. The purpose of the meetings would be to accomplish one or more of the following:

- acquaint one another with local plans and ordinances in effect in the area and as changes occur;

- obtain comments on proposed changes to local comprehensive plans or ordinances;
- discuss current issues/developments of concern (and if appropriate, develop coordinated strategies for addressing these concerns);
- examine annual development trends, for example, report on the amount, location, and type of new development/ water uses;
- exchange ideas on useful plan or ordinance provisions;
- invite guest speakers to address topics of mutual interest;
- conduct joint training exercises, for instance, on how to review a project of mutual interest when asked for comments by a participating community;
- invite harbor masters or code enforcement officers to discuss/ coordinate their activities, occasionally or on a regular basis;
- develop coordinated responses to state or regional proposals or initiatives (for example, regional transportation plans or changes to aquaculture regulations that may affect the river communities and the estuary; or
- discuss and coordinate how to improve public awareness of issues relating to the environmental quality of the estuary and watershed resources.



Bob Pratt, Planner, Nobleboro. "Regional planning for regional resources provides for consistent future growth in the estuary."

#3 Recommendation: Maintain the geographic information system (GIS) database and assist towns with the use of the technology to meet specific information needs.

Why? During the course of the Damariscotta River Estuary Project, computerized maps and related databases of town parcel and natural resource information were developed for the watershed project area. The geographic information can be quickly organized and visually presented on maps.

Town maps can be quickly updated using this geographical information system which relates geographic features to data in the system. This computerized database can organize and reference permit locations, natural resource information, and tax information and easily assist

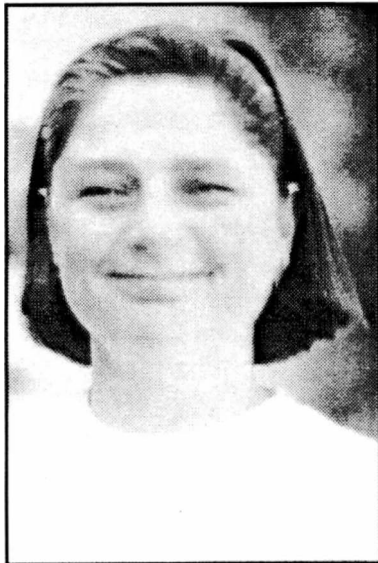
municipal officials and residents with land use decisions.

How? The Planning Alliance would work with the private contractor who developed the database, Maine Mapping of Damariscotta, to assist towns with the collection of information necessary to annually update the database and to arrange workshops to train municipal officials to use the system.

Funds for maintainance of the database would be sought from a variety of grant sources.

#4 Recommendation: Convene an annual River Day where scientists and students at the Darling Center, volunteer water quality monitors, aquaculturists, fishermen, other river users and the public could exchange information on the river and update each other on research and trends.

Why? Various groups and individuals are collecting information on the river resources, yet there is no formal forum for everyone to meet and exchange information. Such a meeting, perhaps held in coordination with local chamber of commerce river celebrations, would provide



Lucy Craib, cartographer, South Bristol
"Geographical Information Systems (GIS) is a tool for evaluating complex layers of geographic information. By seeing the relationships more objectively, community leaders are able to make more informed decisions."

opportunities for attendees to build partnerships and indentify emerging issues.

How? Alliance and staff at the Darling Center in Walpole would organize the event and involve students and community volunteers. Written proceedings of the event could be produced to chronicle the status of the river resources over time.

#5 Recommendation: Continue to work with schools in the Damariscotta River Watershed to encourage experiential education related to the natural resources of the area.

Why? Students and teachers enjoy hands-on projects in the community. Using the river and river towns as a classroom teaches children how to apply their learning to practical problems and enriches the whole community. Children often pass on newly acquired knowledge to their parents, so targeting educational efforts at school age children can affect a much broader group of residents.

How? Several groups in the watershed, most notably, Earthways, are already working in the schools on environmental issues. In 1994, the Damariscotta River Estuary Project funded a training workshop for Boothbay region teachers to develop experiential education projects using a model developed by the nonprofit KIDS Consortium organization. The Planning Alliance would work to find funding to bring programs such as KIDS to area schools and resources to local organizations such as Earthways.

#6 Recommendation: Develop a regional river festival that includes all the communities on both sides of the estuary.

Why? A well-coordinated festival could draw considerable visitors to the region which would benefit the local economy. The Yarmouth Clam Festival draws in over 150,000 people each year; a multi-town Damariscotta River festival might easily attract as many.

How? Local conservation, Chamber of Commerce and other business groups could



coordinate a celebration of the historical and cultural connection to the river. The event would serve as an opportunity to showcase and market locally grown and harvested seafood and as an educational tool to inform the public about water quality concerns, resource issues and other topics. Such an event could be broad in scope, involving activities on both peninsulas over a two- or three-day period.



Becky Brown, realtor/conservationist, South Bristol. *"It is very important that the surrounding communities learn about, honor, and celebrate the heritage, resources, and healthy economic potential of the Damariscotta River."*

#7 Recommendation: Develop opportunities for ecotourism activities in the region. Such ecotourism activities might include bicycle touring, guided archeological tours, canoe trips down the river and bird watching boat trips.

Why? Ecotourism activities can be used to promote environmental awareness and stewardship of the natural resources of the region. Ecotourism activities are generally nonconsumptive and can be sustained for a long time without impairing the quality of the resource that is attracting the business.

How? The Chambers of Commerce would convene a workshop inviting area residents and business owners in the area to discuss ecotourism in the Damariscotta region. In cooperation with local businesses, develop a brochure advertising regional ecotourism opportunities which could be distributed by the Maine Publicity Bureau and local tourist information offices.



GOAL: Maintain High Water Quality.

Those who have grown up along the Damariscotta River remember when homes and businesses in the village area of Damariscotta and Newcastle discharged raw sewage directly into the water. Since construction of the sewage treatment systems in the village areas of Damariscotta/ Newcastle in 1987 and Damariscotta Mills in 1988, water quality has significantly improved. In addition, the large volume of water exchanged with each tide flushes the river to a great extent and is responsible for its relatively clean condition.

It takes about 5 days in the summer to replace resident water in Great Salt Bay with new water, 12 days for the segment from Route 1 to Fitch Point and 18 days between Fitch Point and Fort Island.

The river water quality is classified by the Department of Environmental Protection as Class SB. Discharges, including finfish aquaculture and hydroelectric power generation, are allowed in Class SB waters as long as they do not cause detrimental changes to the aquatic community of plants and animals.

Class SB water must have certain dissolved oxygen and bacteria levels (85% of oxygen saturation and bacteria concentrations that do not exceed those recommended for shellfish growing areas.) Most estuaries in Maine are classified as SB.

Generally, water quality problems result from increased amounts of any of four major categories of pollutants—sediments, nutrients, bacteria, and toxins. Each of these pollutants impact the organisms that live in the Damariscotta River Estuary. Some examples of the effects of these pollutants include:

- Increased sediments can cover and kill eggs of invertebrates and fish. Excess sediment may decrease the amount of light in the river's water column, causing slower growth and possibly death for plants that live on the bottom.
- Increased fecal coliform bacteria and viruses from human and animal waste cause illnesses in humans when ingested. Sources of bacteria

include wildlife, birds, malfunctioning overboard discharges and surface run-off from the lands along the River as well as groundwater. Shellfish beds that have been contaminated by fecal coliform bacteria are required to be closed.

- Increased nutrients (phosphorus and nitrogen) can cause a process known as eutrophication to occur. This means that the added nutrients stimulate the growth of phytoplankton, which in turn causes a decrease in the amount of dissolved oxygen available (the tiny plants use oxygen as they decay).

Reduced oxygen levels can be lethal to certain types of fish and plants. In Maquoit Bay in the Town of Brunswick, a combination of an algae bloom and certain weather conditions in 1988 led to decreased oxygen levels in the bay and massive die-offs of shellfish.



Bill Mook, aquaculturist, South Bristol.

"Those of us who live and work around the Damariscotta River Estuary must be the ones to ensure that the estuary stays productive and beautiful. We must know the quality of its water. We must understand how we can use the estuary and the impacts of those uses, and how the surrounding communities can coordinate their actions to prevent damage from overuse. Above all, we cannot assume that the state or federal government will protect the Damariscotta as energetically or as wisely as the people whose lives it affects daily."

- Increased toxins (i.e. heavy metals, pesticides, herbicides, hydrocarbons) can cause death, deformity, and reproductive impacts to different species. These substances wash off roads, lawns, parking lots and other areas.

The Damariscotta Tidewater Watch, a volunteer group sponsored by the Damariscotta River Association (DRA), has been monitoring river water quality since 1989. Samples are tested for fecal coliform bacteria, temperature and salinity. In the Spring of 1993, the Damariscotta River Estuary Project awarded a two-year grant to the DRA and the Boothbay Region High School to extend the testing program to the lower section of the river.

The testing program has shown that most of the river has relatively low levels of bacteria. However, testing during the past two years has revealed high bacteria levels in East Boothbay and several areas in the Great Salt Bay.

Researching the historical businesses located on the shores of the river may provide clues to the types of pollutants that may exist in the river sediments. Most of the pollutants from long ago are likely covered by decades of mud and probably do not present a problem unless disturbed.

Today, as in the past, run-off from the village areas of East Boothbay, South Bristol and Damariscotta/ Newcastle carries oils and other toxic compounds from parking lots, roads, service stations and other sources.

The only study of heavy metals done in the river suggests that contamination is not a problem in the Damariscotta River in general. The Maine Department of Environmental Protection analyzed mussels for heavy metal concentrations at one site about one mile south of the Damariscotta town landing (Sowles 1993). Concentrations of cadmium, chromium, silver, mercury, nickel, zinc, copper and lead were within the 'normal' range as compared with samples taken in other Maine estuaries and coves.

Water Quality Management Recommendations

The Damariscotta River Estuary is presently free of the type of heavy industry that is typically

associated with "point" sources of pollution (i.e. discharges into the water directly through a pipe). Nonetheless, two kinds of point discharges warrant some attention — licensed overboard discharges and septage from boats.

#8 Recommendation: Focus on the removal of remaining overboard discharges that impact priority shellfish areas.

Priority areas (productive areas closed to shellfishing because of pollution sources) identified by the Department of Marine Resources include: Huston Cove (Damariscotta); the western shore of Newcastle; and Jones Cove in South Bristol. (Productive shellfish growing areas on the river are listed in Appendix E.)

Overboard discharges (ODs) of a lower priority because they are located in permanently closed shellfish areas or areas without productive flats are concentrated in the Gut, off the western shore of Rutherford Island, and Christmas Cove in South Bristol as well as in Little River, East Boothbay Harbor, Linekin Bay, Mill Pond, and off Ocean Point in Boothbay.

Why? The immediate benefits associated with such action would be the re-opening of clam flats that are presently closed to harvesting due to the potential for contamination from OBDs as required by federal regulations.

How? Communities should be encouraged to work with the Department of Environmental Protection (DEP) to secure overboard discharge removal grants for individual systems (state funds will cover 90% of the cost for year-round residents and 25% of the cost for seasonal residents) and /or small community grant funds if individual subsurface systems are not feasible.

A successful effort will involve town Selectmen and local code enforcement officers working with landowners and businesses, the Regional Biologist for the Department of Marine Resources and DEP staff. Administrative assistance with application forms and other paperwork would be provided by the Alliance.

Costs for replacement systems will be determined on a site by site basis. Modest expenses would also be incurred by the Planning Alliance

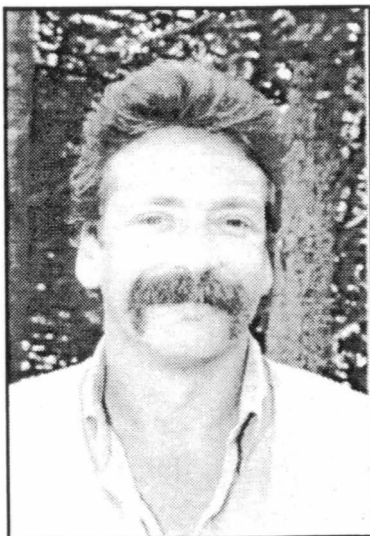
to assist with project coordination and administration on behalf of local selectmen and code officers.

#9 Recommendation: Provide additional boat pump-out facilities along the river and encourage their use.

Why? Major boat mooring areas are located in Christmas Cove, the South Bristol Gut, East Boothbay harbor, the Little River, and Damariscotta/Newcastle harbor. There are five marinas within the Project study area. Within the past two years, a field of about 11 moorings has been established at Hunters Landing in Wiley Cove. At the present time, the only boat pump-out facility on the river is located at C&B Marina in East Boothbay. Another is located in nearby Boothbay Harbor.

Discharge of sewage into coastal waters from boats introduces bacteria and pathogens into coastal waters which may affect human health and close shellfish areas. The chemicals used in boat toilets are often harmful to marine life. Public education efforts to improve boater use of pump-outs is very important.

How? Local marinas should be encouraged to install and operate boat pump-out systems. Costs range from \$5,000 to \$10,000. Grant funds for purchasing and installing boat pump-outs at



Steve Nichols, code enforcement officer, Boothbay and Edgecomb. "Implementation of best management practices (BMPs) throughout the watershed should be a high priority."

either public facilities or private marinas are available from the Maine State Planning Office. The local match requirement is 25%.

Boater education materials on the location and use of boat pump-outs along the coast are also available from the State Planning Office and could be distributed to marinas in the estuary area. Marinas could offer incentives, such as coupons, to encourage pump-out use.

In addition to direct point source discharges, the river is also impacted by sediments, nutrients, bacteria and toxics that "run-off" into the river and feeder streams with rainwater and snow melt. Steps can be taken to reduce the amount of this run-off. Presently, water quality protection standards are included in local Shoreland Zoning Ordinances. Shoreland Zoning standards can protect water quality. The standards establish a "buffer" or setback from the water's edge, restrict tree cutting, and set minimum lot and frontage requirements.

The limitation of Shoreland Zoning is that it only applies to a strip of land 250-feet back from the River and associated wetlands and a 75-foot border along certain stream segments. Land use activities outside of the Shoreland Zone can have an impact on water quality as well. For example, water flowing through an eroding road ditch can carry sediments, nutrients, oil, and other pollutants to the river by way of streams or other drainage swales.

#10 Recommendation: Incorporate requirements for the use of "Best Management Practices" into local land use regulations and ordinances that would apply within the entire watershed of the Damariscotta River.

Why? The term "Best Management Practices" (BMPs) refers to the way in which an activity designed to prevent or reduce pollution is carried out. These practices help landowners, contractors, road crews and others construct projects using techniques that minimize soil erosion and runoff.

Many of these techniques are simple and relatively inexpensive to use, such as properly

seeding and mulching a cleared area after construction to prevent erosion during rainstorms. The Department of Environmental Protection together with local Soil and Water Conservation Districts have developed a set of construction BMPs for use in Maine. BMPs have also been developed for agricultural and forestry activities and marina operations.

How? Towns along the river would refer to these BMPs in their local ordinances (i.e. Subdivision, Site Plan Review) and require their use for some or all types of construction projects. BMPs and related information are available from the Department of Environmental Protection.

#11 Recommendation: Develop training program for municipal officials, road crews and local contractors on the proper use of Best Management Practices (BMPs) to control soil erosion and runoff.

Why? If BMPs are to be used effectively, local code enforcement officers, planning board members, road crews, and local contractors will require field training to learn appropriate techniques. Similar training has been offered in Cumberland and York Counties and could be easily brought to the Damariscotta region.

How? Staff from DEP and local Soil and Water Conservation Districts would be asked to assist with the training program. The Program would be coordinated by the Planning Alliance and/or the Lincoln County Planning Office and engage the MDOT Local Roads Assistance Program.

#12 Recommendation: Work with marina operators and boatyards to reduce pollution from oil, gas, and other materials related to boat maintenance and construction activities.

Why? As noted above, best management practices (BMPs) for marina operations have been developed by the Department of Environmental Protection in cooperation with Maine's marina industry. As with BMPs for erosion and run-off, these management ideas provide practical advice for marinas on how to identify poten-

tial sources of nonpoint source pollution and how to minimize impacts on water quality.

How? On a voluntary basis, the Planning Alliance would work with marinas and pollution prevention experts (either from public agencies or a private firm) to tour each marina and review day-to-day practices that may be impacting water quality. A written set of comments and suggestions for using BMPs would be provided to marina operators. The Planning Alliance would assist marinas in obtaining grant funds to help offset any costs if major improvements are required.

#13 Recommendation: Establish a voluntary marine debris collection program along the river.

Why? Trash in coastal waters is not only an eyesore, but harms fish, birds and other marine wildlife. Successful efforts are underway in Portland, Rockland, Stonington and Eastport to encourage proper disposal of fishing and other debris and oil by making designated trash cans and oil repositories readily available along the waterfront. Similar types of disposal stations could be established in Christmas Cove, the Gut, Damariscotta/Newcastle, East Boothbay, and Little River.

How? Towns, local marinas, the Planning Alliance and the Lincoln County Planning Office could join together to coordinate this effort. (See the City of Rockland's "Proactive Pollution Prevention Plan for Rockland Harbor" (1993) that outlines the approach used to establish a program.) Guidance is available from the Maine State Planning Office. The cost would be approximately \$2,000 for purchase of recycling containers and signage at each site.

#14 Recommendation: Reduce the debris left by smelters on the Salt Bay each winter by continuing regular clean-ups and encouraging local control over smelt shanties.

Why? While many smelt fishermen responsibly pack out their trash and remove their shacks

before the spring thaw, a few leave trash on the bay shores and on the ice.

Despite the efforts of the Town of Nobleboro to require removal of smelt shanties by mid-March, several shanties are abandoned to sink through the ice during mid-season or spring thaws. The debris left by smelters clutters the bottom habitat and can pollute the water.

How? Regular clean-ups of the bay during the annual Coastal Cleanup each fall have removed much of the debris. These cleanups are conducted by local scout troops and other volunteers.

A smelt shanty registration program instituted by the Town of Nobleboro provides local control for enforcement and monitoring of shanties, and will make a substantial difference in future year.

#15 Recommendation: Remove failing septic systems around the outlet of Damariscotta Lake.

Why? Approximately eleven malfunctioning septic systems have been identified in residences that border the Lake outlet at the head of the estuary. These malfunctioning systems contribute bacteria to the lake waters which are used for drinking and swimming.

How? The project will be directed by the Great Salt Bay Sanitary District in cooperation with the Planning Alliance and the Damariscotta Lake Association. The village of Damariscotta Mills has a small sewer system which already services most homes in the area.

An engineering study funded in part by the Damariscotta River Estuary Project in the summer of 1995 will explore alternatives to the failing systems, including hooking these residences into the existing sewer system. When the study is complete, the Small Community Grants

Number of Smelt Shanties on the Great Salt Bay Ice over a Four-Year Period

Winter	1991/2	1992/3	1993/4	1994/5
# shanties	185	212	75	65

Source: Regina Davey, personal communication

Program at the Maine Department of Environmental Protection (MDEP) will consider funding the installation of the new system(s).

#16 Recommendation: Conduct a study to determine the sources of fecal coliform in the East Boothbay area.

Why? The river water quality testing program has reported high levels of bacterial contamination at certain sites in East Boothbay. The shallow depth to bedrock and intense development in the area contribute to water quality problems.

How? An in-depth testing program would attempt to pinpoint the sources of pollution and identify options for remediation. Funds are available from DEP for the assessment.

#17 Recommendation: Develop a public awareness campaign aimed at the importance of septic system maintenance.

Why? Failing septic systems are a source of bacterial and nutrient contamination. Many homeowners may not be aware that septic systems require periodic pumping and maintenance.



Regina Davey, artist, Nobleboro. "Smelt shanty regulations will discourage irresponsible smelters from using the bay and should substantially reduce the amount of garbage and debris left behind."

How? A variety of educational tools can be used. For example, reminders could be sent out with local property tax bills or handed out when people register their cars. Pamphlets, radio and local T.V. public service announcements, posters and presentations to local groups (including school programs) can be effective in increasing awareness and understanding of the problem.

Educational materials have already been developed as part of a state-wide public awareness effort; these materials could be used effectively by towns, school and civic groups and other organizations in the Damariscotta region.

#18 Recommendation: Provide opportunities for households and businesses to properly dispose of old paints, oils, household chemicals and other toxics.

Why? Improper disposal of old chemicals and oil into storm drains, sewers, or septic systems will eventually pollute the river and local groundwater.



Mary Ellen Bowers, Superintendent, Great Salt Bay Sanitary District, Damariscotta. "All residents of the watershed should join in a vigilant stewardship of this resource by developing an awareness of how all wastes including automotive by-products, agricultural runoff, and household wastewater have the potential to adversely affect the quality of the water in the Damariscotta River."

How? Organize semi-annual collection weeks, one in the summer and one in the fall, when local residents can bring their old paint cans, unused lawn chemicals, old batteries, and other toxic leftovers to the transfer stations in Boothbay, Nobleboro and Bristol. The Lincoln County Recycling Office could work with the waste management staff at the State Planning Office to facilitate disposal.

Water Quality Monitoring

The volunteer Tidewater Watch group has been monitoring river water quality since 1989. As part of Tidewater Watch, a committee of the Damariscotta River Association coordinates the sampling and testing of river water in cooperation with the Department of Marine Resources. Adult and student volunteers from Lincoln Academy and Boothbay Region High School test and sample the river. During the summer the group employs a student intern to continue the program.

#19 Recommendation: Encourage town support of the water quality testing program.

Why? Funding for test equipment, interns and other expenses is drawn from a patchwork of sources including, the Damariscotta River Association, the Damariscotta River Estuary Project, Cooperative Extension and the Shore Stewards program of the Maine State Planning Office. A stable source of funding would ensure the continuity of the testing program.

How? Support inclusion of a request for funding at annual town meetings. The annual cost to each town to maintain a thorough water quality testing program in the estuary would be approximately \$300 to \$500.

Septic systems may pollute surface waters or groundwaters with nutrients and bacteria even if working properly. A nutrient loading study undertaken for the Casco Bay Estuary Project estimates that the average malfunctioning septic system discharges 30 lbs. of nutrients each year to surface waters while functioning septic systems discharge an average of 3 lbs. of nutrients each year to subsurface waters.

GOAL: Balance Sustainable Economic Opportunities with Environmental Quality.

The Damariscotta River is used by residents and visitors as a food source, a means of transportation, an anchorage, a marine research site, a receiving area for waste and stormwater, a recreational oasis, and as a place to gather inspiration and refresh the spirit.

Balancing these uses which contribute to the economic vitality of the region with the environmental quality that sustains the uses is the challenge.

Some of these uses are potentially in conflict. For instance, federal Food & Drug Administration (FDA) rules require the closure to shellfish harvesting of any flats within a certain distance of a marina or any area with 10 or more boats at slips or moorings. In situations where flats are on the verge of closure because of concentrations of moorings, the economic benefits of shellfishing need to be weighed against the rights of riparian owners and others to moor boats.

The river provides considerable economic benefit to the region. The river is estimated to

provide more than 2.5 million dollars worth of harvested wild product and an additional one million dollars worth of farmed shellfish annually (Bertaska 1994). In addition, the marine-related businesses in the area including boatyards, marine research facilities, seafood wholesalers, marinas and others, support payrolls totaling approximately seven million dollars.

The following are summaries of fishing and aquaculture activities in the river, the status of harbor management by the river towns and an overview of opportunities for public access to the river resources.

COMMERCIAL FISHERIES & AQUACULTURE

Commercial fisheries and private sea farms coexist in the river. Overall, there is little competition between wild and cultured fisheries since there is no overlap in product (there are no native wild stocks of oyster in the river) and minimal conflict between the fishing grounds and lease areas.

Competition within the wild fisheries is expected to increase as offshore fish stocks diminish and fishermen resort to other fisheries, such as lobstering. Few local fishermen have turned to sea farming to supplement their income. At present, only one lobsterman in the river has a shellfish lease. As wild fish stocks dwindle, more "traditional" fishermen are expected to pursue aquaculture opportunities.

Smelts

A winter smelt fishery thrives on the Great Salt Bay each winter. More than a hundred fishermen from as far east as Belfast set shanties out on the ice and jig for the small fish. Spring smelt runs exist in most of the small streams draining into river coves. The smelt runs appear to be declining along the river. This is consistent with a trend observed elsewhere along the Maine and Maritime coasts. Reasons may include changes in water temperature, overfishing, acid rainfall affecting egg hatch, and disturbance of habitat crucial to their life cycle. A survey of smelt egg



Ralph Norwood III, planning board member, South Bristol. "I hope water quality stays the same and even improves in our lifetime. If we can do this, maybe generations after us can enjoy the Damariscotta River in the way we have."

set (Chapman, 1994) found a heavier eggset in streams draining to the east side of the estuary, rather than those draining to the west side.

The survey also found considerable evidence that modifications of the stream beds by harvesters, who often build low rock dams in order to more effectively catch the smelt, reduce the spawning success of the fish.

Eels

Tiny glass eels are harvested from the Great Salt Bay and five or six other spots along the river each spring (mid April to early June) for eventual sale overseas in Europe and Asia. Glass eels are very small, from two to three inches in length and the diameter of a pencil lead. A pound of glass eels has between 2,700 to 2,800 individuals. The eels can be harvested directly from nets set in the river or in the small smelt streams draining to the river.

In the spring of 1995, approximately 15 to 20 harvesters were involved in the glass eel fishery (P. Bryant, pers. comm.). In the Great Salt Bay elver nets (called fyke nets) are restricted to the bay side of the railroad bridge in Damariscotta Mills on either side of the channel. According to one fisherman, the glass eel harvest in the Damariscotta River in 1995 was one-third of that in 1994.

Historically, large eels were harvested in the Great Salt Bay each winter by spears thrust down

through holes in the ice into the bay mud. In recent years, one fisherman sets eel traps, often baited with horseshoe crab carcasses, in the bay each summer and fall.

Unlike alewives and smelt which travel back to their natal freshwater spawning areas from the sea, eels travel from freshwater to the sea to spawn. The glass eels returning to the Damariscotta River each year from the Sargasso Sea are nonselective, meaning that they seek any source of freshwater. Fishing pressure all long the coast will reduce the population in general but harvesting in the Damariscotta will not necessarily directly affect successive annual harvests. Some residents, however, have expressed concern that reduced numbers of eels entering Damariscotta Lake will adversely impact the lake's ecology.

Alewives

Once the Damariscotta River had the largest alewife harvest in the state. Over the past decade, the number of alewives returning to the Great Salt Bay has declined. Following the construction in 1807 of the fishway over the 42-foot falls to Damariscotta Lake, the spring alewife run was commercially harvested and eaten fresh or smoked and the surplus salted and packed in barrels for shipment to the West Indies and other markets (Dunbar and Dow 1988). In recent years, lobstermen from the area bought the fresh alewives for use as the first fresh bait of the season.



Alewife Harvests at Damariscotta Mills

The alewife stream marks a section of the town boundary between Nobleboro and Newcastle. Selectmen from the two towns manage the fishery. For the past seven years Consolidated Hydro has had the contract for the fishing rights and the accompanying right to control the water flow from the Damariscotta Lake into the power station and down the fish way. For two years, no commercial harvest has occurred in an effort to rebuild the stock. Widow orders, however, have been filled. (The Towns of Newcastle and Nobleboro grant two bushels of alewives to each resident widow.)



Alewives usually begin running in the Great Salt Bay from late April through May. Blueback herring arrive at the end of the run. During this season, bald eagles, osprey and sea gulls hover over the pools of the stone-built fish run or watch from the roofs of homes bordering the stream.

Between 40 to 60 percent of the adult fish survive to leave the lake and return to the sea. Because of the effort involved in negotiating the fish run, far fewer egg-laden females successfully reach the lake than male fish.

Along the Damariscotta River are several ponds which could be stocked with alewives to



A.J. Campbell, fisherman and writer, East Boothbay. "It is critical that we restore the river's habitat for finfish, including juvenile benthic species, stripers, pollock, and spawning alewives and smelt."

create small runs. To sustain the runs, fishways would have to be installed to allow passage of the alewives over the dams into these ponds.

Lobsters

Commercial fisheries for lobster and crab flourish in the lower river. Approximately 25 large lobster boats and 12 or 15 skiffs fish the river from Fort Island to the Outer Islands and John's Bay. From Fort Island to just above Fort Island

to just above Glidden Ledge, from 10 to 15 large boats fish for lobster along with 8 to 10 skiffs. The large boats fish between 400 and 600 traps and the smaller skiffs fish approximately 100 traps. Most traps are set singly, although a few fishermen out of Little River set their traps in pairs.

Crabs

The crab species fished commercially in the river is known locally as sand or eelgrass crab (*Cancer irroratus*). The crabs are fished with crab traps by lobstermen mainly above Fort Island. About 5 harvesters trap crabs in the River as of spring 1995 (S. Nelson, pers. comm.) The fishermen fish approximately 100 crab traps each in addition to lobster traps. The daily catch averages 800 to 1,000 lbs. per day from May through mid-July. Traditionally, wives of local lobstermen picked lobster and crabmeat in their kitchens for resale, however, new federal regulations require substantial investment in sanitary facilities and the practice is declining.

Clams

Occasionally, sea scallops are harvested by divers or draggers around islands in the lower River. Only one or two boats drag for scallops regularly in the area with heavy four-foot drags because of the strong current. Sea urchin and mussel are also commercially harvested when there are sufficient quantities. Urchins are not found in harvestable amounts above Fort Island.

Clams and marine worms are harvested from the River flats. The Damariscotta River has supported a vigorous soft-shell clam fishery for

thousands of years. Most of the approximately 75 prehistoric shell midden sites identified on the River consist of soft-shell clam remains. In the early 1800's, clams dug from the Damariscotta were used as bait for a cod fishing fleet out of Pemaquid Harbor. In the 1900s clams from the Damariscotta and other area rivers, supplied a cannery in Bremen. In the 1930s and 1940s, clams were very plentiful on the River with diggers averaging 10 bushels a tide which were sold for 30 cents a bushel. Digging was limited to about five months because of winter weather and the custom of not eating shellfish in a month without an 'r' in the name. After World War II, fried clams and 'steamers' became popular foods for summer tourists and the demand for the clams increased. This increase in harvesting pressure is believed to be one reason the clam resource has dwindled in recent times (Chapman 1995).

In 1995, the seven river towns issued approximately 157 clam licenses to diggers who dig clams in the river and nearby areas. Harvesting closures are from the Great Salt Bay south to below Damariscotta/Newcastle village and around licensed overboard discharges in Houston Cove, Farmers Island, Jones Cove, East Boothbay, Christmas Cove and Linekin Bay. The remainder of the river is open for shellfish harvesting.

The four towns of Newcastle, Edgecomb, Boothbay and Damariscotta have pooled resources to manage their shellfish flats collectively with reciprocal digging agreements between the towns and the hiring of a clam warden. In the Damariscotta area there are

approximately 200 digging days a year and the average price of a bushel of clams is 65 dollars. Most diggers harvest between one and two bushels per tide. (Appendix E lists the productive clam flats in the Damariscotta River, according to a 1982 inventory.)

The Damariscotta River is the primary oyster-growing area in the state. The predominant shellfish species under cultivation in the Damariscotta River is the American oyster, *Crassostrea virginica*. Other species under cultivation include the European oyster, blue mussel, sea scallop, surf clam and quahog.

As of March 1995, seven aquaculture companies lease 71.59 acres of river bottom at 14 lease sites. The oyster spat are raised in floating trays on long lines in nursery areas until they reach a size suitable for direct seeding on the bottom. The oysters are harvested using hydraulic dredges, by hand with divers, and small drags.

The shellfish aquaculture nursery areas include sites near the Route One bridge in the Great Salt Bay and outside Damariscotta/Newcastle Harbor south to Glidden Ledge. Bottom culture lease sites (where the oysters are grown to market-size) are located on hard-packed bottom in small coves and shallow protected areas north of Glidden Ledge. A mussel farm is located in Clarks Cove. The mussels are grown on vertical lines to market size. One shellfish hatchery is located on the river in Walpole and another in nearby John's Bay.

While most of the river bottom suitable for oyster culture is already leased, the full potential of the river for aquaculture may not be realized. New species and growing techniques may utilize different areas of the river in the future, provided that sites are available for use and the river remains clean.

There has been no herring fishery in the river in recent years. Occasionally pogies school up the river and are harvested by purse seiners. Striped bass and bluefish are caught seasonally by recreational anglers. During the annual striped bass migrations in late spring, fishermen crowd the river between the Newcastle/Damariscotta village bridge and the reversing falls. There is no indication that striped bass spawn in the river.



HARBOR MANAGEMENT

Native Americans used the Damariscotta River and Lake as an important link between interior and coastal encampments. Running with the tides, water travel provided the easiest method to move substantial distances. The early European settlers established villages at the water's edge along the river and lake in Jefferson, Damariscotta Mills, Damariscotta, Newcastle, East Boothbay and South Bristol.

Eighty years ago, boats of all sizes, from schooners to dories, plied the river waters. For many years a ferry steamer picked up summer visitors who arrived by train in Newcastle and dropped them off at vacation destinations along the river. Boat use of the river is again on the rise as recreational boaters, crowded out of harbors to the south, seek anchorages and more harvesters and sea farmers work the estuary waters and flats.

The growing reliance on automobile travel in the past fifty years has tended to isolate towns along the two peninsulas that frame the River. By boat, East Boothbay and South Bristol are just minutes apart, but by auto, travel between the towns takes nearly an hour. Recently, a proposal to connect the peninsulas by a small ferry boat has drawn considerable attention.

The Damariscotta River estuary has five primary harbors: Damariscotta/Newcastle, East Boothbay, South Bristol Gut, Little River and Christmas Cove. South Bristol Harbor is the fifth largest commercial fishing harbor in the state based on the pounds of seafood landed. Commercial boats are also moored in East Boothbay, Little River, Clark's Cove and occasionally, Damariscotta/Newcastle harbors. The other harbors are dominated by recreational boating interests.

Each town along the river shares the responsibility of managing the placement of moorings and traffic on the river. The communities vary in the degree to which they have exercised their responsibilities to manage their harbors. The U.S. Coast Guard maintains navigational buoys and markers and U.S. Army Corps of Engineers has historically maintained the channel up to Damariscotta/Newcastle villages for navigation. The people of the State of Maine own the

submerged lands seaward of the privately owned intertidal flats and these submerged areas are regulated by state law.

Good harbors are a finite resource. Of the 7,600 acres of estuary surface area, relatively few acres provide the blend of shelter, depth and access to shoreside services essential to a good harbor. Recent years have seen a proliferation of moorings along the Damariscotta River outside established harbor areas. Concentrations of moorings are a concern because federal regulations require the closure of shellfish areas if adjacent to areas with moorings or docking space for 10 or more boats.

All of the river towns, except Nobleboro, have harbor ordinances, harbor masters and harbor committees and charge for moorings. None of the Damariscotta River towns have active mooring plans. The table below summarizes the numbers of moorings and slips along the river in June 1995.

Boothbay

Boothbay moorings are concentrated in East Boothbay Harbor, Linekin Bay, and Little River. Most slips are in East Boothbay. The Boothbay harbor ordinance was adopted in 1992. In 1994, a consulting firm was hired to develop a new harbor ordinance for Boothbay and mooring plan for Little River. A draft ordinance was completed and mooring plan developed. In the spring of 1994, the town selectmen chose not to put the draft ordinance and mooring plan on the annual town warrant until the public had additional opportunity to comment.

Moorings and Slips in the Damariscotta River (estimated June 1995)

<i>Town</i>	<i>No. Moorings</i>	<i>No. Slips</i>
<i>Boothbay</i>	375	70
<i>Bristol</i>	0	0
<i>Damariscotta</i>	25	15
<i>Edgecomb</i>	13	0
<i>Newcastle</i>	25	0
<i>Nobleboro</i>	2	0
<i>South Bristol</i>	325	0

Source: Interviews with harbor masters and municipal officials, June 1995

Damariscotta/ Newcastle Harbor Area

The Damariscotta /Newcastle harbor area is near the head of the river, south of the old Route 1 bridge and reversing falls. The harbor occupies a shallow shoaling areas with large mud flats exposed at low tides and most moorings are between the bridge and Hall Point. In the channel separating the two communities, mean water depths at low tide are adequate for boats that draw five to six feet.

Within the harbor area bordered by the Business Route 1 bridge and Hall Point there are approximately 50 moorings, 15 slips, a public dock with 24' of dock space and a public launch ramp. There are no transient moorings, pump out facilities, fuel, or other marine provisions available to the mariner dockside. Eight to twelve shellfish harvesters regularly use the public landing. Several oyster growers and skiff lobstermen access work boats and rafts from the landing.

Nobleboro/Salt Bay

The shallow Salt Bay at the head of the estuary is shared by Newcastle, Nobleboro and Damariscotta. During the 1800s, the bay was the focus of a large shipbuilding industry. Today, the area is residential and few boats regularly use the bay. Nobleboro does not have a harbor ordinance. Newcastle and Damariscotta do not actively manage the Salt Bay as a harbor area.

The southern end of the bay drains at low tide and the northern end of the bay drains to about 30 inches at mean low water. A small channel,



with a depth of about 15 feet, meanders toward the railway bridge at the western end of the bay.

In the spring of 1995 there were two moorings and four docks on the bay. A public landing at Oyster Creek off the Belvedere Road is used minimally. An old public landing in Damariscotta Mills, west of the railroad bridge, is overgrown and silted in. Transient boat traffic coming upriver to the bay is seldom seen due to the swiftly flowing current and rocks at the reversing falls between the Route 1 and Main Street bridges. The extensive eelgrass meadow in the bay discourages motor boat use.

Bristol

Bristol has six harbors. None are located on the Damariscotta River. Bristol enacted an harbor ordinance in 1986. The brief ordinance directs the Selectmen to appoint a Harbor Master for each of six harbors. The ordinance is unclear as to which harbor master has responsibilities for harbor management of the 6,459 feet of Damariscotta River shoreline within the municipality.

South Bristol

The Gut between the Damariscotta River and John's Bay is the focus of commercial fishing activity in South Bristol. Christmas Cove harbor caters to yachtsmen. A number of smaller coves, on both the River and John's Bay support smaller concentrations of marine activity. Clark's Cove in Walpole has a concentration of recreational moorings and is the site of a suspended culture mussel farm. Approximately 11 moorings are located off the town dock in Wiley Cove, Walpole.

South Bristol enacted a harbor ordinance in 1988 and revised it in 1989. The ordinance calls for Selectmen to appoint a harbor master every two years and assigns primary responsibility of the Gut to the harbor master. The harbor master is allowed to appoint deputies for Christmas Cove, John's Bay, and the Damariscotta River. A five-member harbor committee is appointed annually by the Selectmen and aids the harbor master and deputies in the management of town harbors. According to the harbor master, South Bristol's most pressing navigational need is to remove fallen rocks adjacent to the channel on the western side of the bridge and to dredge the gut channel.

Access to the River

We access the river by boat or walking along the shore. Visually, scenic vistas of the river are afforded from several roadways and village areas. The Damariscotta River Estuary Project identified 53 access sites in the Damariscotta River Estuary Project Study area (see Appendix C).

Access sites identified during this inventory include sites owned by municipalities, nonprofit conservation organizations, the State of Maine, the U.S. government, and private marine dependent businesses. Among the scenic vistas of note along the river are views of the Great Salt Bay from Bayview and Belvedere Roads, and views from the village areas of Damariscotta/Newcastle, East Boothbay, South Bristol Gut area and Clarks Cove in Walpole.

The seven municipalities surrounding the estuary hold title to 14 public access sites. These access sites include town landings with floats, swimming areas, boat ramps, and municipal right-of-ways which provide legal access to the shore.

The State of Maine holds title to five river-front parcels. These lands are managed by the Bureau of Public Lands (Dodge Point Preserve), the University of Maine (the Ira C. Darling Center) and the State Bureau of Parks and Public Lands (Fort Island, Newcastle Shell Heaps). The most recent public acquisition is Dodge Point Preserve in Newcastle. Dodge Point, a 506-acre headland with trails, beaches and 8,700 feet of frontage on the river was purchased with Maine for Land Future funds from a state-bond issue.

Non-profit conservation organizations hold title or deed restrictions to more than nine parcels in the estuary project study area. These organizations include local land trusts—the Damariscotta River Association, the Pemaquid Watershed Association and the Boothbay Region Land Trust as well as conservation organizations such as The Nature Conservancy (Plummer Point) and Maine Audubon Society.

Collectively, they provide a very valuable service to the residents and communities in the estuary by preserving open space and helping to keep intact habitats that sustain the natural communities in those areas.

Private landings, boatyards, marinas, fishing cooperatives and other marine businesses also provide access opportunities to those who wish to use their services.

Balancing Economic and Environmental Considerations

The following are recommendations developed over the course of the Damariscotta River Estuary Project during public meetings, conversations with harvesters, public officials, and others and various studies commissioned by the project. The fishery management recommendations aim to maintain and improve the wild and cultured fisheries in the river, while recognizing that the offshore depletion of fish stocks will put more pressure on nearshore resources.

Recreational use of the river by boaters is on the rise, as is demand for recreational use of the shorelands and uplands by hikers, birders, and other nature enthusiasts. The recommendations concerned with harbor management and public access seek to maintain the current mix of recreational and commercial boats on the river and expand opportunities for appreciation of the river resources by the public without damaging those natural resources.

#20 Recommendation: Maintain town support of regional (river-wide) management of the softshell clam resource.

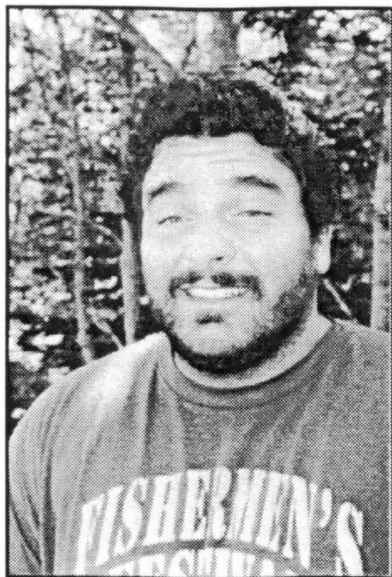
Why? Regional management of the river's soft-shell clams resources enable towns to pool resources to hire a shellfish warden to oversee conservation efforts. Coordinated conservation efforts will enable reseeding and conservation closures while providing sufficient resources available for harvest.

How? The town shellfish management committees would encourage broad participation in clam management beyond those involved in harvesting. Options could be explored for funding for shellfish enforcement and conservation efforts and public education efforts. The five-town shellfish management committee would continue to communicate with the two remaining towns. If license and enforcement fees cover the cost of the local warden, the cost to towns will be minimal.

#21 Recommendation: Incorporate provisions into local shoreland zoning and/or harbor ordinances to protect highly productive clamming coves.

Why? Certain land development practices can contribute to water pollution in adjacent coastal waters and cause the closure of previously available clamflats. In addition, federal regulations require closure of a cove to shellfishing if there are ten moorings within a certain area regardless of water quality unless certain measures are taken to ensure that boaters are not discharging waste into the waters at the moorings. Modifications to shoreland and harbor ordinances could reduce the chance of water pollution and protect the shellfish resources of the River.

How? Provisions could be added to existing shoreland zoning ordinances for shorelands adjacent to certain shellfish areas (See Appendix E for listing of productive shellfish growing areas.) The provisions would include performance standards that require the use of practices that reduce run-off during construction activities and ample setbacks for placement of septic systems. Planning boards from the towns along



Chris Gistis, former shellfish warden, Five-Town Shellfish Commission. "Productive clam flats are critical to the economic well-being of commercial diggers. Conservation measures, including monitoring and reseeded, are essential to this process."

the river would work together to develop criteria for shellfish districts. Harbor committees along the river would be encouraged to work together to designate anchorage areas along the river and discourage the placement of moorings in productive shellfish coves.

The establishment of a 'no discharge' harbor ordinance similar to that adopted by the Town of Freeport could be considered.

#22 Recommendation: Work with landowners to protect buffer areas along small streams that flow onto productive shellfish flats.

Why? Buffer strips of natural or planted vegetation along streams can reduce the flow into the estuary of surface run-off that often carries bacteria and other pollutants.

How? Convene workshops and distribute educational materials to landowners in selected watersheds in cooperation with local land trusts and the Knox/Lincoln County Natural Resource Conservation Service.

#23 Recommendation: Conduct a dye study to determine river flow patterns so that clam flats in the upper river can be opened for shellfishing on a conditional basis.

Why? The upper river is closed to shellfishing because of the sewage outfall of the Great Salt Bay Sanitary District. A dye study would predict the flow if a malfunction were to occur and untreated effluent was discharged into the river. Depending on the results of the study, some flats along the Newcastle shore could be reopened.

How? Dye would be placed in the effluent from the Great Salt Bay Sanitary District and would be tracked during the course of a tidal cycle. The Maine Department of Marine Resources would direct the study in cooperation with the Great Salt Bay Sanitary District. The regional EPA

A dye study conducted by the federal EPA in September 1995 resulted in the opening of shellfish beds along part of the western shore of Newcastle in late October 1995.

office has agreed to conduct the study. There will be no local or state cost if the study is undertaken by the EPA.

#24 Recommendation: Develop landowner commitments to monitor and improve smelt stream habitat.

Why? Many of the smelt streams in the Damariscotta watershed could be improved by the removal of obstacles to fish passage. Monitoring of the streams by local landowners would promote stewardship of the resource.

How? With local land trusts, initiate a landowner contact and education program targeted at five smelt streams — Castner School Stream, Oyster Creek, Huston's Brook, Salt Marsh Cove Brook, and Wiley Brook.

#25 Recommendation: On a trial basis, transport alewives from the base of the fish ladder in Damariscotta Mills to the lake to enhance the stocking of the lake.

Why? At the start of the fish run, the alewives of both sexes are evenly represented. Many more males than females actually make it up to the top of the run because the egg-laden female fish are less able to swim navigate the strong currents. Manual stocking of the lake would ensure optimal representation of females and the total numbers of fish.

How? The Friends of the Alewives committee of the Damariscotta Lake Association would work with the municipal officials of Nobleboro and Newcastle and the Department of Marine Resources to truck the alewives over the dam during the annual migration. Tanks with aeration would be rented and the alewives counted and harvested for transport. The cost is estimated at \$500 each year for tank rental and volunteer time.

#26 Recommendation: Encourage development of small alewife runs by installation of fishways over dams at the outlet of ponds adjacent to the river.

Why? The development of small alewife runs is an economic development opportunity for community groups or individuals. In Hancock

County, school groups have stocked and harvested alewife runs with the proceeds benefiting school programs.

How? The Planning Alliance could publicize the opportunities and invite interested parties to develop proposals which would then be evaluated by DMR biologists. Denil-type fishways could be built or bought. Grant opportunities to fund fishway construction could be investigated by Department of Marine Resource or Alliance staff. The ponds would need to be stocked annually until the run was established (approximately 4 years). Denil fishways cost approximately \$2000 each.

#27 Recommendation: Continue to engage local interest groups in discussions of fish and shellfish conservation measures that the Department of Marine Resources could implement in the Damariscotta River area.

Why? As the offshore groundfish stocks dwindle and other fisheries are depleted from overfishing,



Sam Chapman, fisheries consultant.

"Smelts and alewives are important to the Damariscotta River, both biologically and socially. The condition of the stocks serves as a bellwether of our stewardship of the marine environment. They are a tremendous food stock for larger fish. Their arrival at the head of the estuary signals the traditional end of winter. They are a natural resource that deserves our best efforts to sustain for coming generations."

more fishermen are turning to inshore lobster fisheries and small seasonal fisheries (such as elver). Fishermen in the Damariscotta River have expressed an interest in protecting the existing fisheries (in particular lobster and soft-shell clam) from overfishing. Conservation measures suggested include the establishment of a shellfish and fish conservation district in the river with region-specific conservation provisions such as license and gear and trap limits.

How? Periodic public meetings could be instituted by the Planning Alliance and the Maine Department of Marine Resources to initiate and provide an on-going forum for discussion of local fisheries management. All interests would be encouraged to attend including the shellfishermen, lobstermen, oyster-growers and others. The outcome of the discussions would depend on the interest of those participating. A petition or other publicly supported request for changes in the current management of the river could be made to the Maine Department of Marine Resources (DMR). Towns are permitted to regulate softshell clam harvesting within their boundaries, but other fishing regulations are established by the DMR.

#28 Recommendation: Encourage public outreach efforts by aquaculture businesses along the Damariscotta to educate the public about seafarming.

Why? Seafarming does not deplete wild stocks of seafood and will produce food over the longterm provided that the water quality of the river is maintained. Widespread understanding of the economic and environmental benefits of aquaculture is necessary to engender public support of local ordinances and other requirements designed to protect the estuary water quality.

How? Aquaculture businesses could work with local Chambers of Commerce to organize an annual public openhouse at area aquaculture businesses, perhaps in coordination with local river celebrations.

#29 Recommendation: Identify opportunities for future aquaculture development on the river.

Why? With adequate planning, the aquaculture industry can continue to be a strong sector of the local economy.

How? The Darling Center, Maine Department of Marine Resources, and the Maine Aquaculture Innovation Center could initiate a series of discussions with area growers that would identify the constraints to further development of the industry on the river, types of operation that would be compatible with existing oyster and mussel farms and identify specific recommendations.

#30 Recommendation: Encourage the Town of Boothbay to adopt the 'draft' Boothbay Harbor Ordinance of 1994 and develop a mooring plan for East Boothbay harbor.

Why? The draft Boothbay harbor ordinance provides much more information and direction to municipal officials than the existing ordinance. The draft outlines the responsibilities of selectmen, harbor committee, and harbor master,



*Bob Brown, lobsterman, Edgcomb.
"I was going to get rich. Didn't. I was going to starve—haven't yet."*

defines the administration of moorings and outlines an appeals process for aggrieved parties. A mooring plan would provide for orderly and safe moorings in East Boothbay harbor.

How? The municipal officers of Boothbay should start the process to adopt this ordinance and develop a mooring plan.

#31 Recommendation: Encourage the Towns of Damariscotta and Newcastle to re-draft their harbor ordinances and convene an active inter-town harbor committee.

Why? The existing Harbor Ordinance stipulates that only one Harbor Committee member will be appointed from each town. In addition to the problem of a split vote, a larger and more diverse Harbor Committee, representing marine interests in both communities, would be better able to focus on marine issues that affect both communities such as parking at the public landing and the availability of transient moorings.

How? Municipal officials and residents should initiate public discussions on the future of the harbor area. The status of harbor management and related issues should be among the topics discussed.

#32 Recommendation: A limited wake speed should be posted in Damariscotta/Newcastle Harbor in the vicinity of the Main Street bridge.

Why? According to Maine law, boaters must proceed at head speed within 200 feet of the shore, however, local residents have expressed concern that boaters are not aware of the regulation. Wakes from boats exceeding the legal speed are suspected to accelerate riverbank erosion

The Town of Freeport manages to accommodate both boats and shellfishing by requiring that boats moored within their waters not discharge waste.

By adding language to a harbor ordinance that prohibits sewage discharge to coastal waters within town jurisdiction and undertaking a water quality testing program, the town successfully reopened closed clam flats.

above the bridge and are dangerous for craft at mooring and other anchorages.

How? A sign should be erected on the side of the bridge or in the river, posting the speed limit by the Damariscotta/Newcastle harbormaster.

#33 Recommendation: Inventory the piers, docks, slips, and moorings by river segment. Periodically update this inventory.

Why? The number and location of piers, docks, slips, and moorings is a reflection of the amount of marine activity in the estuary. The cumulative totals are important information that should be shared among all communities.

How? The Planning Alliance should gather this data during the summer of 1996, and add the information to the GIS database maintained for municipalities. Ideally, the inventory would be updated periodically.

#34 Recommendation: Work to establish designated mooring areas in the estuary where boat discharges are prohibited.

Why? Clusters of moorings near productive shellfish areas can cause the closure of the flats to harvesting because of federal regulations which assume certain levels of pollution in areas where ten boats are moored.

How? The Alliance would convene a meeting of harbor masters, shellfishermen, and other interested parties to discuss designated mooring areas. Local harbor ordinances can be developed to accommodate both moorings and shellfishing in certain areas if boat owners agree not to discharge waste into the estuary and if accurate records are maintained by the town describing the boats at the moorings and water quality conditions.

#35 Recommendation: Provide a forum for harbormasters in the region to meet on an annual basis and manage the demand for moorings.

Why? Harbormasters would benefit from exchanging information with colleagues formally

on an annual basis. This forum would provide an opportunity to discuss opportunities for coordinated harbor management and topical issues.

How? The Planning Alliance could convene the meeting.

#36 Recommendation: Install displays with educational materials at local landings and marinas to educate boaters on local harbor ordinances, available pump-outs and river resources.

Why? Education is the most effective way to change what people do with their boat waste. Out on the water, regulations are rarely enforced, and educational materials may help persuade boaters to voluntarily use sewage pump-outs, bring all trash back to the dock, respect posted harbor speeds and give nesting seabirds and other wildlife wide berth.

How? Some educational materials for recreational boaters is available at no cost from the State Planning Office. Displays could be paid for by donations from local organizations, businesses or other sources.

#37 Recommendation: Work with marinas and other shoreside facilities to ensure that there are materials to control minor oil & fuel spills.

Why? Boating accidents, refueling mishaps, or shoreside petroleum spills could cause oil slicks on the river, endangering the shellfish and fish in the river, potentially damaging sea farm shellfish and closing the river to shellfishing for a period of time.

How? An inventory of all the fuel spill response equipment at private marinas and municipal fire departments would be conducted. A group of concerned parties (business owners, residents, etc.) would meet with the U.S. Coast Guard to review the equipment available and coordinate response activities. Marinas would be encouraged to conduct emergency fire and fuel spill drills on an annual basis.

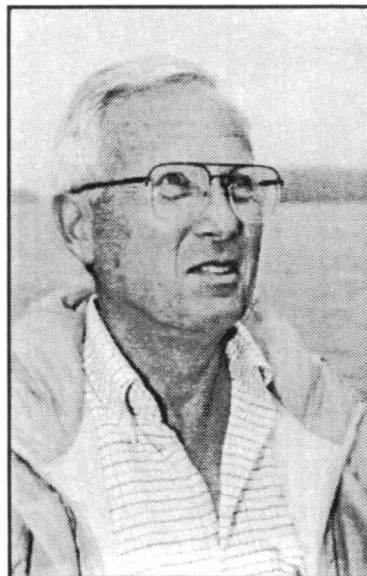
#38 Recommendation: Work with aquaculturists to improve marking of sea farm floating lines to reduce navigational hazards.

Why? Floating lines and equipment used by sea farmers may present a hazard to boaters unfamiliar with the river.

How? The aquaculturists working on the river would collectively develop marking standards for lines beyond the minimal markings required now by Department of Marine Resources regulation.

#39 Recommendation: Explore the development of small boat access on the western shore of the Damariscotta midway between East Boothbay Village and Damariscotta.

Why? Shellfish harvesters wishing to access mud flats by boat must now travel to Damariscotta or East Boothbay to launch their craft, creating a hardship for many harvesters. In the 15-mile stretch of the river between East Boothbay and Damariscotta there is no small boat access to the western shore.



Don Piersol, boater, Newcastle.
"Oil spills, like accidents, happen! Prior preparation through proper training, equipment, and supplies can minimize the effect of spills."

How? Municipal officials in Edgecomb should be encouraged to research the most appropriate site for a small boat launching facility. State and local sources of funds could be explored.

#40 Recommendation: Develop a voluntary shore access registry program.

Why? Along the Damariscotta River are many paths traditionally used to access shellfishing areas. As property has changed hands, some landowners have discouraged their use, making access to the flats more difficult.

How? Develop a voluntary registry program of traditional paths to public shellfish areas. With private landowners encourage informal agreements, or a more formal registry, to allow access over lands and address landowner concerns. With assistance from the Planning Alliance, town shellfish committees would inventory the paths and approach landowners. The committees would work with landowners and shellfish harvesters to resolve problems associated with public access over private lands.

#41 Recommendation: Establish a network of walking paths around the Salt Bay and work to provide safe ways for biking and walking between the Damariscotta Mills area and Damariscotta/Newcastle village area.

Why? The area around the Great Salt Bay and Damariscotta Village is regularly used by walkers and bicyclers. At public meetings held by the Damariscotta River Estuary Project, many residents expressed support for safe walking and cycling trails.

How? A local committee will be formed of interested residents who will contact the bicycle coordinator at the Maine Department of Transportation. Signage will be posted and if possible, the berms along the road widened. The Planning Alliance will assist with applying for grants from the ME Department of Transportation to develop bike and walkways.

#42 Recommendation: Encourage research documenting historic public rights-of way.

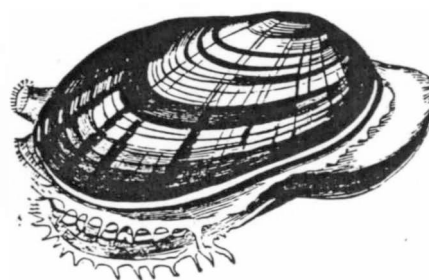
Why? Over the years, many historically-used right-of-ways have been lost from public memory. As the need for public access increases, rediscovery of these old town-owned lands or public paths can be an inexpensive way to provide additional public access.

How? By researching through town records and deeds for historical references, old rights-of-way can be relocated for use again by the public. The research could be undertaken by student interns or community volunteers. The Maine State Planning Office has small grants available for right-of-way discovery projects.

#43 Recommendation: Support the work of local land trusts and private landowners to provide public access to open space on private lands through outright acquisition or the establishment of deed provisions (easements) that limit development and allow use by the public.

Why? Direct acquisition of property or permanent deed restrictions for habitat protection and public enjoyment provide long term benefits to residents in an area.

How? Encourage a dialogue between town officials, conservation organizations and private landowners to promote understanding of the longterm costs and benefits to the community of easements, nonprofit land acquisitions and other measures.



GOAL: Protect Special Places & Scenic Qualities of the Estuary

Much of the open space in the Damariscotta River is protected by nonregulatory means. Several nonprofit groups or state/federal agencies have purchased islands and other parcels of land. Conservation easements between landowners and either municipalities or conservation organizations protect land with restrictions on use that are written into the deed description. Other landowners have registered with the Farm and Open Space or Tree Growth programs which provide landowners the opportunity to apply for tax valuations based on current use (i.e., as farms, recreational land available for public use or timber production). Within the Damariscotta River Estuary Watershed boundaries, approximately 1,650 acres are in conservation ownership.

Many municipal officials worry that conservation or public land not on the tax rolls and land with reduced valuations (because of participation in the Tree Growth and Open Space Programs) places an unfair burden on other taxpayers in town and reduces the ability of the town to raise revenue.

Property protected from development, however, usually has far less need for current or future town services such as sewer, water, schools and fire protection than that of developed lands. A study of the community of Isleboro, Maine, found that land in conservation ownership benefited the town, since the town did not have to provide services to the land (Miller 1992). Most importantly, these areas provide multiple benefits to the community, often providing important recreational and educational opportunities and relatively undisturbed habitat for wildlife.



SPECIAL PLACES

The entire river is a special place, most would agree. But a few areas, such as the Great Salt Bay and the river islands, are recognized by residents as worthy of additional protection beyond current efforts.

The Great Salt Bay

The Great Salt Bay, at the head of the estuary, is a significant natural area. The shores of the bay harbor evidence of past human occupation—oyster shell heaps, old town dumps, and beaches of sawdust. Despite thousands of years of use, the bay persists as an important and unique natural area. The shallow warm waters of the bay support species such as the red chenille algae and red beard sponge which are rarely found this far north. The Great Salt Bay is one of four significant breeding sites in Maine for the horseshoe crab, a species which has persisted unchanged for 200 million years. The bay is vegetated with an extensive eelgrass meadow. In studies of eastern seaboard estuaries to the south, eelgrass meadows have been found to be important nursery areas for small fish. The exact role of the eelgrass meadows in the river are unknown, but they certainly add to the productivity of the river and are an important habitat for fish.

In the winter, flocks of eiders, geese and other birds can be seen in open water at the edge of the ice or near the railroad bridge at the outflow from Damariscotta Lake. In the late summer and fall, shorebirds visit the bay to feed and gather before embarking on long migrations south. The bay muds are full of quahogs and some soft-shell clams. The bay is closed to shellfishing because of the sewage outfall from the community sand filter in Damariscotta Mills and historical poor water quality test results.

Three towns share the bay—Nobleboro, Newcastle and Damariscotta. At this time, stretches of the shore are protected by conservation easements and acquisition and residential development is concentrated in Damariscotta Mills village at the head of the bay. Several large hay fields border the bay and a few large parcels

on the eastern side may soon be subdivided into house lots.

The River Islands

There are twelve islands and several ledges on the river above and including Fort Island. Many of the islands have prehistoric shell middens. Several of the smaller barren islands and ledges are used as seal haulouts and as nesting sites for common terns and other birds.

From Damariscotta/ Newcastle village south, the larger islands are: Hog Island, (off Huston Cove) and Prentiss Island. Below Glidden Ledge are Merry Island, Miller Island and Carlisle Island (off Carlisle Point), Peters Island (at the mouth of Long Cove), Farmers and Stratton Islands (off Seal Cove), and Fort Island (at the narrows.)

The largest island is at the mouth of the river, Rutherford Island, and is connected by draw-bridge to the South Bristol mainland. Off the mouth of the river are Inner and Outer Heron Islands, the Thread of Life Ledges and other islands off Rutherford Island in South Bristol, Inner and Outer Thrumcap Islands, Inner and Outer White Islands, Fisherman Island, Ram Island, The Hypocrites Pumpkin Island and Ledges and Damariscove Island.

Offshore islands provide nesting habitats for a variety of seabirds and shorebirds. The islands are important as nesting sites because of their relative isolation from mainland predators such as dogs, cats, fox, mink and raccoons. Among the species nesting on the islands of the Damariscotta are eiders, gulls, terns, and cormorants. The most common threat to the nesting populations is from recreational boaters who come ashore the islands for picnics and inadvertently disturb the nesting birds during the spring and summer months.

#44 Recommendation: Encourage the towns of Nobleboro, Damariscotta and Newcastle to manage the Great Salt Bay as a multiple use conservation area and standardize the shoreland zoning setback around the Great Salt Bay.

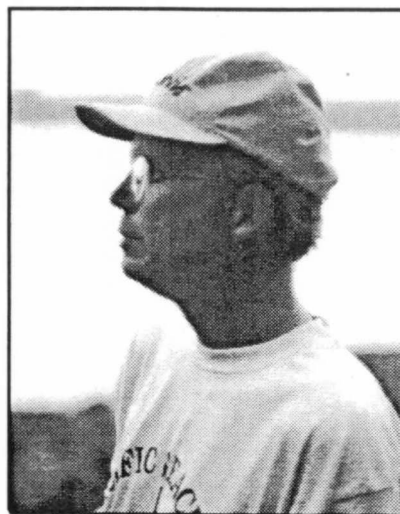
Why? The Great Salt Bay has state significance as a staging and feeding area for waterfowl and is

recognized by local and federal conservation groups as an important natural area. Only short sections of the tidal creeks adjoining the bay are protected by shoreland zoning designations. Ample setbacks from the water and provisions for natural buffers would contribute to maintenance of the good water quality, high habitat values and scenic beauty of the area.

How? The planning boards of Damariscotta, Nobleboro and Newcastle would work to amend existing shoreland zoning ordinances to establish ample standardized setbacks and performance standards along Oyster Creek, Little Oyster Creek and the Great Salt Bay. The Maine Department of Inland Fish and Wildlife should be contacted for the most current state standards applicable to this area.

#45 Recommendation: Develop a volunteer monitoring program to monitor the ice smelt fishery, use of the bay by shorebirds, and seabirds, and spring elver and alewife runs.

Why? A volunteer monitoring network of volunteers who would record natural events on the river would over time, provide a valuable record of the natural history of the watershed over time.



Tom Arter, naturalist, South Bristol.
"If the river is the body, then Great Salt Bay is the heart of the system. The bay plays an integral role in the nutrient cycle, but also acts as a refuge for nesting species, and a much needed stop-over site for migrants."

How? The monitoring program would be a loose-knit network of citizen volunteers that would monitor certain natural resources associated with the river. Coordinated by local conservation organizations and Darling center staff, the network would interface with professional researchers and high school and college students to track trends and events affecting the natural resources of the river.

#46 Recommendation: Encourage the Town of South Bristol to designate part of Lowes Cove as a special management area to be used for research and study.

Why? Researchers at the University of Maine's Darling Marine center in Walpole have used Lowes Cove as a long term research area for decades. On land, scientists monitor experimental forests for generations, but in the marine environment, few sites available for long-term experiments exist in Maine. In addition, Lowes Cove is a 'type location' for several invertebrate species, meaning that an animal was first collected and described at this site.

How? The Town of South Bristol would develop a conservation closure for sections of Lowes Cove. The Darling Center administration would work with the town shellfish committee to explore arrangements satisfactory to all parties.

#47 Recommendation: Provide current information on Maine's Tree Growth and Open Space tax abatement programs to area landowners.

Why? Enrollment in the Tree Growth or Open Space Programs can protect undeveloped lands, although not on a permanent basis, and provide financial incentives for landowners to discourage subdivision and development. Recent changes to the Tree Growth Program by the state legislature has caused landowners to withdraw from the program in part because of uncertainty of the future of the program. Updated materials would allow landowners to make informed decisions about enrolling in the program.

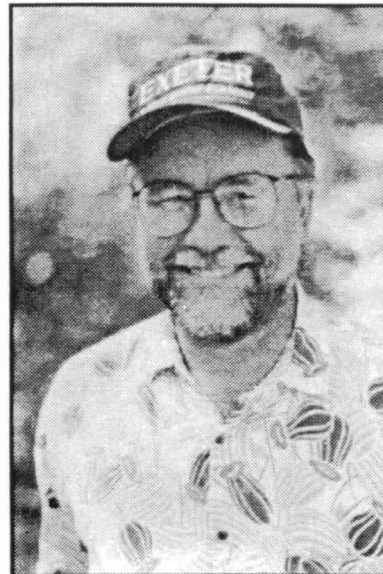
How? Provide consistent information for inter-

ested landowners at all the town offices. A bulletin summarizing the latest information on the Tree Growth and Open Space Programs is available from the Maine Coast Heritage Trust, Brunswick, Maine.

#48 Recommendation: Work with planning boards of South Bristol and Boothbay to develop island protection standards beyond the band of shoreland protected by shoreland zoning ordinances on certain islands.

Why? Current resource protection districts allowed under shoreland zoning provide for protection measures within a 250-foot band around the perimeter of an island. Activities inland of the shoreland zone impact the freshwater and ecological resources of the island.

How? The Planning Alliance and the Lincoln County Planning Office would convene a workshop using model ordinances and protection standards developed by the Maine State Planning Office for planning board members and island landowners.

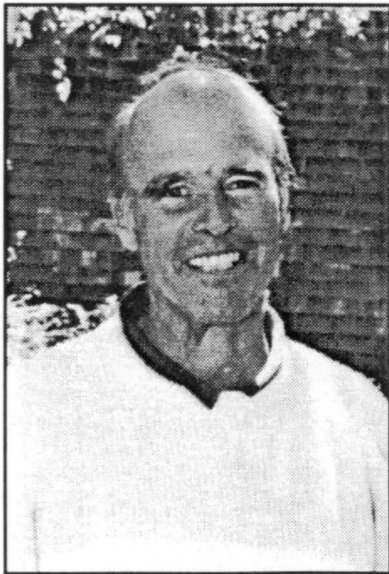


Arthur Webster, musician, Boothbay.
"Our islands are a wellspring of life. They have been a steadfast source of renewable bounty for wildlife and man alike. It is our responsibility to maintain and care for this fragile resource."

#49 Recommendation: Develop an educational program in schools and the communities focused on vernal pools, their role in the landscape and importance to local ecology.

Why? Vernal pools were identified as one of the most special habitats within the Damariscotta River watershed in field studies of the upland ecology. Vernal pools are small woodland wetlands that have standing water only in the wettest months. They are critical habitats for frogs, salamanders and other amphibians and play an important role in the survival of many woodland species.

How? Among the elements of the campaign would be a brochure and display set up at local libraries and town offices, field trips sponsored by the local land trusts for students and articles in the local newspapers. The educational effort would be a cooperative effort between local conservation groups and the Planning Alliance.



Pete Noyes, land trust member, Damariscotta. "It is important to act now to protect the resources and values that define the spirit and values of this special place, otherwise our children and grandchildren may not be privileged to know it as we do."

#50 Recommendation: An effort should be made to conserve examples of each of the 25 natural community types found in the Damariscotta River Watershed (Weber & Rooney, 1994.)

Why? The Damariscotta Watershed area includes at least 25 upland natural community types such as maritime spruce-fir forests, salt marsh environments, vernal pools, and oak hardwood. The animals and plants living in these community types reflect the wide range of diversity found on the midcoast of Maine. Protecting this diversity is important since we do not understand how all living things interrelate in the natural environment.

How? Land trusts and other conservation groups should be encouraged to work together to develop acquisition priorities which take into consideration the need to include protection of representative community types. In particular, efforts should be taken to conserve areas of intact maritime spruce-fir forest and pitch pine woodlands.

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Appendices

Appendix A: Overview of Local Comprehensive Plans	Appendix-1
Appendix B: Public Opinion Survey	Appendix-4
Appendix C: Damariscotta River Estuary Access Sites	Appendix-6
Appendix D: Estuarine Habitat Classifications	Appendix-8
Appendix E: Soft-shell Clam Data	Appendix-10
Appendix F: Natural Plant Communities of the Damariscotta River Watershed	Appendix-12
Appendix G: Overboard Discharges	Appendix-16
Appendix H: Damariscotta River Association Damariscotta River Bird/Wildlife Survey	Appendix-17
Appendix I: Islands of the Damariscotta Region	Appendix-22
Appendix J: Geographical Information System (GIS): Databases and Map Information	Appendix-24
Appendix K: Economic Indicators of the Damariscotta River Estuary	Appendix-25
Appendix L: Census Data from Estuary Towns	Appendix-26

Appendix A

Overview of Local Comprehensive Plans

The following lists summarize recommendations included in Comprehensive Plans prepared under the Growth Management Program for the Towns of Boothbay, Damariscotta, Edgecomb, Newcastle, Nobleboro, and South Bristol. (Note: Bristol has not yet received state funding for development of a comprehensive plan.)

The policies/strategies are organized under five major topic areas:

1. public access to the river
2. septic systems, overboard discharges, and sewage systems
3. fisheries and aquaculture
4. harbor management
5. water quality/land use.

Public Access to the River

- Develop more public access to the water [note that plan does not mention the Damariscotta River specifically] (South Bristol)
- Encourage municipal development of a riverfront park and prepare restrictions to assure that private development does not spoil the public values, including scenic and recreational values, of the River (Damariscotta)
- Expand parking facilities along the river for commercial and public users or the boat launching facility, to ensure adequate parking now and in the future. (Damariscotta)
- Promote striped bass fishery and develop public access to assure continued utilization of striped bass and rainbow smelt resources of the Damariscotta and Sheepscot Rivers (towns should work together to locate a regional boat launching facility on west side of the Damariscotta River. (Newcastle)
- Continue to increase the boat fund with a view to acquiring property at the first opportunity. Explore alternate funding sources to assist the town in acquiring property for public access. (Edgecomb)
- Develop a public access strategy. This would include an inventory analysis, development and management plan for existing town-owned access and ROWs and properties containing public access potential. Where feasible, an acquisition strategy should be developed. (Boothbay)
- Develop a parking and storage area within walking distance of the Gut. (South Bristol)

Septic Systems, Overboard Discharges, Sewage Systems

- Encourage policies to reduce and eventually eliminate overboard discharges and investigate alternative ways of safe disposal of holding tank contents. (South Bristol)
- The Sanitary District should explore alternative methods of waste disposal, rather than direct discharges into the river. (Damariscotta)
- Expand the sewer system to Great Salt Bay School and along Business Route 1. (Damariscotta)
- Closely monitor tests of the Sanitary District discharges into the river to assure that such discharges do not exceed allowed levels of pollution. (Damariscotta)
- Support continued expansion of public sewer service in and around the village area. (Newcastle)
- Eliminate malfunctioning septic systems through better code enforcement (Newcastle)
- Encourage the use of ecologically sound alternative septic waste treatment systems (Newcastle)
- Work to eliminate all overboard discharge systems as required by state law (Newcastle)

- Incorporate provisions in the Land Use Ordinance to minimize overboard discharges of point and non-point pollution sources. (Boothbay)
- Dispense information on maintenance for existing septic systems. Use correct and up-to-date codes for new systems. (Nobleboro)
- Require the code enforcement officer (CEO) to follow-up on all complaints on septic systems. Support ongoing training for the CEO in these matters. (Nobleboro)

Fisheries and Aquaculture

- Support the needs of commercial fishing and mariculture. (South Bristol)
- Work with Newcastle in studying what, if any, regulations might be desirable for future aquaculture operations in the river. Together, we should work with the industry and the State, as well as property owners, appropriate associations, and members of the aquaculture industry, to develop policies which are agreeable to all. (Damariscotta)
- Encourage marine-related activities such as aquaculture, fishing clamming, worming, and lobstering. (Newcastle)
- Work with DMR to enhance the alewife fishery and resource of the Damariscotta River. (Newcastle)
- Promote the striped bass fishery and develop public access to assure continued utilization of striped bass and rainbow smelt resources of Damariscotta and Sheepscot Rivers. (Newcastle)
- The towns in the region should work together to explore the practicality and feasibility of developing a reciprocal shellfish harvesting ordinance. (Newcastle)
- Develop a long-range plan for the alewife fishery in Damariscotta Mills. (Nobleboro)
- Develop long-range plans for control of the dam at Damariscotta Mills. (Nobleboro)
- Pursue options to minimize impact of the power station on migrating fish. (Nobleboro)

Harbor Management

- Develop a joint harbor policy with Newcastle to provide guidance for dealing with future growth pressures for additional mooring spaces, float space for dinghies, docks, etc., and amend the existing Harbor Ordinance as necessary. (Damariscotta)
- Continue to support strong cooperation with the Town of Damariscotta in the use and maintenance of the public boat landing and harbor area. Add a pump-out facility. Work with Damariscotta to solve the current boat trailer parking problem at the existing landing. (Newcastle)
- Continue to support the existing marine navigational system on the Damariscotta River (Newcastle)
- Develop a long-range Harbor Management Plan. (Newcastle)
- Develop a harbors and mooring plan and strategy. This would include an assessment of existing mooring areas and other harbor areas with mooring development potential. These areas should be analyzed according to capacity, safety, ease of access and shoreside support. (Boothbay)
- Establish limits on the development and expansion of commercial marinas in areas that conflict with commercial water-dependent uses. (Boothbay)
- Develop a harbor management ordinance in accordance with Title 38, MRSA, taking into account local issues. (Boothbay)
- Consider amendments to Shoreland Zoning for water-dependent uses (one site is along the Damariscotta River). (Edgecomb)
- Provide marine traffic control in the harbor during the summer. Continue priority of mooring space in the Gut to commercial marine vessels. (South Bristol)

Water Quality and Land Use

In addition to the policies/strategies below, local plans also called for implementation and enforcement of Shoreland Zoning. Shoreland Zoning related measures are not reprinted here.

- Support and participate in regional management efforts by DEP, LSWC, DRA, DLWA, and PWA (referring to continued water quality monitoring). (Nobleboro)
- Coordinate land use and shoreland zoning ordinances with those of adjacent towns. (Nobleboro)
- Work with DOT to minimize pollution from road construction and maintenance. (Nobleboro)
- Select contractors with adequate equipment and manpower to properly maintain roads in the Winter (minimize salt and phosphorus pollution). (Nobleboro)
- Adopt a soil erosion plan for new developments. (Nobleboro)
- Encourage public education on preventive measures. (Nobleboro)
- Coordinate with state, regional, and private organizations in the preservation, protection, and enhancement of fish and wildlife resources in Nobleboro. (Nobleboro)
- Work with surrounding towns and water district to ensure that land use development within the watersheds does not have adverse impacts on the quantity and quality of water resources in the region including lakes/ponds, streams, rivers, wetlands, and estuaries. Boothbay)
- Permit no activity, including water-dependent use activities, which would tend to cause adverse affects to the Damariscotta River. Prohibit construction of buildings or roads in the more fragile of our watersheds. (Edgecomb)
- Greater use of stormwater retention measures. (South Bristol)
- Conserve water resources by setting minimum standards for new fixtures. (South Bristol)
- Educate seasonal and year-round residents about water as a finite resource, and the protection of water quality. (South Bristol)
- Selectmen should encourage and support local and regional lake conservation groups to develop educational information and programs to educate landowners concerning ecologically sound alternative waste systems and on the use of fertilizers, pesticides, and herbicides. (Newcastle)
- Local CEO should be trained concerning the installation and use of ecologically sound alternative septic waste disposal systems and on soil erosion prevention measures. (Newcastle)
- Local CEO should supply available information to prospective home builders and others on ecologically sound alternative septic waste systems. (Newcastle)
- Selectmen should work with the State DOT to encourage better maintenance practices to protect water quality. (Newcastle)
- Local road commissioner should work with the Soil Conservation Service to identify ecologically sound maintenance practices. (Newcastle)
- Develop a soil erosion and sediment control ordinance for all construction and adopt a standard set of preventive measures for soil erosion and sediment control. (Newcastle)
- The towns in the region should work to provide more aggressive code enforcement concerning malfunctioning septic systems, cutting regulations, and manure-spreading guidelines. (Newcastle)



Appendix B

Public Opinion Survey

FEBRUARY 1993

Recreational boating, hiking and birdwatching along the Damariscotta River top the list of recreational activities enjoyed by local residents who responded to an informal survey conducted by the Damariscotta River Estuary Project (DREP) this winter. Over 200 residents filled out the surveys which were published in local papers and distributed at some polling places during the fall election. Approximately 18% of those who filled out the survey, actually own land along the Damariscotta River. 195 of the 203 respondents are year-round residents. All but four of those surveyed live in one of the seven towns along the Damariscotta River.

More than 16% of the respondents indicated that they used the river resources commercially. Aquaculture and clam, lobster, scallop and urchin harvesting as well as related businesses such as marine research, marine electronics and wholesale seafood distribution were among the economic activities engaged in by the respondents.

The chart, at right, indicates the percentage of those surveyed who participated in certain recreational activities on or along the river. Many of those surveyed, indicated that they also enjoyed swimming, duck hunting, photography, and shellfish digging along the river.

The survey queried, "What do you think about the following uses of the river?" The category receiving the most support was 'Public Parks & Trails' with 72% of all respondents wanting more use. Approximately 67% of those surveyed indicated they want less 'Non-Marine Related Commercial Use' along the Damariscotta River. The results of this question are tabulated below as rounded-off percentages of those who responded to the question.

Percentage of respondents who indicated they participate in river-related recreational activities	
Smelt fishing	14%
Sport fishing	24%
Bird watching	40%
Hiking	56%
Recreational boating	64%

Preferred River Use			
Use of the River	Want more	OK as is	Want less
Residential Shoreland Development	6%	45%	49%
Commercial Shoreland Development (Marine-related)	22%	48%	30%
Commercial Shoreland Development (Non-Marine related)	2%	31%	67%
Recreational Fishing	25%	71%	4%
Recreational Boating	18%	75%	7%
Shellfish Harvesting	23%	69%	8%
Aquaculture	48%	44%	8%
Public Parks & Trails	72%	26%	2%
Commercial Fishing	14%	70%	16%

The survey also asked residents, “How important to you are the following issues and problems — as they relate to the river?” The following issues received the most support as ‘very important’ according to those who completed the survey: reducing water pollution, controlling litter, and conserving natural resources. Preserving archeological sites and strengthening enforcement of local land use ordinances also received strong support. The tabulated results are listed in the chart below as rounded-off percentages of those who answered the question.

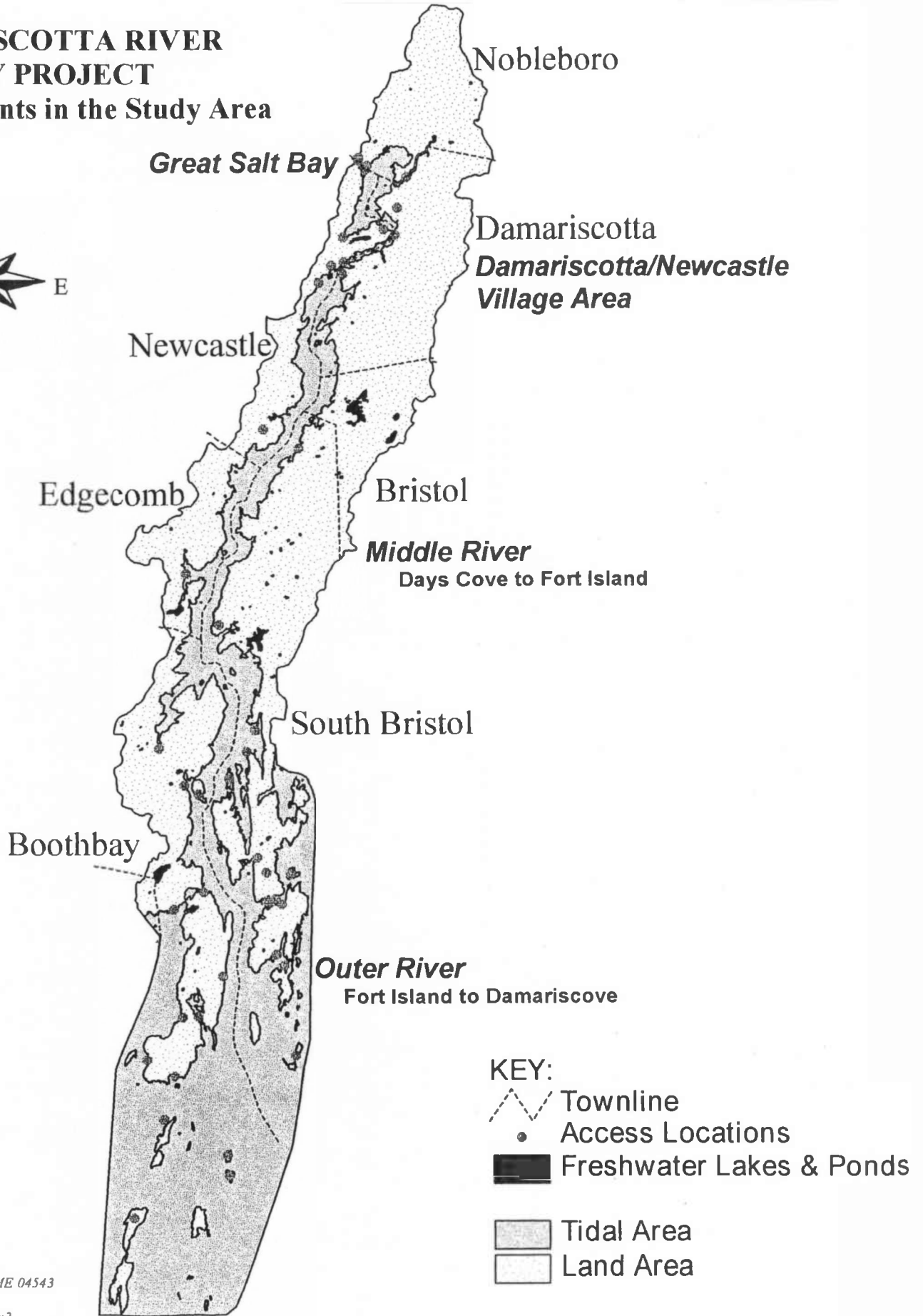
Importance of Issues Affecting the River			
Importance of Issues	Very Important	Important	Not Important
Increasing Public Access	40%	41%	19%
Opening Closed Shellfish Areas	37%	44%	19%
Controlling Litter	90%	10%	>1%
Reducing Water Pollution	94%	6%	0%
Conserving Natural Resources	89%	10%	1%
Preserving Historic & Archeological Sites	74%	24%	2%
Strengthening Enforcement of Local Land Use Ordinances	72%	25%	3%

The Damariscotta River Estuary Project circulated this survey to gather indications of public opinion. The survey was not distributed in a rigorously scientific fashion, so the results are not statistically valid. The responses and comments received, however, do reveal a high level of awareness and concern for the Damariscotta River and watershed and will be useful in guiding the direction of the project.



DAMARISCOTTA RIVER ESTUARY PROJECT

Access Points in the Study Area



Produced by:
Maine Mapping
Damariscotta, ME 04543
(207)563-1558
Oct. 1995 access 2

Appendix C

Damariscotta River Estuary Access Sites

			Historic Site	Walking/ Natural Habitats	Swimming	Parking	Dock/Landing Marina -	Boat Yard	Launch Ramp	Camping
BOOTHBAY										
BB1	Damariscove Island	Nature Conservancy	x	x						
BB2	Outer White Island	BRLT, DRA, MCHT	-	x	x					
BB3	Inner White Island	BRLT	-	-	x					
BB4	Ram Island	Island Institute/in transition	x	x	-					
BB5	Grimes Cove	Town of Boothbay	-	x	-					
BB6	Card Cove	Town of Boothbay	-	x	x					
BB7	Little River area									
	Little River Lobster	Private	-	-	-	x		x	x	x
	Spar Shed Marina	Private	-	-	-	-		-	-	-
BB8	Smuggler's Cove	Town of Boothbay	-	x	-	-	x	-	-	-
BB9	Levison Prop.	BRLT	-	x	-	-	x	-	-	-
BB10	Murry Hill	Town of Boothbay	-	x	-	-	-	-	-	-
BB11	E. Boothbay village area									
	C & B Marina	Private	-	-	-	x	-	-	-	-
	Goudy & Stevens	Private	-	-	-	x	x	x	x	-
	Rice Boat Yard	Private	-	-	-	-	-	-	-	-
	Washburn & Doughty	Private	-	-	-	x	-	-	-	-
	Boothbay Marina	Private	-	-	-	x	-	x	-	-
BB12	Fort Island	State of Maine	-	x	-	x	-	x	-	-
BB13	Back Narrows	State of Maine	-	x	x	-	-	x	x	-
BB14	M. Saunders Mem. Park	BBRLT	x	x	x	-	-	-	-	x
EDGECOMB										
ED1	Kit. Colby Wildlife Preserve	BBRLT	-	x	x	-	-	-	-	-
NEWCASTLE										
NC1	Dodge Point Preserve	State of Maine	x	x	-	-	-	-	-	-
NC2	Riverside Boat	Private	-	-	x	x	-	-	-	-
NC3	Village Park	Town of Newcastle	x	x	-	x	-	-	-	-
NC4	The Gateway	Town of Newcastle	x	x	-	-	x	x	-	-
NC5	Great Salt Bay Preserve	DRA	x	x	-	-	-	-	-	-
NOBLEBORO										
NB1	Ice House Park	Town of Nobleboro	-	-	-	-	-	-	-	-
NB2	Mills landing	Town of Nobleboro	x	x	x	-	-	-	-	-
NB3	Alewife Fishway	Private	x	x	-	-	-	-	-	-
NB4	Dam access	Private	x	-	x	x	-	-	-	-
NB5	Oyster Creek	Town of Nobleboro	-	-	-	-	-	-	-	-
DAMARISCOTTA										
DA1	Salt Bay Farm and Heritage Center	DRA	x	x	-	-	-	-	-	-
DA2	Whaleback Midden	State of Maine	x	x	-	x	-	-	-	-
DA3	Riverside Park & Landing	Town of Damariscotta	-	x	-	-	x	-	-	-
DA4	Schooner Marina	Private	-	-	x	x	-	-	-	-
BRISTOL										
no access										
SOUTH BRISTOL										
SB1	Hunters Landing	Town of So. Bristol	-	-	-	-	-	-	-	-
SB2	Darling Center	University of Maine	-	x	-	-	x	-	-	-
SB3	Peter's Island	Private	-	x	x	x	-	-	-	-
SB4	Hodgdon's Island	DRA	x	x	x	-	-	-	x	-
SB5	Plummer Point Preserve	TNC	x	x	x	-	-	-	-	x
SB6	Tracy Shores	Town of South Bristol	-	x	-	x	-	-	-	-
SB7	Witch Island	Maine Audubon/DRA	x	x	-	x	-	-	-	-
SB8	Library Park	DRA	-	x	-	-	-	-	-	-
SB9	Eastern Gut area									
	Fisherman's Coop	Private	-	-	-	-	-	-	-	-
	Eugley's Wharf	Private	-	-	-	-	x	-	-	-
	Riley's Wharf	Private	-	-	-	-	x	-	-	-
	Farrin's Lobster Pound	Private	-	-	-	-	x	-	-	-
SB10	Western Gut area									
	A. Farrin	Private	-	-	-	-	x	-	-	-
	J. Gillison	Private	-	-	-	-	-	-	-	-
	H. Gammage yard	Private	-	-	-	-	x	-	-	-
SB11	Town Dock	Town of South Bristol	-	-	-	-	-	-	-	-
SB12	Bitter Sweet Landing	Private	-	-	-	x	-	-	-	-
SB13	Coveside Marina	Private	-	-	-	x	-	-	-	-
SB14	Town Dock at Christmas Cove	Town of South Bristol	-	-	-	x	x	-	x	-
SB15	Outer Thrumcap	Private	-	x	-	x	x	-	x	-

Appendix D

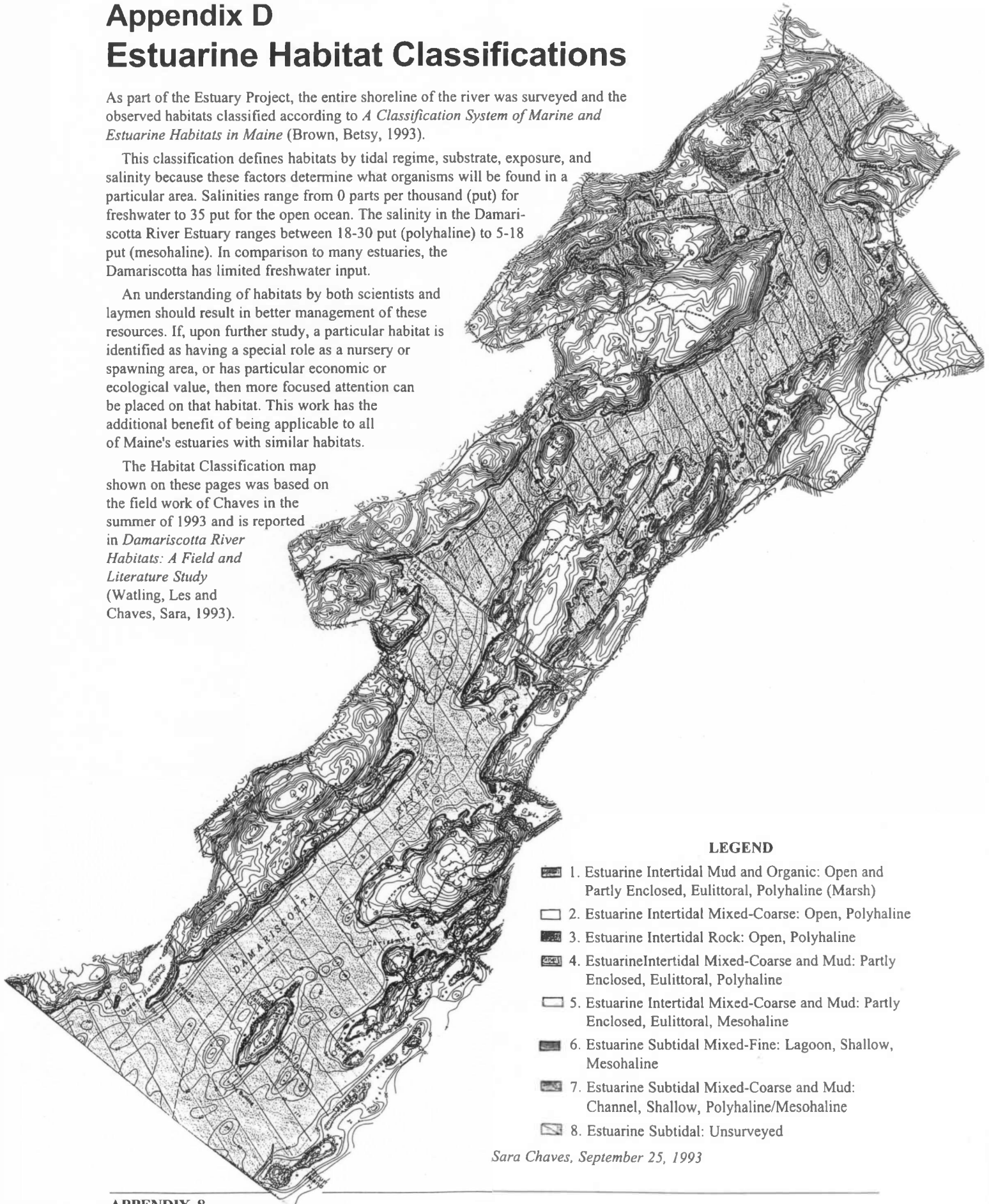
Estuarine Habitat Classifications

As part of the Estuary Project, the entire shoreline of the river was surveyed and the observed habitats classified according to *A Classification System of Marine and Estuarine Habitats in Maine* (Brown, Betsy, 1993).

This classification defines habitats by tidal regime, substrate, exposure, and salinity because these factors determine what organisms will be found in a particular area. Salinities range from 0 parts per thousand (put) for freshwater to 35 put for the open ocean. The salinity in the Damariscotta River Estuary ranges between 18-30 put (polyhaline) to 5-18 put (mesohaline). In comparison to many estuaries, the Damariscotta has limited freshwater input.

An understanding of habitats by both scientists and laymen should result in better management of these resources. If, upon further study, a particular habitat is identified as having a special role as a nursery or spawning area, or has particular economic or ecological value, then more focused attention can be placed on that habitat. This work has the additional benefit of being applicable to all of Maine's estuaries with similar habitats.

The Habitat Classification map shown on these pages was based on the field work of Chaves in the summer of 1993 and is reported in *Damariscotta River Habitats: A Field and Literature Study* (Watling, Les and Chaves, Sara, 1993).



LEGEND

- 1. Estuarine Intertidal Mud and Organic: Open and Partly Enclosed, Eulittoral, Polyhaline (Marsh)
- 2. Estuarine Intertidal Mixed-Coarse: Open, Polyhaline
- 3. Estuarine Intertidal Rock: Open, Polyhaline
- 4. Estuarine Intertidal Mixed-Coarse and Mud: Partly Enclosed, Eulittoral, Polyhaline
- 5. Estuarine Intertidal Mixed-Coarse and Mud: Partly Enclosed, Eulittoral, Mesohaline
- 6. Estuarine Subtidal Mixed-Fine: Lagoon, Shallow, Mesohaline
- 7. Estuarine Subtidal Mixed-Coarse and Mud: Channel, Shallow, Polyhaline/Mesohaline
- 8. Estuarine Subtidal: Unsurveyed

Sara Chaves, September 25, 1993

1. Estuarine Intertidal Mud and Organic: Open and Partly Enclosed, Eulittoral, Polyhaline (Marsh)

These are the vegetated salt marshes that are most common in the upper half of the estuary, but also occur in the lower half in protected coves. Associated species include salt marsh hay, saltwart, salt marsh cordgrass, sea lavender, seaside goldenrod, black grass, knotted wrack, periwinkle, ribbed mussel, and green crab.

2. Estuarine Intertidal Mixed Coarse: Open, Polyhaline

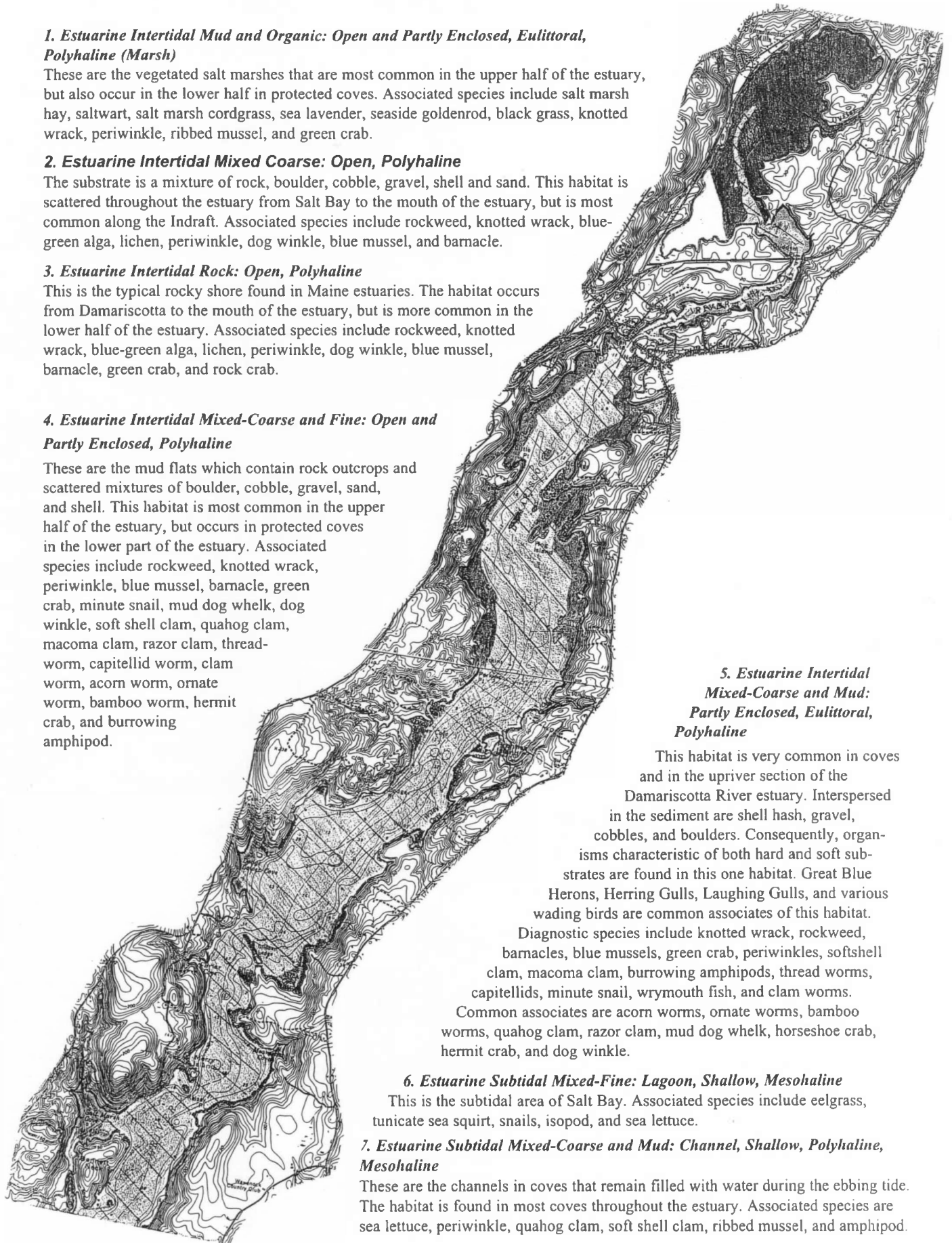
The substrate is a mixture of rock, boulder, cobble, gravel, shell, and sand. This habitat is scattered throughout the estuary from Salt Bay to the mouth of the estuary, but is most common along the Indraft. Associated species include rockweed, knotted wrack, blue-green alga, lichen, periwinkle, dog wrinkle, blue mussel, and barnacle.

3. Estuarine Intertidal Rock: Open, Polyhaline

This is the typical rocky shore found in Maine estuaries. The habitat occurs from Damariscotta to the mouth of the estuary, but is more common in the lower half of the estuary. Associated species include rockweed, knotted wrack, blue-green alga, lichen, periwinkle, dog wrinkle, blue mussel, barnacle, green crab, and rock crab.

4. Estuarine Intertidal Mixed-Coarse and Fine: Open and Partly Enclosed, Polyhaline

These are the mud flats which contain rock outcrops and scattered mixtures of boulder, cobble, gravel, sand, and shell. This habitat is most common in the upper half of the estuary, but occurs in protected coves in the lower part of the estuary. Associated species include rockweed, knotted wrack, periwinkle, blue mussel, barnacle, green crab, minute snail, mud dog whelk, dog wrinkle, soft shell clam, quahog clam, macoma clam, razor clam, thread-worm, capitellid worm, clam worm, acorn worm, orate worm, bamboo worm, hermit crab, and burrowing amphipod.



5. Estuarine Intertidal Mixed-Coarse and Mud: Partly Enclosed, Eulittoral, Polyhaline

This habitat is very common in coves and in the upriver section of the Damariscotta River estuary. Interspersed in the sediment are shell hash, gravel, cobbles, and boulders. Consequently, organisms characteristic of both hard and soft substrates are found in this one habitat. Great Blue Herons, Herring Gulls, Laughing Gulls, and various wading birds are common associates of this habitat. Diagnostic species include knotted wrack, rockweed, barnacles, blue mussels, green crab, periwinkles, softshell clam, macoma clam, burrowing amphipods, thread worms, capitellids, minute snail, wrymouth fish, and clam worms. Common associates are acorn worms, orate worms, bamboo worms, quahog clam, razor clam, mud dog whelk, horseshoe crab, hermit crab, and dog wrinkle.

6. Estuarine Subtidal Mixed-Fine: Lagoon, Shallow, Mesohaline

This is the subtidal area of Salt Bay. Associated species include eelgrass, tunicate sea squirt, snails, isopod, and sea lettuce.

7. Estuarine Subtidal Mixed-Coarse and Mud: Channel, Shallow, Polyhaline, Mesohaline

These are the channels in coves that remain filled with water during the ebbing tide. The habitat is found in most coves throughout the estuary. Associated species are sea lettuce, periwinkle, quahog clam, soft shell clam, ribbed mussel, and amphipod.

Appendix E

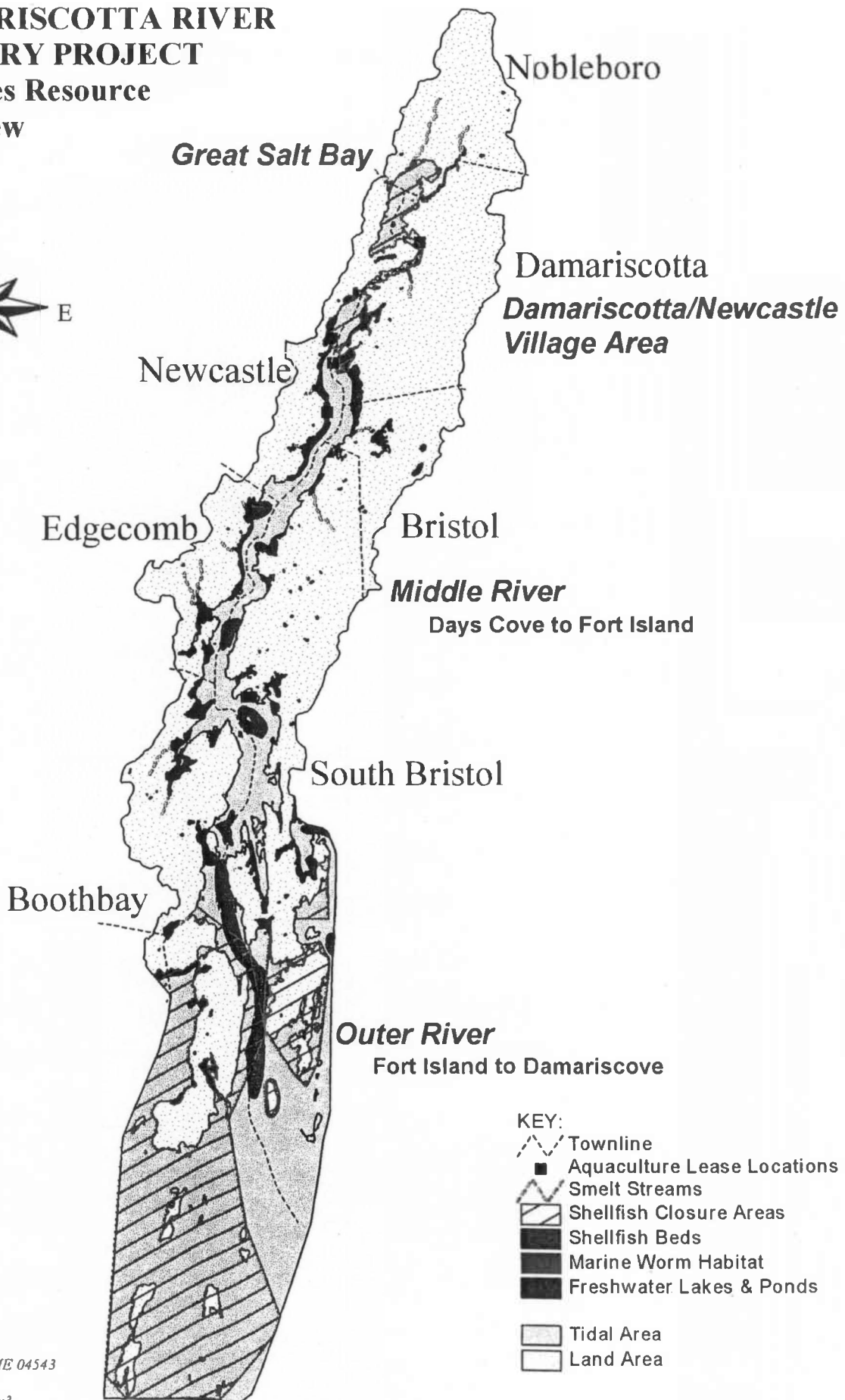
Soft-shell Clam Data

Productive Shellfish Growing Areas of the Damariscotta River & Johns Bay (1982)

Location	Productive Area	Av. Density (bu./acre)	Standing Crop (bu.)	Priority (rankings of production)
Dodge Lower Cove, Edgecomb	10.9	26.8	291.9	2
Salt Marsh Cove, Edgecomb	40.5	33.5	1357.2	1
Outer Pleasant Cove, Boothbay	16.3	30.2	492.3	2
Head of Pleasant Cove, Boothbay	75.3	27.4	2061.0	1
Burnham Cove, Boothbay	15.1	32.4	489.7	1
Wadsworth Cove, Boothbay	5.7	15.3	87.0	3
Long Cove, South Bristol	6.4	19.9	127.2	3
Long Cove, South Bristol	2.5	19.6	48.9	3
Seal Cove, South Bristol	32.9	43.7	1438.8	1
Bradstreet Cove, South Bristol	6.4	24.6	157.4	2
Jones Cove, South Bristol	8.6	6.7	57.5	3
South end, Poorhouse Cove, South Bristol, Johns Bay	21.5	66.9	1437.7	1
North end, Poorhouse Cove, South Bristol, Johns Bay	11.9	25.6	304.4	2
North Branch, South Bristol, Johns Bay	31.6	52.2	1648.0	1
Eastern Branch, South Bristol, Johns Bay	20.7	73.9	1530.0	1
Dodge Upper Cove, Newcastle	5.2	32.2	167.4	2
Cove north of Dodge Upper Cove, Newcastle	3.0	42.0	125.9	2
Cove east of Prentiss Island, So. Bristol	8.4	56.1	471.3	1
Cove south of Prentiss Is., So. Bristol	0.7	25.4	17.8	3
North of Perkins Point, Newcastle	5.4	113.6	613.7	1
South of Huston Cove, Newcastle	4.7	16.0	75.0	3
South of Huston Cove, Damariscotta	17.5	16.4	287.8	3
Flats north of Bristol line, Damariscotta	11.4	69.3	789.5	1
Flats south of Bristol line, Damariscotta	8.4	56.1	471.3	1

Source: D.Card & R. Aho (1982) Coastal Marine Resources Inventory, Small Point to Pemaquid Point. Prepared by the Maine Department of Marine Resources for the Maine Department of Environmental Protection.

**DAMARISCOTTA RIVER
ESTUARY PROJECT
Fisheries Resource
Overview**



Produced by:
Maine Mapping
Damariscotta, ME 04543
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Appendix F

Natural Plant Communities of the Damariscotta River Watershed

Excerpted from Weber, J.E. & Rooney, S.C., 1994, The Damariscotta River Estuary Project: Upland Characterization, Damariscotta River Estuary Project, Damariscotta, Maine

Below are brief descriptions of each of the natural plant communities that we found during field surveys in the watershed. Refer to map on page 13 for locations of the various plant communities, numbered in description below.

Maritime spruce-fir forest (2, 5)

Dominated by red spruce (*Picea rubens*) and balsam fir (*Abies balsamea*). This is the most seaward of the forested communities. Only the most exposed areas of the South Bristol and Linekin peninsulae and associated islands have pure Maritime spruce-fir forests. Because the forest floor is shady, the herb layer is poorly developed. Herbaceous species present are Canada mayflower (*Maianthemum canadense*) and wild sarsaparilla (*Aralia nudicaulis*). Even these areas are fragmented by residential development.

Oak-pine forest (13, 14, 15)

This is the most common forest community in the Damariscotta watershed. These forests occur on sandy, rocky, well-drained soils throughout the area. Dominant species include: red oak (*Quercus rubra*) and white pine. We found pitch pine (*Pinus rigida*) and white oak on a few of the field-checked sites. Most of the areas we visited were either remnants of this forest type, or were in transition due to logging, agricultural, residential or other disturbance.

Mixed hardwood-conifer forest (1, 3, 4)

White pine, red spruce, red oak, white birch (*Betula papyrifera*) and red maple (*Acer rubrum*) dominate the canopy in this transitional forest community. Common shrubs are striped maple (*Acer pensylvanicum*) and beaked hazelnut (*Corylus cornuta*). Herb layer components include: wild sarsaparilla, bunchberry (*Corpus canadensis*), Canada mayflower, pink lady's

slipper (*Cypripedium acaule*) and wild oats (*Uvularia sessilifolia*).

Pine-hemlock/spruce forest (14)

This community occurs infrequently in the Damariscotta watershed. The white pine and hemlock (*Tsuga canadensis*) dominated canopy is dense, limiting light penetration and therefore shrub and herb layer development. Red spruce also appears infrequently in the canopy.

Northern hardwood forest (Damariscotta Lake watershed)

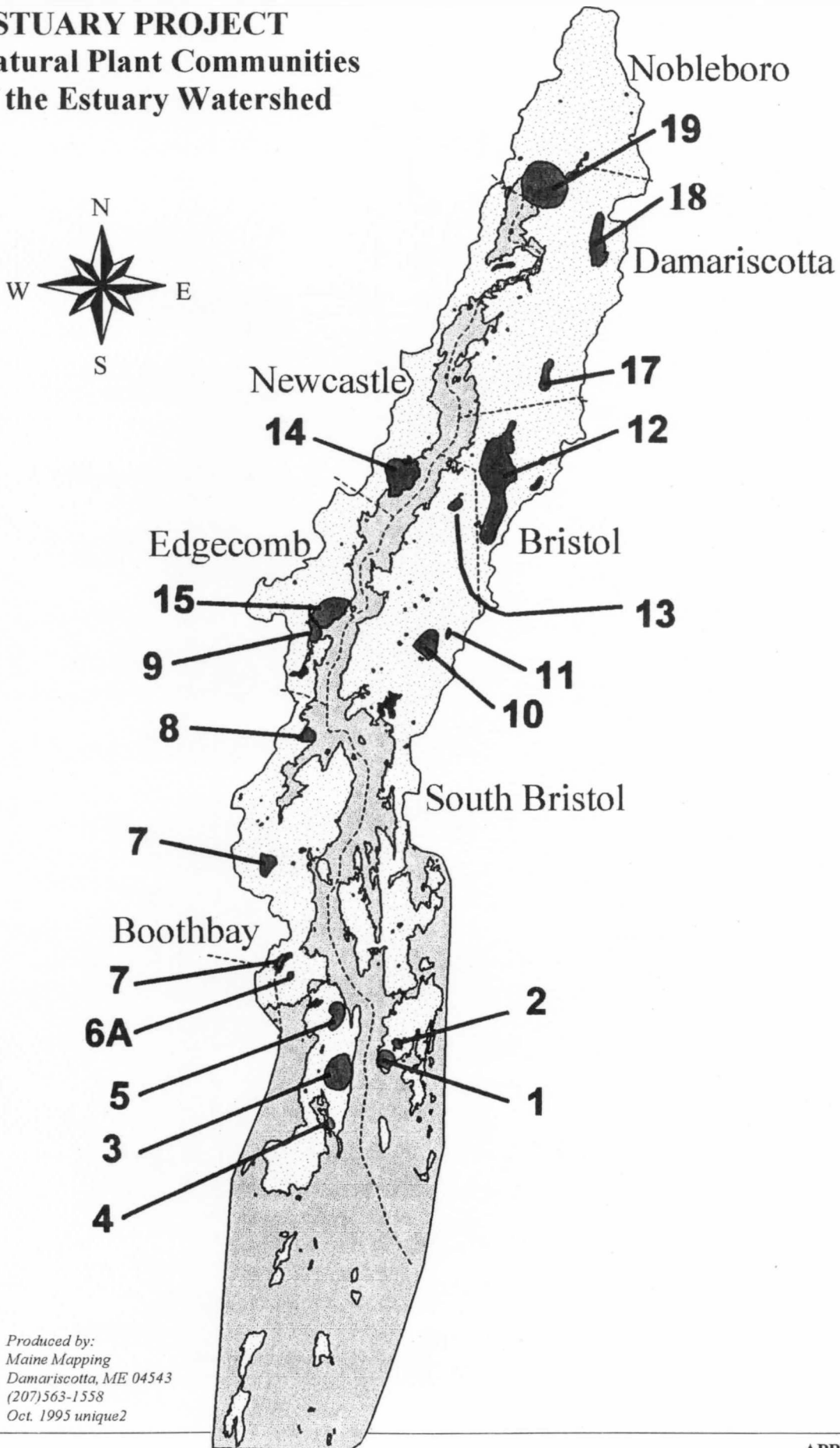
We found examples of this community only in the northern portion of the watershed. Canopy dominants include: sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*) and American beech (*Fagus grandifolia*). Eastern hemlock and red oak are frequent in the canopy. Striped maple and red spruce are often present in the subcanopy. Characteristic shrubs include: witchhobble (*Viburnum alnifolium*), maple-leaved viburnum (*V. acerifolium*) and beaked hazelnut. Typical herb layer components are shining club-moss (*Huperzia lucidula*), Indian cucumber-root (*Medeola virginiana*), Canada mayflower, wild oats, trilliums (*Trillium spp.*) and ferns (*Dryopteris*, *Thelypteris*, *Polystichum* and *Gymnocarpium spp.*).

Early successional forest (Damariscotta Lake watershed)

This community develops following disturbance and is characterized by the presence of poppies (*Populus spp.*) and birches (*Betula spp.*) in the canopy. Typical shrubs are pin cherry (*Prunus pensylvanica*) and brambles (*Rubus spp.*). Common herb layer components in open areas include bristly sarsaparilla (*Aralia hispida*) and many introduced weedy species.

DAMARISCOTTA RIVER ESTUARY PROJECT

Natural Plant Communities of the Estuary Watershed



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Pitch pine woodland (5, 6a)

Pitch pine (*Pinus rigida*) is the canopy dominant on these open, rocky outcrops and bards. Huckleberry (*Gaylussacia baccata*) dominates the shrub layer, while lowbush blueberry (*Vaccinium angustifolium*), broom crowberry (*Corema conradii*) and crowberry (*Empetrum nigrum*) dominate the low herbaceous layer. Many lichens of the genus *Cladina* abound on the rocks.

Shrub swamp (10, 18)

This community may be associated with several other types (e.g. red maple swamps and beaver flowages) and is characterized by tall shrubs at the edges of water bodies. Common species include willows (*Salix* spp.), speckled alder (*Alnus incana* ssp. *rugosa*), sweet gale (*Myrica gale*), red osierdogwood (*Corpus sericea*), highbush blueberry (*Vaccinium corymbosum*), arrowwood (*Viburnum recognitum*), winterberry (*Ilex verticillata*), mountain holly (*Nemopanthus mucronata*) and buttonbush (*Cephalanthus occidentalis*). This community occurs commonly throughout the watershed.

Sedge meadow (11, 12)

Dominated by several species of sedges (*Carex* spp.) and bulrushes (*Scirpus* spp.), we found this community in embayments of Damariscotta Lake. Bluejoint grass (*Calamagrostis canadensis*) is often a component in these meadows. The peaty or mucky soils are seasonally flooded and saturated during the growing season.

Graminoid swale (Damariscotta Lake watershed)

These "grassy" communities occur on mineral soils which are permanently saturated. Bluejoint grass is usually the dominant species, while other grasses, rushes (*Juncus* spp.), sedges and bulrushes may grow in these areas. Swales are often portions of larger fields and are thus, frequently mowed and/or hayed.

Vernal pool (Damariscotta Lake watershed)

Vernal pools are shallow, ephemeral pools in small forest floor depressions. Typical shrub vegetation includes winterberry, highbush blueberry, mountain-holly, arrow-wood and sheep laurel (*Kalmia angustifolia*). In pools which stay somewhat moist during the summer, a carpet of sphagnum moss may be present. These communities provide essential breeding habitat for numerous amphibian and invertebrate species.

Cattail marsh (12)

This community occurs in portions of lake and pond basins, shores of slow-flowing rivers and streams and disturbed aquatic habitats where cattails (*Typha latifolia*) dominate. Standing water is present for most of the year.

Red maple swamp (12)

These forested wetlands are hardwood-dominated and occur in basins at edges of lakes, ponds, peatlands, and along slow-flowing rivers. They are flooded in the spring, with standing water present throughout the growing season. Canopy species include red maple as the dominant, associated with green and brown ash (*Fraxinus pennsylvanica* and *F. nigra*), and American elm (*Ulmus americana*). The well developed shrub layer typically includes: winterberry, highbush blueberry, arrowwood, witherod (*Viburnum cassinoides*), mountain holly and speckled alder. The herbaceous layer is dominated by ferns of the genus *Osmunda*.

Beaver flowage (6, 7)

Beaver flowages are temporary impoundments whose species composition varies according to site topography. They may occur in tree- or graminoid-dominated wetlands.

Dwarf shrub bog (Damariscotta Lake watershed)

Leatherleaf (*Chamaedaphne calyculata*) growing in sphagnum moss (*Sphagnum* spp.) characterizes this community. Other vegetation includes: eastern larch (*Larix laricina*) and ericaceous shrubs [e.g. sheep laurel, and Labrador-tea (*Ledum groenlandicum*)]. Cotton-grasses

(*Eriophorum* spp.) and sundews (*Drosera* spp.) are common herbaceous species.

Lacustrine emergent (18)

Rooted aquatic vegetation occurs in shallow bays of lakes. Common species are: pickerel weed (*Pontederia cordata*), bur-reed (*Sparganium* spp.), water-lily (*Nymphaea odorata*), spatterdock (*Nuphar variegatum*), pondweeds (*Potamogeton* spp.), and coontail (*Ceratophyllum* spp.).

Rush bed (Damariscotta Lake watershed)

The Damariscotta watershed supports only a few occurrences of this community. These beds are nearly pure stands of rushes and bulrushes that occur in shallow waters along the lake shore.

Monomictic mesotrophic lake (Damariscotta Lake watershed)

These are shallow, unstratified lakes where rooted aquatics are common. Spatterdock, water-lily, water shield (*Brasenia schreberi*) and pondweeds dominate the shallow waters.

Dimictic mesotrophic lake (Damariscotta Lake watershed)

Deeper lakes with spring and fall turnover and moderate productivity fall into this category. Vegetation is similar to that described above and occurs only in shallow embayments. Phyto- and zooplankton are present in the limnetic zone

Eutrophic pond (6, Damariscotta Lake watershed)

Naturally occurring eutrophic ponds have nutrient-rich, shallow waters that typically support pondweeds, duckweeds (*Lemna* spp.), spatterdock, water-lily, bladderworts (*Utricularia* spp.) and coontail.

Deadwater (Damariscotta Lake watershed)

Deadwaters are slow-moving, flat portions of rivers where there is a dam or other impediment to water flow. Water tends to be eutrophic and supports cattails, spatterdock, waterlilies, pondweeds and bladderworts. The best example of this community occurs on the West Branch, in Somerville.

Riverine emergent: This community is found on protected rivershores and in areas of flatwater. Bur-reeds, pickerel weed, and spatterdock grow here. The confluence of Davis Stream and Damariscotta Lake is a typical riverine emergent occurrence.

Rocky headwater stream (Damariscotta Lake watershed)

Within the Damariscotta River Watershed, these are small permanent streams with rocky or cobbly beds. They are lined with shrubby vegetation, often speckled alder.

Cordgrass saltmarsh (8, 9)

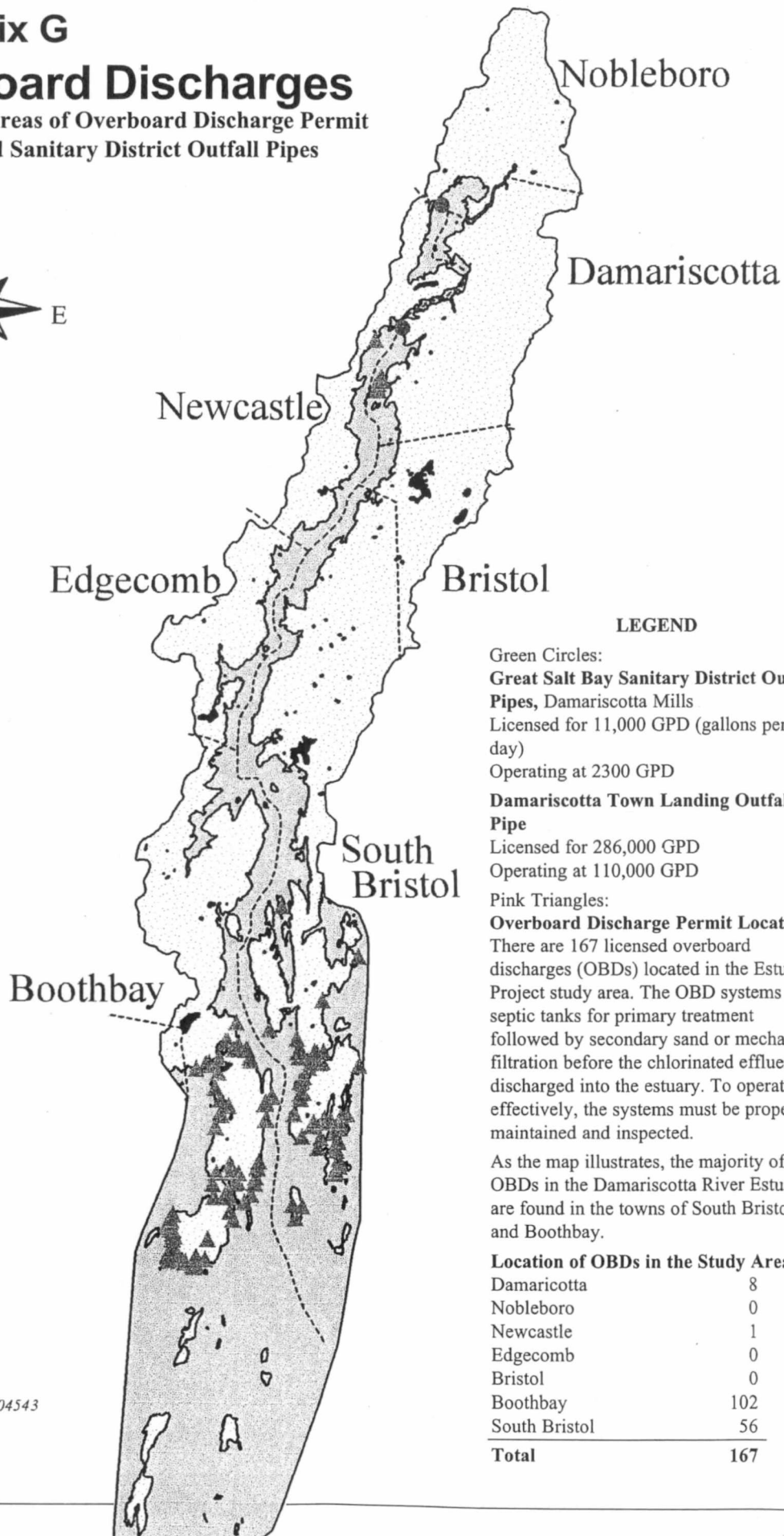
Cordgrass (*Spartina alterniflora*) dominates in these small, young, estuarine marshes. Peat deposition and erosion influence species composition. Typical associates include: salt marsh cordgrass (*S. patens*), a grass (*Distichlis spicata*), sea lavender (*Limonium carolinianum*), sea blite (*Suaeda* spp.), orach (*Atriplex* spp.) and seaside goldenrod (*Solidago sempervirens*).

Fresh water tidal marsh (19)

Very few examples of this community occur in the Damariscotta estuarine system. Typically, tall graminoids [e.g. *Scirpus pungens* and narrow leaved cattail (*Typha angustifolia*)] dominate the shores and muddy substrates support low, rosette-forming species [e.g. Parker's pipewort (*Eriocaulon parker*)], mudwort (*Limosella australis*) and pygmy weed (*Crassula aquatica*)]. The latter three are rare in Maine and we found none in the Damariscotta estuarine system.

Appendix G Overboard Discharges

Generalized Areas of Overboard Discharge Permit Locations and Sanitary District Outfall Pipes



LEGEND

Green Circles:
Great Salt Bay Sanitary District Outfall Pipes, Damariscotta Mills
 Licensed for 11,000 GPD (gallons per day)
 Operating at 2300 GPD

Damariscotta Town Landing Outfall Pipe
 Licensed for 286,000 GPD
 Operating at 110,000 GPD

Pink Triangles:
Overboard Discharge Permit Locations
 There are 167 licensed overboard discharges (OBDs) located in the Estuary Project study area. The OBD systems use septic tanks for primary treatment followed by secondary sand or mechanical filtration before the chlorinated effluent is discharged into the estuary. To operate effectively, the systems must be properly maintained and inspected.

As the map illustrates, the majority of OBDs in the Damariscotta River Estuary are found in the towns of South Bristol and Boothbay.

Location of OBDs in the Study Area

Damariscotta	8
Nobleboro	0
Newcastle	1
Edgecomb	0
Bristol	0
Boothbay	102
South Bristol	56
Total	167

Produced by:
 Maine Mapping
 Damariscotta, ME 04543
 (207)563-1558
 Oct. 1995 obd2

Appendix H

Damariscotta River Association

Damariscotta River Bird/Wildlife Survey

November 8, 1994

During the spring and summer of 1994, supported by grants from the Fields Pond Foundation in Massachusetts and the Damariscotta River Estuary Project, the DRA undertook to survey and monitor nesting and roosting sites of colonial seabirds and birds of prey (Eagles and Osprey). Seal pupping and haul-out ledges in the area extending from Great Salt Bay to the outer offshore islands and ledges were also surveyed. Earlier nesting surveys of the islands had been made in by the DRA in cooperation with the US Fish and Wildlife Service (USFWS) in June 1993 and by Maine's Department of Inland Fisheries and Wildlife (MDIFW) on several occasions during the late 1970s to the mid-1980s. Pete Noyes and Tom Arter, representing DRA's marine program, Peter Abello, a student intern employed by the Damariscotta River Estuary Project (DREP), and Stewart Fefer, director of the USFWS Gulf of Maine Project in Portland took part in the survey.

Nesting Seabirds

General

The 1994 survey work had several purposes: First, it would contribute to the database the Damariscotta River Estuary Project was collecting on the habitats and resources of the estuary. Second, the survey would document the nesting activity on Little Thrumcap Island, which has been designated by MDIFW as essential nesting habitat for the endangered Roseate Tern. The DRA currently has an option to purchase Little Thrumcap. Though terns had nested in numbers on Thrumcap as recently as the mid-1980s there is no record of any nesting activity since that time. As a preliminary to possible efforts to restore nesting terns to Thrumcap, we wanted to determine where the many terns—Roseate, Common, and Arctic—that are often observed feeding on the river are coming from.

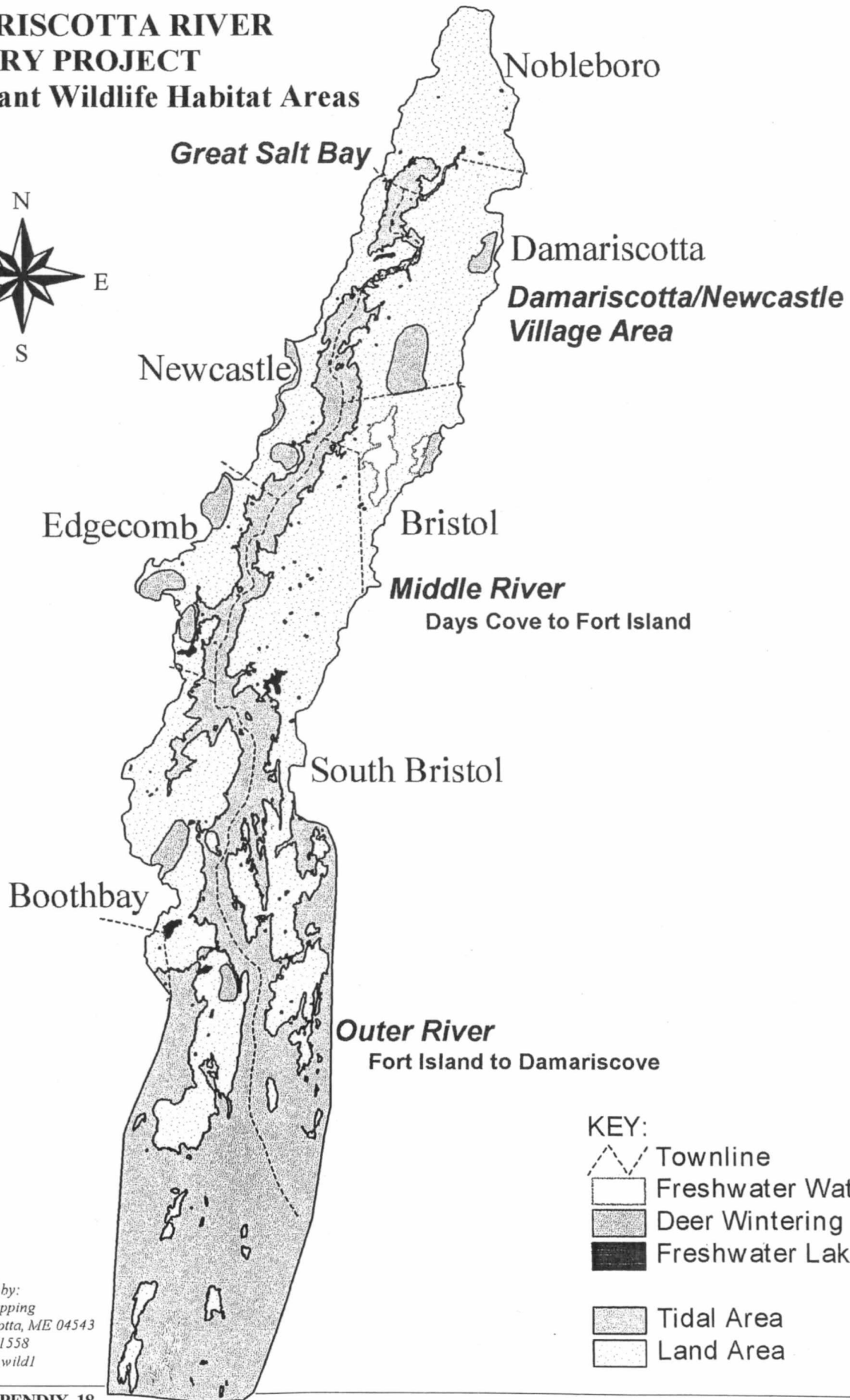
A. Terns

June Survey: The first survey took place on 13 and 15 June and was conducted mostly by boat, with actual landings on several islands. The survey area included the entire Damariscotta River, most of the islands stretching from Pemaquid Peninsula westward to Lower Mark Island, a cormorant and heron nesting island near the western entrance of the Sheepscot. The boat survey was timed to tie into a statewide survey being conducted in association with the Gulf of Maine Tern Working Group and the MDIFW, and also into an aerial cormorant colony study being carried out by MDIFW.

The only nesting terns in the survey area were discovered on the southernmost of the two Goose Ledges, approximately one mile south of the Damariscotta Town Landing. No tern nests were observed on Little Thrumcap or at any other location. An independent, overlapping survey done in the same time frame by Maine Audubon naturalist Jane Arbuckle supports our observation that, other than Goose Ledges in the Damariscotta, there are no island tern nesting colonies on the Maine coast between Casco Bay (Jenny Island) and Muscongus Bay (Killick Stone Is. and Eastern Egg Rock). (A small inland Common Tern colony has been documented on a freshwater lake in Bremen and there may well be other small unrecorded sites in the Sheepscot or other estuaries.) From this, we conclude that most of the many terns seen fishing and resting on the Damariscotta's islands and ledges in recent years have flown in from Eastern Egg Rock, about eight miles away. Eastern Egg Rock supports a large Common, Roseate, and Arctic tern colony managed by the National Audubon Society.

Goose Ledges: According to a long-term neighbor, there has been a small nesting tern

**DAMARISCOTTA RIVER
ESTUARY PROJECT**
Significant Wildlife Habitat Areas



Produced by:
Maine Mapping
Damariscotta, ME 04543
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Oct. 1995 wild1

colony here for at least 50 years, which, under pressure from human visitors, gulls, and perhaps other predators, has declined considerably in size during recent decades. The DRA first focused attention on the southern Goose Ledge in response to a letter of concern from this neighbor in 1993. cursory observation confirmed the presence of Common Tern adults and, on one occasion, a single nearly fledged chick on the ledges in July 1993.

A landing on the ledge on 13 June 1994 revealed seven Common Tern nests in and near the small grassy area at its highest point (most of the ledge is under water at high tide) Three of the nests contained three eggs, three had two eggs, and one had one egg. Though there were a number of cormorants and gulls roosting on northern Goose Ledge, the terns (14 were seen on the nests and in the air nearby) seemed to have the southern ledge to themselves. Frequent viewings by boat during the next few weeks showed terns on these nests continuously. A single chick was spotted on 4 July (and was attempting to fly by the 14th). Though 3-4 terns continued to occupy their nests on the small ledge during following weeks, no additional hatchlings were spotted from the water.

A second landing on the ledges was made on 11 August, when one two-week old tern chick and three nests were found. The latter contained one, two, and three eggs respectively, and there was also one broken egg containing an embryo nearby. We believe that this chick and eggs were probably the result at a second nesting attempt, the first having produced only one successful fledgling. By 17 August, this chick was about to fly and three others had hatched. No adult terns remained on their nests, though several were busy flying off and returning with small fish to feed the nestlings. By 8 September, all terns had disappeared from the ledge, which was now occupied by gulls (Herring and Black-backed) and Double-crested Cormorants, and two days later, during a trip to Outer White Island, only a few terns remained on the entire river. It is doubtful that the three youngest chicks survived.

The Goose Ledges are included in the Coastal Island Registry as belonging to the Maine Bureau of Public Lands. The DRA has initiated

action to have them transferred to MDIFW and then placed under DRA stewardship.

Little Thrumcap Island: A survey completed by the MDIFW in June 1982 at Little Thrumcap Island identified 178 nesting pairs of Common Terns and 5 pairs of Roseate Terns on the island Ten nesting pairs of Herring Gulls and 75 pairs of Laughing Gulls were also found. Another MDIFW survey in July 1984 found 65 pairs of "unidentified terns" there, but did not note other species. From that date, no surveys were made and no data are available until 1993, when a DRA visit found no nesting terns or other seabirds.

In June 1993, not long after Little Thrumcap's designation as essential nesting habitat, DRA and USFWS made a survey of the offshore island group that includes Little Thrumcap The subsequent report states: "One Black-backed Gull nest was found at the peak of the island No other evidence of nesting seabirds was found.... Common Terns were feeding off the island. One flock of about 30 were seen, one close to the southwest shore and one of about 30 terns west of the island at least a mile offshore."

As noted above, no nesting seabirds were found on Little Thrumcap Island when we visited there on 16 June 1994, though three gull nest bowls, with no eggs, were discovered Terns and gulls were resting on and flying by the island during the visit. We think most of these terns and the many others observed during the summer in the same area probably originated from the tern colony on Eastern Egg Rock in Muscongus Bay.

B. Other Seabirds

Even though Herring, Black-backed, and Laughing Gulls, Double-crested Cormorants, and Common Eiders feed regularly in the river, no nests of these species were discovered north of Shipley Point during our 1994 survey.

1) Thread of Life Ledges

Herring Gulls, Black-backed Gulls, Common Eiders, and Double-crested Cormorants traditionally nest on the ledges stretching north-south between Crow and Big Thrumcap islands. Our 1994 survey counted several hundred cormorants and at least 100 active nests, a considerable increase over 1993. There were roughly 30 pairs of nesting Common

Eiders this year, about the same as last. Both Herring and Black-backed gulls in large numbers nest on these ledges and many were evident in the air and on the rocks. This is the gull colony closest to Little Thrumcap, about half a mile away.

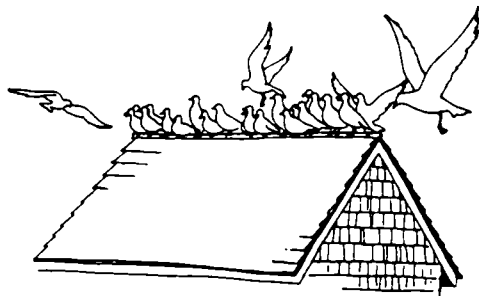
2) Inner White Island

Our June 1994 survey, from the water only, detected large numbers of nesting Black-backed and Herring Gulls, Double-crested Cormorants, and Common Eiders on shore and in the water nearby. Several Black Guillemots were seen flying by. A visit ashore during our 1993 survey found 197 gull nests, 40 active Doublecrested Cormorant nests, and strong evidence that Black Guillemots also nest on the island A MDIFW survey in June 1984 discovered 208 Great Black-backed Gull nests and a total of 925 Cormorant nests, indicating a substantial shift in the latter population during the past decade.

3) Outer White Island

Black-backed and Herring Gulls in large numbers as well as a substantial colony of Common Eiders nest on this island. Black Guillemots in the air nearby during our 1994 survey and seen on the island itself in 1993 and during earlier MDIFW surveys in the 1970s are evidence that they do nest here. We found no evidence in either 1994 or 1993 that cormorants nest here, although some were seen on the shore.

Perhaps of significance to past and possible future nesting terns on Little Thrumcap Island, about two miles distant, a small (fewer than a dozen nests) colony of Blackcrowned Night Herons, a significant tern predator, was discovered during the 1994 survey.



Other Nesting Birds

A. Eagles

Eagles have been seen flying, fishing, and roosting year round along the entire river. These have included both adult and young birds. Two nesting areas are currently in use, one in Damariscotta Mills near Great Salt Bay, which has been active for a number of years, and one in the vicinity of Stratton (Hodgdons) Island and the Fort Island Narrows. Although eagles began to build a nest several years ago on the shore of the DRA Salt Bay Farm, this effort never resulted in an active nest.

In 1993 a pair of eagles occupied an Osprey nest at the northern end of DRA's Stratton Island in South Bristol and successfully fledged two young (as a result of which Stratton and a portion of nearby Farmers Island have been declared essential eagle nesting habitat by MDIFW). Subsequent to fledging, this nest was blown down in heavy wind in September 1993. In spring 1994, a pair of eagles, presumed to be the same pair, assumed ownership of another Osprey nest in East Boothbay, about half a mile to the west and almost directly across the river from Stratton Island. Here they successfully fledged one eaglet in 1994.

B. Osprey

Osprey are a common sight on the river. DRA boat surveys identified a total of 22 active nests during the past season and there surely are more, most of which probably have been noted in a more detailed aerial study done this summer by the Chewonki Foundation, the results of which will soon be available. Of the 22 nests found, the greatest concentrations are at the mouth of the river, where there are at least six active nests, and Great Salt Bay, with four. DRA has no independent knowledge of the productivity of these nests but preliminary indications from the Chewonki investigation are that, though the number of nests in the region has increased dramatically, there has been a recent decline in nestling survival, perhaps due a reduction in the availability of alewives, pogies, and other food in the past two years.

C. Herons

Great Blue Herons are a common sight on mudflats and in saltmarsh, with their heaviest concentrations in Great Salt Bay and the upper river. (On a number of occasions in 1994 a dozen or so were seen from a single location fishing in Salt Bay at the same time) Yet, there are no identified nesting locations on the river and we are unsure where they are coming from. Possibilities include a reported rookery of approximately 30 nests on an inland pond in Jefferson, Little Mark Island in the Sheepscot (a good distance away), and Outer Heron Island (whose once large heron population has been greatly depleted, at best, in recent years). This is a question deserving further study.

As noted above, there is a small colony of Black-Crowned Night Herons on Outer White Island. Night Herons can sometimes be seen fishing as far north as Great Salt Bay. In 1994, as in earlier years, there have also been occasional sightings of transient Snowy Egrets on the river, this year on Goose Ledges and on a peninsula north of Dodge Point.

Marine Mammals—Seals

Harbor Seals are another common resident frequently found sunning themselves, peering at passing boats, or fishing incoming tides the length of the river, from the offshore islands to the inner Great Salt Bay.

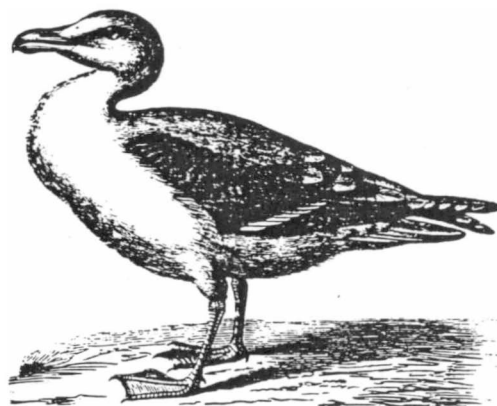
Seal haul-outs along the river include the following, north to south:

1. small ledges southwest of Goose Ledges—half a dozen or so seals are common.
2. ledges slightly southeast of the above, on the Bristol side of the river—6- 10 seals.
3. Glidden Ledges—again, half a dozen seals not uncommon.
4. Ledges north of the entrance to Pleasant Cove on the west side of the river—same size.
5. Ledges northwest of Plummer Point, at the entrance of Long Cove in South Bristol. This is the largest haul-out in the river proper. One count showed over 50 seals hauled out here during pupping time in June.
6. So-called Seal Ledges” in Seal Cove—a dozen or so seals are frequently found here.

7. Ledges west of Stratton Island and north of Fort Island narrows—six to twelve seals often hauled out.

There are several larger seal haul-outs and pupping areas offshore in the immediate vicinity of the river’s mouth These include:

1. The Thread of Life ledges, where 30 or more adult and newborn seals can be seen in the spring.
2. The Hypocrite Ledges alongside Fishermans Island—a large colony of sometimes over 75 seals frequented by tour boats from Boothbay Harbor.
3. Pumpkin Ledges, just south of Outer Heron Island. This is the area’s largest colony, with sometimes as many as several hundred harbor seals, distinguished by their large size and varied colors, on the ledges and in nearby waters. During a visit on 9 September 1994, two inquisitive Gray Seals approached the DRA’s boat. There may have been more in the vicinity.



Appendix I

Notes on Outer Islands of the Damariscotta Region

Damariscove

Damariscove Island was one of the earliest settlements in New England. As early as 1614, it was reported that 13 men were engaged in fishing for the English market. Various maritime and agricultural enterprises continued on the Island for the next 300 years. Damariscove is presently owned by The Nature Conservancy. The island is a seabird nesting island. The cove is very congested with cruising boats in the summer.

Fisherman's Island

This island was home to as many as a dozen fisherman families during the 1670s. The island is currently in private ownership. The stone building on the island was built in 1925 as a summer retreat. The island supports a small flock of sheep and the southern end is colonized by gulls.

Outer Heron

This island is named for the blue herons that have nested here since colonial days. The island is privately owned.

The Hypocrites

The Hypocrites are a series of ledges east of Fisherman's Island. The Hypocrites are a seal haul out and pupping area.

Pumpkin Island and Ledges

The island and ledges are owned by the Bureau of Public Lands. Access to the island and ledges is very difficult. The ledges are often covered with hundreds of seals and are a significant seal rookery.

Ram Island

Named by the early residents of Fisherman's Island as pasture for wayward male sheep, a lighthouse was erected on Ram Island in 1883 to aid navigation through Fisherman Island Passage. The land is currently leased by the Ram Island Light Association.

Inner Thrumcap

There is a private seasonal residence on the island.

Outer Thrumcap

The island is an historic roseate tern nesting site and part of the Petit Manan National Wildlife Refuge (U.S. Department of Interior's Fish and Wildlife Service).

Outer White Island

The island also a part of the Petit Manan National Wildlife Refuge and is a bird nesting area for eider ducks. The island is used as a rest stop for migrating monarch butterflies.

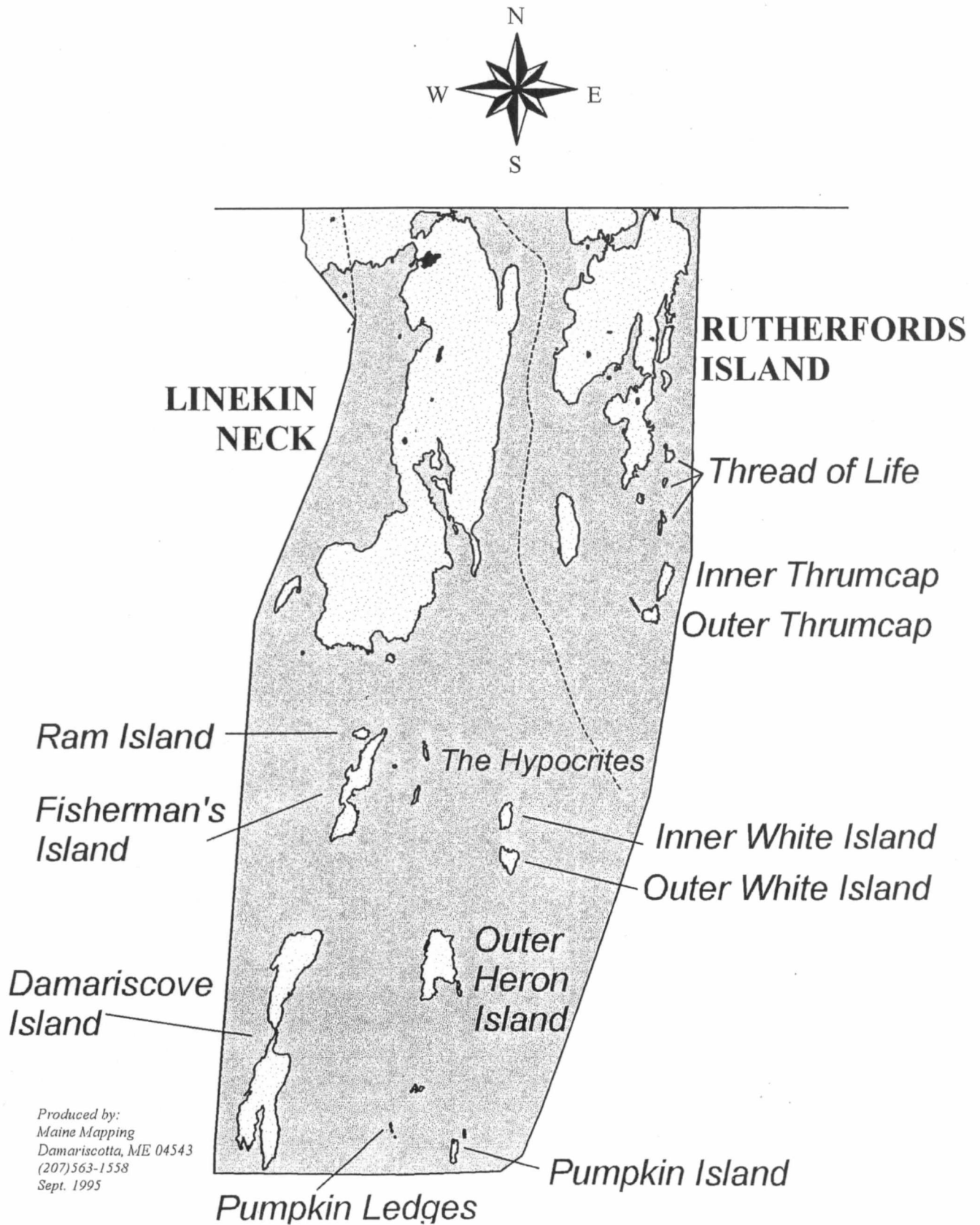
Inner White Island

The Boothbay Region Land Trust owns Inner White Island, a bird nesting island.

Thread of Life

This group of islands and ledges are roosting areas for cormorants, gulls and eider ducks, and a seal haul-out.

The Outer Islands of the Study Area



Appendix J

Geographical Information System (GIS): Databases and Map Information

A significant part of the Damariscotta River Estuary Project's effort has included extensive inventory work and mapping various elements of the study area. The mapping component is computer-generated in a Geographic Information System (GIS) format.

GIS is capable of producing maps in a variety of sizes and colors as well as providing tools for analysis by attaching data to the map elements. For example, a parcel displayed as part of a municipal tax map has information associated with it—owner, map number, lot number, and whether or not it is tax exempt or registered in the tree growth program. A point illustrating the location of an overboard discharge permit site carries the permit number in the attached database.

There is supporting documentation that accompanies the computerized map data. The data is archived with the Maine Office of GIS in Augusta and the Maine Mapping Service in Damariscotta. Using appropriate software, some of which is in the public domain, the digital data is available to individuals and municipalities. Technical assistance is also available.

Several sets of maps have been produced for this project providing insightful information. Large-scale maps include a natural resources overview, present land and water use, and an overview of municipal shoreland zoning.

Future applications of GIS technology may include

- Expansion of parcel mapping and related database assessment
- Planning and land use analysis
- Water and wastewater management
- Monitoring and analysis of natural resources over time
- Enhancements to the E-9-1-1 system
- Road analysis to better maintain town roads

The databases below are indexed in the *Characterization Studies of the Damariscotta River Estuary* which is available to residents and municipalities.

DATA FILES

Description	File Name
Municipal Boundaries	ETOWN
Tidal Area/River	COAST
.....	COASTCLP
Freshwater Ponds	POND
Streams	ESTREAM
Transportation	EROAD
Bald Eagle Nest Sites	EAGLE
Bald Eagle Essential Habitat Area	EAGLEBUF
Deer Wintering Areas	EDWA
Freshwater Waterfowl and Wading	EWWH
Bird Habitat Areas	
Marine Worm Habitat Areas	MWORM
Unique Natural Areas	UNA
Aquaculture Lease Sites (1992)	LEASE92
Water Quality Monitoring Stations	WQSTAT
Overboard Discharge Sites	OBD
Municipal Sewer Service Area	SEWER1
Municipal Water Service Area	
Damariscotta/Newcastle Area	WATER1
East Boothbay Area	WATER2

Description	File Name
Public Access -	
Commercial 8 Non-profit	ACCESS
.....	ACCESRED
Parcels:	
Boothbay	EPARBB
Bristol	EPARBR
Damariscotta	EPARDA
Edgecomb	EPARED
Newcastle	EPARNC
Nobleboro	EPARNB
South Bristol	EPARSB
Generalized Shoreland Zones:	
Boothbay	ESZ_BB
Bristol	ESZ_BR
Damariscotta	ESZ_DA
Edgecomb	ESZ_ED
Newcastle	ESZ_NC
Nobleboro	ESZ_NB
South Bristol	ESZ_SB

Appendix K

Economic Indicators of the Damariscotta River Estuary

The Damariscotta River continues to provide a wealth of opportunities for economic development. In addition to wild stock fisheries, the Estuary is host to a growing aquaculture industry. Tourism and marine research are other areas in which there is room for growth and development. All these activities create demand for products and services provided by a variety of marine-related local businesses.

WILD STOCK FISHERIES

- 787 harvesters were licensed in 1991 for commercial fishing, not including harvesting of sea urchins. 243 of those commercial harvesters may actually fish specifically in the Damariscotta River Estuary (DRE). The estimated value of their landed catch is \$2.54M.
- * 50 lobstermen worked the DRE harvesting 600,000-800,00 pounds of lobsters valued between \$ 1.5-2.0M.
- * 150 clam diggers harvested a minimum 206,935 pounds valued at \$742,896.
- * 28 marine worm licenses were issued to residents in DRE communities; approximately 50 acres of worming flats are identified on the DRE, any harvest from the DRE is likely to be valued less than \$10,000.
- * 28 commercial sea scallop licenses were issued to residents of DRE communities; only three boats may have actually worked the river during the season; estimated value of the harvest is \$50,000-100,000.
- * 10 divers maximum were harvesting sea urchins in the lower DRE; estimated harvest is valued at less than \$200,000.
- * crab harvesting is mostly incidental to lobstering on the DRE; the value of the estimated harvest is \$20,000.
- * 100 anglers are estimated to fish the DRE for bluefish and striped bass, landings data for recreational fisheries is not generally recorded; the annual expenditure by anglers is estimated between \$20,000-75,000.
- * 300 anglers are estimated to participate in the winter smelt fishery landing 15,904 pounds valued at \$13,677; the additional annual expenditure by anglers are minimally estimated at \$64,800.
- * 305 bushels of alewives valued at \$2196 were harvested at Damariscotta Mills.

AQUACULTURE

In 1992 on the Damariscotta River estuary there were six aquaculture operations leasing six sites comprising a

total of 55.6 acres. The DRE comprised 27.2% of the total leases and 16.6% of the total leased shellfish acreage in Maine. In 1993 four of the six operations added 6 new lease sites, increasing the total of leased acreage to 71.59 acres, an increase of 22.3%. The aquaculture industry operating on the Damariscotta River Estuary

- employed 41 people at an approximate payroll of \$0.46M.
- reported their investment value at \$1.1M.
- reported their gross sales at \$1.1M.

MARINE-RELATED BUSINESS

58 businesses are identified as dependent on the estuary or are providing products and services primarily associated with the estuary. These firms employ approximately 518 people and have a total payroll of \$3.94M.

- 33 businesses wholly or largely dependent upon the DRE employ approximately 415 people on a payroll of \$2.7M.
- 15 businesses support those businesses directly working on the DRE, employing 45 people on a payroll of \$0.67M.
- 10 businesses provide services or products used on the river but are not necessarily dependent on the river for their existence. These employ roughly 30 people and have a total payroll of \$0.45M.
- 25 part-time and seasonal employees of these businesses earn a minimum of \$0.12M.

MARINE RESEARCH

Marine research has grown into a business which provides considerable employment in this region. Three marine research laboratories, Ira C. Darling Center, Bigelow Laboratories, and the Maine Department of Marine Research provide employment opportunities for approximately 130 people. The estimated value of their combined payrolls is \$3.25M.

CONCLUSION

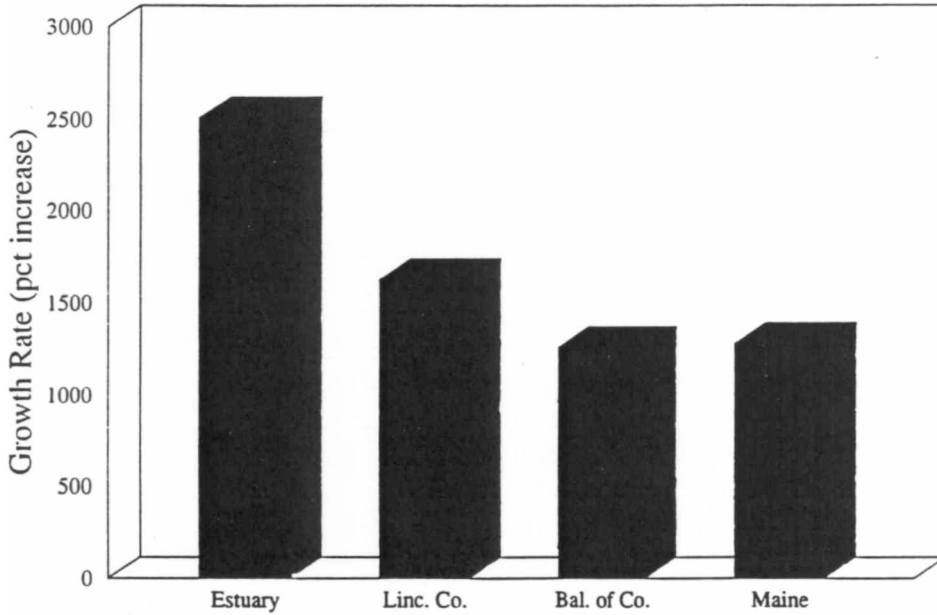
Between 1991 and 1992 the following activities provided employment for 648 people and had an economic value minimally estimated at \$12.1-13.3M.

- fisheries harvested: \$3.6-4.8M
- non-resource value: \$1.3M
- employment payroll \$7.19M

Appendix L

Census Data from Estuary Towns

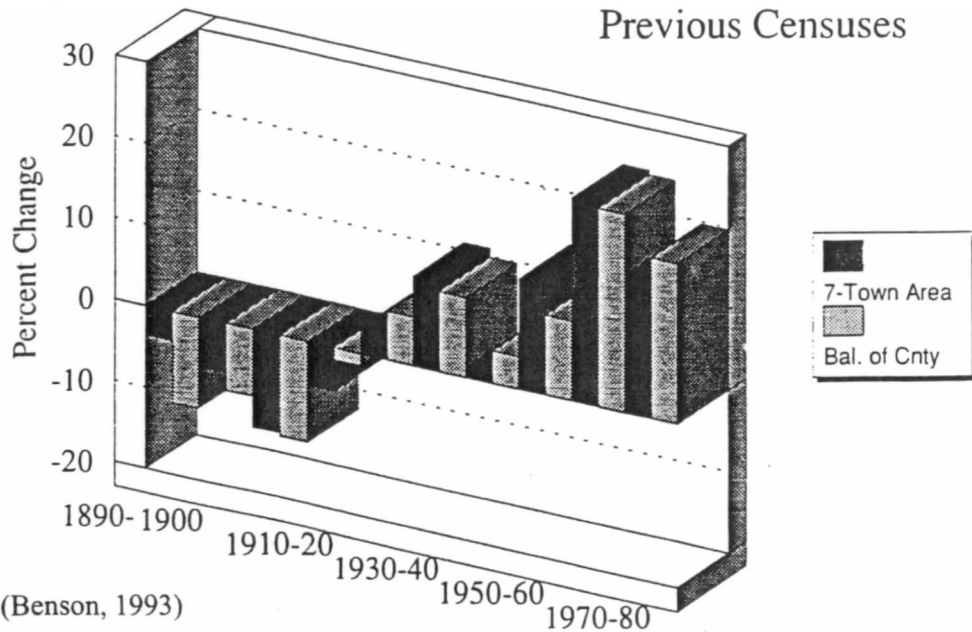
Growth in Real Estate Value, 1970-90
Damariscotta River Estuary Towns



Damariscotta River Estuary Towns

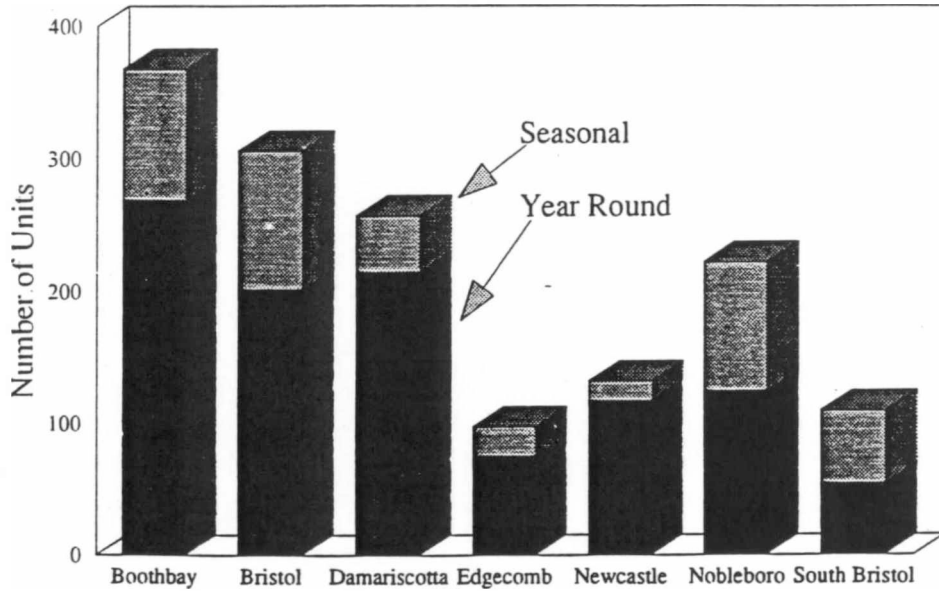
Rate of Population Change from

Previous Censuses



Source: U.S. Census Data (Benson, 1993)

Housing Units Added, 1980-1990 Damariscotta River Estuary Towns



Seasonal Housing by Town, 1990 Damariscotta River Estuary Towns

