FHWA-ME-EIS-86-01-DS

Maine DOT
FHWA

Draft Supplemental Environmental Impact Statement

Sears Island Dry Cargo Terminal • Searsport, Maine

Distribution of Eelgrass in Penobscot Bay, Maine

Salmon Falls Research Associates, Inc.

May 1995

Distribution of Eelgrass in Penobscot Bay, Maine

By
Frederick T. Short
Salmon Falls Research Associates, Inc.
P.O. Box 462
Durham, New Hampshire 03824-0462

For
Normandeau Associates Inc.
25 Nashua Road
Bedford, New Hampshire 03110-5500

January 31, 1995
Revised May 15, 1995

Distribution of Eelgrass in Penobscot Bay, Maine

Executive Summary

Eelgrass was surveyed using aerial photography, low elevation surveillance, and ground truthing by boat to define the spatial distribution of eelgrass beds throughout Penobscot Bay. The narrative presented here accompanies a set of 14 maps that depict both confirmed and probable eelgrass beds. The largest stands of eelgrass were found in the Bagaduce River on the eastern side of the Bay, although substantial beds were found in many protected harbors and coves particularly around Sears Island, Cape Jellison, Islesboro and Deer Isle. Smaller eelgrass beds were scattered throughout the Bay. The ecological significance of the eelgrass resource to the Penobscot Bay region is great. Its functions and values include fish and waterfowl habitat, trophic food chain basis, water filtration, lobster nursery, shellfish recruitment substrate, and sediment binding and stabilization.

Introduction

The distribution of eelgrass, *Zostera marina* L., in Penobscot Bay, Maine, was assessed using aerial photography with field checking by low level aerial surveys and, in some cases, by boat. A series of maps depicting locations of eelgrass beds throughout the Bay in 1994 was produced from these data. Coastal habitat maps of Penobscot Bay and elsewhere in Maine were created in the mid-1970s (Timson 1976) from aerial photographs (1:20,000) to identify areas of eelgrass and other coastal habitats. Although less than 2% of the shoreline was field checked (Tucker 1991), these maps do provide an assessment of eelgrass distribution 20 years ago. As with many resource assessments from years ago, the validity of these eelgrass maps is difficult to determine. Thus, the current project was undertaken in coordination with the Maine Department of Transportation and the Maine Department of Marine Resources in an effort to develop a current eelgrass distribution map that could be easily entered into the Maine Geographic Information System (GIS). The immediate purpose of the eelgrass survey was to provide information regarding eelgrass distribution as a basis for site selection for the proposed dry cargo terminal on Sears Island.

Methods

Area Covered

A set of 14 maps depicting eelgrass distribution in Penobscot Bay was produced. These full sized set of GIS base maps are 3 x 4 feet at a scale of 1:12,000 and are used for the incorporation of the eelgrass data into the Maine GIS. For inclusion in this report, a set of 14 maps in reduced size (8.5 x 11.0 inches) showing eelgrass in color was created with scales of 1:44,000 or 1:64,000. The maps cover most of Penobscot Bay, from Owls Head on the western shore in Rockland north to Bucksport and south to Stonington, excluding North Haven and Vinalhaven. Maps for the western shore of Penobscot Bay (Maps PB1-PB5) are arranged as an overlapping series along the coastline (see map of Penobscot Bay Eelgrass Habitat Manuscript Location). The nine remaining maps of the eelgrass survey area in Penobscot Bay are depicted on a grid system (see map of Penobscot Bay Eelgrass Habitat Manuscript Location).

Determining and Mapping Eelgrass Distribution

Aerial photography (1:12,000) for the project was made by J.W. Sewall Company of Old Town, Maine, from flights on October 4 and October 7, 1992. Approximately 300 color positive 9 x 9 inch photographs were produced. The photographs were generally of acceptable quality, except that they were not made during optimum conditions (spring low tide). Thus, determination of the lower depth limit of the eelgrass beds from the photographs was difficult in some areas. Additionally, the photographs from the two days did not have the same degree of tidal exposure, creating differences in our ability to delineate beds depending on the day of the photography. However, the time window during which the photography was done was appropriate and the photographs produced were of sufficient quality to map eelgrass distribution.

Possible eelgrass areas were outlined on a transparent sheet overlain on each aerial photograph using a light table. Then the presence and extent of eelgrass was determined by field checking and marked on the transparencies. Two methods of field checking these possible beds were employed. For the areas covered by the two maps near Sears Island (Maps PB1 and PB2),

possible beds were ground truthed in a boat using both visual inspection and divers. Eelgrass beds for the other twelve maps were checked at low altitude in a light plane. Details for the field checking activities are given in the following section.

Following field checking, polygons indicating eelgrass beds were transferred to GIS base maps printed on Mylar™ sheets. The GIS base maps were provided by the Department of Marine Resources and by the Maine Department of Transportation at a scale of 1 to 12,000. The data were transferred to each GIS base map on a light table by overlaying the translucent base map on each pair of transparencies and photographs of the Bay and aligning the physical features of the Bay with features indicated on the GIS map (i.e., shorelines, roads). With careful positioning of photographs, and utilizing only the central 6 x 6 inch area of each photograph to avoid the distortion caused by the curvature of the camera lens, the outlines of suspected and confirmed areas of submerged vegetation were marked with indelible ink.

Field Checking

An essential step in the development of the eelgrass distribution map was to perform low elevation aerial surveillance of all suspected eelgrass areas. Flying at low elevation (300 to 1000 feet) around the shoreline of Penobscot Bay in October 1993 and September 1994, it was possible to eliminate from the map any suspected areas that could be determined from the air not to be eelgrass beds. Mussel beds and most dense algal beds could be distinguished from eelgrass beds using low level aerial surveillance. On the other hand, many of the possible beds were confirmed by the procedure (green on colored maps), while others could neither be confirmed nor rejected (yellow on colored maps).

Groundtruth activities were limited to the northwest side of the Bay (Maps PB1 and PB2) near Sears Island. Assessment by boat and using scuba was done from Sandy Point in Stockton Springs to Browns Head in East Northport around the northwest portion of Penobscot Bay in July 1994. Groundtruthing was done by observation from a boat at low tide and by scuba diving at high tide to determine the presence or absence of eelgrass at possible eelgrass sites demarcated on the photographs and transparencies. Groundtruthing was especially important to determine the extent of eelgrass distribution at its lower depth limit. Groundtruth assessment of the area covered

by the two maps allowed determination of an approximate accuracy of the findings of eelgrass distribution which were not groundtruthed, but checked with low level aerial surveillance only.

The water depth at the seaward edge of eelgrass beds (lower depth limit) was determined during groundtruthing. A weighted tape measure was dropped from the side of the boat, and positioned over the deep edge of a given bed. A diver on the bottom held the measuring tape to the edge of the eelgrass bed, and a measurement was taken to the water's surface. The measurement was then adjusted to mean low tide using the appropriate correction for the time of the measurement (Tide Tables, NOAA 1993).

Photointerpretation

In general, the minimum-size of an eelgrass bed that can be detected with aerial photography is a function of eelgrass density, eelgrass patch size, and water depth and clarity, along with the resolution of the photographs (e.g., plane altitude, film quality). However, in the case of this mapping project, the time gap between the photography (1992) and the groundtruthing (1993, 1994) precludes clear determination of the size of a minimum detectable eelgrass bed. Because more than a year passed between the time of the photography and the groundtruthing, the eelgrass beds may have expanded or contracted before groundtruthing. Based on general experience and observation of other objects (boats, docks) in the photographs, a patch of approximately 6 feet in diameter is the minimum observable size of an eelgrass bed for the photography used in this project. Due to the limitations of depicting the outline of an eelgrass bed, the minimum sized bed mapped for this project was approximately 12 feet in diameter.

Results

For maps PB1 and PB2, included in this report, eelgrass areas now groundtruthed are marked in green. Areas suspected of being eelgrass beds that proved not to be eelgrass after groundtruthing were shown to be either macroalgal beds or mussel beds covered with dense algal growth. A few areas on maps PB1 and PB2 were not examined by boat; these are shown in yellow and remain to be groundtruthed.

For all other maps, low level aerial surveys were used to field check the beds. For these maps green (colored reduced maps) or clear (full-sized GIS maps) polygons have positive field checks, whereas yellow areas (colored maps) or polygons marked with a "g" (GIS maps) depict overlooked or uncertain areas. Based on accuracy determinations from groundtruthing maps PB1 and PB2, possible eelgrass areas marked in yellow have between a 50 and 75% likelihood of being eelgrass beds and still require field verification. Areas marked in green on the remaining maps have an 87% likelihood of being eelgrass, again based on ground truth assessment following low level aerial surveillance of suspected beds on maps PB1 and PB2. .

Eelgrass was found to be widely distributed over the northwest portion of Penobscot Bay, with eelgrass beds occurring off Sandy Point, in Stockton Harbor, around Sears Island, and in the mouth of Belfast Bay. In other areas such as the west side of Long Cove and south of Searsport, eelgrass was found to occur in numerous small patches along the shoreline. In some places, eelgrass did not occur in dense beds or patches but was distributed sparsely over a rather extensive area. "Dense" is defined as greater than 50% cover of eelgrass; "sparse" is defined as less than 50% cover, assessed by observing a measured area and determining the amount of eelgrass relative to unvegetated mud. "Fifty percent cover" is a designation which denotes eelgrass covering one half the area of the bottom upon visual inspection from above.

The overall condition of eelgrass in northwest Penobscot Bay appeared to be quite good with, in most cases, healthy long green leaves and sexually reproductive plants visible at most sites. The notable exceptions were inner parts of Belfast Harbor where eelgrass blades were heavily coated with epiphytes and water quality conditions appeared to be disadvantageous to eelgrass growth, and off Sandy Point in northern Penobscot Bay where eelgrass seemed to be limited in its depth distribution, again due to poor water clarity conditions, as seen from aerial photography and during groundtruthing. Another site where eelgrass appeared to be growing in less than healthy conditions was adjacent to the shoreline loading facility of the Mack Point Pier operation. The eelgrass at this site had a yellow tinge, many dead blades, heavy epiphytic algal growth on the blades and/or blades coated with sediment. Also, at this site eelgrass was very sparse. Sparse eelgrass beds with extensive epiphytic growth on the blade have often been noted in areas with excessive nutrient or other stresses (Short et al. 1989).

Along the west side of Sears Island, extensive eelgrass beds were observed growing to an average depth of 9.7 feet below mean low tide. Off Sandy Point, eelgrass only grew to a depth of 2.3 feet below mean low tide. Eelgrass off Browns Head south of Belfast grew to an average depth of 8.3 feet below mean low tide.

Discussion

Eelgrass was found in many protected shallow areas along the northwestern shore of Penobscot Bay, the area where groundtruth surveys were completed (Maps PB1 and PB2). Eelgrass throughout the Bay was found growing in sediment that ranged from a soft muddy silt in areas like Stockton Harbor to sand and sand interspersed between cobble on the shoreline south of Belfast. At the northern end of Penobscot Bay and in areas near urban development, eelgrass distribution appears to be limited by poor water quality conditions. In other areas, eelgrass distribution is naturally limited by lack of suitable substrata to support growth, as in the exposed shoreline areas off the south end of Sears Island and the northern shore of outer Belfast Harbor.

Eelgrass beds were found with lower depth limits as deep as 9.7 and as shallow as 2.3 feet. These depth findings are restricted to the northwest portion of Penobscot Bay where groundtruth assessments were made. In general, water clarity controls depth distribution of eelgrass. In Penobscot Bay, the variability of water clarity leads to differences in the lower depth limit of eelgrass. Sandy Point, at the outfall of the Penobscot River, appears to have restricted eelgrass distribution, which may result from poor water color and high sediment load, both emanating from the river. Overall, eelgrass distribution in upper Penobscot Bay appears to be more restricted by lack of water clarity than eelgrass elsewhere in the Bay.

The remainder of the western shore (Maps PB3-PB5) has some fairly large eelgrass beds, primarily associated with protected harbor areas, particularly Duck Harbor and Rockland Harbor. Eelgrass is found extensively along the coast of Islesboro (Maps B2-B4; Maps C2 and C3), the largest beds located at the southern end of the island chain, where eelgrass is often found in protected coves and harbors.

In the Penobscot River and upper Penobscot Bay (Maps C1 and C2), several areas of possible eelgrass were detected but these could not be confirmed by low level aerial survey. Likewise in Castine Harbor and the mouth of the Bagaduce River (Map C2), a number of possible eelgrass areas were identified. Smith Cove (Maps C2 and C3) had fairly widespread eelgrass areas. The rest of Cape Rosier (Map C3) had only small, isolated beds within cove and harbor areas. The possible eelgrass beds around Hog Island (Map C3) are extensive and deserve field verification. The largest stands of eelgrass found in Penobscot Bay were in the Bagaduce River (Maps D2 and D3), where beds cover large portions of the estuarine river bottom. Upstream of a tidal restriction, eelgrass is found covering the entire river bottom (Maps D2 and D3) as the restriction prevents this area from draining at low tide. Numerous eelgrass beds are found on the western shore of Deer Isle in harbors and coves (Maps D3 and D4).

Comparison of the current survey of eelgrass distribution in Penobscot Bay with the previous survey made in 1976 (Timson 1976) is inconclusive even for the areas where groundtruthing was done in 1993-94. In the 1970s, no eelgrass was identified around Sears Island, an extensive bed was evident in Stockton Harbor, and a bed existed at the head of Long Cove. In the 1990s, extensive eelgrass was found around Sears Island, the eelgrass bed in Stockton Harbor was similar in size and shape to the bed mapped in the '70s, while the bed at the head of Long Cove, initially identified as a possible eelgrass bed in the 1990s, was upon groundtruthing found to be a mussel bed with a heavy growth of fucoid algae. Given the limited groundtruthing in the 1970s (2% of the shoreline), and the incongruity of the '70s and '90s information, it is not prudent to infer trends in eelgrass distribution or extent.

Eelgrass habitats provide many functions that maintain the ecological health of estuaries: improving water quality through filtration, reducing subaqueous erosion, providing a food source, and creating fish and waterfowl habitat (Short 1992, Thayer et al. 1984). Eelgrass meadows act as a filter of estuarine waters, removing both suspended sediments and dissolved nutrients (Short and Short 1984). And eelgrass traps suspended sediments, clarifying estuarine waters and reducing resuspension of sediments (Ward et al. 1989). The beds provide a breeding area and nursery for young finfish and shellfish such as flounder, tom cod, scallops, mussels, crab, and lobster

(Thayer et al. 1984, Newell et al. 1991, Short et al. 1994). Eelgrass areas are frequent stopping points for migrating waterfowl, many of which consume the leaves or seeds of the plant (Milne and Milne 1951). Additionally, eelgrass is an important basis of the detrital food chain, contributing organic matter to the estuary (Fenchel and Blackburn 1979).

Overall, eelgrass is found throughout the area surveyed in Penobscot Bay, Maine in disjunct beds located largely but not entirely in protected harbors and coves. The most extensive stands of eelgrass were in the protected waters of the Bagaduce River above an area of tidal restriction. The eelgrass beds delineated in this study represent an important habitat for marine resources in Penobscot Bay and the Gulf of Maine. The area of possible and confirmed beds is small relative to the entire Bay and small relative to the area of the Bay with proper depths for eelgrass growth (between MLW and 10 feet below MLW). Thus, with improvements in water clarity throughout the Bay, the distribution of eelgrass could expand considerably. Nonetheless, the beds shown in the maps represent a widespread and extremely important estuarine habitat that is distributed throughout Penobscot Bay.

EELGRASS DISTRIBUTION MAPS FOR PENOBSCOT BAY, MAINE

Map numbers	Location
Site map	Penobscot Bay Eelgrass Habitat Manuscript Locations
PB1	Sears Island
PB2	Belfast Bay
PB 3	Lincolnville
PB4	Camden
PB5	Rockland
B2	Searsport
B3	Islesboro
B4	North Haven West
C1	Bucksport
C2	Castine
C3	Cape Rosier
C4	Penobscot
D3	Sargentville
D4	Deer Isle

References

Fenchel, T. and T. H. Blackburn. 1979. Bacteria and Mineral Cycling. 225.

Milne, L. J. and M. J. Milne. 1951. The eelgrass catastrophe. *Scient. Am.* 184:52-55.

Newell, C. T., H. Hidu, B. J. McAlice, G. Podniesinski, F. Short and L. Kindblom. 1991. Recruitment and commercial seed procurement of the blue mussel *Mytilus edulis* in Maine. *Journal of the World Aquaculture Society* 22:134-152.

Short, F. T., [ed.]. 1992. The Ecology of the Great Bay Estuary, New Hampshire and Maine: An Estuarine Profile and Bibliography, Durham, NH, NOAA-Coastal Ocean Program.

Short, F. T., H. M. Hoven, J. Whitten and D. M. Burdick. 1994. Lobster use of eelgrass habitat in the Piscataqua River on the New Hampshire/Maine Border. Portsmouth Naval Shipyard, Final Report, 11 pp.

Short, F. T. and C. A. Short. 1984. The seagrass filter: purification of estuarine and coastal water. 395-413. In V. S. Kennedy (ed.), The Estuary as a Filter, Acad. Press, Orlando.

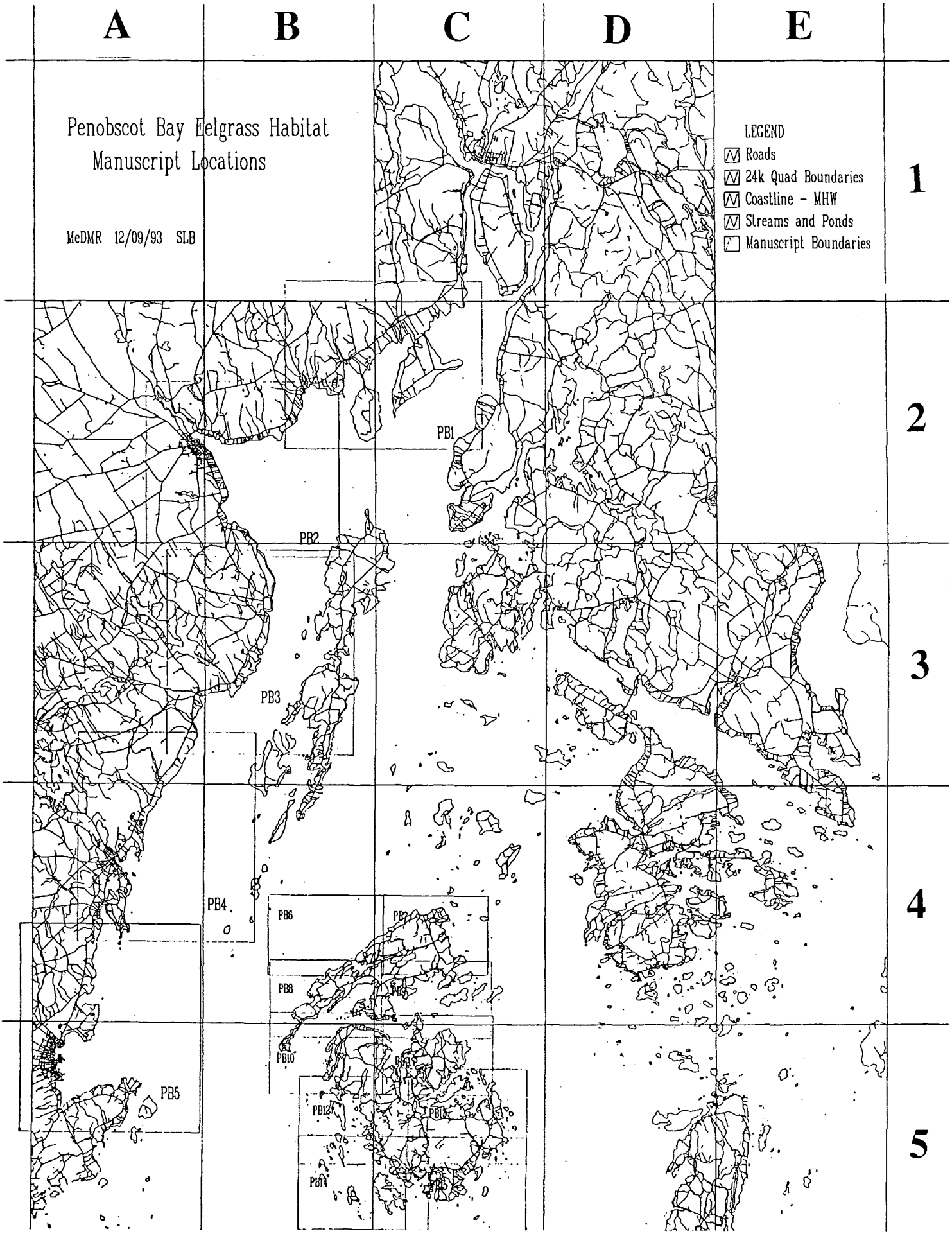
Short, F. T., J. Wolf and G. E. Jones. 1989. Sustaining eelgrass to manage a healthy estuary. Proceedings of Sixth Symposium on Coastal and Ocean Management/ASCE, July 11-14, 1989, Charleston, SC, American Society of Civil Engineers, 3689-3706 pp.

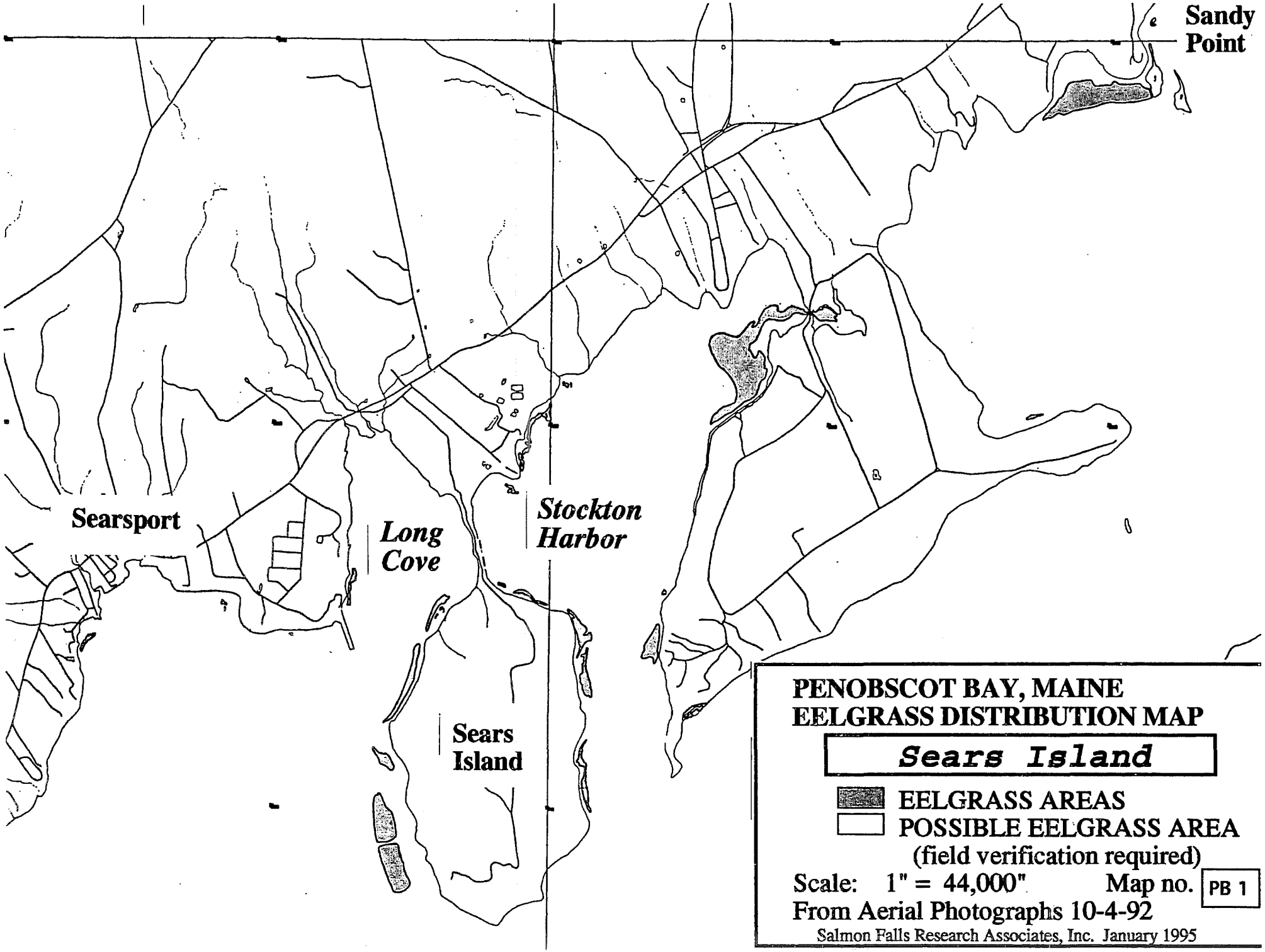
Thayer, G. W., W. J. Kenworthy and M. S. Fonseca. 1984. The ecology of eelgrass meadows of the Atlantic coast: a community profile. U.S. Fish and Wildlife Service, FWS/OBS0-84/02., 147 pp.

Timson, B.S. 1976. Coastal Marine Geologic Environments of the Castine (NW and NE) Quadrangle, Maine. Maine Geological Survey, Augusta, ME. Open-file #76-73 and 76-74.

Tucker, R.D. 1991. Index to Coastal Marine Geologic Environments Maps. Marine Geol. Survey.

Ward, L. G., W. M. Kemp and W. R. Boynton. 1984. The influence of waves and seagrass communities on suspended particulates in an estuarine embayment. *Mar Geol* 59(1-4):85-103:


A
B
C
D
E
1
2
3
4
5
Penobscot Bay Eelgrass Habitat
Manuscript Locations
MeDMR 12/09/93 SLB
LEGEND
Roads
24k Quad Boundaries
Coastline - MHW
Streams and Ponds
Manuscript Boundaries
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PB8
PB10
PB12
PB14



PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP

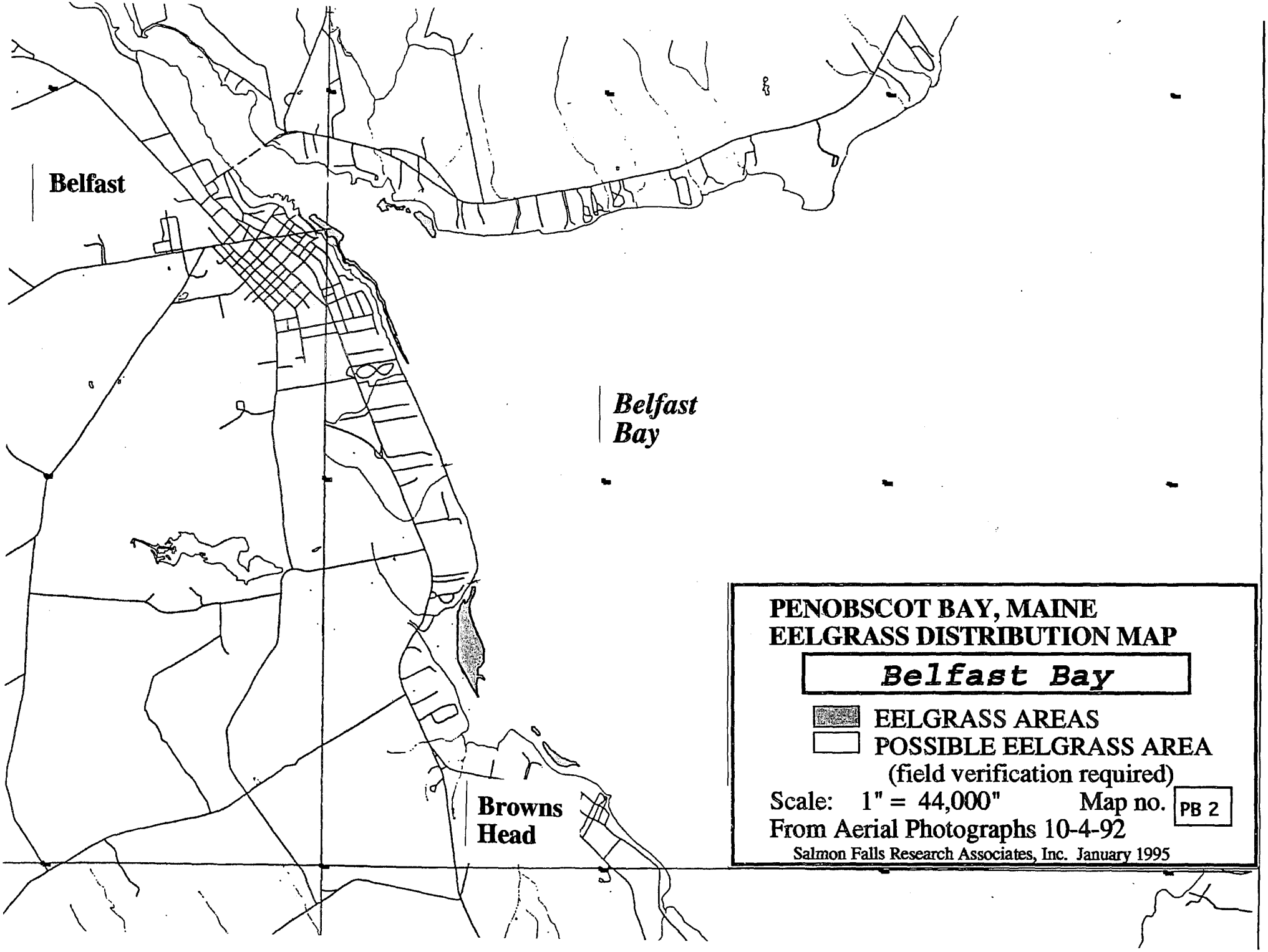
Sears Island

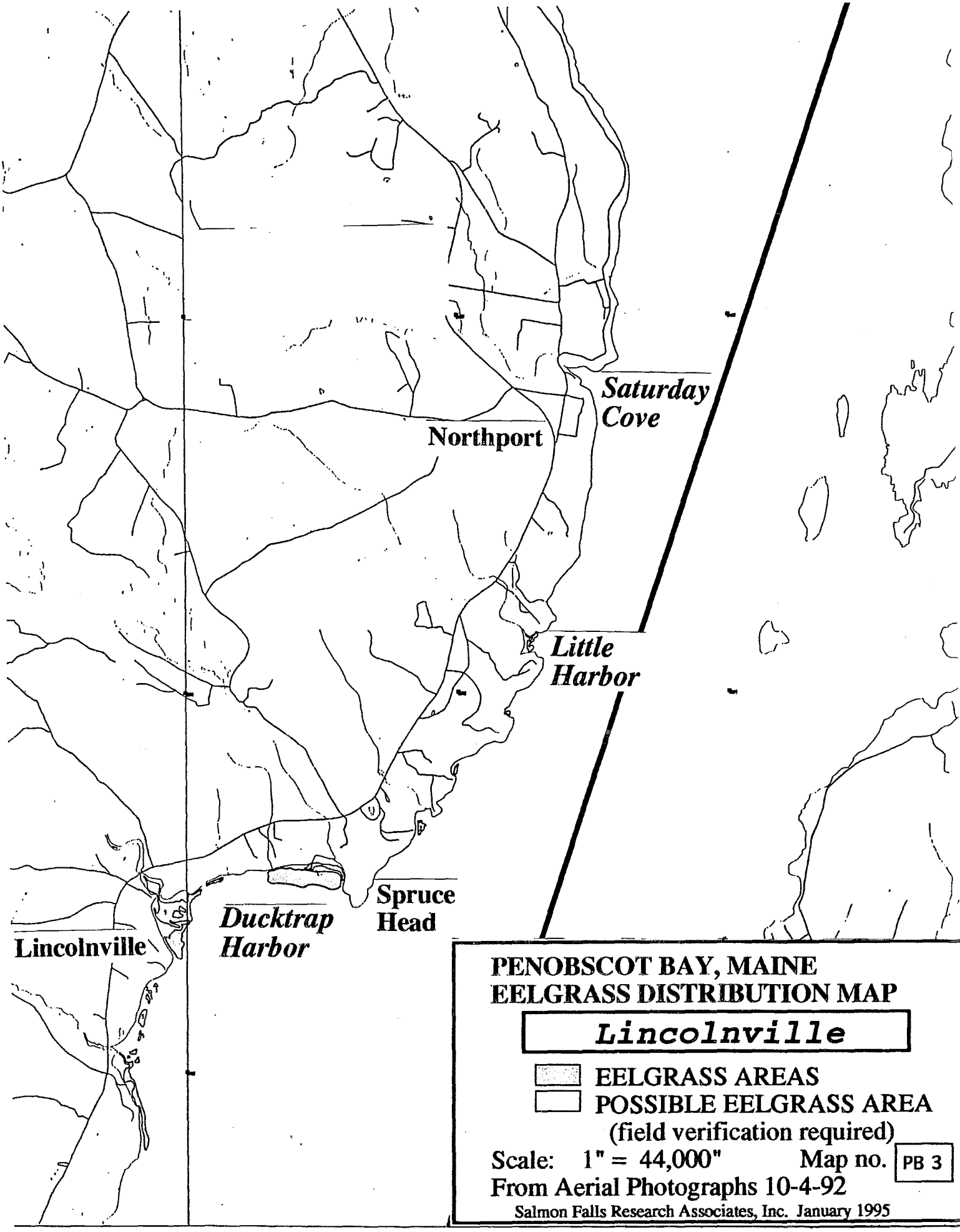
EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)

Scale: 1" = 44,000" Map no. PB 1

From Aerial Photographs 10-4-92

Salmon Falls Research Associates, Inc. January 1995


Belfast
Belfast Bay
Browns Head
PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Belfast Bay
EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 44,000"
Map no. PB 2
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995



PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP

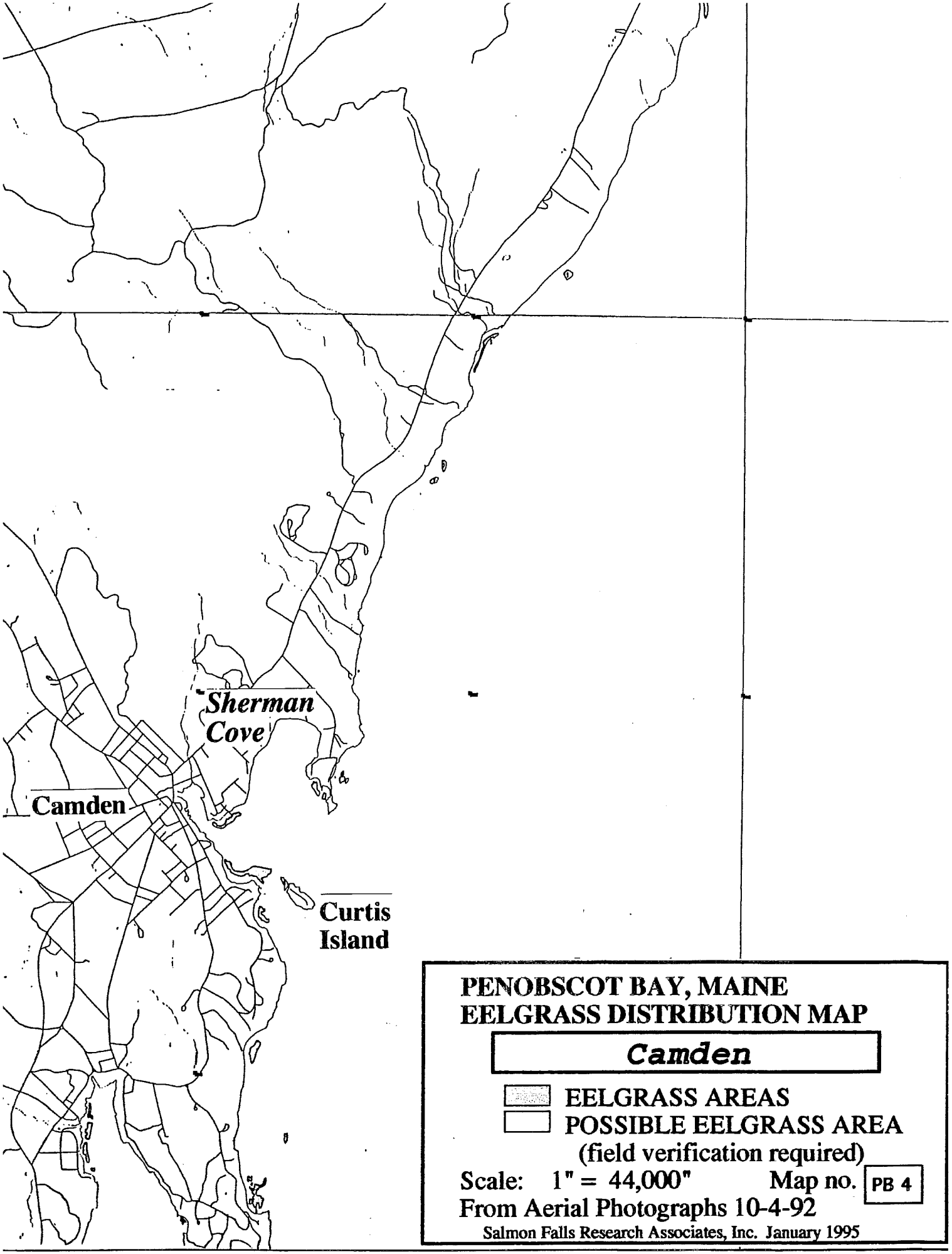
Lincolnville

EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)

Scale: 1" = 44,000" Map no. PB 3

From Aerial Photographs 10-4-92

Salmon Falls Research Associates, Inc. January 1995



PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP

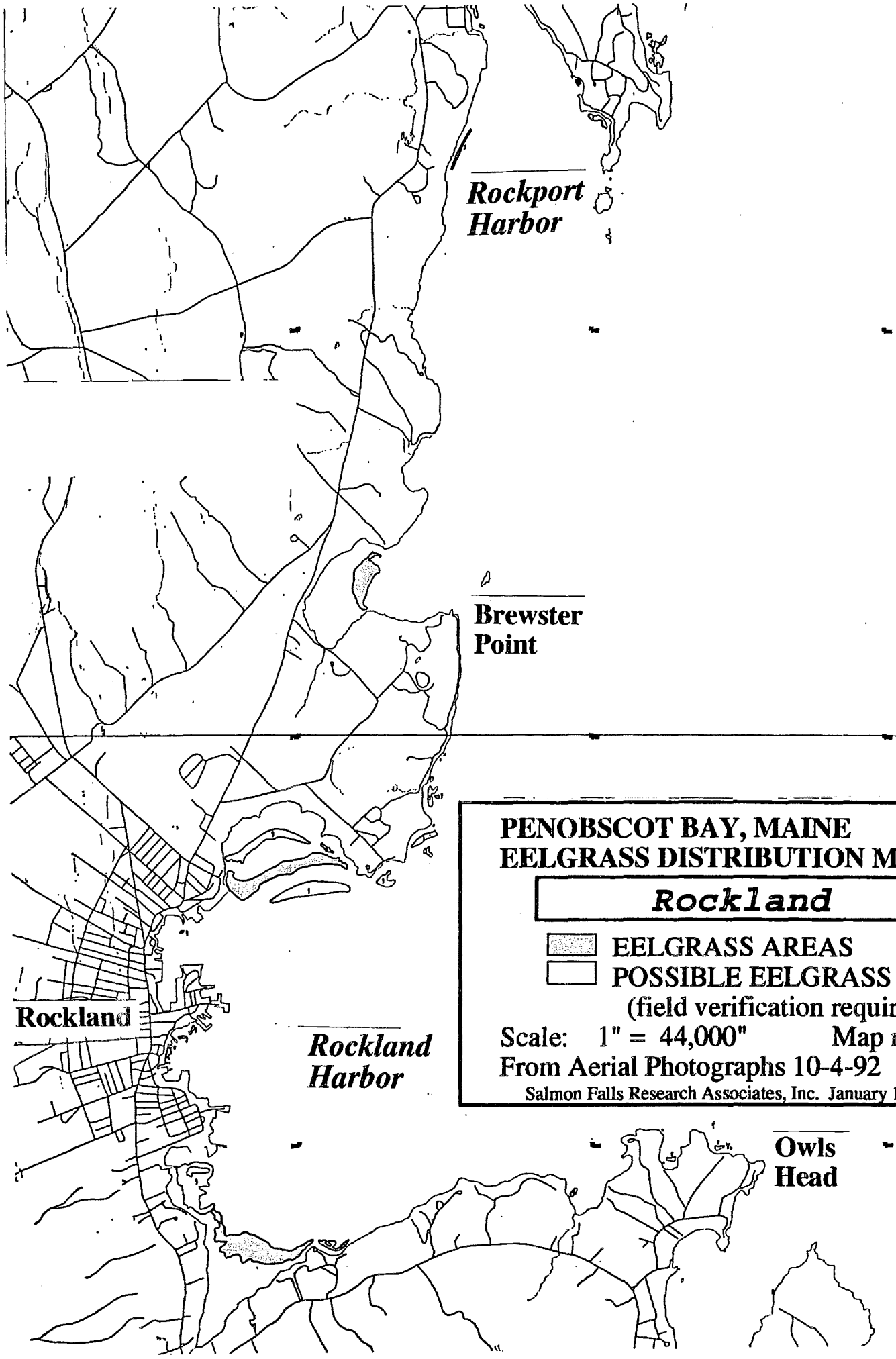
Camden

EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)

Scale: 1" = 44,000" Map no. PB 4

From Aerial Photographs 10-4-92

Salmon Falls Research Associates, Inc. January 1995



PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP

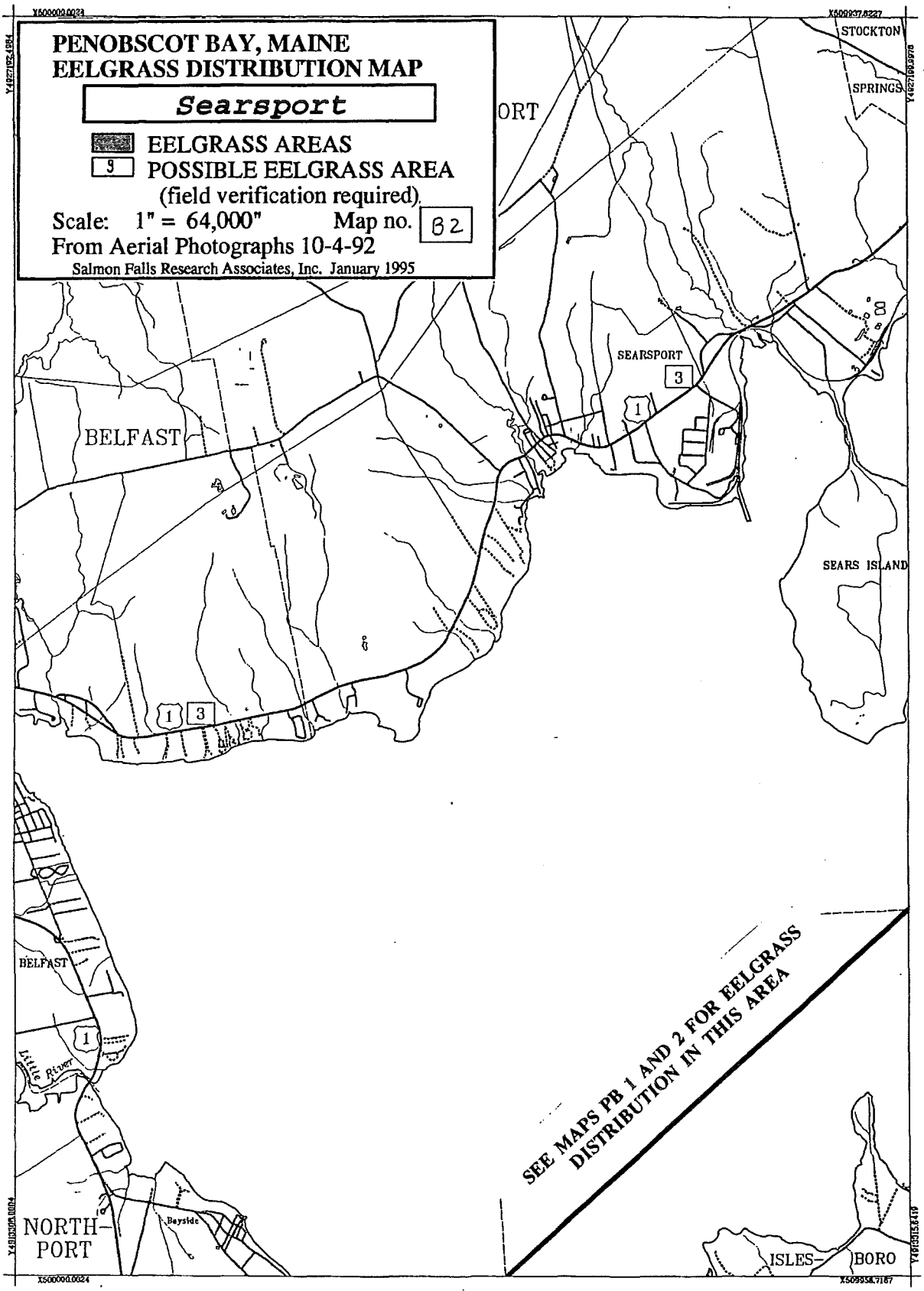
Rockland

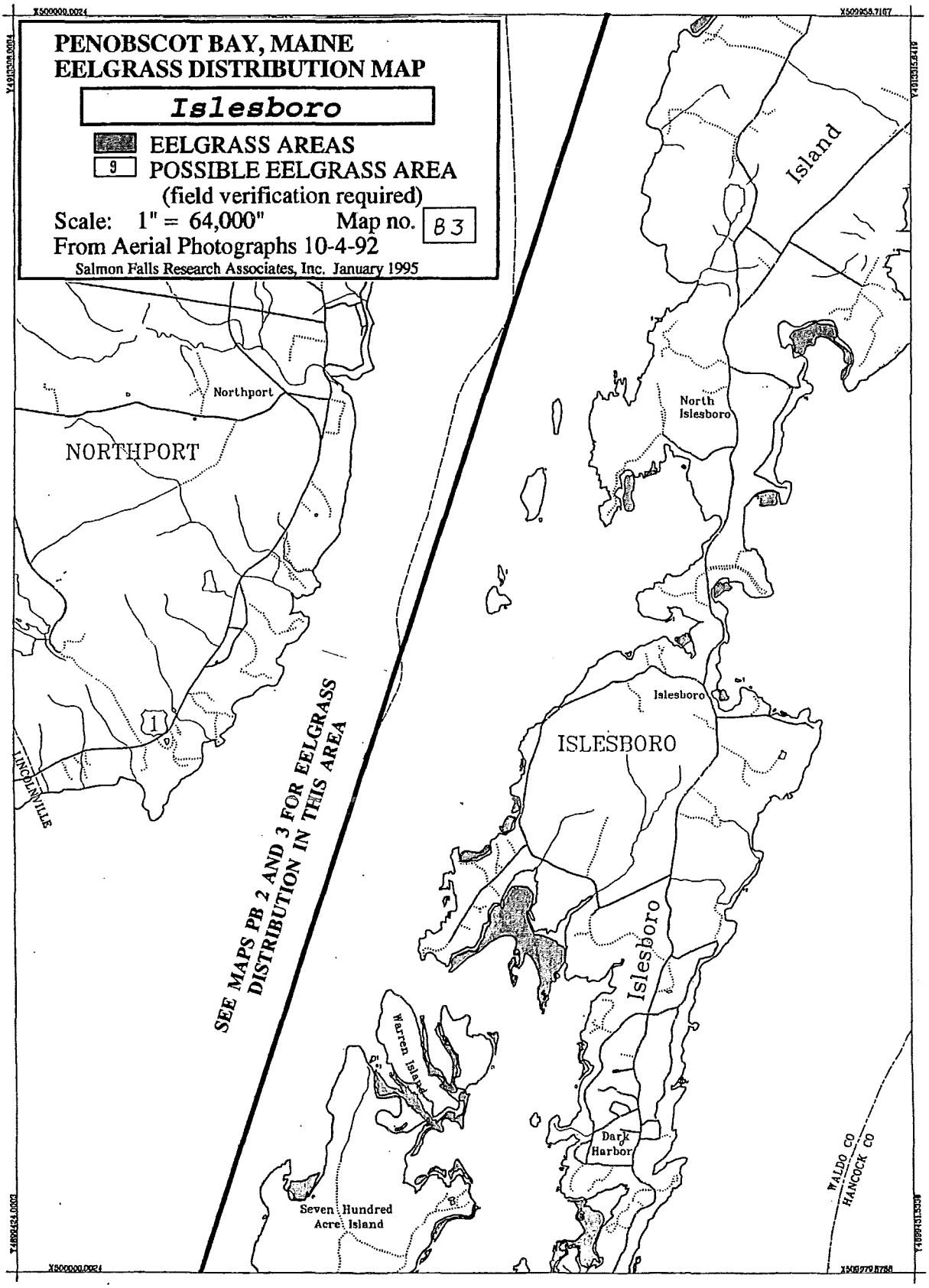
EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)

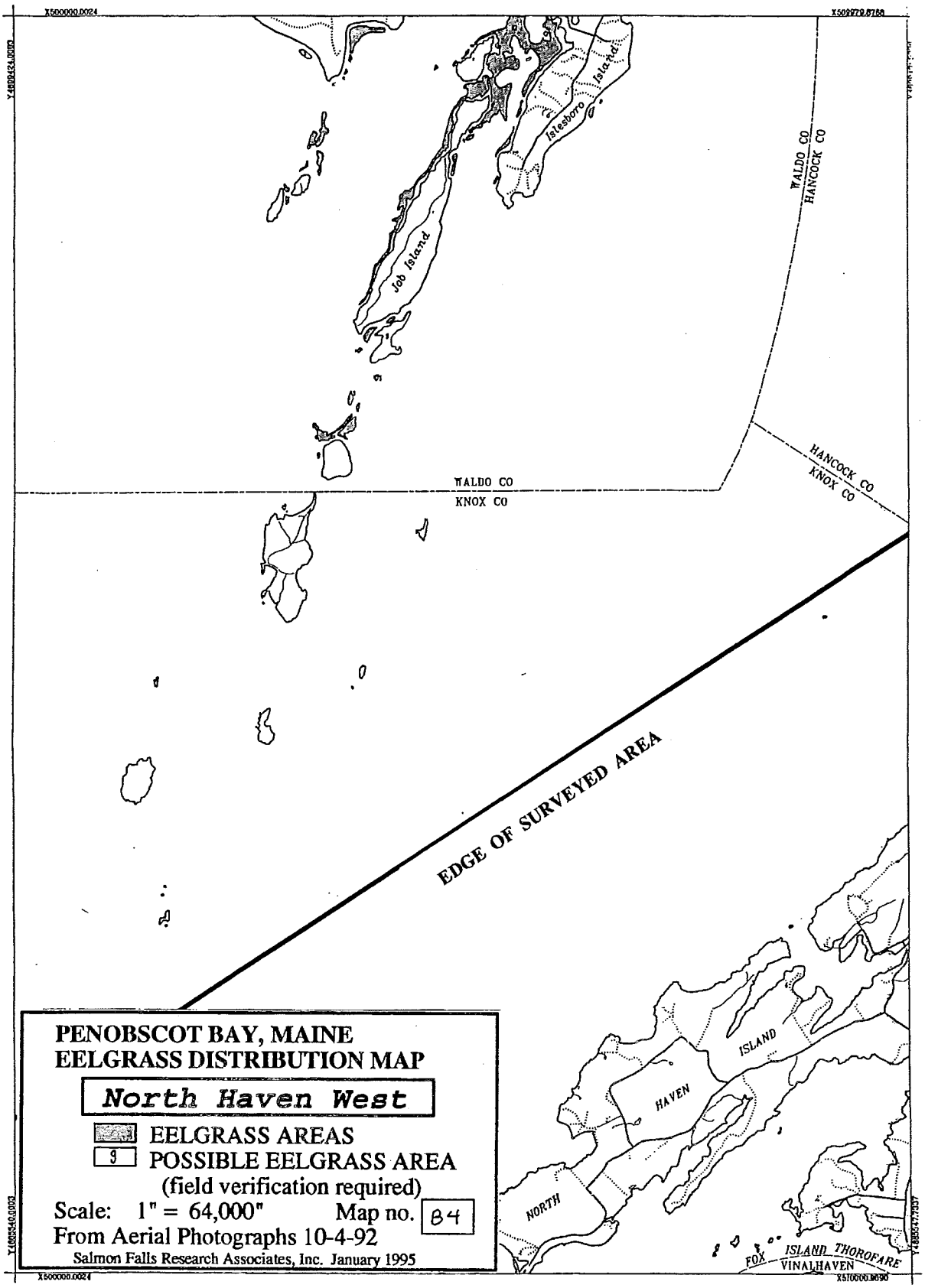
Scale: 1" = 44,000" Map no. PB 5

From Aerial Photographs 10-4-92

Salmon Falls Research Associates, Inc. January 1995


PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Searsport
EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000"
Map no. 62
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
STOCKTON
SPRINGS
ORT
SEARSPORT
3
1
BELFAST
SEARS ISLAND
1
3
BELFAST
1
Little River
NORTH-
PORT
Bayside
ISLES-
BORO
SEE MAPS PB 1 AND 2 FOR EELGRASS
DISTRIBUTION IN THIS AREA


PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Islesboro
EELGRASS AREAS
9 POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000" Map no. B3
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
Northport
NORTHPORT
North Islesboro
Islesboro
ISLESBORO
Islesboro
Warren Island
Dark Harbor
Seven Hundred Acre Island
LINCOLNVILLE
WALDO CO
HANCOCK CO
SEE MAPS PB 2 AND 3 FOR EELGRASS DISTRIBUTION IN THIS AREA



PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP

North Haven West

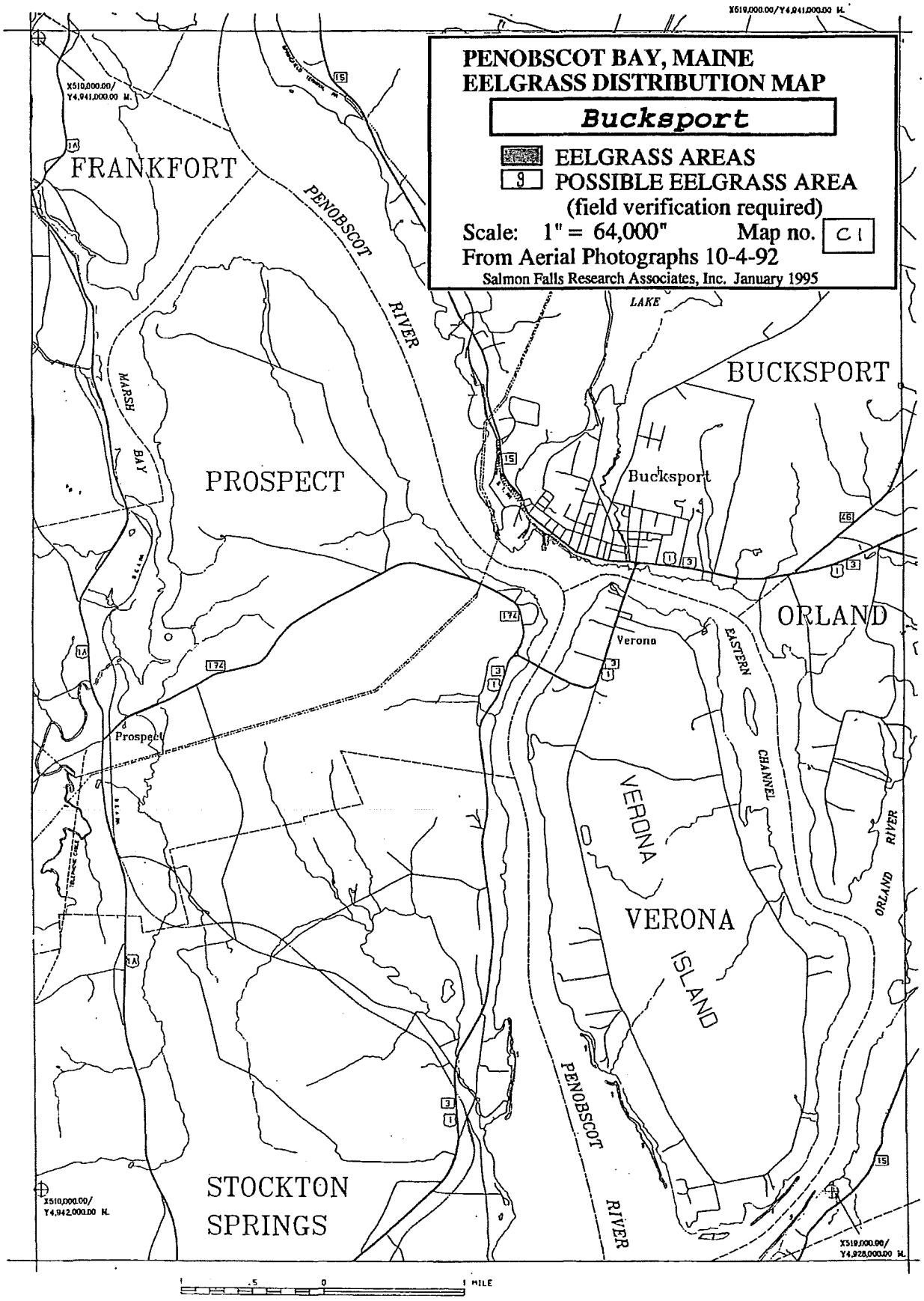
EELGRASS AREAS

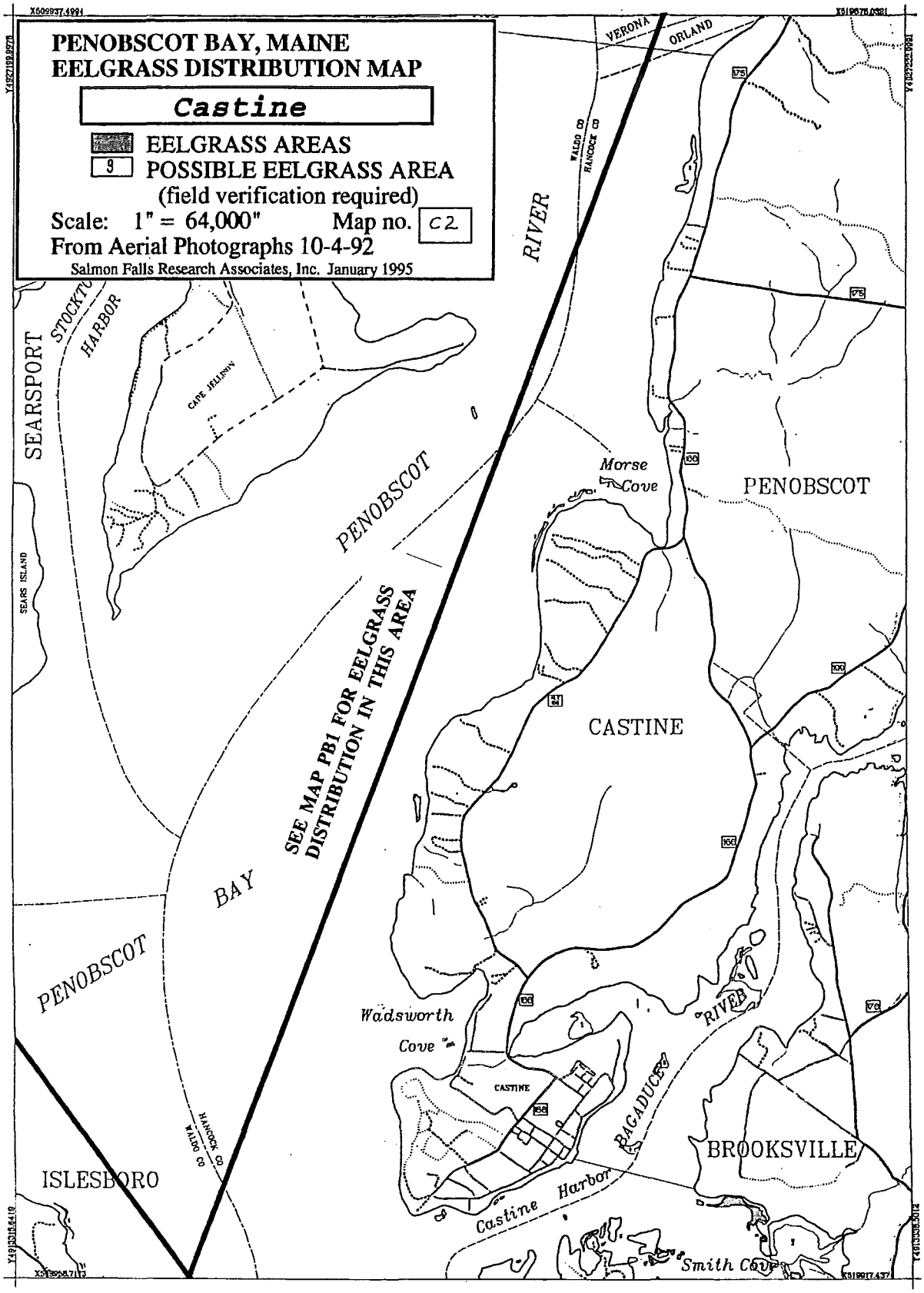
9 POSSIBLE EELGRASS AREA
(field verification required)

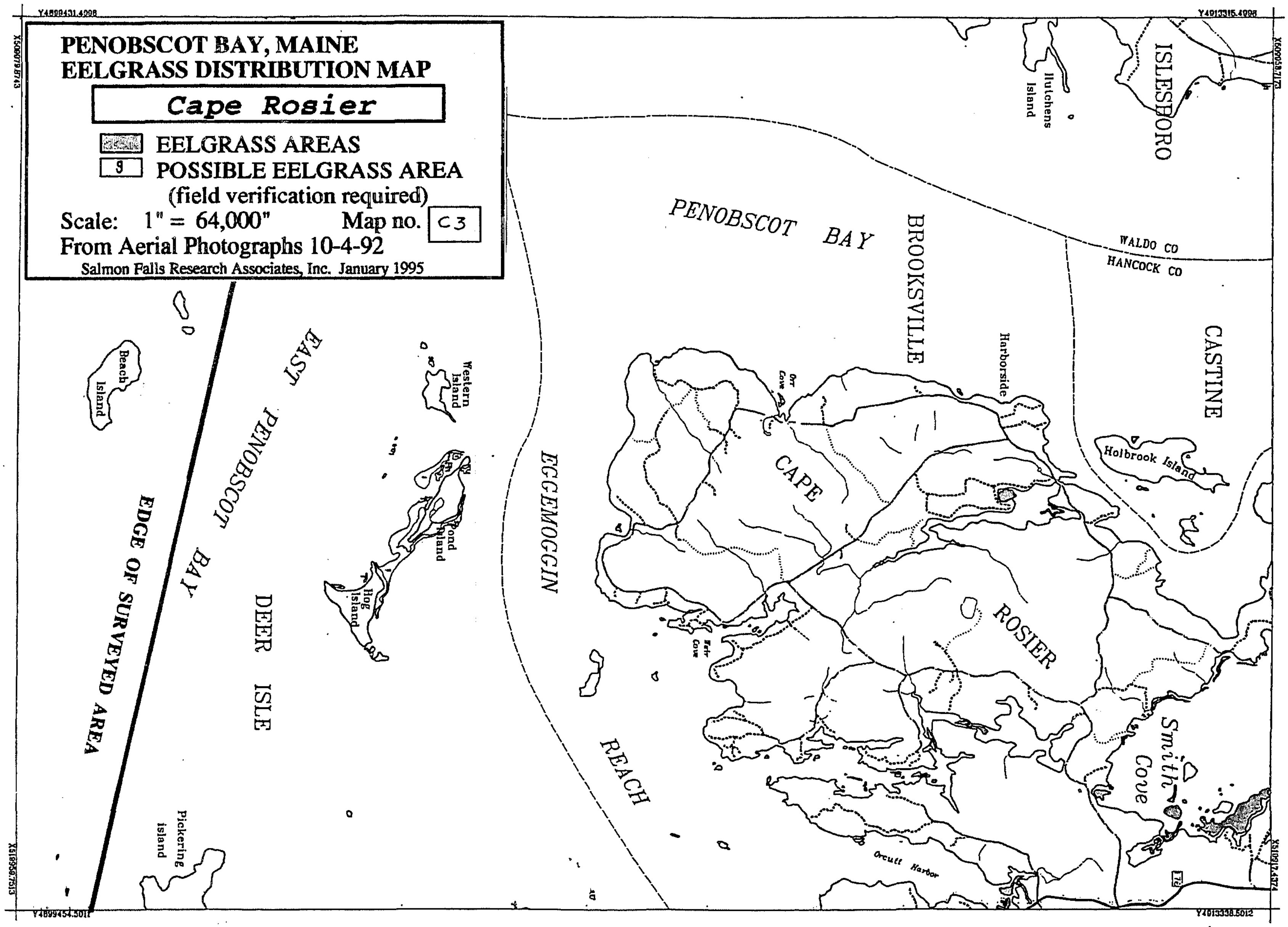
Scale: 1" = 64,000" Map no. 84

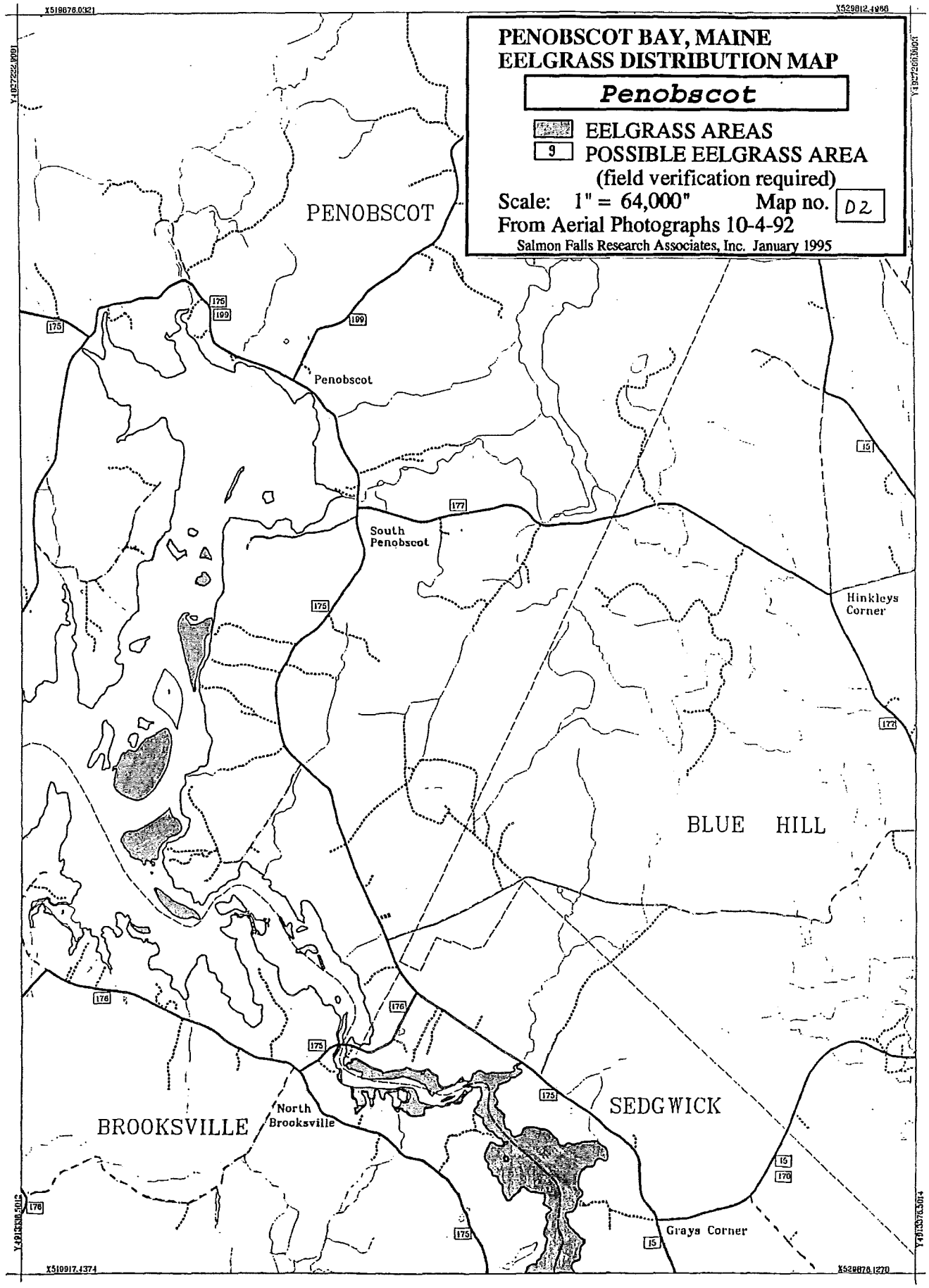
From Aerial Photographs 10-4-92

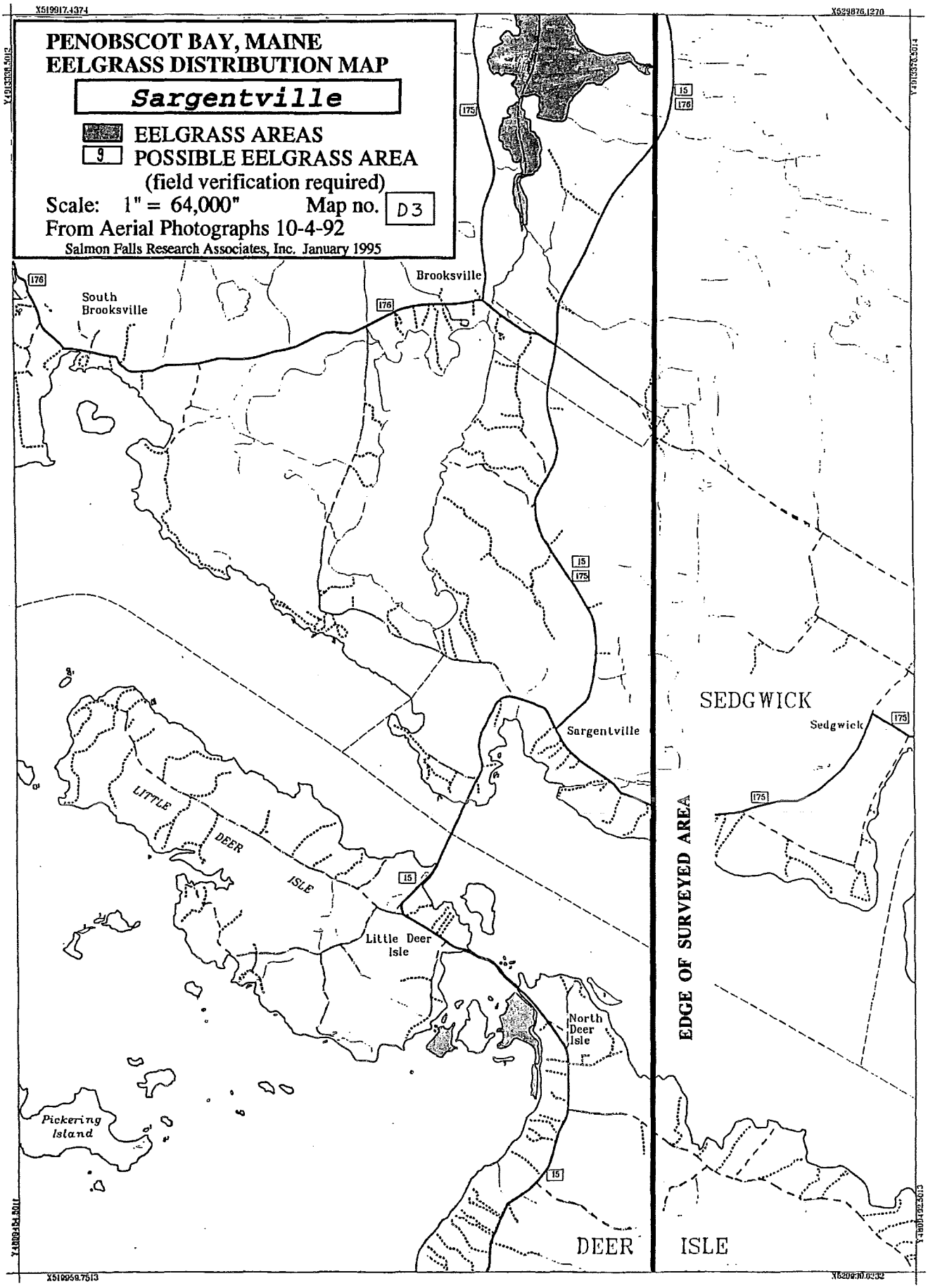
Salmon Falls Research Associates, Inc. January 1995

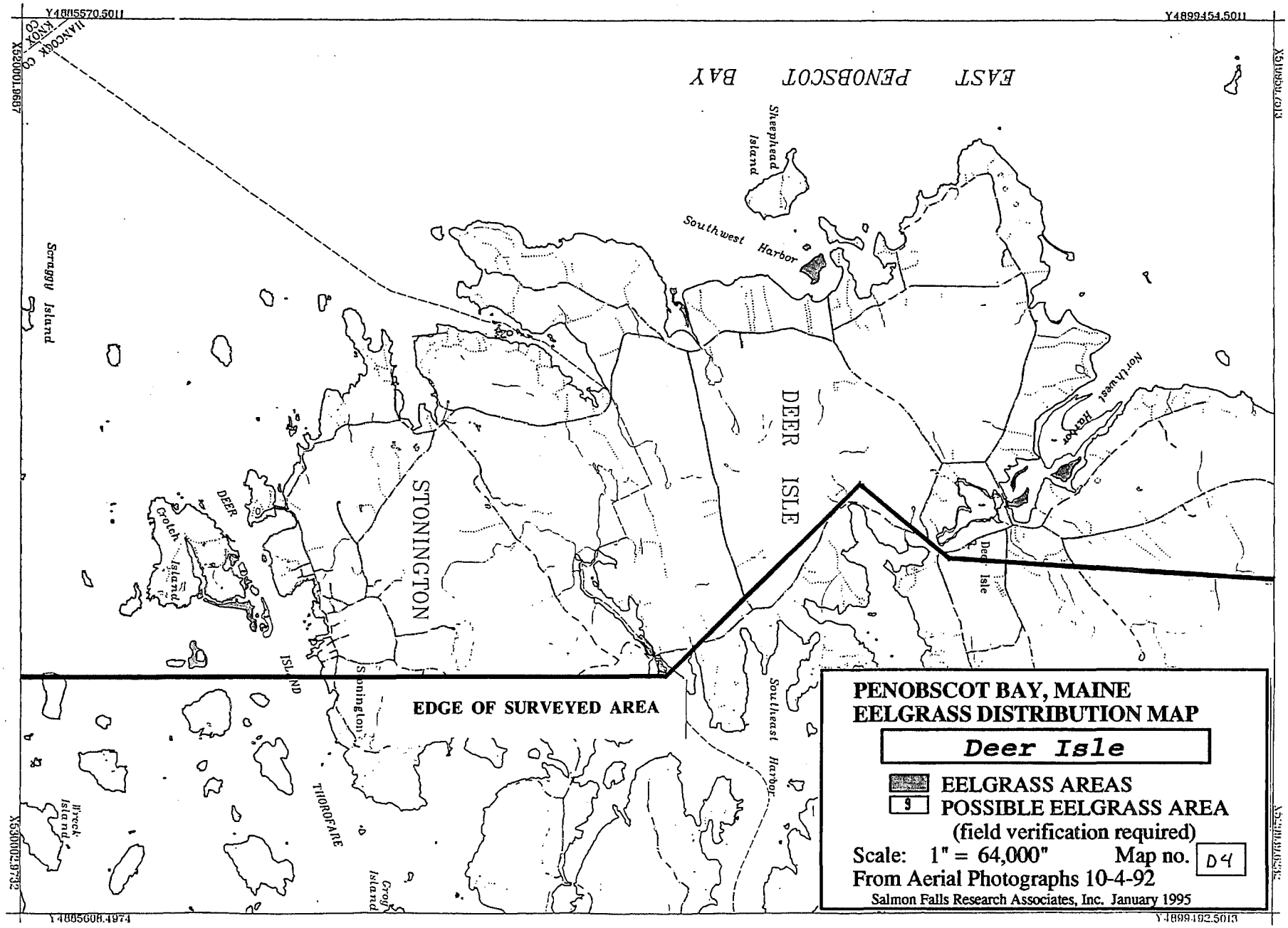

PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Bucksport
EELGRASS AREAS
9 POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000" Map no. C1
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
FRANKFORT
PENOBSCOT RIVER
MARSH BAY
PROSPECT
BUCKSPORT
Bucksport
LAKE
ORLAND
Verona
EASTERN CHANNEL
Prospect
VERONA ISLAND
ORLAND RIVER
STOCKTON SPRINGS
PENOBSCOT RIVER
X519,000.00/Y4,941,000.00 M.
X510,000.00/Y4,941,000.00 M.
X510,000.00/Y4,942,000.00 M.
X519,000.00/Y4,928,000.00 M.
.5 0 1 MILE


PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Castine
EELGRASS AREAS
9 POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000" Map no. C2
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
VERONA
ORLAND
WALDO CO
HANCOCK CO
RIVER
SEARSPORT
STOCKTON HARBOR
CAPE JELLISON
PENOBSCOT
Morse Cove
PENOBSCOT
SEARS ISLAND
SEE MAP PB1 FOR EELGRASS DISTRIBUTION IN THIS AREA
CASTINE
BAY
PENOBSCOT
Wadsworth Cove
CASTINE
RIVER
BAGADUCE
BROOKSVILLE
ISLESBORO
Castine Harbor
Smith Cove


PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Cape Rosier
EELGRASS AREAS
POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000"
Map no. C3
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
PENOBSCOT BAY
BROOKSVILLE
ISLESBORO
Hutchens Island
WALDO CO
HANCOCK CO
CASTINE
Harborside
Holbrook Island
CAPE
ROSIER
Smith Cove
Orcutt Harbor
EGGEMOGGIN
REACH
EAST PENOBSCOT BAY
DEER ISLE
EDGE OF SURVEYED AREA
Beach Island
Western Island
Pond Island
Hog Island
Pickering Island


PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Penobscot
EELGRASS AREAS
9 POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000" Map no. D2
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
PENOBSCOT
Penobscot
South Penobscot
Hinkleys Corner
BLUE HILL
BROOKSVILLE
North Brooksville
SEDGWICK
Grays Corner
175
199
177
178
176
15


PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Sargentville
EELGRASS AREAS
9 POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000" Map no. D3
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995
South Brooksville
Brooksville
Sargentville
SEDGWICK
Sedgwick
LITTLE DEER ISLE
Little Deer Isle
North Deer Isle
Pickering Island
EDGE OF SURVEYED AREA
DEER ISLE
X519917.4374
X529876.1270
X519959.7513


EAST PENOBSCOT BAY
Sheephead Island
Southwest Harbor
Scraggy Island
DEER ISLE
STONINGTON
Northwest Harbor
Deer Isle
Crotch Island
DEER ISLAND
Stonington
Southeast Harbor
THOROFARE
Hardwick Island
Crow Island
EDGE OF SURVEYED AREA
PENOBSCOT BAY, MAINE
EELGRASS DISTRIBUTION MAP
Deer Isle
EELGRASS AREAS
9 POSSIBLE EELGRASS AREA
(field verification required)
Scale: 1" = 64,000" Map no. D4
From Aerial Photographs 10-4-92
Salmon Falls Research Associates, Inc. January 1995