THE SPATIAL PATTERNS OF LOG CUTTING IN BAY D'ESPOIR, 1895-1922

EDWARD COKES

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THE SPATIAL PATTERNS OF LOG CUTTING IN BAY D'ESPOIR, 1895-1922

by

© Edward Cokes

Submitted in partial fulfillment of the requirements for the degree of Master of Arts, Department of Geography, Memorial University of Newfoundland.

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ABSTRACT

There are few studies by geographers or others on the spatial patterns of log cutting and, as far as is known, the topic has not been examined at a micro-level. This thesis attempts to analyze the spatial behaviour of a small group of loggers operating in the forests around Head Bay d'Espoir, southern Newfoundland, between 1895 and 1922. This inner portion of the bay was settled after 1850 mainly from coastal settlements immediately to the south. Nine small settlements, containing about 350 persons by 1890, were established around the inner bay. A multiple resource economy based on logging, farming, hunting, trapping, and fishing evolved. Commercial logging became significant after 1895, with the introduction of the first local sawmill. Prior to this, the technology of logging comprised essentially the manually operated axe and sled and this technology persisted until 1903, by which time hauling distances extended one half mile inland from most waterways. It was no longer economically feasible to haul logs manually, so animal draft was introduced.

The hypothesis tested in this dissertation was that this technological change resulted in a change from

a basically linear pattern of cutting along waterways to an inland, lateral pattern of expansion. This change in technology also resulted by 1922 in quadrupling the area exploited in 1905, despite increased physiographic, economic, cultural and political impediments.

The thesis is arranged chronologically, with chapters on the influx of settlers and pre-sawmill cutting, the sawmill era, technological innovation and the changing spatial patterns of cutting. There is an introductory chapter on methodology and one on the ecology of the forest. The basic hypothesis was validated, and the reasons for the changing spatial patterns are discussed in detail in the conclusions.

PREFACE

Bay d'Espoir, located on Newfoundland's South Coast, is a long, narrow ribbon of salt water extending some thirty miles inland from the mouth of the bay. There are two discrete blocks of settlement in the bay, one at its mouth, traditionally dependent upon the fishery for its livelihood, and the other based traditionally on commercial logging and located strategically in the inner part of the bay. This latter niche, comprising nine small settlements distributed in a necklace fashion around the head of the bay, is the focus of this study. Although there are many examples of logging settlements in Newfoundland, few studies have been carried out on the nature of these settlements and none that is strictly geographical. This thesis is an initial attempt to understand the geography of a basic Newfoundland resource by examining the traditional spatial behavior of loggers at work in Bay d'Espoir between 1895 and 1922. The work is one of reconstruction of lost patterns of logging activity and the bulk of the data was collected through field inquiry.

Academic interest in logging communities first arose through preliminary work on this topic as an undergraduate at Memorial University of Newfoundland.

Bay d'Espoir was chosen as a study area mainly because of familiarity with the area of which the writer is a native and the fact that he is the son of a logger.

The data for this thesis were mainly a result of extensive interviewing of old loggers in the area. Such information was cross-checked at every opportunity. The basic questionnaire had to be refined as it was applied. Aerial photographs and topographic sheets (1:50,000) were used during interviews for pin-pointing logging locations and transport routes of the various crews from year to year.

In a study of this scope, the activity of every logging crew had to be recorded, particularly that of crews who logged continuously within the study period. Family genealogies were first constructed and were the basic unit of reference used for reconstructing the loggers' activities. Without the use of genealogies, the data for most of the tables in this thesis could not have been obtained. Although archival sources were rewarding, in some cases the Newfoundland census was not corroborated by information collected in the field.

There are a number of terms which require explanation. The term "log" refers to timber of sawlog size (minimum of 5"-6" in diameter). Derivatives of the term are also restricted in meaning: "logger", for example, means one who cuts sawlogs and "logging" includes

both the cutting and transporting of sawlogs. The term "lumbering" refers to both the woods operation or logging and the manufacture of lumber, but the latter activity is not considered here.

During the research and writing of this thesis a great deal of assistance was received, without which this work could never have been completed. I would therefore like to extend my sincere thanks to the following: Dr. John Mannion, Assistant Professor of Geography at the Memorial University of Newfoundland, my supervisor, for his criticism and advice in the writing of this thesis; Dr. A.G. Macpherson, Director of Graduate Studies in Geography, for his encouragement during the more difficult periods; Mr. Gilbert Learning for the final draft of the cartographic work; my father, John Cokes, for accompanying me on much of my forest travel; my wife, Shirley, for her assistance in the checking of table data and calculations, and the reproduction of details on maps used for rough work; and the Institute of Social and Economic Research, Memorial University of Newfoundland, for financial assistance in conducting field research.

Special thanks must also be extended to all my informants especially Mrs. M.J. Bussell, recently deceased, for relating her vast historical knowledge of Bay d'Espoir for the second half of the nineteenth

century, and the following retired loggers: David Collier, John Organ, Joseph Walsh, deceased, and Philip Willcott, all of St. Alban's; Mark Dolomount of St. Joseph's Cove; John Organ of St. Veronica; John Cribb Sr., James Kearley, Sr., Samuel Kearley, Sr., John Roberts, deceased, all of Head Bay d'Espoir; Philip Kendell of Milltown; Albert Kendell, and James Kendell, Sr. of Morrisville; and Matthew Jeddore of Conne River; and John P. Lake of Fortune, former sawmill manager at Milltown.

Acknowledgement is also made for the assistance rendered by: the staff of the Memorial University Library particularly of the Newfoundland Room; the Department of Mines, Agriculture and Resources, especially the Forestry Division and Crown Lands Division; and all others who in any small way helped with my work.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

When one considers that the forest has been a major resource in the early exploitation of North America and still has an important place in the economy of many areas here, it comes as a surprise to discover that the geographical literature on lumbering is sparse. The limited literature has emphasized aspects of the historical geography of logging, locational analyses of present and future forest products industries, and the quantitative analyses of contemporary sawmill production and marketing. Historical geographers have focused in a general way on the various aspects of sawmilling and its associated settlements, on sawmill production, and on log transportation, particularly on waterways.[1]

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[1] L.C. Belthius, "The Geography of Lumbering in the Mississippi River Section of Eastern Iowa," Iowa Journal of History (Apr., 1948), pp. 115-155; E.M. Dinsdale, "Spatial Patterns of Technological Change: The Lumber Industry of Northern New York," Economic Geography, XLV (1968), pp. 252-274; G.B. Hartman, "The Iowa Sawmill Industry," Iowa Journal of History, XL (1942), pp. 52-93; M.W. Mikesell, "The Deforestation of Mount Lebanon," The Geographical Review, LIX (1969), pp. 1-28; E. Stokes, "Kauri and White Pine: A Comparison of New Zealand and American Lumbering," Annals of the Association of American Geographers LVI (1966), pp. 440-450; G.A. Stokes, "Lumbering in Southwest Louisiana: A Study of the Industry as a Culturo-Geographic Factor," (unpublished Ph.D. thesis, Department of Geography and Anthropology, Louisiana State University, 1951).

Only two geographers, Vladimirov and Monahan, have focused on the location of forest products industries.[2] Vladimirov analyzed the logging settlements in a region in the Soviet Union and proposed a model for the location of settlement within the forest in relation to the forest resource. Monahan analysed factors influencing forest products industries locating at large ports.

The third aspect in the geography of logging focuses on sawmill production and marketing from a quantitative economic approach.[3] These are regional studies within Canada focussing on operating costs and fluctuations of the industry within each region.

Attention given forest exploitation by historians has been restricted generally to settlements on the North

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[2]V.V. Vladimirov, "Settlement in Lumber Industry Regions in the U.S.S.R.," Soviet Geography, IX (1968), pp. 710-725; R.L. Monahan, "Locational Changes in Forest Products Industries on the Pacific Northwest," Association of Pacific Coast Geographers, XXVIII (1966), pp. 29-40.

[3]W.G. Hardwick, "The Geography of the Forest Industry of Coastal British Columbia," Canadian Association of Geographers, Occasional Papers, No. 5, 1963; C.H. Jones, "The Lumber Industry in New Brunswick and Nova Scotia," (unpublished M.A. thesis, University of Toronto, 1934); R.B. MacLock, "The Geography of the Forests Products Industries of Northern Alberta," (unpublished M.A. thesis, University of Alberta, 1967).

American frontier.[4] Their writings emphasized logging in relation to settlement growth, waterway development, railway construction, and lumber production and demand. Economists' writings on lumbering focus primarily upon log harvesting costs, lumber production and marketing costs.[5] As might be expected, the writings of foresters on forest exploitation are more prolific than the works of other disciplines. Their primary emphases are on forest ecology, methods and techniques of timber harvesting, and factors influencing the devices and means of log

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[4] R.B. Clarkson, Tumult on the Mountains: Lumbering in West Virginia, 1770-1920 (Parsons, West Virginia: McClain Printing Co., 1968); R.F. Fries, Empire in Pine: The Story of Lumbering in Wisconsin (Madison: The State Historical Society of Wisconsin Press, 1951); A.R.M. Lower, Settlement and Forest Frontier of Eastern Canada (Toronto: The MacMillan Co. of Canada, Ltd., 1936); A.R.M. Lower, et al., The North American Assault on Canadian Forest (Toronto: Ryerson Press, 1938); W.G. Rector, Log Transportation in the Lake States Lumber Industry (Glendale, California: The Arthur H. Clark, Co., 1953); R.G. Woods, "A History of Lumbering in Maine, 1820-1861," Maine University Studies, Series 2, No. 33, XXXVII, No. 7, 1935.

[5] W.W. Ashe, "Cost of Cutting Large and Small Timber," Southern Lumberman (December, 1916), pp. 91, 92; G.E. Bell, Factors Influencing the Manufacture of Sawlogs into Lumber in Eastern Canada, Canadian Department of Resources and Development, Forestry Branch, Bulletin No. 99 (Ottawa: Canadian Government Printing Office, 1951); E.G.B. McGinley, "The Lumber Industry in the Atlantic Region, 1945-1955" (unpublished M.A. thesis, University of New Brunswick, Fredericton, 1958).

transportation both on land and along waterways.[6]

All these studies were conducted mainly at the macro-level and tended to make overly generalized statements and broad, sweeping conclusions. Much of their writing consists of descriptive accounts of timber harvesting and particularly log driving in the various regions of North America. Even though it was common for the majority of writers to describe the tasks involved in cutting and transporting logs, the effects of changing methods of transport on the pattern of cutting were generally ignored.

As far as the author is aware, there are no analyses of the spatial distribution of timber harvesting, irrespective of scale. In macro studies, factors influencing the spatial cutting patterns are briefly mentioned. Bryant, for example, when discussing log

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[6]N.C. Brown, Logging: The Principles and Methods of Harvesting Timber in the United States and Canada, (New York: John Wiley & Sons, Inc., 1949); R.C. Bryant, Logging (2nd ed.; New York: John Wiley & Sons, Inc., 1923); A.M. Koroleff and R.C. Bryant, The Transportation of Logs on Sleds, Bulletin No. 13 (New Haven: School of Forestry, Yale University, 1925); L. Margolin, "The Hand-Loggers of British Columbia," Forestry Quarterly, IX (1911), pp. 563-567; C.A. Schenk, Logging and Lumbering (printed for the author by L.C. Wittich, Darmstadt, Germany, "n.d."); S.H. Spurr, Forest Ecology (New York: The Ronald Press Co., 1964); A. E. Mackerman, W.D. Hagenstein, and A.S. Michell, Harvesting Timber Crops (New York: McGraw-Hill Book Company, Inc., 1949).

transportation asserted that "methods of transport varied from manual labor to animals and machines depending on log sizes, snowfall, distance and degree of swamp and slope."[7] He briefly discusses each factor, for example, "Animal draft decreases rapidly with distance hauled on level ground."[8] There is, however, no further discussion of this point.

The author feels that research should begin at a micro-level in order to begin to understand why loggers cut where they did. Moreover, it is the author's belief that this question can only be resolved through an historical analytical framework, tracing the emerging locational patterns over a considerable period of time. This study, therefore, attempts to further the knowledge of relatively primitive logging operations and to broaden the general approach to the understanding of the working of logging operations on a macro scale. It deals with a small group of loggers (less than 300) over approximately three decades and analyzes the spatial distribution of cutting for this period.

Bay d'Espoir is a traditional logging area. The logging activity consisted of a series of stages, beginning

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[7] R. Bryant, Logging (1923), p. 123.

[8] Ibid., p. 124.

with the loggers leaving their homes and going to logging areas - either commuting daily or weekly. Trees were cut with axes and trimmed. Then they were transported by the shortest feasible route to waterways. There they were rafted, if by the sea, or driven down rivers and then rafted. This was followed by the towing of logs to the sawmill where they were sawn. The merchant was responsible for processing the lumber and for marketing it, generally along the South Coast of the Island.

Here, then, is a series of activities that can be examined - the patterns of cutting, hauling, driving, buying, processing and distributing - but this thesis examines only the spatial behavior of loggers in the cutting and hauling sectors.

The hypothesis tested is that change in the technology of log transportation from manual labor to the utilization of draft animals in Bay d'Espoir early in the present century resulted in the change from a linear pattern of log cutting along the coast and lower courses of rivers to a lateral pattern of expansion.

This study involves two primary geographic concepts - man-resource relationships and spatial location. Although the impact of distance is the central concern, analyses of the spatial behavior of primary resource exploiters at a micro-level are rare, even in

agricultural geography. Chisholm's reworking of von Thunen's model is perhaps the closest, methodologically, to the present work.

> To a remarkable extent, students of location problems have fastened attention upon industrial and urban matters rather than upon agriculture and rural affairs.... Perhaps it has also seemed that the location problems posed by city life and factory employment are more amenable than those of the countryside to rigorous analysis.[9]

There is little in the geographical literature on location theory readily applicable to the present concern, for most models relate to industrial-urban situations and are conceived at the macro scale.

This thesis is organized strictly along chronological lines. Although the key period in this study is 1895-1922, timber harvesting prior to that is briefly analysed. The early period of sawmilling (1895-1922) embraces the hand-logging phase which resulted in a cutting pattern along narrow coastal/riverine strips, and the change in technology of hauling was followed by the change in the pattern of logging. Chapter I deals with the resource before the turn of the century and places it in geographical context with respect to the major

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[9]M. Chisholm, Rural Settlement and Land Use (London: Hutchinson University Press, 1962), p. 9. See also J.H. von Thunen, von Thunen's Isolated State, edited by P. Hall, translated by C.M. Wartenberg (Glasgow: Blackie & Sons, 1966).

environmental forces which determined the forest type and tree sizes. The amount of timber cutting in the Bay d'Espoir area before the introduction of sawmills and the factors which determined the pattern of cutting are considered in Chapter II. Chapter III discusses the increased hand-logging operations which resulted from the demands of sawmills and places special emphasis on the factors which determined the spatial distribution of cutting. The reasons why land transportation of logs changed from manual hauling to the utilization of draft animals are set down in Chapter IV. The pattern of cutting consequent upon this change in transportation is dealt with in Chapter V, followed by conclusions in Chapter VI.

CHAPTER I

THE CHARACTER OF THE FOREST

Southern Newfoundland is one of the most barren regions on the Island. Pockets of forest do exist, however, in the sheltered riverine valleys near the coast. The largest of these timber stands, comprising over 100 square miles, is in Bay d'Espoir. From the Bay it extends northward up the Conne River and Northwest Brook watersheds in two narrow belts that join the interior forest of the Exploits and Gander watersheds (Figure 1-1).

The tree species, their density and size vary considerably, depending on conditions of soil, drainage, topography, climate and exposure. Most of the merchantable forest grows on the coastal slopes and in river valleys which intersect the dominant 600-800-foot plateau surface, much of which is gently rolling and hummocky, barren and filled with ponds and swamps. On these upland areas, timber is sparse and most of it is of lower quality than that found in the lower-lying areas.

Much controversy surrounds the question of the origins of these treeless areas, but research thus far has indicated glaciation and fire. Glaciation may have scoured the soil from some areas, leaving bare rock and patches

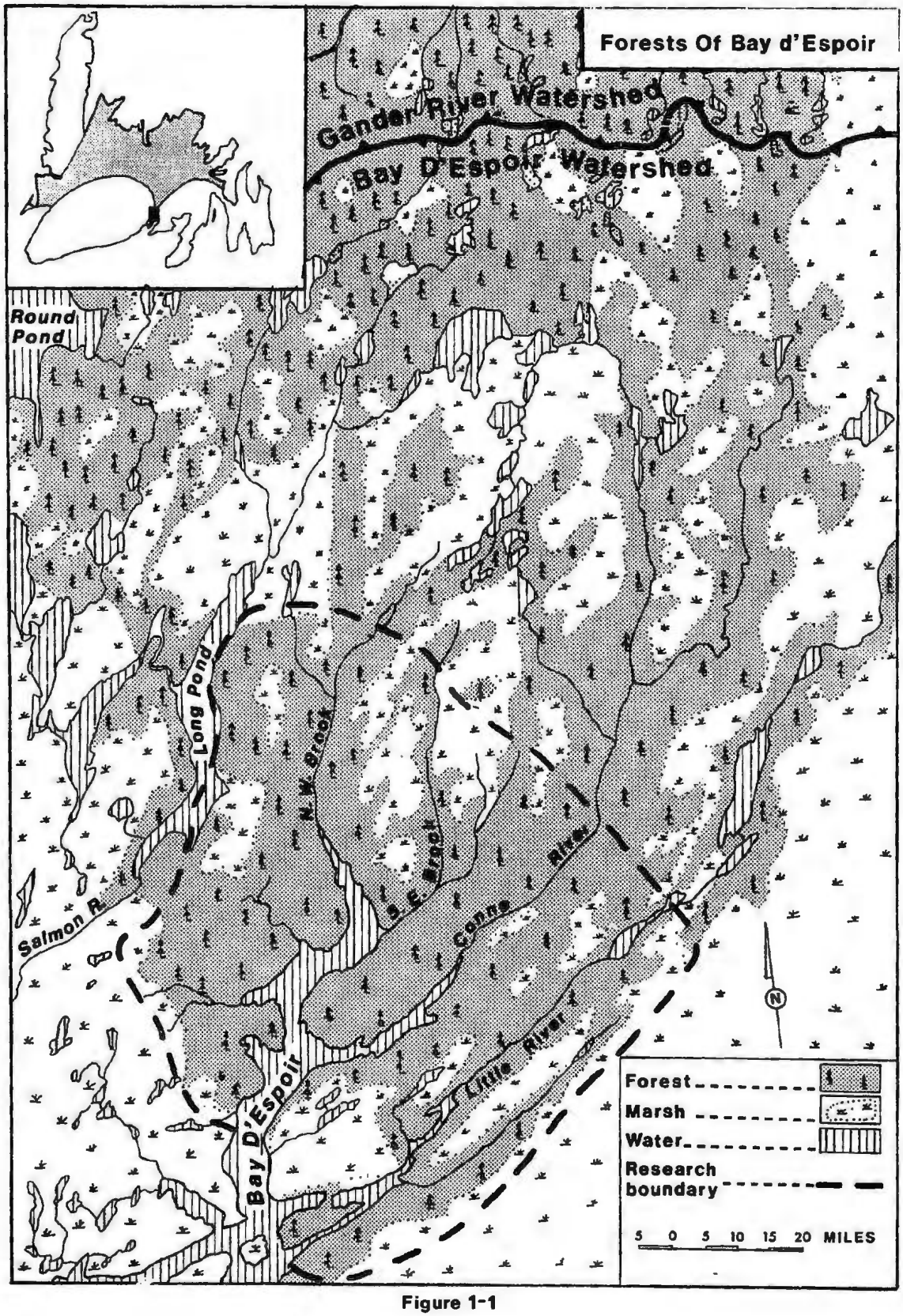
Forests Of Bay d'Espoir
Gander River Watershed
Bay D'Espoir Watershed
Round Pond
Long Pond
N.W. Brook
S.E. Brook
Conne River
Salmon R.
Bay D'Espoir
Little River
N
Forest
Marsh
Water
Research boundary
5 0 5 10 15 20 MILES

Figure 1-1

of thin soil which resulted in barrens. In other areas glaciation impeded the natural drainage causing boglands.[1] Large areas of forest may have been destroyed by fire, either from lightning or from the agency of man, their failure to regenerate accounted for by the destruction of the thinly developed soils.[2]

The study area shown in Figure 1-2 has a distinct geological grain to it running in a northeast-southwest direction. The arms of that section of the Bay and its rivers, streams, ponds, barrens, and marshes have the same orientation. With the exception of St. Joseph's Cove Brook and several smaller streams which are superimposed upon the land - cutting almost at right angles across ridges - the geological grain determines the general drainage pattern. Drainage is fairly well developed and provides well-drained soils favourable to forest growth. Most of the soils of the forested area in the Bay have glacial and glacio-fluvial deposits as parent material. In the valleys and on the coastal slopes where the best forests are found, the glacial till is generally thick and contains materials from large boulders to silt and clay particles. The material composition varies considerably

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[1]W.B. Jewell, "Geology and Mineral Deposits of the Bay d'Espoir Area," Geological Survey of Newfoundland, Bulletin No. 17, 1939, pp. 4-9

[2]Report of the Newfoundland Royal Commission on Forestry, 1955 (St. John's: Printed for the Department of Mines, Agriculture and Resources by David R. Thistle).

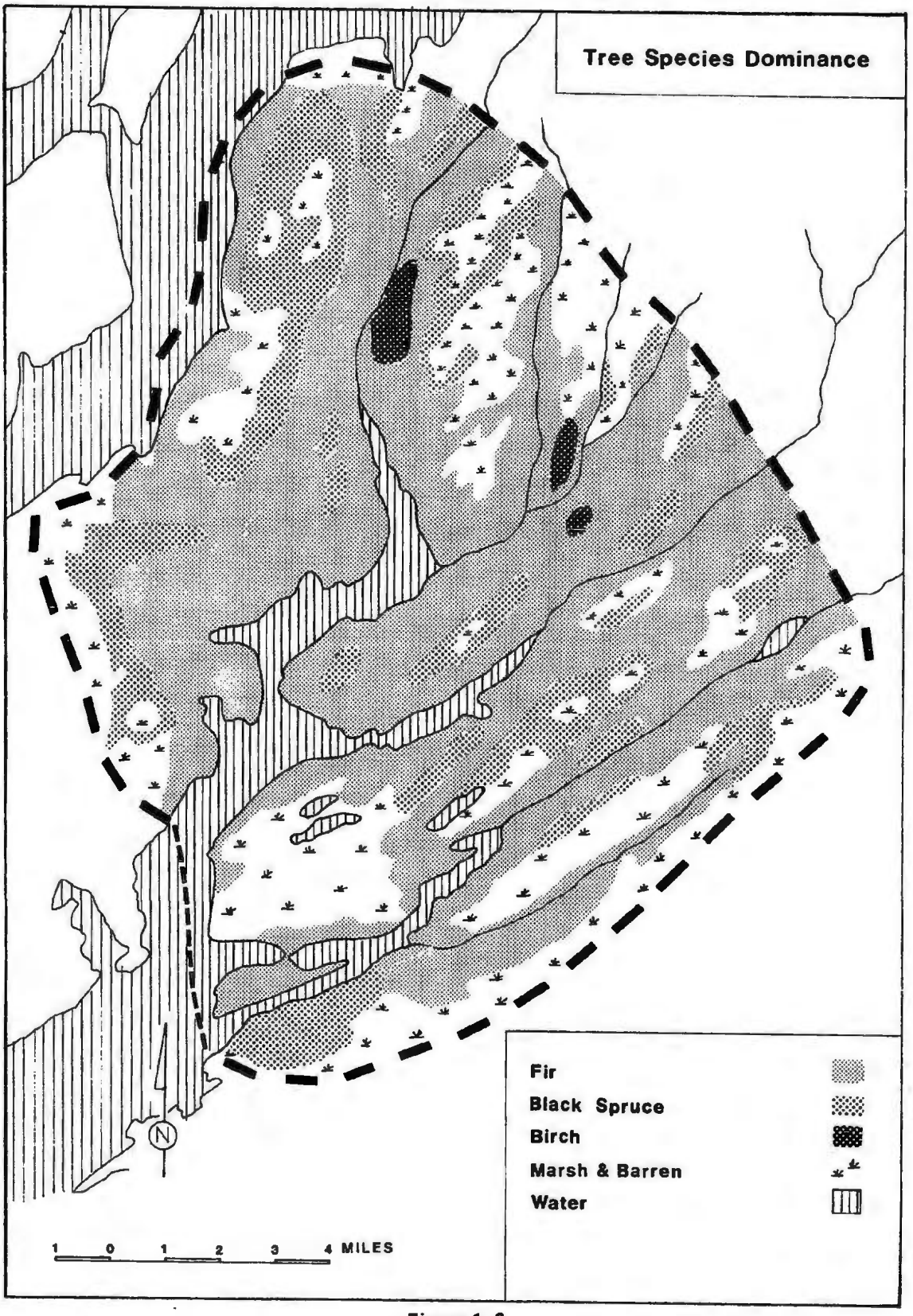
Tree Species Dominance
Fir
Black Spruce
Birch
Marsh & Barren
Water
N
1 0 1 2 3 4 MILES

Figure 1-2

from place to place and in turn influences tree growth and species composition.

Climate, with its components of temperature, precipitation, sunshine and wind, has the major influence on forest growth. As in most of Newfoundland, the climate at Bay d'Espoir is continental in character, though modified by its nearness to the sea. Precipitation in the Bay averages around fifty inches annually and is well distributed throughout the year. The total length of the growing season for the forest is 150 days.[3] This combination of climatic factors places Bay d'Espoir within the boreal forest region, but on its southern boundary where timber stands tend to be composed of mixed species. Retardation of growth and blow-down from strong winds are more characteristic of the more exposed higher portions of the forest than of the more sheltered valleys.

Mapping the distribution of mixed species is difficult. This difficulty is overcome somewhat, however, by omitting species not used commercially. Softwoods are predominant especially balsam fir (Abies balsamea) and the black spruce (Picea mariana). Of the hardwoods,

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[3] F.K. Hare, The Climate of the Eastern Canadian Arctic and its Influence on Accessibility, Ph.D. thesis, Department of Geography, University of Montreal, 1950.

the white birch (Betula papyrifera) is most numerous. Although there are few large pure stands of these three species, large areas of overwhelming dominance - seventy-five to ninety percent of softwoods - are common.* Other trees of commercial value - white spruce (Picea glauca), white pine (Pinus strobus), yellow birch (Betula lutea) and tamarack (Larix laricina) - are found in smaller numbers.

Throughout the study area the proportion of each species per unit area is approximately the same in all watersheds except in that of Northwest Brook where the proportion of black spruce and white birch is greater (Figure 1-2). For the whole study area the percentage of each species (numbers) is approximately as follows: balsam fir, over fifty; black spruce, twenty to thirty; white birch, ten to twenty; yellow birch, less than five percent; and white pine and tamarack combined, less than five percent.[4]

Although all species mentioned can be found within an area as small as a few acres, the most common subordinates are listed in Table 1-1. In both pure and

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* 'Pure stand' in this study means in excess of ninety percent although foresters consider seventy-five percent plus as "pure". Percentages of species dominance are impressionistic, based on travelling through the forest.

[4]Rough estimates were made from field work during the summer of 1971 and interpretation of 1966 air photos.

Table 1-1

SPECIES	HABITAT	DOMINANCE AND COMMON SUBORDINATES	FORM	SIZE
Balsam fir (Abies balsamea)	Grows best on moist, well-drained soils in sheltered locations	The dominant species in Bay d'Espoir forms pure stands but generally mixed with all other species	Symmetrical in outline. Narrow pyramidal crown. Slightly tapering trunk. In open lower branches remain alive down to ground	40' - 60' high 1' - 2' in diameter
Black spruce (Picea mariana)	Commonly found on wetter soils but grows best on well-drained sandy soils	Grows in pure stands and/or mixed with balsam fir and tamarack	In stands, straight trunk with little taper and without branches for much of its length. Narrow crown of drooping branches of up-turned ends	30' - 50' high 6" - 12" in diameter
Eastern White Pine (Pinus strobus)	Found on many different soils but grows best on moist sandy or loamy soils	Pure stands rare. Grows in association with balsam fir, black spruce and white birch	In open, crown wide-spreading and generally irregular. In closed stands lower two-thirds of length often free of branches	50' - 70' high 1' - 2' in diameter
White spruce (Picea glauca)	Grows best in rich, moist, well-drained soils where most commonly found	Found scattered throughout the best stands of balsam fir and black spruce	Uniform conical crown. Branches to ground in open with trunk of pronounced taper. In stands lower branches shed and long slender tapering trunk	40' - 60' high and 1'-2' in diameter and up to 100' high and 3' in diameter
Tamarack (Larix laricina)	Found mostly on poorly-drained soils and needs well-lighted locations	Widely spaced species in mixture with black spruce, balsam fir, and white birch	In stands, straight trunk with little taper, and small, narrow, open, conical crown. In open, crown extends over most of trunk and becomes irregular	30'-40' high; up to 80' high, 12"-18" in diameter

Table 1-1 (Continued)

SPECIES	HABITAT	DOMINANCE AND COMMON SUBORDINATES	FORM	SIZE
White birch (Betula papyrifora)	Grows best on well-drained sandy soils and is intolerant of shade	Forms pure stands in several areas as a result of fires but tends to grow in association with conifers	In stands, trunk usually extends free of branches almost to top of oval, open crown. In open, crown pyramidal rounded outline and comprises greater part of height	40' - 50' high 1' - 2' in diameter
Yellow birch (Betula lutea)	Best growth on moist, rich soils and is intolerant of shade. Bay d'Espoir is 1 of 3 areas it grows on the Island	Not as numerous as white birch. Grows among balsam fir and/or other hardwood	In stands, trunk generally free of branches for over half of tree's height, has little taper and short round crown. In open, crown long and widespread	40' - 50' high 2' - 3' in diameter

Source: (Hosie, 1969; Bearns, 1969; Fieldwork, 1971).

mixed stands, sunlight produces a dense canopy particularly in valleys, thus leaving the trunks of most trees free of branches almost to the top. In the open, however, the trunks of these same species generally bear branches almost to the ground.

The balsam fir and black spruce have shallow root systems and are not wind firm, while the white spruce and tamarack are moderately resistant to windthrow, and the white pine and hardwoods which have deeper root systems are quite windfirm. This is a necessary characteristic of the white pine because it generally extends above the canopy of the other trees.

The proportion of large trees of commercial value was not as great by the 1920s as previously because of the amount of cutting, particularly since the beginning of the sawmilling industry. Most of the cutting before 1895 was restricted to the white pine, yellow birch, the large tamarack, the choice balsam fir, and the black and white spruce. Choice softwoods were generally in excess of ten inches in diameter breast high, were straight and were usually free of branches for over a third of their heights. Because of this very selective cutting, the degree of forest depletion was minimal and therefore did not drastically change the ratio of the species except for the white pine and yellow birch.

CHAPTER II

TIMBER EXPLOITATION BEFORE 1895

From at least the beginning of the sixteenth century, Basques and Frenchmen migrated seasonally to Newfoundland to fish. It is likely that during that century these groups fished along the South Coast and may have sought timber for ship repairs from Bay d'Espoir. In the seventeenth century this South Coast fishery increased and was dominated by the French. By the middle of that century the French were concentrated in Placentia, St. Pierre, Fortune and the area around the mouths of Hermitage Bay and Bay d'Espoir.[1] This included both seasonal fishing ships and settlers. With settlement, timber was needed for fuel, homes, outbuildings, wharves, boats, and schooners. Most of the building materials could not have been obtained from the small trees on the coast. It was therefore likely that any large timber required was obtained from Bay d'Espoir; however, the degree of forest exploitation appears to have been small in the seventeenth century.[2]

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[1]Grant Head, The Changing Geography of Newfoundland in the Eighteenth Century, Ph.D. thesis, 1971, University of Wisconsin, p. 77.

[2]Head, p. 251.

With the extension of British sovereignty to the South Coast after the signing of the Treaty of Utrecht in 1713, a survey reported abundant timber for ship masts, boards and planks.[3] It is likely such products were obtained in Bay d'Espoir, the only forest later found on the South Coast by Cook as worth describing: "... great Plenty of all Sorts of Wood, common to this country...."[4] The English were slow in settling the South Coast. More than fifty years later, in 1765 there were still only a few settlements in Fortune and Hermitage Bay.[5] In the 1760s and 1770s the population of the South Coast (Fortune Bay and westward to Port aux Basques) did not exceed 600 but trebled during the summer fishing season.[6] Since sufficient small timber grew in the vicinity of these small fishing settlements on the coast to supply the needs for fuel, fencing, and flakes,[7] it seems that only

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[3] Ibid., p. 105.

[4] James Cook, "Directions for Navigating on Part of the South Coast of Newfoundland," 1766, p. 18 (Newfoundland Room, Library, Memorial University of Newfoundland).

[5] Cook (1776), pp. 7-17.

[6] Head (1971), p. 252.

[7] Cook (1776), pp. 13-17.

ship building material and wide boards and planks, particularly pine, were obtained from Bay d'Espoir.[8] However, during the last quarter of the eighteenth century the demands for these special products increased. The French were given permission in 1776 to cut timber in Bay d'Espoir.[9] Ship building increased particularly in Bay d'Espoir and on the Burin Peninsula.[10] Even ships from as far away as Placentia went to Bay d'Espoir for building materials, including pine planks.[11]

Up to the 1830s there is little known of where in Bay d'Espoir and in what season or seasons most of the cutting was done. With an increase in the South Coast population and merchant establishments, the demand for timber increased; however, at least one of the largest fishing-shipping companies on the South Coast imported some of their lumber from the New England States.[12] The

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[8]Prowse (1895), p. 286.

[9]Ibid., p. 340.

[10]Robert Newman & Company Ledger Books, 1796-1806, Maritime History Collection, Department of History, Memorial University of Newfoundland.

[11]Letter Book, Saunders & Sweetman, 1788-1803, Mss. Arts & Culture Center Library, St. John's: June 14, 1789 "Pierce Sweetman, merchant agent, Placentia, ordered Captain Fling to go to Paradise and then to Bay of Despair to take in all the pine plank that John Farrell & crew had cut."

[12]Robert Newman & Company Ledger Books, 1796-1806.

exploitation of timber at Bay d'Espoir had increased in intensity by the 1830s. English merchant crews and South Coast families were wintering in the Bay to log, while fishing schooners and coastal settlers came to log during ice-free seasons.

Merchant Crews

Of the merchant crews who visited Bay d' Espoir, it appears that Newman's crews were the most frequent. This company continued building ships into the nineteenth century[13] and depended on Bay d'Espoir forests. In addition to ship-building in the Bay, Newman & Company built ships in Hermitage Bay and on the Burin Peninsula.[14]

It appears that many of the ship-building materials were procured by English merchant crews who wintered in the Bay. In 1835 the locations and size of two of them - for the Newman and Nicoll companies - are on record[15] (Figure 2-1).

Nicoll and Company with headquarters at Jersey Harbour and Newman & Company at Harbour Breton both had

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[13]Prowse, p. 402. See also Newman's Ledger Books 1796-1806. In 1804, a 94-ton schooner was built at Bay d'Espoir.

[14]Prowse, p. 340. Between 1815 and 1817, Newman's built several fine vessels at Great Jervois, all constructed out of timber obtained in Bay d'Espoir. See also Robert Newman & Company Ledger Books, 1796-1806. (Information is found in each ship's account).

[15]Edward Wix (1836), pp. 77-80, 108-110.

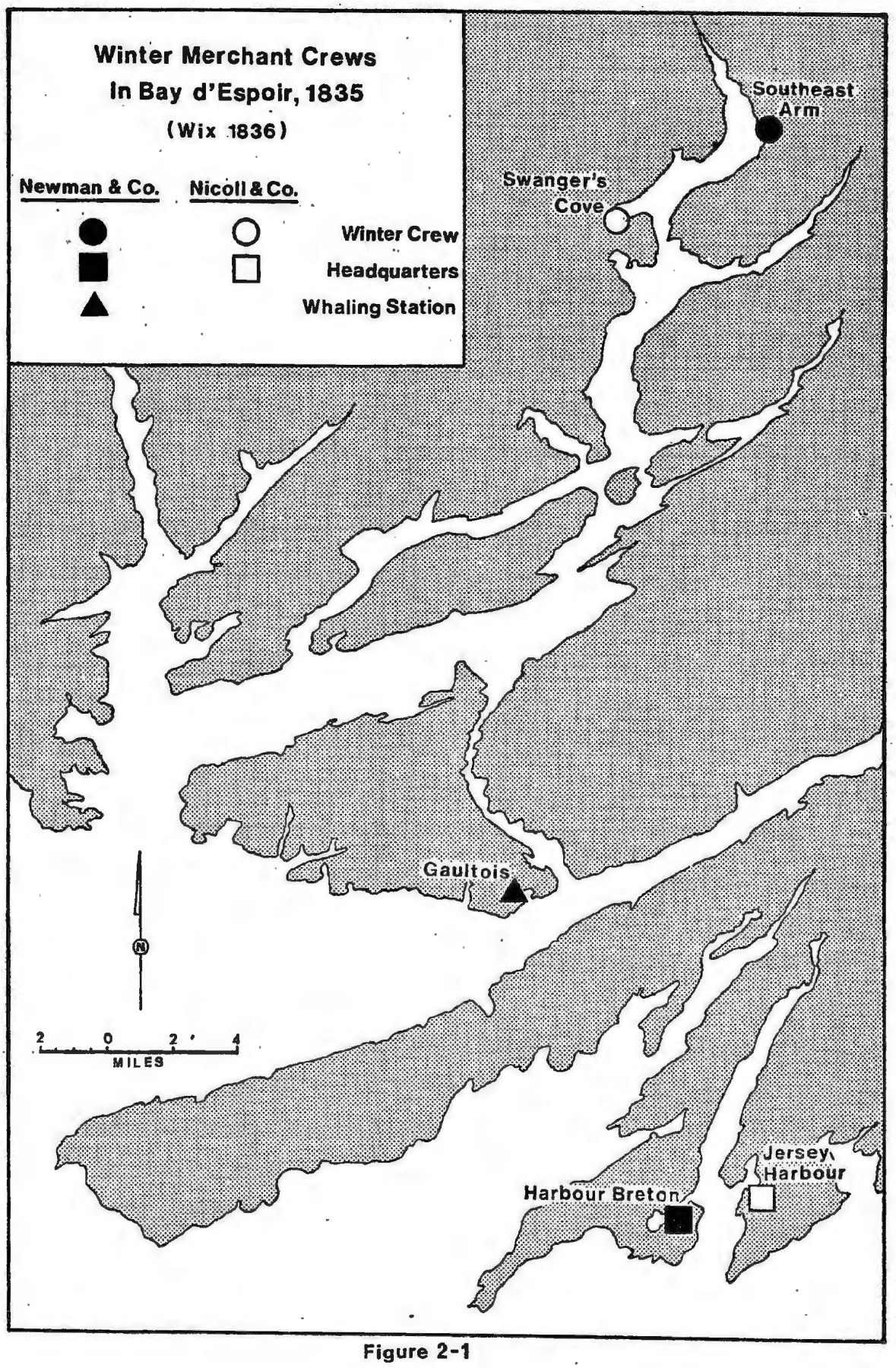
Winter Merchant Crews
In Bay d'Espoir, 1835
(Wix 1836)
Newman & Co.
Nicoll & Co.
Winter Crew
Headquarters
Whaling Station
Southeast Arm
Swanger's Cove
Gaultois
Jersey Harbour
Harbour Breton
N
2 0 2 4
MILES

Figure 2-1

other establishments along the South Coast. Through a mutual agreement they managed between them to monopolize most of the trade along that coast.[16] As the principal merchants on the coast, they were the chief exploiters of the Bay d'Espoir forest. Crews from both companies were the only ones mentioned during Wix's visit in 1835.

The number of winter crews per year after the 1840s varied generally from one to three, usually from Gaultois, Harbour Breton and Jersey Harbour. They moved before winter to locations in the vicinity of river mouths and other areas of level or gently sloping land by the sea that supported the tree species and sizes sought.[17] A crew varied from eight to fifteen men, comprising a cook, foreman and loggers. They all lived in a single room log house, called a tilt. For example, in the winter of 1834-35, the eleven-man Newman crew lived in a tilt 20' by 15', which had an open fire place for heating and cooking.[18]

Merchant crews came to Bay d'Espoir in summer but not as frequently as in winter. This was practised

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[16]Philip Tocque, Newfoundland: As it was and as it is in 1877 (Toronto, 1878), p. 186.

[17]Locations of crews from the 1840s were learnt from informants who were sons of members of merchant crews from the mid 1840s to the 1870s.

[18]Edward Wix (1836), p. 70.

particularly by the two larger merchant establishments on the South Coast - Newman's, and Nicoll's. However, the crews were generally between 4 and 6 men and their stays appear to have been shorter than those of the winter crews; usually the men and the timber were picked up by schooners after two to three weeks.

Between 1860 and the late 1880s the total number of merchant logging crews declined and eventually disappeared. This was partly because of a decline in ship building by Newman's and partly because of the increase in permanent settlers at Bay d'Espoir who supplied some of the merchants' timber demands.

Timber for shipbuilding was usually given priority by these merchant crews before the 1860s. Included in the other orders were frames, boards, clapboard and shingles for the building of houses and a variety of outbuildings and fishing premises, staves and hoops for barrels used in the fishery, and plank and logs for wharf construction and repair.

The principal tree from which ships' timbers, keels, stems, and planks for shipbuilding and repair were obtained was the yellow birch, locally called the witch hazel. Only the heartwood* part of that species was used.

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* The core or central portion of a tree trunk which is dead and is more durable than the sapwood or live portion.

The live part of the trunk was chopped away where the tree was felled. The exposed heartwood was then shaped by axes and pitsaws into pieces somewhat larger than ultimately required for shipbuilding.

Other timber used in shipbuilding was obtained from white pine, black and white spruce and tamarack, locally called juniper which is one of the least dominant species. Periodically balsam fir was used but only as a substitute for pine or spruce in the decks of small schooners.

The durable tamarack was utilized for ship timbers, keels, stems and masts. Its scarcity restricted its use to ship planking. The white spruce, renowned for its size, straightness and strength, was in great demand for ships' masts. The white pine was sometimes utilized as deck planks of ships. The use of black spruce was minor although greater than the balsam fir because of its superiority in strength and durability. For wharf construction crews generally cut white birch, black and white spruce, and any available tamarack. It appears that the white pine was in greater demand than its substitute, balsam fir, for building construction. Houses built in Bay d'Espoir in the 1860s and 1870s were constructed of pine boards of widths up to two feet. Besides being more durable than the latter, the pine was easier to pit saw.

With the depletion of the most accessible pine by the 1870s, the choice firs were exploited. Crews sometimes produced barrel staves from fir and hoops from birch one to two inches in diameter.

Sawpits were established in the vicinity of abundant choice trees which were rarely hauled more than 200 yards to a pit; only the sawn products were transported to the shore. With the advantage of snow, the winter crews had the option of using sleds. In the absence of snow, the crews carried the sawn products on their shoulders and hauled logs with rope over the bare ground. This cumbersome technology restricted their penetration of the forest to within a quarter mile of the sea in comparison with a penetration upwards of a half mile by winter crews. These distances were not applicable to trees sought for masts and ship keels which were harvested at points up to one mile distant. When unavoidable ascents were encountered, tackles were utilized in moving such large and valuable logs.

Individual Fishermen

It was common in the nineteenth century for individual families from fishing communities along the South Coast, particularly from the mouth of Bay d'Espoir and from Hermitage Bay, to winter in the forests of Bay d'Espoir. It is likely that French fishermen in

Hermitage Bay had adopted the same practice as early as the seventeenth century.[19] Since the English did not settle the area before the latter half of the eighteenth century, it is likely that there was an interruption in the wintering of families in the Bay d'Espoir forests. Apparently its resumption had not become common until the mid-1830s.[20] After the 1840s, such families increased, reaching a dozen or so by the 1860s. Each family lived in a small one room tilt with 100 to 150 square feet of floor space. Because they came primarily to cut logs to build a house in their home fishing settlements, they did not always return after one winter. However, oral tradition asserts that at least five families returned annually for ten to fifteen years before settling permanently in the 1870s. They wintered there to be near a source of fuel, to be nearer the caribou and also to make hoops, staves and shingles for sale, to cut fuel, and to saw logs to barter with the merchant for food and fishing supplies.

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[19] J.D. Rogers (1911), p. 124. Cited from the 1713 report of resources of the South Coast by Captain Taverner.

[20] Edward Wix (1836), p. 94. Wix mentions all the inhabitants encountered in Bay d'Espoir - both Indian and European, and only one tilt was that of a fisherman wintering in the Bay.

It was common during the latter half of the nineteenth century for clusters of from two to four families to locate in sheltered coves and at river mouths around the Bay, and traces of their abandoned tilts are remembered. Some of the coves and points were named after these temporary settlers.

Unlike the merchant crews, such families continued their periodic winter stays until the beginning of the present century. Their numbers reached a peak of approximately twenty families in the 1870s and declined to three or four by the late 1890s.

Visits of Fishing Vessels

In addition to those who resided in Bay d'Espoir for a season, others visited briefly to obtain timber and usually lived aboard ship. Winter visits were rare because the Bay generally froze over, and generally such visits tended to reach their peak in the autumn. The fishermen can be divided into three groups: first, those in small open boats 20 to 25 feet long and dories; second, the small fishing schooners between 10 and 40 tons; and third, the larger banking and trading schooners.

The small fishing boats and dories came from the nearer fishing settlements at the mouth of Bay d'Espoir and Hermitage Bay. Their visits were generally less than

a week's duration. They often located at the nearer south edge of the forest except when they had big timber to cut which forced them to be more selective in their locations which were farther north. Among their demands was timber for boat building, home and outbuilding construction, and fuel, particularly birch for the winter. The latter was generally obtained during the autumn visit. Any trips made earlier in the year were primarily for timber utilized in the maintenance of premises. Because of boat size, the logs had to be rafted and towed instead of being loaded aboard.

The small fishing schooners from the South Coast were most commonly found in Bay d'Espoir in the autumn. To avoid shallow water, the crews tended to log the slopes bordering the deeper water. To be close to shore and to prevent grounding at low tide, depths of at least a fathom within a hundred yards of the shore were sought. The prime objectives were to cut their timber by the shore to have both short hauling and towing distances to the schooner. The more accessible forested areas within 200 to 300 yards of the sea and bordering deep water became depleted of choice timber by the 1870s.[21] This forced an

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[21]A. Murray, "A Report on the Geological Survey of Newfoundland for 1869-70," Journal of Council, 1870, p. 79. Murray showed concern for the destructive method of timber exploitation by people in small ships from Placentia Bay and St. Pierre in particular, but mentioned the interest of settlers nearer the Bay to protect the forest.

increasing number to move to less exploited forest bordering the shallower water. It was common from the 1880s to see as many as 15 to 20 small fishing schooners in the Bay at one time during the autumn. This annual fleet continued its autumn visits into the present century.

Vessels were usually loaded within a week or two, depending on the crew size. After the 1860s fuel became increasingly the dominant cargo and by the 1920s it made up nearly all of the schooner loads. This apparently resulted from fuel depletion along the coast.

Little is known of the larger banking and trading schooners' visits previous to the 1850s. Throughout succeeding years predominantly merchant-owned vessels from as far away as Placentia Bay came for timber. Such visits were primarily in the late autumn after the fishing season was over. Even though the large vessels made regular visits throughout the latter half of the nineteenth century, their numbers decreased from a high of approximately ten to three or four by the beginning of the present century.

These ships drew up to two fathoms of water when loaded and were therefore forced to anchor in the deeper channels of the Bay. There were places where they were only a hundred yards from the cutting area, but between the 1850s and 1890s this water distance from the ships to

the areas logged gradually increased to a mile for choice timber. By restricting hauling distances on land to within 200 to 300 yards, the distances logs had to be towed in a rowboat increased.

In addition to each ship's crew of 4 to 8 men who cut large timber, after the 1870s settlers of the Bay contributed to the loads. Because the majority of the ships were merchant-owned, their timber loads were normally used to fill the needs of the merchant establishments. These were primarily logs, boards, and planks for ship construction and repair; the erection and repair of buildings, and wharf maintenance or reconstruction. Ships' crews spent little time in obtaining fuel after the 1860s because residents of the Bay supplied most of it. Because many of these visits were late in the autumn, ship crews desired to fill their timber demands in order to leave the Bay before it froze over.

Permanent Settlement

According to archival data and field enquiry, there was no permanent settlement by Europeans in the forested section of Bay d'Espoir (Tables 2-1 and 2-2) until at least the middle of the nineteenth century.[22] The early 1850s saw the first whites settle at Ship Cove, now St.

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[22]Newfoundland Census Returns, 1836 and 1857. See Tables 2-1 and 2-2.

Table 2-1

Size of Settlements by Families

Settlement	1855	1860	1865	1870	1875	1880	1885	1890
Ship Cove (St. Alban's)	2	3	4	5	8	15	23	29
Conne River (Including Indians and Europeans)	?	9*	?	22?þ	12?ð	?	18#	14
Head Bay d'Espoir			?	3	3	3	4	8
Head of Conne		1	1	1	1	1	2	2
Burnt Woods				1	1	1	1	1
St. Veronica				1	1	1	1	2
St. Joseph's					1	1	1	1
Aaron's Cove					2	2	2	3
Little River				1	1	1	1	1
Weasel Island				1	1	1	1	1

Source: Field work 1971
* Newfoundland Census Returns, 1857
þ Includes 5 whites married to Indians 1869 Census
ð 1874 Census
1884 Census

Table 2-2

Data Totals for Bay d'Espoir from the Newfoundland Census Returns

Year	European Population	Indian Population	European Families	Indian Families	No. engaged in Fishing	No. engaged in Farming	No. engaged in Lumbering	Miscellaneous Occupations	No. of Firs	No. of Ships	No. of Milch Cows	No. of Neat Cattle	No. of Sheep	No. of Swine	Lbs. of Butter	Tons of Hay	Barrels of Potatoes	Barrels of Turnip	Acres of Land Cleared
1836	-	-*	-	-*	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1857	30	55	4	-	-	-	-	-	-	-	1	2	10	-	-	-	20	-	2
1869	120	88	17	-	3	6	10	5		3	20	28	44	2	1008	27	275	3	37
1874	89	79	Combined 31		20	-	37	8		17	38	56	45	44	3092	63½	496	7	32
1884	185	77	Combined 51		17	19	-	35		4 over 30 tons	70	53	45	12	2350	82	765	-	71
1891	Combined 350		Combined 64		-	25	-	64	441	5 over 30 tons	46	24	169	83	2590	64	1269	18	78

* In 1835 there were Indians living at Bay d'Espoir (Wix).

Alban's. By the late 1860s, non-Indian settlers had increased to 12 families, dispersed throughout the Bay with a concentration at St. Alban's [23] (Table 2-1).

Although the 1836 Newfoundland Census Returns do not account for any Indians at Bay d'Espoir, there are several references to their presence before this date.[24] Because the natives were primarily trappers and hunters, the amount of timber exploitation attributable to them seems to have been very limited even after European settlement.[25] By at least the 1860s intermarriage occurred between Europeans (French and English) and Micmac women at Conne River.[26] However, the Indian families, instead of settling permanently at Conne River like the mixed families, continued their migratory life, moving to the interior in the fall and returning to Bay d'Espoir

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[23]There is some disparity between field data and the 1869 Newfoundland Census which records the population of European descendants at 17 families; however, the other census returns of the nineteenth century correspond closely with field data.

[24]W.E. Cormack (1822), pp. 50, 52, 57, 66, 89. See also Tocque (1877), pp. 200-201, citing Rev. Mr. Noall in 1827; Rogers (1905), pp. 164-165, and Wix (1835), pp. 70, 72, 93.

[25]Newfoundland Census Returns, 1857.

[26]Captain Miller, "Report on the Newfoundland and Labrador Fisheries," Journal of Council 1874, pp. 391-393.

in the spring.[27]

Through visits to Bay d'Espoir to cut timber, most of the first settlers had become familiar with the area before settling there.[28] The majority of the first settlers were from fishing settlements in Hermitage Bay and at the mouth of Bay d'Espoir. They knew of the area's resources for logging, trapping, hunting, and fishing for salmon, herring and lobster, and because of a luxuriant forest cover they apparently speculated on the soil's potential for farming.

Reports of ship captains submitted in the early 1870s show that although lumbering played an important part in the exploitation of a multiple resource base, the other occupations were of great importance in the subsistence economy.[29]

The incentives for settlers to locate permanently at Bay d'Espoir possibly varied to some extent. At least four with a farming background in southwestern England moved from fishing communities to the south to prime

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[27]Captain Malcolm, "Report of Fisheries on the S.W. Coast of Newfoundland," Journal of the Assembly, 1872, p. 611.

[28]Four of the original European settlers had spent three to six winters at Bay d'Espoir as members of merchant crews before the 1860s: William Barnes, Henry Willcott, Michael Collier and George Hoskins.

[29]Journal of the Assembly, 1871, p. 612. See also Journal of Council, 1874, pp. 764-765.

farming locations at Bay d'Espoir. Others wanted to practise basically subsistence farming, lumbering, hunting and trapping while they continued with the commercial fishery, although on a reduced scale.

A trickle of settlers into Bay d'Espoir continued throughout the 1870s and into the early 1880s (Tables 2-1 and 2-2). Although most exploited each resource to varying degrees, the majority depended more on one resource than any other. Even though a half dozen families depended largely upon farming for their main source of income, others on fishing, and more on trapping, all depended to some degree on the forest from the start. The few families which heavily depended upon lumbering for bartering purposes appear to have attracted a larger proportion of the population into the occupation after the 1860s.

Except for the fifteen to twenty part-time commercial fishermen at St. Alban's from the early 1870s into the 1890s fishing was of little significance. However, salmon, herring, cod, eels, and trout were taken by the majority for home consumption. Trapping was generally a profitable seasonal occupation and was prosecuted in the autumn and early winter when animal pelts were in their best condition. Hunting for caribou, which provided the main source of meat, was prosecuted by all. Farming, although the chief occupation for a half dozen families after the 1860s, was practised by every

family. Root crop and cattle raising formed the core of this activity. Farming, however, was confronted with the problem of forest clearing, a very time-consuming task.

Even though the original settlers selected some of the best locations for farming and timber cutting, their sons who married in the 1880s and 90s still had at their disposal equally good areas within a mile of their fathers' abodes. Although most either received a share of the father's land or settled next to his property sometimes in less favourable locations, several moved across estuaries and along the shore. There they claimed land just as fertile and saw-timber was much closer to their homes. There was also more room to expand clearings and cuttings.

Although the forest was a barrier to farming initially, it was of great importance in the multiple resource economy. Timber filled the settlers' needs for fuel, fencing, housing and boats. For fuel they used both the more numerous softwoods: balsam fir and black spruce - and hardwoods, principally white birch which was more numerous and easier to cut than the yellow birch. Of the fuels traded, hardwoods made up an overwhelming proportion because of its higher value. The timber products bartered were pitsawn planks, boards, house frames, hewn boat frames, shingles, barrel staves, hoops

and fir bark. The principal buyers were South Coast and St. Pierre merchants.

The majority of these settlers had two homes. During the summer they lived by the shore where they had cleared land, while in the winter they moved to their log-built 'winter houses'. These were generally within a half mile of the summer homes or at river mouths within four miles along the shore. Wintering in tilts in the forest provided shelter from winter winds, and proximity to choice logging areas and fuel ready by the door. This seasonal movement, then, although on a smaller scale, was similar to that practised by fishermen from along the coast who wintered in the forests of Bay d'Espoir.

By the 1880s the trickle of settlers came primarily to pitsaw logs to market along the coast. Most came from the source area immediately to the south, particularly from Pushthrough, Great Jervois and smaller settlements in their vicinity. From the 1870s to the early 1890s a growing number of the earlier settlers switched to lumbering as a primary source of income. These two factors resulted in increased pitsawn production and increased marketing activity along the coast.

About twenty-five percent of the settlers owned small schooners. This enabled them to market products from their multiple resource economy with wood products usually forming the principal items for sale. Generally,

each schooner made at least one visit per year to St. Pierre to barter for the less expensive goods, particularly sugar, tobacco and alcoholic beverages available there. The delivery of products to the market by these loggers resulted in more orders particularly from the South Coast merchants and French Islands. This move was instrumental in the displacement of many of the merchant-financed crews formerly sent to log at Bay d'Espoir.

Forest Depletion by 1894

Figure 2-2 shows the approximate areas which had been subjected to varying degrees of forest depletion by the early 1890s. Although very valuable and often extremely large trees had been cut farther inland than the boundaries shown, they made up such a small percentage of the trees that these areas were virtually clad with virgin forest. Boundaries of cuttings were difficult to delineate because the cutting limits of the different tree species and the extent of cuttings by the various types of exploiters did not coincide.

Since this study is concerned primarily with the more predominant softwoods upon which the sawmill industry depended, it was decided to limit the cutting boundary for the early 1890s to enclose only those areas having at least 25 percent of their choice softwoods cut. Choice softwoods in this study refers to primarily balsam fir,

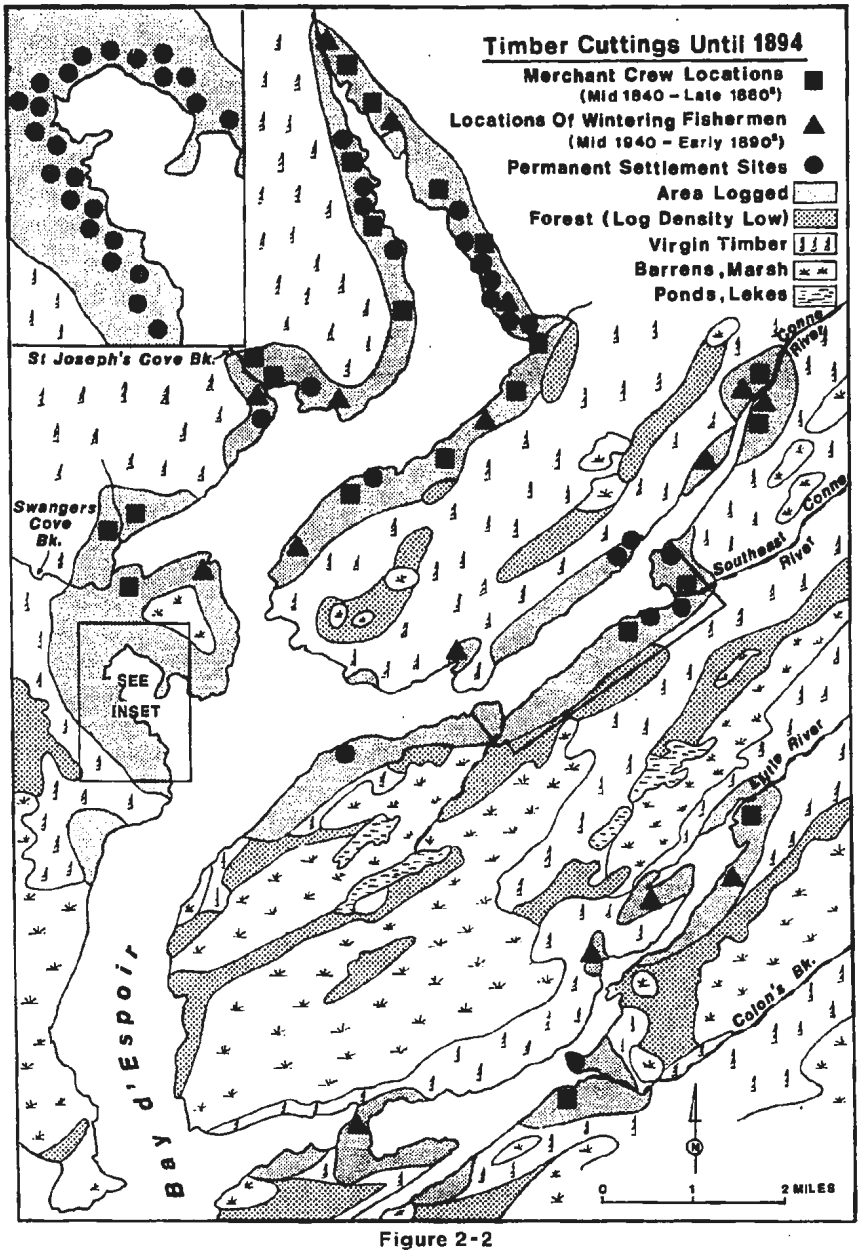
Timber Cuttings Until 1894
Merchant Crew Locations
(Mid 1840 – Late 1880's)
Locations Of Wintering Fishermen
(Mid 1940 – Early 1890's)
Permanent Settlement Sites
Area Logged
Forest (Log Density Low)
Virgin Timber
Barrens, Marsh
Ponds, Lakes
St Joseph's Cove Bk.
Swangers Cove Bk.
SEE INSET
Bay d'Espoir
Conne River
Conne
Southeast River
Eagle River
Colon's Bk.
N
0
1
2 MILES

Figure 2-2

and black and white spruce having breast high diameters greater than 10 inches, straight and free of live branches for at least 15 feet. It has been the ultimate purpose of this chapter to determine the approximate amount of forest depletion which in turn forced sawmill loggers to penetrate farther inland much sooner. The study of this period of timber cutting was also necessary because this kind of exploitation extended into the first phase of logging in the sawmill era.

The form of forest exploitation used during these years is called "hand-logging". Trees were cut, made into logs and transported to the shoreline without the help of any machinery or animals. The only equipment was an axe, a hauling rope and in the winter a handsled which was more widely used after the 1870s.

The degree of depletion became less intense with the distance from the shore. This distance varied around the Bay depending upon accessibility and the size and species of trees. Thus there were areas depleted of most choice trees up to a half mile inland. Other areas bordering the salt water were barely touched because of steep shoreline cliffs.

Within the areas exploited the degree of depletion of each species varied considerably. White pine, yellow birch, and tamarack, none of which were predominant, had been in greater demand than the more numerous balsam fir

and black spruce. Practically all merchantable white pine in the more accessible areas had been cut up to half a mile inland or to the top of the shoreline slope. The yellow birch, choice white spruce and choice juniper were less numerous than pine and had also already been in great demand. However, their depletion was barely noticeable - apparently making up less than one percent of all choice trees. Their value in the shipbuilding industry resulted in these three species being cut as far as a mile from the sea in the most accessible and productive areas by the late 1880s. White spruce and tamarack for ships' masts of sixty to eighty feet were cut as far as two miles up the large rivers and floated down. However, the distance upstream for yellow birch did not change because its specific gravity was too high for it to be floated successfully downstream. The most numerous species - balsam fir, black spruce and white birch - had been exploited proportionately less than the less dominant species just mentioned. By the late 1880s they had been rarely cut back farther than a half-mile at which distance only the choicest were taken.

The areas of greatest forest depletion by the early 1890s were (1) within close vicinity of the shore where crews from the annual fleet of vessels cut; (2) surrounding the immediate area of tilts of merchant crews and individual fishermen; and (3) around the summer

and winter homes of settlers, especially where land was cleared for farming. Consequently there were pockets of maximum depletion in the exploited areas, followed by the more recent sawpit areas of less intensive cutting which generally bordered virgin timber.

As Figure 2-2 shows, the pattern of cutting, determined by accessibility, and timber quality and quantity, consisted of narrow coastal/riverine strips by the early 1890s. In the most accessible places the annual yield exceeded the increment, but apparently over half of the suitable saw timber within half a mile of the sea yielded less than its annual increment. The most accessible areas were in the vicinity of river mouths, on gentle slopes and up valleys inland from coves and settlements. However, forest at distances in excess of a quarter of a mile of these locations generally yielded only its choicest timber for pit sawing.

Logging had extended farther upstream in the valleys of Northwest Brook, Conne River, and Little River because these rivers were tidal, eliminating the task of log driving. In fact, oral tradition asserts that logs were never driven on any river in Bay d'Espoir before the 1890s except for schooner masts. There is good reason to believe that there were sufficient numbers of large trees around the Bay within a half mile of the sea to avoid the

extra task of log driving, increased commuting distances upstream, and the need for boom construction. The amount of timber exploitation was far below the expensive demand for booms.

CHAPTER III

The Hand Logging Phase of the Sawmill Industry, 1895 - 1905

The Sawmill and its Impact

In 1894 a large sawmill employing up to 18 men, excluding loggers, was built at Bay d'Espoir by a Fortune-based merchant. His business began in 1868 based on the fishery, and later expanded into ship building and furniture manufacture. With the addition of two more sawmills by 1905, both at Bay d'Espoir, this business developed into one of the largest on the South Coast of Newfoundland.

The Bay d'Espoir forest, which exceeded any other on the South Coast in quantity, quality and accessibility, was therefore chosen for exploitation and the site of the sawmill. Although sawmilling depended upon both hardwoods and softwoods, the dominant balsam fir and to a lesser degree the spruce were the two most important species. These two had been spared from depletion until the latter half of the nineteenth century as a result of the demand for the more valuable white pine. Their lighter

exploitation and fairly high annual increment[1] gave even the more accessible forest a density of sawlog-size fir and spruce greater than half that of virgin forest. Thus, one of the important factors in the location of the mill at Bay d'Espoir was the high percentage of log size trees left in the partially depleted coastal strips.

Suitable sawmill site requirements were not difficult to satisfy. It was very close to an ideal site which would have a combination of (1) a sheltered cove next to the mill for holding booms of logs with shallow enough water for grounding them at low tide for scaling, (2) a stream for the disposal of sawdust and other wastes, and water for the steam boiler, (3) level land by the shore at sea level for the mill, and (4) deep water for a wharf to load lumber onto schooners (Figure 3-1).

The sawmill did not operate during winter because logs would have frozen into the ice in the boom. If taken out of the water logs would freeze, making it very difficult for accurate sawing. Although the management returned home to Fortune each winter, a few of the mill workers remained to form part of a logging crew with settlers. This crew, which varied from 8 to 12 men, was

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[1]Forest Capabilities Study, 1967-70. Newfoundland Forest Service, Department of Mines, Agriculture and Resources, St. John's, Nfld. Annual increment ranges from 1/4 to 3/4 cords per acre.

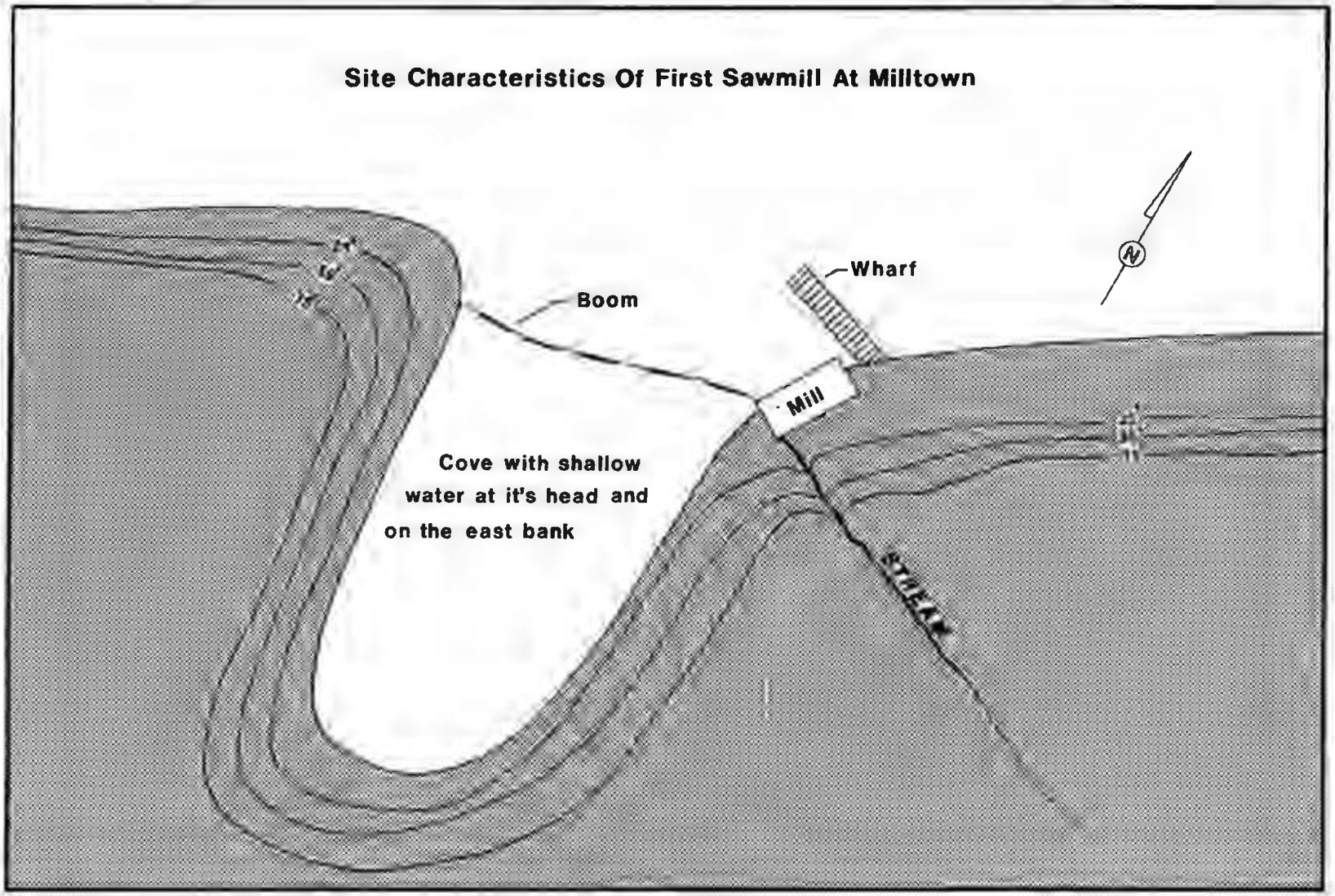

Site Characteristics Of First Sawmill At Milltown
Wharf
Boom
Mill
Cove with shallow
water at it's head and
on the east bank
STREAM
N

Figure 3-1

paid a fixed monthly salary and was supervised by a foreman.

The mill itself increased the demand on the forest by sawing approximately 150 logs per day, and when the sawyer gained in experience, over 200 logs were sawn daily. The marked increase in the demand for logs as a consequence stimulated increased migration to Bay d'Espoir, particularly to Head Bay d'Espoir and Milltown, the location of the sawmill.

The new migrants came from Fortune and the settlements scattered around Hermitage Bay and the southern non-forested part of Bay d'Espoir. The population increase before the sawmill was less than three percent annually whereas from 1895 to 1900 it was over twelve percent. Post-1894 migrants came mainly to log. They hunted, fished and farmed at a subsistence level, but rarely trapped; by then the majority of earlier settlers had adopted a more diversified and intensified use of local resources.

This multiple resource economy continued to exist among the older settlers for at least a decade, with little impact on it from the sawmill industry. These earlier settlers had well-established markets along the South Coast and at St. Pierre for their forest products, farm produce and wildlife products; a dozen or so traded fish, especially canned lobster and barrels of salmon.

Because of their other sources of income, the earlier settlers did not have to be dependent upon the sawmill operations for a living. Yet they sometimes cut up to 50 sawlogs each during the summers while producing timber products to market along the coast. The later settlers, however, logged for the sawmill during both seasons - summer and winter, and especially the latter (Figure 3-2).

The shift to a greater dependence on sawlog cutting by the majority of the younger, pre-1894 settlers was a gradual process. Less than half had started by the summer of 1896, the mill's second full season of sawing. Four to five years later, over half of the earlier settlers were cutting sawlogs, either on a full time basis from January to the middle of March and part time in the summer or part time in both seasons of the year. However, they continued to supply timber products to their earlier markets and usually reserved the late winter and early spring for obtaining these products. Thus there was a merging of the two types of timber exploitation in winter with a gradual, but still only partial, shift towards sawlog cutting.

Periods of Logging

Logging may be divided into two seasonal categories: the autumn-winter period and the spring-summer period. The former will be called winter logging and the

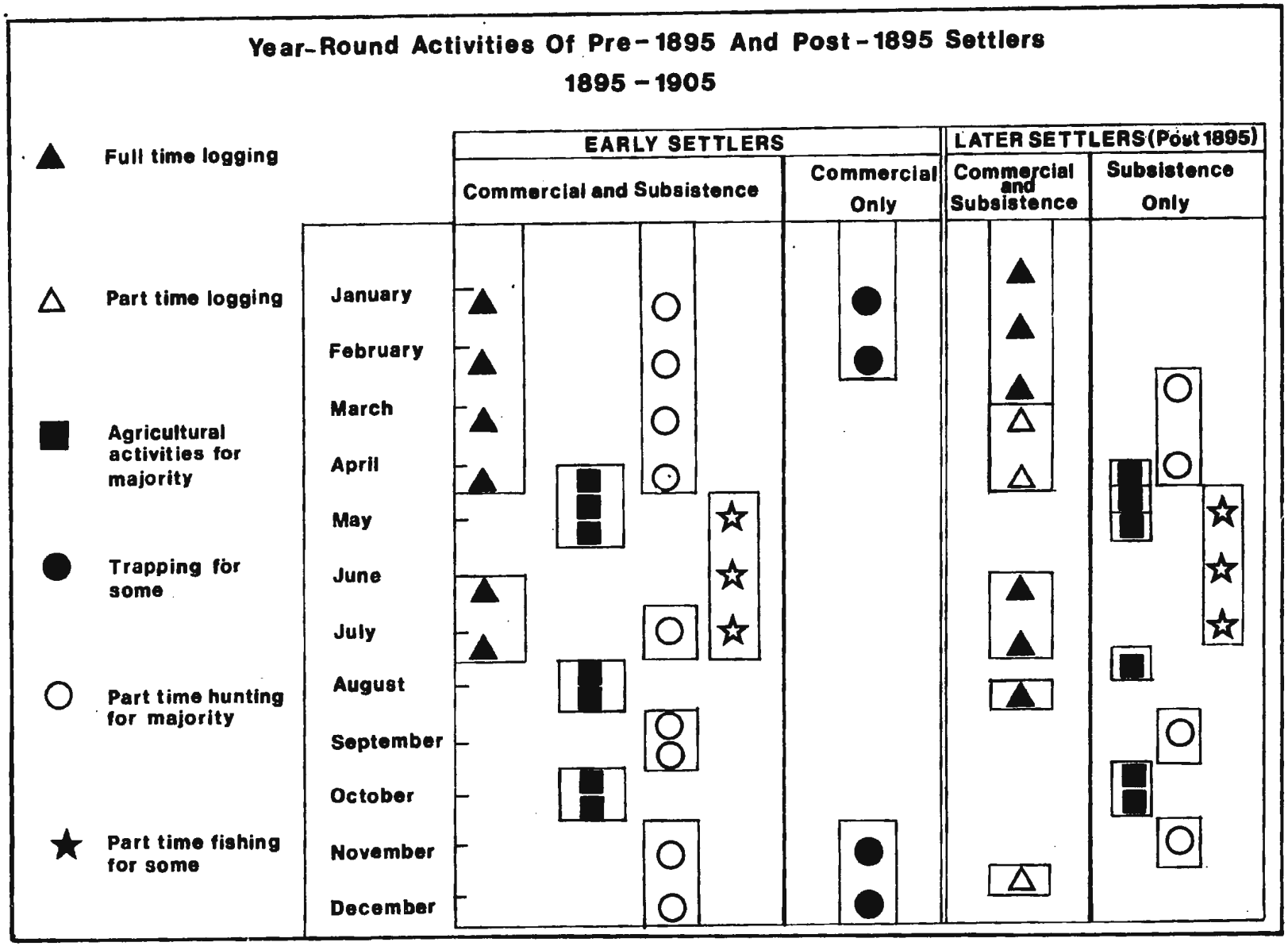

Year-Round Activities Of Pre-1895 And Post-1895 Settlers
1895 - 1905
Full time logging
Part time logging
Agricultural activities for majority
Trapping for some
Part time hunting for majority
Part time fishing for some
EARLY SETTLERS
Commercial and Subsistence
Commercial Only
LATER SETTLERS (Post 1895)
Commercial and Subsistence
Subsistence Only
January
February
March
April
May
June
July
August
September
October
November
December

Figure 3-2

latter, summer logging except when minor variations within each are discussed.

Winter logging was usually prosecuted between the first week of January and the end of March, except for the small number of crews (including the salaried ones) who used oxen for transporting logs from 1901 to 1905 (Table 3-1). The crews with oxen logged during the latter half of the autumn to accumulate sufficient logs in addition to those cut during the winter to maximize the use of the oxen while the ground was snow-covered.

Until the autumn of 1900, all sawlogs except those of the salaried crews had to be barked before being accepted at the sawmill. The removal of bark from trees was very time-consuming. Logs cut during the sap-running months of summer were much easier to rind than in any other season. It was most difficult during the winter when bark was also frozen to the wood fiber. Then barking was more easily done by beating logs with the pole of the axe than by chopping. When the management of the sawmilling industry realized in the autumn of 1900 that, for a full sawing season in 1901 with an additional mill, the demand for the larger and therefore more valuable winter logs would be greater than the supply, it eliminated the barking of winter logs with very little reduction in value.

Table 3-1

Winter Logging Crews, 1895-1905

Year	Lone Loggers	Fathers and Son(s)	Brothers	Brothers and Their Sons	Friends	Salaried Merchant Crews	In-Laws	Total Crews	Total Men	Crews without Oxen	Crews with Oxen	No. of Oxen
1895	14	9	3	-	1	1	-	28	73	28	-	-
1896	18	13	2	1	1	1	-	36	79	36	-	-
1897	16	15	4	2	2	1	-	40	87	40	-	-
1898	17	16	5	2	2	1	-	43	93	43	-	-
1899	17	17	5	2	2	1	-	44	95	44	-	-
1900	15	17	6	4	2	1	1	46	98	45	1	1
1901	18	15	10	3	3	2	1	52	113	50	2	3
1902	19	19	7	3	2	2	1	53	121	49	3	4
1903	16	20	9	3	3	2	1	54	128	48	5	6
1904	13	18	12	4	4	2	1	54	130	48	6	7
1905	10	17	14	5	4	2	2	54	133	47	7	8

Fieldwork 1971

Winter and summer logging were somewhat different. Summer logs were on an average smaller than winter logs and were rinded for easier hauling. Summer logs generally ranged from 15 to 20 feet in length and 6 to 9 inches at the butt. Winter logs were usually in excess of 20 feet and larger than eight inches at the butt and ranging up to two feet at the butt and forty or more feet long.

Summer logging as distinct from spring logging was prosecuted normally during the sap peeling season from the middle of June to the last part of August, depending on the variations in seasonal temperatures. Spring logging, done in April, was prosecuted by non-winter loggers who had the same bartering policies and similar logging conditions as the summer loggers. Unlike the continuation of autumn logging into the winter, spring logging did not merge into the summer operation although both were exploited in generally the same locations. After barking requirements were dropped, spring logs generally were rinded only on one side to reduce hauling resistance. They were transported singly with a rope like summer logs and were approximately the same size as the latter.

Summer logging was pursued on a weekly basis by some and a two-week basis or longer by others. From Monday to Thursday logs were cut and hauled. On Friday

the loggers rafted and towed them behind row dories to the mill boom where they were scaled when grounded at low tide. Saturday was "pay day" when sometimes as little as a pound of tea and a gallon of molasses were given each logger for his 30 or 40 logs. During this hand-logging phase there was a monopoly of the sawmilling industry by Lakes, a single merchant family. Thus the demand for summer logs from the beginning of the sawing season in late April or early May until as late as September was usually low because of the larger winter logs sawn. Instead of withholding their logs in the hope of an increased demand for them in the autumn, loggers normally had to exchange their logs for whatever they could get from the merchant.

The arrangement between the merchant and those who logged in winter was entirely different. Because the merchant desired the larger logs which were obtained more easily in winter, he actually paid loggers in advance. These loggers were provided with a winter's supply of food in the autumn as well as any logging equipment needed, in return for payment with logs the following spring or summer. This practice, known as "the credit system", worked to the advantage of the mill owner who often charged high prices for the supplies and gave low prices for the logs. This was a necessary precaution for protection against bankruptcy since occasionally a number

of loggers failed to obtain sufficient logs to pay their debts. Some loggers' debts would have been greater had they received the requested amount of food and supplies for their large families. Any credit owed loggers was rarely paid in cash but instead given in kind on "settling-up day" or later, or else it was left in the hope of receiving money in the future. Around the turn of the century a man's share of a "winter's work" ranged from $100 to $200, usually the largest source of income throughout the year for the majority of the settlers depending primarily upon lumbering for a living. In terms of the credit system then, winter logging was the equivalent of the summer fishery elsewhere in Newfoundland.

The increased demand for winter logs in 1901 in particular led to the increase of winter loggers among the settlers and resulted in yet another and larger migration from the fishing communities to the south. This migration was augmented by the recruitment of men from outside the Bay to log either as members of the salaried crews or as independent contract loggers. Around this time the number of winter loggers began to exceed the number of summer loggers.

Winter logging with its more favourable working conditions, resulting from the season's climate, became more profitable than summer logging after barking requirements were dropped. The frozen and snow-covered ground

permitted the more efficient use of sleds which, because of their capability resulted in larger logs and loads being transported. Melting snow and rain in the spring raised rivers to the flood stage which provided winter loggers with optimum driving conditions.

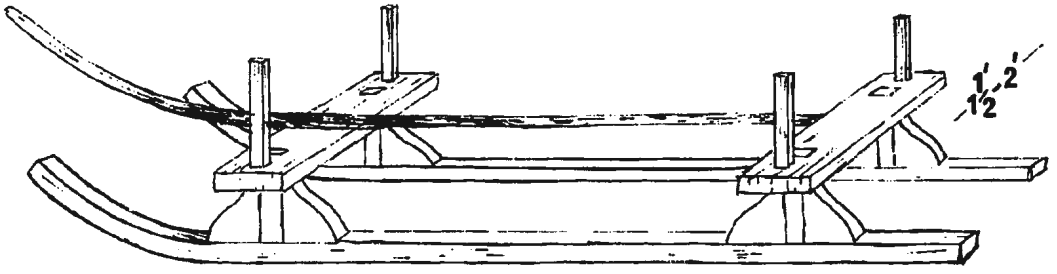
Log transportation methods until 1900 were limited to a hauling rope and a sled, the choice of which depended upon hauling conditions and distances. Although the ox was used for transporting logs as early as the winter of 1899-1900, by 1905 there were only seven of the forty-six crews using them.

Sleds were of a uniform type but their sizes varied with the number of men in hauling crews. They were light but sturdy and a slightly modified form of the type used for hauling firewood (Figures 3-3 and 3-4). A one-man sled accommodated two to three logs while others for larger hauling crews held as many as six logs.

Except during the winter, rope was the only hauling equipment. Logs were also slid down slopes, especially during the summer when they were sap-peeled to reduce frictional resistance. The nearer trees, suitable for summer logs only, were bypassed in winter. Summer logging locations were generally within 300 yards of the sea or rivers large enough for summer driving. The most favourable areas were on hillsides overlooking the sea and

Handcat For Hauling Firewood

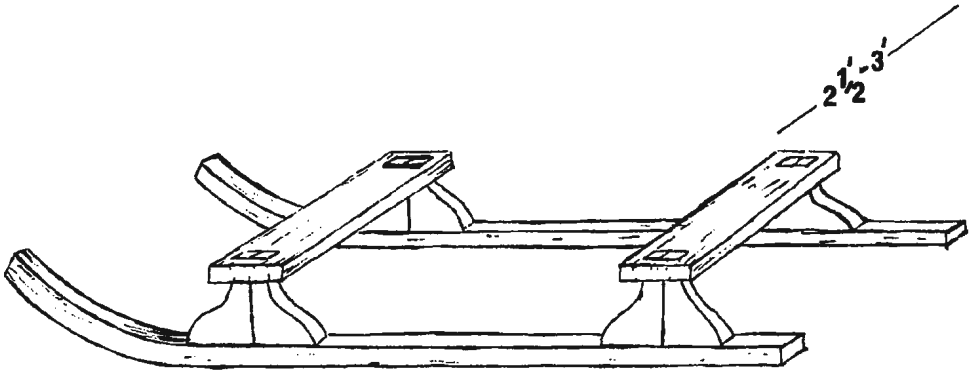
Ranged From 10' To 12'



Ranged From 6' To 7'

Figure 3-3

The Logging Handcat



Ranged From 7' To 9'

Figure 3-4

rivers to which logs slid to the water's edge down obstruction-free routes. The hauling of logs over level ground drastically reduced their sizes. Under adverse hauling conditions the greater the diameter, the shorter the log. Sections of these accessible coastal/riverine strips used by summer loggers were restricted from public use through land grants to individuals. Other sections within summer logging range were avoided because of unfavourable topographic conditions. Other areas were periodically excluded as a result of extremely dry summers which prevented log driving on the more dependable rivers.

These rivers, however, had sufficient water in early summer for log driving. Spring logging was restricted mainly to the exploitation of the Micmac Indians of Conne River. Their logging activity up to 1905 was small - around fifty logs per year and rarely over a hundred. This is borne out in Millais' description of the routine life of Micmacs at Conne River in 1905 when he showed clearly that some of the Indians logged in spring, generally in April.[2]

During the hand-logging phase of the sawmill industry, the Micmacs logged the Southern side of Conne

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[2]J.G. Millais, Newfoundland and its Untrodden Ways, London: 1907, pp. 219, 220.

Arm and the valleys of South East Conne Brook and Conne River. Even with rivers in flood during this season, they rarely logged more than a mile upstream from these river mouths.

Log Selection and Cutting Techniques

Sawlogs, except for a small percentage of summer logs, were restricted to the minimum size of seven inches at the butt. Thus selective cutting was practised almost by accident, and varied from area to area depending upon the density of trees that met sawlog requirements: straightness, diameter and length.

Loggers commonly worked singly when felling trees. Rarely, even when trees exceeded a foot and a half in diameter, did two men cut them together. Experienced loggers felled logs with great precision - a task sometimes made difficult when trees stood close together, hung up in adjacent trees or windfalls. Although few trees broke, except at the tops when they fell on windfalls, stumps, or across gulches and streams, those that did were generally over 50 feet.

The axe was the only tool used for felling, limbing, topping and "nosing" logs. The character of the butt disclosed in felling or of the knots in limbing often influenced the length of the log. For example, if a decayed condition were revealed, the log was cut off

shorter than planned. Except for the majority of summer logs, all were topped at a minimum of six inches in diameter. The size and density of knots determined the length of logs because (1) of the difficult trimming and, (2) extremely knotty logs produced poor quality lumber and thus a reduced value for such timber.

FACTORS DETERMINING WINTER LOGGING LOCATIONS

Even with the varying degrees of forest depletion near the shore and in the lower reaches of rivers, there were sufficient logs for all within a half mile of their homes for at least five years (1895-1900), except for the majority of settlers at St. Alban's. Because of the scarcity of log-size firs within a half mile of that settlement, most of the loggers had to log at Swanger Cove and at the mouths of Conne River and Little River. Other settlements around the Bay, however, were more widely dispersed and had a greater proportion of less depleted forest nearer the loggers' homes.

When deciding upon a logging location each crew had a combination of factors to consider. These inter-related factors consisted of: log transporting distances on both land and water; the topography and terrain for cutting and hauling; driving conditions on rivers; the locations and kinds of landings; commuting distances,

daily or weekly, to logging areas; log sizes sought; log prices; crew sizes and capabilities; forested land grants; and time spent logging. These factors in turn determined the number of logs that would be harvested and placed in the sawmill booms. However, once a crew logged an area and decided to return to it, other loggers through mutual agreement regarded the area as private territory while in actual use. A second method of claiming a logging site for a winter was the marking of a number of log size trees in an area by cutting off pieces of bark from them.

Hauling Distances

Since logs are great in bulk and weight in proportion to their value, the time spent transporting them by manual labor generally restricted logging up to 1905 to within a thousand yards of waterways. This distance varied under the combination of different conditions affecting logging. The greater the number of loggers per household in proportion to its dependents, generally the greater the distance they could afford to haul logs, since the main objective was to pay for supplies bought collectively for the whole family. Also the different capabilities of crews with the same number of members resulted in varying hauling distances but still the same income.

Topography and surficial material were very influential. These factors varied from steep descents and ascents to level land, and from dry ground to swamps. All ascents were avoided if possible, as were all swamps unless frozen. Ideally the topography between logging areas and landings consisted of gradually descending slopes but less ideal terrain was often encountered. Steep slopes were overcome by sliding logs to the bottom before loading them on sleds. Logs were untouched in areas having ascents unless choice ones were sought. Then, if needed, tackles were utilized to assist in overcoming the obstacle of grade. When tackles were used, or any ascent was attempted, hauling time per unit of distance increased resulting in shorter hauling distances.

Log sizes and prices were very influential in determining hauling distances. Prices were geared to the demand for lumber, and demand - usually consistent - at times rose rapidly.

Because winter logs were not sawn until summer, loggers were not always certain of the approximate price they would receive for them, as was the case for summer logs cut and sold during the lumber marketing season. With respect to log size, the larger the log was in diameter, the more valuable per cubic unit because it was proportionately less expensive to saw. This resulted in

the smaller winter logs being transported an average of approximately one quarter of a mile and the larger, an average of approximately one half mile by 1905. Smaller winter logs were from 18 to 22 feet long and 7 to 8 inches at the butt, while larger winter logs were from 25 to 30 feet long and 10 to 15 inches in diameter.

Hauling distances to rivers were generally shorter than to the sea, because in the former case extra time was spent driving logs - sometimes up to a month was needed to drive all the winter logs down rivers with low spring run-off. Because of variations in water volume from spring to spring, driving conditions varied.

Figure 3-5 and Table 3-2 show the distances logs were transported by the different winter crews from 1895 to 1905. Summer logging was excluded from this table because some crews split up during that season and distances varied little. It is evident that for the first five years (1895-1899), although there was an increase in the number of crews, there was also an increase in the number who logged within a quarter of a mile of the sea or a river. However, there were greater increases in number of crews who logged between one quarter to one half mile until 1903, and between one half and three quarters of a mile between 1900 and 1904. The increased use of draft animals from 1900 onwards ended the

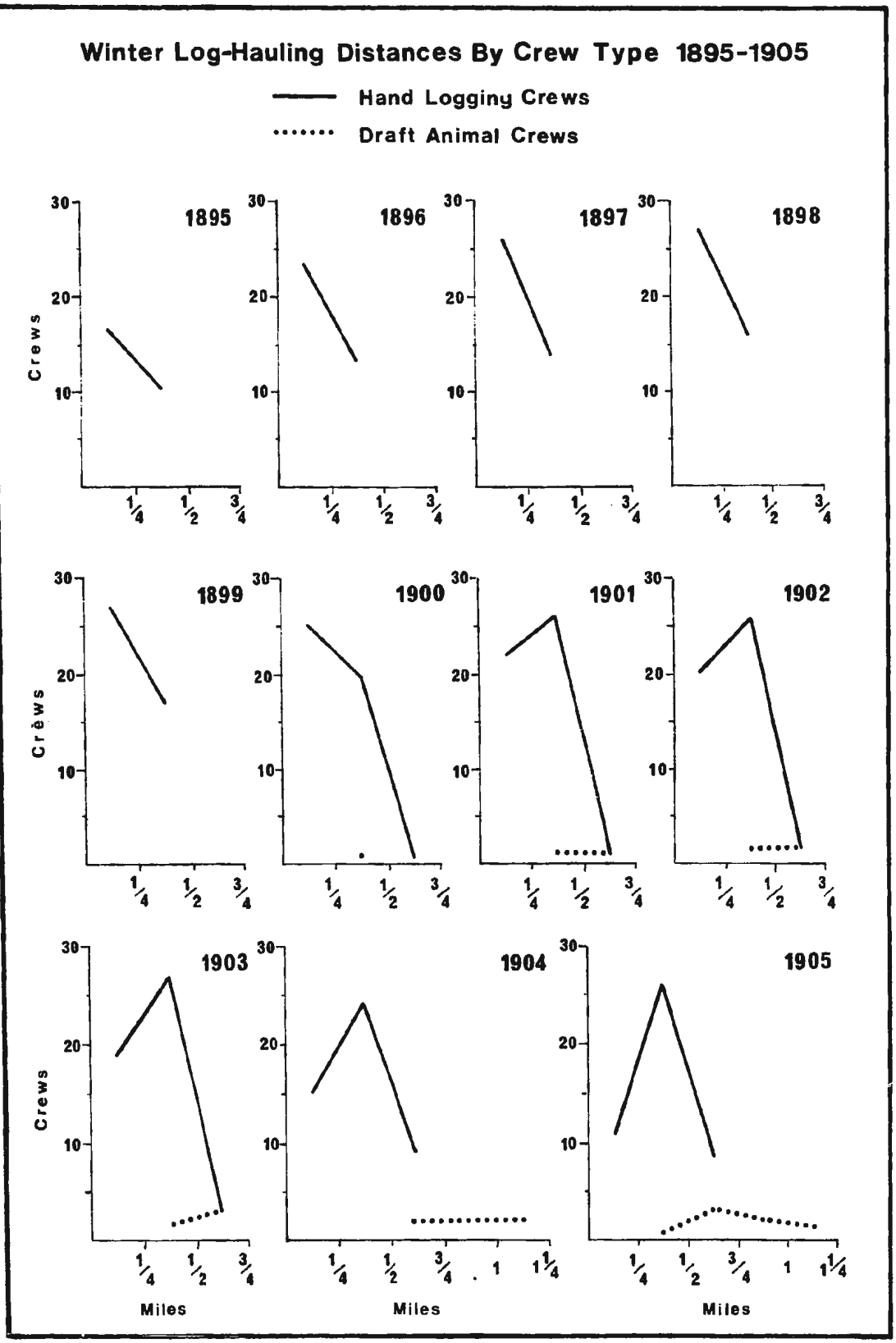
Winter Log-Hauling Distances By Crew Type 1895-1905
Hand Logging Crews
Draft Animal Crews
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
Crews
Miles
30
20
10
1/4
1/2
3/4
1
1 1/4

Figure 3-5

Table 3-2

Log Hauling Distances, 1895-1905

Distance in Miles	0 - ¼		¼ - ½		½ - 3/4		3/4 - 1		1 - 1 1/4	
Means of Transport	Men	Animals	Men	Animals	Men	Animals	Men	Animals	Men	Animals
Year										
1895	17	-	11	-	-	-	-	-	-	-
1896	23	-	13	-	-	-	-	-	-	-
1897	26	-	14	-	-	-	-	-	-	-
1898	27	-	16	-	-	-	-	-	-	-
1899	27	-	17	-	-	-	-	-	-	-
1900	25	-	19	1	1	-	-	-	-	-
1901	23	-	26	1	1	1	-	-	-	-
1902	20	-	27	2	2	2	-	-	-	-
1903	19	-	27	2	3	3	-	-	-	-
1904	15	-	24	2	9	2	-	2	-	-
1905	11	-	26	1	8	3	-	2	-	1

the increase in hand-logging crews between one quarter and one half mile after 1902 and for those between one half and three quarters of a mile after 1904. The crews with oxen were larger than the average hand-logging crew, and are therefore not strictly comparable. The most important aspect of the data is the gradual increase in hauling distances for the majority of crews, although this increase was slowed by movement of loggers along the shore.

Commuting Distances

When logging inland from home, the commuting distances to cutting areas for the workers were approximately the same as their hauling distances. As transporting distances reached points inland from homes where hand-logging was not as economical as at shorter log-hauling distances and longer commuting distances, loggers sought the more feasible areas generally. This caused logging to spread along the coast from settlements and up river valleys. Depending upon the location of loggers' homes in the elongated settlements, the closest areas for a minority were over a mile. Commuting distances, however, ranged from less than a half mile to ten miles. When these distances exceeded approximately one and a half miles both for land and water, most loggers generally lived in tilts in the vicinity of the cutting areas and

returned home once or twice a week. Other factors influencing the decision to live away from home were: adverse walking and/or rowing conditions which increased travel time; fords (except in summer), steep hills, swamps, unsafe ice, deep snow, wind and tide, all of which increased 'time distance' which in turn limited 'linear distance'.

Commuting distances were practically eliminated for about half of those who moved their families to their winter homes for the season. This was a continuation of the annual practice of the nineteenth century when winter homes were built in prime logging locations, usually close to mouths of rivers (Table 3-3, Figure 3-6). The use of oxen by two of the crews and children attending school after 1900 caused a decline in the number of migrants after 1900. These seasonal migrations involved distances of over nine miles for a few families, but most were less than four miles. The majority of those migrants were usually members of crews seeking large logs in virgin forest up river valleys. About half of those who neither lived away from home nor moved their families to winter homes, usually logged alone and cut smaller logs near home.

Table 3-4 shows the increasing commuting distances for winter logging crews from homes to cutting areas from 1895 to 1905. Such distances normally followed routes to landings and then onto cutting areas; yet in some cases

Table 3-3

Winter Crew Abodes, 1895-1905

Year	Lived at Home	Lived in Tilts Without Families. Returned Home on Weekends	Families Lived in Winter Houses in the Logging Areas
1895	18		10
1896	24		12
1897	28		12
1898	29		14
1899	30		14
1900	29	2	15
1901	31	5	16
1902	31	9	13
1903	30	12	11
1904	28	13	11
1905	26	17	11

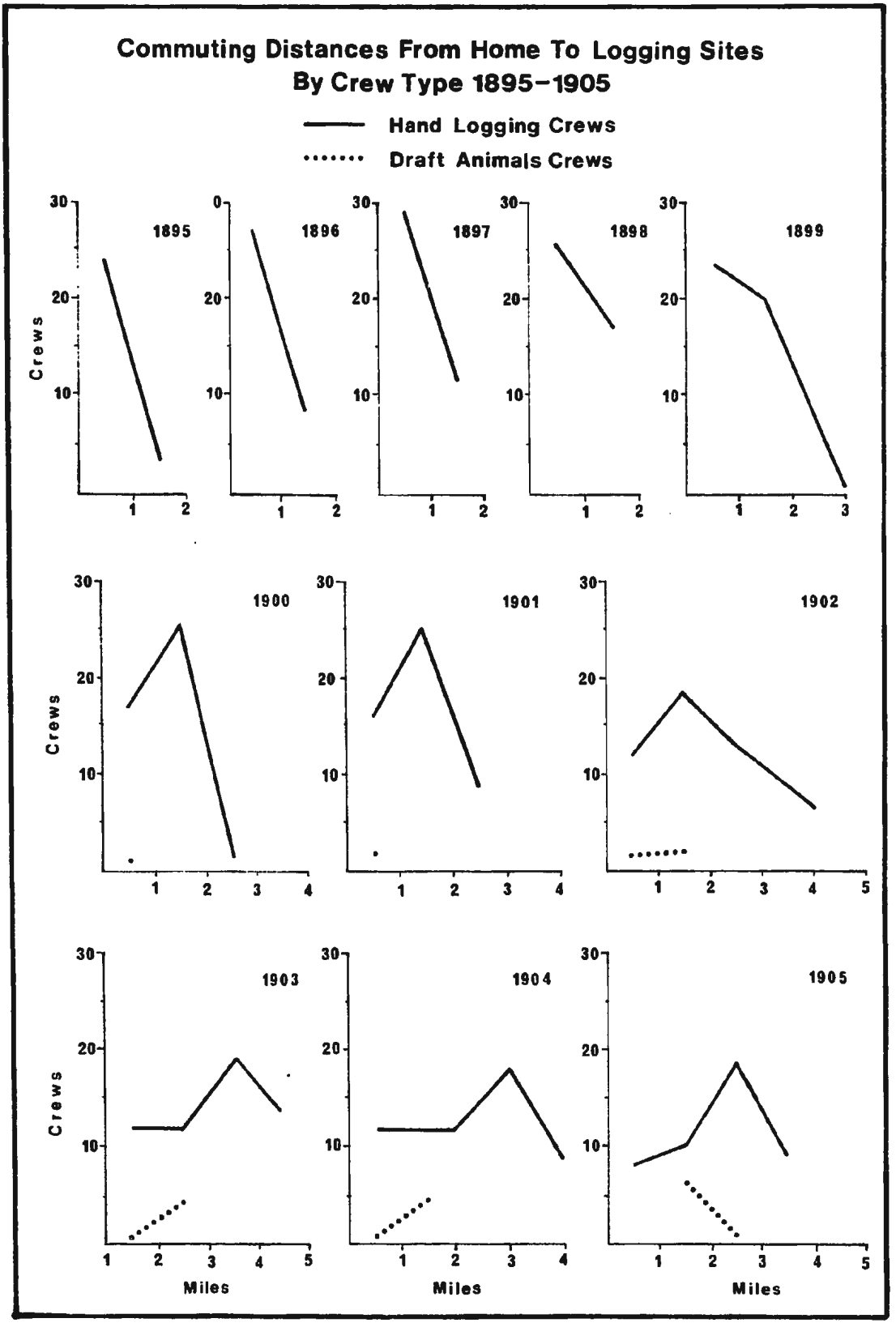
Commuting Distances From Home To Logging Sites
By Crew Type 1895–1905
Hand Logging Crews
Draft Animals Crews
1895
1896
1897
1898
1899
1900
1901
1902
1903
1904
1905
Crews
Miles

Figure 3-6

Table 3-4

Commuting Distances of Winter Crews, 1895-1905

	Within one mile		Between 1 and 2 miles		Between 2 and 3 miles		Between 3 and 4 miles		Over 4 miles		
Year	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Total Crews
1895	24	-	4	-	-	-	-	-	-	-	28
1896	27	-	9	-	-	-	-	-	-	-	36
1897	29	-	11	-	-	-	-	-	-	-	40
1898	26	-	17	-	-	-	-	-	-	-	43
1899	23	-	20	-	1	-	-	-	-	-	44
1900	17	1	26	-	2	-	-	-	-	-	46
1901	16	2	25	-	8	-	1	-	-	-	52
1902	12	2	18	2	13	-	6	-	-	-	53
1903	12	1	12	4	18	-	7	-	-	-	54
1904	11	1	11	4	17	1	9	-	-	-	54
1905	8	-	10	6	18	1	9	-	2	-	54

shortcuts by-passed landings, while in others, cutting areas were closer than landings. For the first five years the majority of loggers were within one mile of their cutting areas. This included those living in winter houses with their families. After 1897, the number of loggers with commuting distances less than a mile declined, while those having between one and two miles increased until 1900. About that time commuting distances of two to three miles and three to four miles began to increase and reached peaks in four and five years respectively.

Granted Forest Land

Certain individuals bought forested land.[3] Although all lots before 1905 were less than 150 acres each, they covered land from the shoreline inland from one quarter to one half mile which were generally the maximum distances for hand loggers. The restriction on non-owners from logging in these otherwise accessible areas was extended in a few locations when more land was claimed than was granted. Several wittingly claimed more than they legally owned while others, through

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[3]Newfoundland Registry of Grants, Manuscripts in the Department of Mines, Agriculture and Resources, Crown Lands Division, St. John's, Newfoundland.

either careless or unskilled surveyors, ended up with nearly double the amount of land indicated on their official documents. Comparisons of field data with copies of these grants show that, unless the boundaries were changed after the surveying, present day boundaries enclose as much as double the area that legal documents state, according to calculations from aerial photographs of the area.

Owners of granted land rarely logged out their forests before going elsewhere to log. In fact, after clearing was done for small-scale farming, they cut the larger mature and over-mature trees sparingly from their lots. Apparently, non-owners of forested land, uncertain of the location of the legal boundaries in some cases and in others reluctant to make enemies of neighbours, rarely checked these allegedly wrong claims. Instead, those who were affected travelled greater distances along the shore past such land in order to log, resulting in more rapid extension of the coastal/riverine strips.

Log Sizes and Numbers

Log sizes were important in determining winter logging locations. Those loggers who took pride in cutting larger than average size winter logs* by-passed areas that

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*Average size winter logs then were approximately 10" at the butt and 25 feet long.

others would not. Consequently when a crew vacated an area after cutting only big logs, another crew usually moved in within a year to harvest the remaining smaller logs. Men who sought large logs generally had to go up river valleys after 1900 because most trees of that size within practical hand-logging range from the sea had been cut. However, loggers contented with cutting smaller logs found a sufficient supply within a half mile of the sea to last the majority of them the first decade of sawmilling. Those who logged up valleys of the smaller rivers and depended upon them for driving were restricted to cutting logs smaller in diameter and shorter than were loggers using larger rivers, in order to reduce the risk of log jams.

Average log sizes differed as between crews to such a degree that the average of at least a half dozen crews trebled that of about a dozen in 1905. For example, a 7-inch log 20 feet long will yield approximately one third as much lumber as a 10 inch, 30-foot log. Crews who cut large logs normally had fewer logs than crews who cut small logs, provided all other factors were similar. Usually, though, the sizes and number of logs per crew varied as a result of the number of members in each crew and the time spent logging, as well as the factors already discussed.

Log size normally reflected crew size. Men logging alone cut mostly 7 to 8 inch logs from 18 to 22 feet long. Crews of two to three, being able to handle heavier weights together, commonly cut logs in excess of 24 feet in length and 10 inches at the butt. Logs larger than a foot and a half in diameter and 30 to 40 feet in length required a crew of at least four to six men to transport them. Such logs were nearly always cut in virgin timber.

On an average, when winter logs had to be barked, a man cut and hauled between 200 and 250 from early January to the middle of March. After logs were accepted with bark, the average number per man rose to a point between 350 and 400 per winter. The total number of logs cut in a year by individuals generally ranged from a low of 50 to a high of 1500. Those who spent little time logging, as few as two weeks, did so in their spare time. Others logged throughout part of the autumn, the whole winter, part of the spring and again in the summer. Using an average of 300 logs per man for 1895, logs cut increased from approximately 20,000 to 53,000 by 1905 using a yearly average of 400 logs per man for that year.

Landings

Since logging developed primarily by salt water and along rivers for transporting logs, locations for piling logs had to be chosen by the water. These locations, called landings, were selected on a combination of factors. Most important were: level land for piling, bare, unobstructed slopes for rolling logs down to the water, and a splash area free of obstructions for the floating of logs.

In the beginning some river landings were placed above points with a high risk of jamming. Because it was not feasible for three to four crews averaging two men each to construct a dam across the river they were using, they had to depend on the spring run-off to help them float their logs to the sea. The lower the spring run-off the greater these risks of log jams became and several large log jams within a year forced the relocation of these landings downstream below such risk points. This ended hand-logging of sections of the forest previously accessible. Landings for winter logs were usually farther upstream than those for summer logs because of greater volumes of water in rivers for the spring drive of winter logs. Winter landings on rivers were often used for summer logs but before summer landings were utilized for winter logs,

they had to be enlarged to accommodate the much greater numbers of logs.

Landings atop cliffs, particularly those high ones by the sea, were abandoned when the percentage of breakage and scarring of logs from the fall were too costly. Also undetected rocks that penetrated logs were very damaging to the sawmill cutting equipment. In a few cases landings were abandoned when the shoreline waters below them were too deep for rafting logs without a dory. This was a very awkward and time-consuming task as opposed to the more common method of rafting, standing in shallow water. The abandonment of these landings sometimes placed the previously exploited area out of reach of hand-loggers from other approaches mainly as a result of increased distances.

LOGGING PATTERN

Figure 3-7 shows the areas that had attracted some degree of sawlog cutting between 1895 and 1900. With possibly two exceptions, all loggers in this five-year period worked within the same coastal/riverine strips that had been exploited earlier. In fact winter log paths revealed that sawlog cutting had not extended to the edge of earlier cuttings in some places. Except for pockets of intensive cutting within 200 and 300 yards from the shore, the greater part of the previously

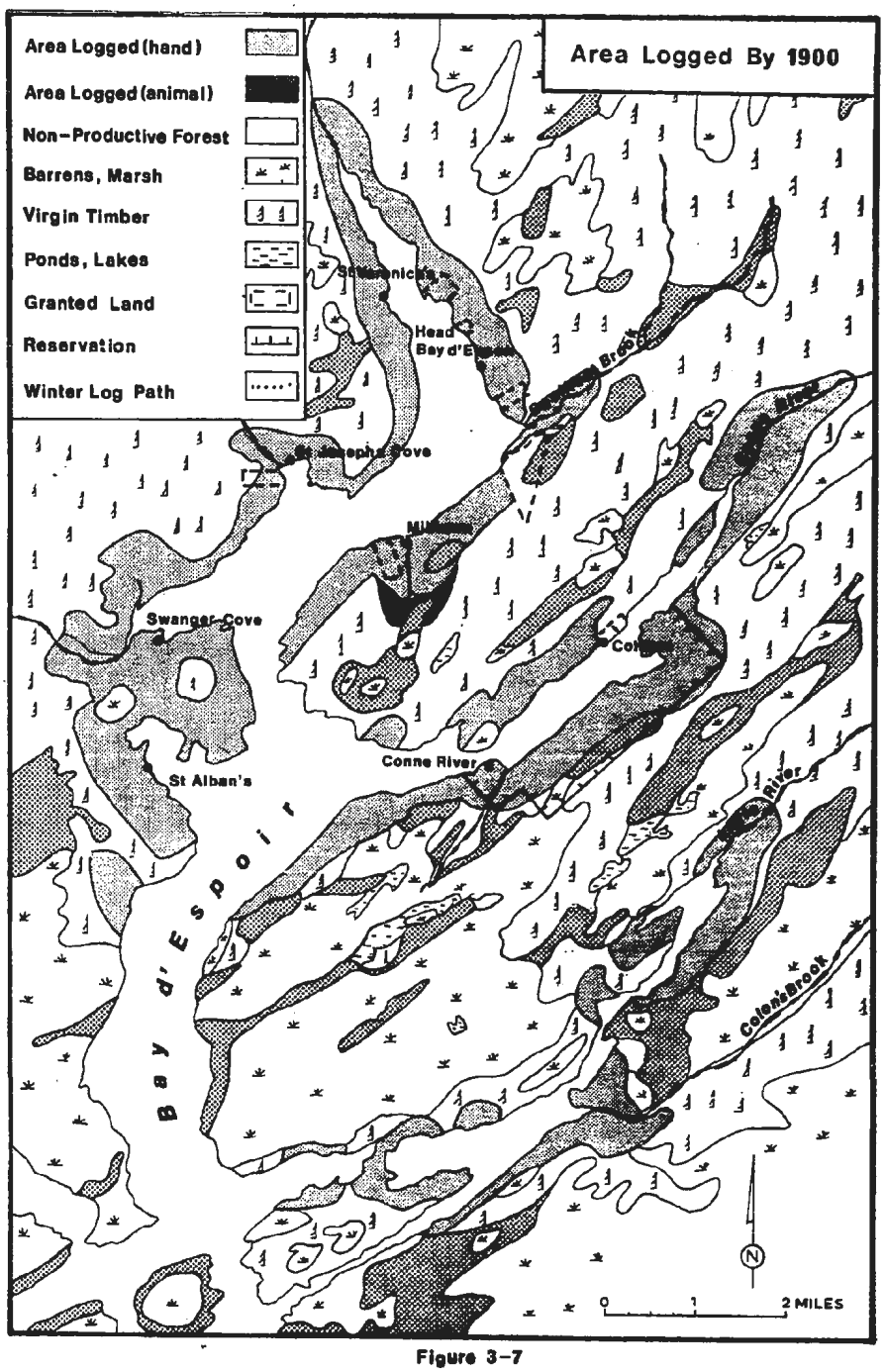
Area Logged By 1900
Area Logged (hand)
Area Logged (animal)
Non-Productive Forest
Barrens, Marsh
Virgin Timber
Ponds, Lakes
Granted Land
Reservation
Winter Log Path
St Veronica's
Head Bay d'Espoir
St Joseph's Cove
Swangar Cove
St Alban's
Conne River
Bay d'Espoir
Colenis Brook
N
0 1 2 MILES

Figure 3-7

exploited areas was still productive. The only significant extensions of sawlog cutting outside the areas of earlier cuttings were up river valleys and inland from homes of settlers. The more concentrated winter logging is indicated by the networks of paths (Figure 3-8). These were generally the most accessible areas, closest to both settlers' summer and winter homes, having more and larger logs. Sections of the coast with cliffs or very steep hills had not been exploited for sawlogs up to 1900.

Many of the fishermen who migrated to Bay d'Espoir to log after 1895 showed their lack of logging experience in their cutting pattern. They usually cut their paths at right angles to the shoreline and extended them every year. In so doing, they by-passed trees as large as those they cut at greater distances inland. The earlier settlers, however, tended to develop a system of main and secondary paths which enabled them to log a roughly circular area close to the water rather than a narrow rectangular one extending inland as practised for a few years by the inexperienced loggers.

By 1905 the amount of timber exploitation had increased considerably, mainly as a result of increased numbers of loggers and the introduction of another sawmill. Much of this expansion was into virgin timber particularly up the river valleys (Figure 3-8). The

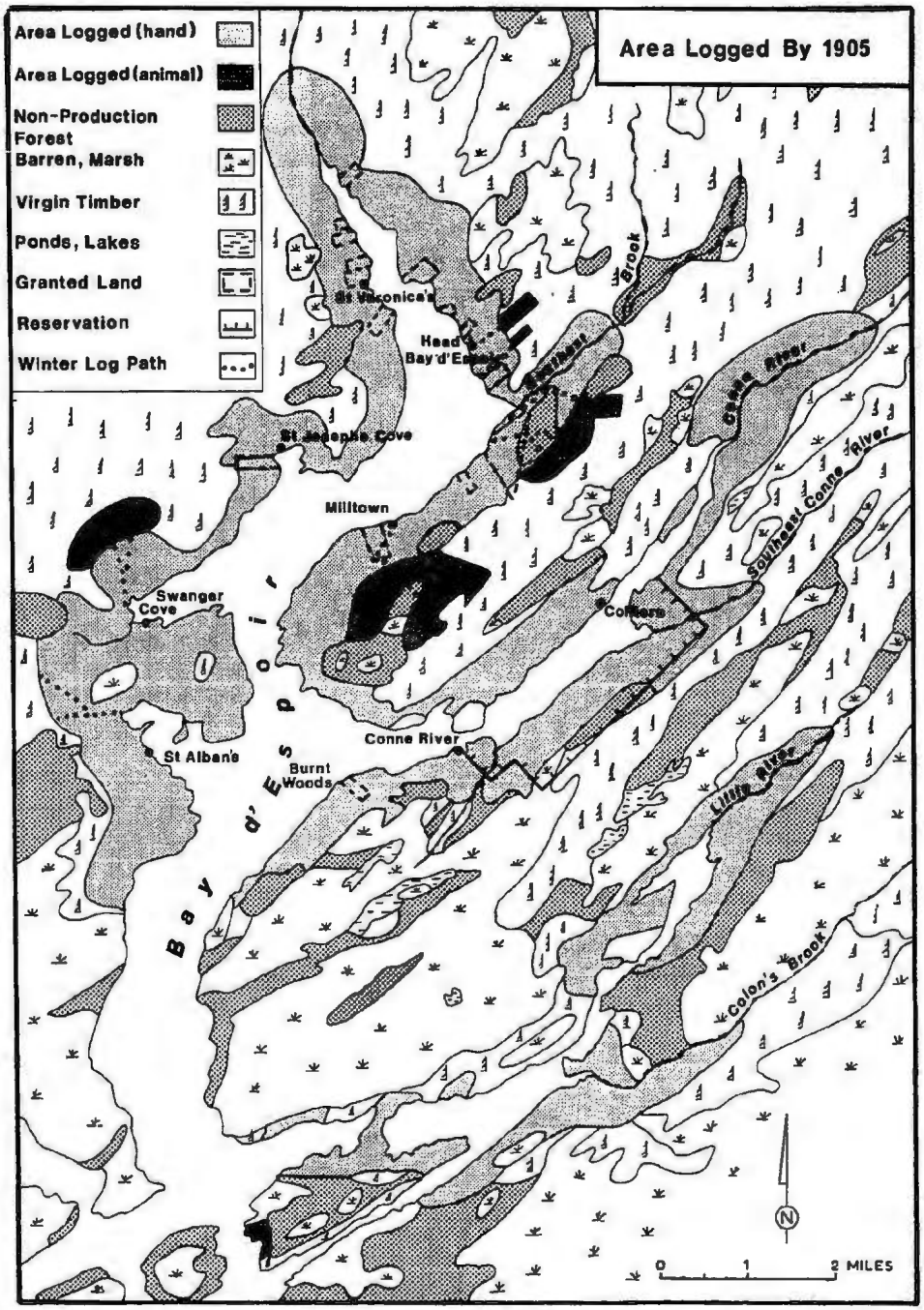
Area Logged By 1905
Area Logged (hand)
Area Logged (animal)
Non-Production Forest
Barren, Marsh
Virgin Timber
Ponds, Lakes
Granted Land
Reservation
Winter Log Path
St Veronica's
Head Bay d'Espoir
Southeast Brook
Grand River
Southeast Conne River
St Joseph's Cove
Milltown
Swanger Cove
Conne River
St Alban's
Burnt Woods
Bay d'Espoir
Little River
Colon's Brook
N
0
1
2 MILES

Figure 3-8

majority of crews continued hand-logging and at least eight of them were hauling logs between a half and three-quarters of a mile. Along the shore the coastal strips of logged forest began to join. By 1905 there were three distinct strips of coastal/riverine cutting: (1) the Colon's Brook-Little River area, which did not continue around the headland to Conne Arm, (2) an approximate 10-mile strip along the southern side of Conne Arm and up the valley of the two rivers that flow into it, and (3) the longest strip, beginning on the northern side of Conne Arm where cliffs end which extended the whole distance around the Bay - in excess of thirty miles - to the end of the forest south of St. Alban's. In addition these coastal strips had extended inland for nearly a half mile in many places. River valley logging, however, resulted in increased log driving on these rivers as the paths leading to them indicate.

During this latter phase of the hand-logging period, the loggers observed the form of timber exploitation that would eventually replace the old method. Between 1900 and 1905, seven oxen had been introduced. This innovation in the technology of log transportation is impressively evident in the map showing the cuttings for this period (Figure 3-8).

CHAPTER IV

TECHNOLOGICAL INNOVATION AND CHANGE IN LOG HAULING, 1906-1912

Before the introduction of the draft animal in logging, every aspect of the operation was done by man power; the cutting, the gathering of logs into piles, and the transporting of them to waterways. Such an operation was labor intensive in an economy where labor was at a premium. The utilization of the ox in gathering some of the logs into piles in the autumn, and the transporting of them in winter, considerably reduced the amount of human energy required in these portions of the operation. With this change in the technology of hauling, loggers were able to transport logs greater distances, the effects of which are dealt with in this chapter.

Before the changes that took place during the 1906-12 period are analyzed, the reasons why oxen were not accepted earlier in larger numbers by loggers and the later incentives for using oxen are discussed. The effects of the increased utilization of the draft animal are analyzed: the increased hauling and consequent commuting distances; increased log demands; the relaxing of merchant terms with regard to oxen; the increased

crews with oxen; and the additional difficulties because of topography and surficial materials. Then the impact of these factors on the pattern of log cutting is discussed.

The use of draft animals in the logging operations in Nova Scotia had been observed by the Bay d'Espoir sawmill owner in 1899. The following winter he introduced an ox into the logging operations of his salaried crew at Bay d'Espoir. His choice of ox over horse depended upon a number of factors. The ox was stronger, steadier, less inclined to founder in snow or bog, and rarely became sick. Unlike the horse, he lived on hay only and required little attention. His slowness in relation to the horse was compensated for by his ability to move larger loads.

By 1905, however, the number of crews with oxen had only increased to seven; the other 47 crews still relied on the traditional technology of hand-hauling. During the next seven years there was an abrupt increase in the number of crews with oxen and a sharp drop in the number of hand-logging crews (Figure 4-1). This period (1906-12) may be regarded as one of transition in log transportation technology. The trend slackened after 1912. The superior efficiency of oxen was clear as early as 1908 when the output of 20 crews with oxen exceeded that of 38 hand-logging crews. This major change in the technology of transportation of logs had influenced the pattern of

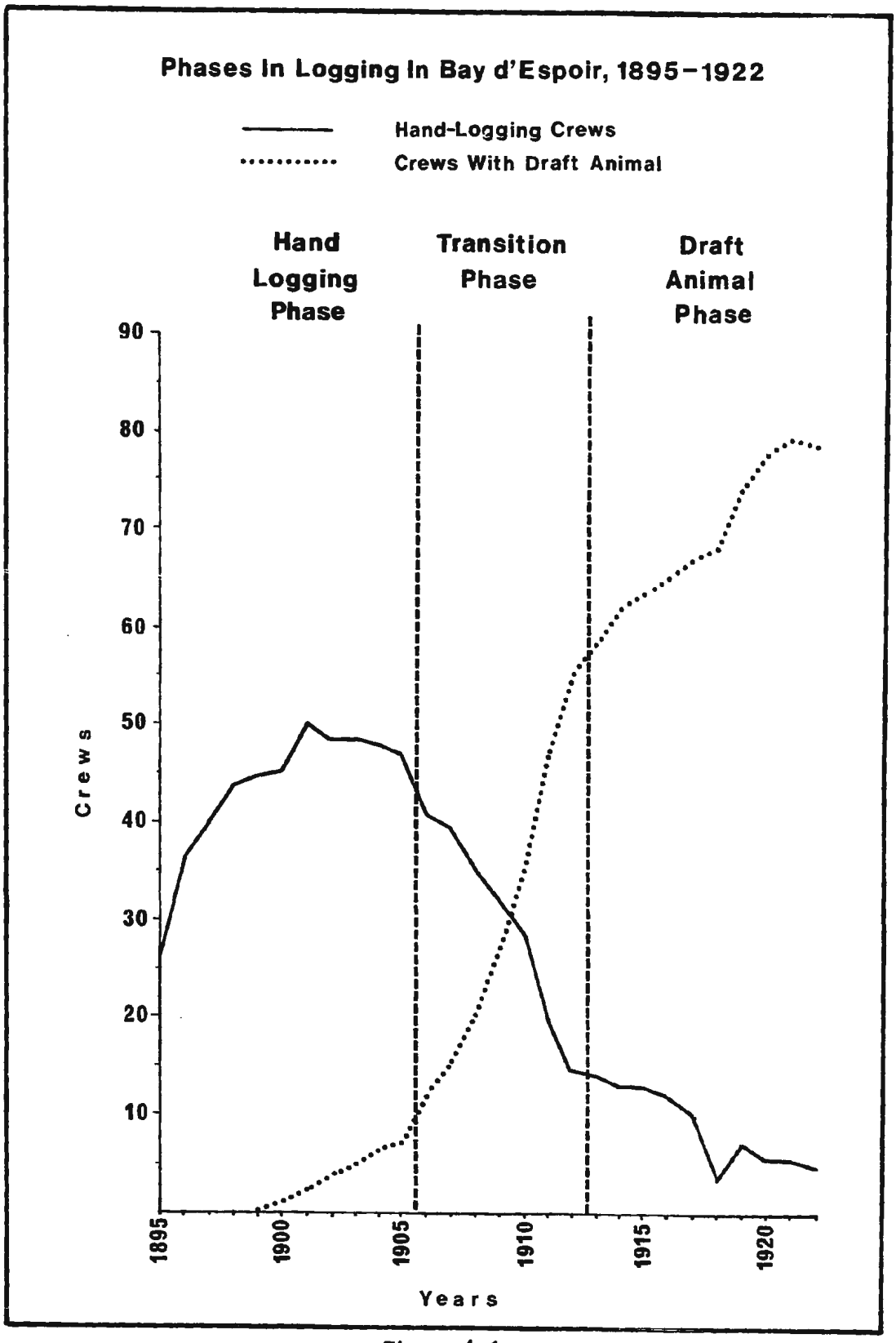
Phases In Logging In Bay d'Espoir, 1895–1922
Hand-Logging Crews
Crews With Draft Animal
Hand Logging Phase
Transition Phase
Draft Animal Phase
90
80
70
60
50
40
30
20
10
Crews
1895
1900
1905
1910
1915
1920
Years

Figure 4-1

log cutting by 1912.

Despite rising demands for logs and the superior efficiency of the new technology in harvesting the larger logs farther inland, the rate of accepting the ox during the 1901-1905 period was slow. This sluggish response resulted primarily from economic and cultural reasons. Usually only the merchant could afford to buy oxen, thereby acquiring an initial monopoly. He offered to buy oxen and lease them to loggers on his terms. The major stipulation was that in return for the use of an ox and his winter's food, the merchant claimed a "man's share" of the winter's work. A man's share was an equal portion of the income of the crew. Generally, the most productive loggers were approached; however, by 1905 only five of approximately fifteen had accepted. This made up a total of seven crews using oxen but two of them were salaried crews.

The terms weighed heavily in favour of the merchant, whose income from one winter of leasing an ox was normally sufficient to cover the cost of buying him in addition to supplying winter feed. Thus the merchant stood to gain high profits over succeeding winters. Most loggers resented the capitalism of the merchant and at least a dozen loggers detested the thought of sharing a winter's work with him. Hence, as long as the majority of them in this 1901-1905 period could remain solvent

under the old technology, they did not accept oxen on the merchant's terms.

The benefits which should have accrued from transporting logs with oxen were less evident for the first two to three years (1900-02) than had been expected because loggers did not have the requisite skills to manage draft animals. The first three crews using oxen did not adopt the conventional sleds and harness used in Nova Scotia, although the equipment was imported. This inefficiency retarded the pace of acceptance of the ox because the loggers either used no sleds, or harnessed him to a large handsled by a rope only, so that the animal had no control over the vehicle.

Such practices as skidding logs on the ground for distances in excess of a half mile not only greatly reduced the ox's efficiency but also required three men to accompany loads of two to four logs - one man to walk ahead to warn hand loggers using the same path that the ox was coming, a second to lead the animal, and a third to follow to watch the load. Thus only one to three members of each crew were left to cut logs. Also with an ox harnessed to a handsled two men were generally required to steer and brake the load; thus, the lowering of loads down slopes depended entirely upon the men's braking methods and ability which usually resulted in the underemployment of the ox and restricted his use to

relatively level land. Slopes in excess of four to five degrees were therefore normally avoided, thus reducing the area amenable to this method of transport. The dependency on man power still continued for transporting logs from the steeper slopes to points from which the ox could haul. Inefficient logging practices and ineffective animal use lowered the income of individual crew members and reduced crew size. Even though log skidding was abandoned after one year, the handsled arrangement continued up to three years, depending on the crew.

Apart from draft animal crews, few loggers became engaged in winter logging until January because of other traditional activities throughout the autumn (see Chapter III). For small crews without logs before the winter hauling season, the likely underemployment of the ox plus the deduction of the merchant's share usually led to a less profitable undertaking than hand-logging. If the merchant sold oxen costing 50 to 100 dollars each, and small crews of two men each could afford to buy them, the total expenditure could not be recovered in the short winter logging period. The continuance of traditional autumn activities, which were not always more economically attractive than logging, prevented men from changing their logging methods and period of cutting. This conservatism was greatest among the earlier settlers who had slowly switched from logging for their established

markets along the South Coast to logging for the sawmill. The pronounced conservatism of loggers as a breed has also been noted by McGinley writing of a period considerably later than the one presently under consideration:

> ... it seems to be a peculiarity of the lumber industry for there to exist a great inertia on the part of a large portion of the industry towards any change in harvesting methods or towards making desirable technological changes.[1]

During the 1880s and 1890s there were some fifteen to twenty men in Bay d'Espoir who participated in forming hand-logging crews and who also owned up to three cows and sometimes in addition, up to three beef cattle each. They could therefore have raised their own oxen before animals became involved in the logging operations but did not because of insufficient hay for winter feed. A working ox ate approximately two tons of hay per winter, enough possibly for two cows. When log transportation began to exceed a half mile, livestock owners, in order to continue logging reduced the number of cows to keep an ox or else increased their hay production to obtain a sufficient quantity for both.

The slow growth in the number of oxen in the logging operations until 1905, then, resulted from the

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[1]E.G.B. McGinley, The Lumber Industry of the Atlantic Region, 1945-55, M.A. thesis, University of New Brunswick, 1958.

combination of the unfavourable merchant terms of leasing, the ineffective use of oxen in the beginning, the high cost of buying them and to a lesser degree the cost of hay for raising one, and the way of life or conservatism of a number of loggers. This in turn affected the pattern of log cutting by inducing loggers, because of hauling distances, to move along the coast instead of farther inland.

The shaft sled was a more effective implement for transporting logs by draft animals (Figure 4-2). The adoption of this sled type and harness in 1904 enabled the ox to transport larger loads, and have full control of steering and braking of loads. The ox was assisted with other braking devices on the steeper declines of approximately five to twenty degrees. Braking assistance was provided by placing a chain under one or both runners of the front sled, or the rear sled was disconnected from the load so that the log ends dragged on the ground (Figure 4-3). On occasion both methods were used in unison.

This equipment and methods of braking greatly increased the area of accessible forest. The hand logging of slopes and the assembling of logs on practically level land was replaced to some degree. This, however, imposed greater effort on the ox when ascending the slopes on the return journey.

An Ox Harnessed To The Front Sled

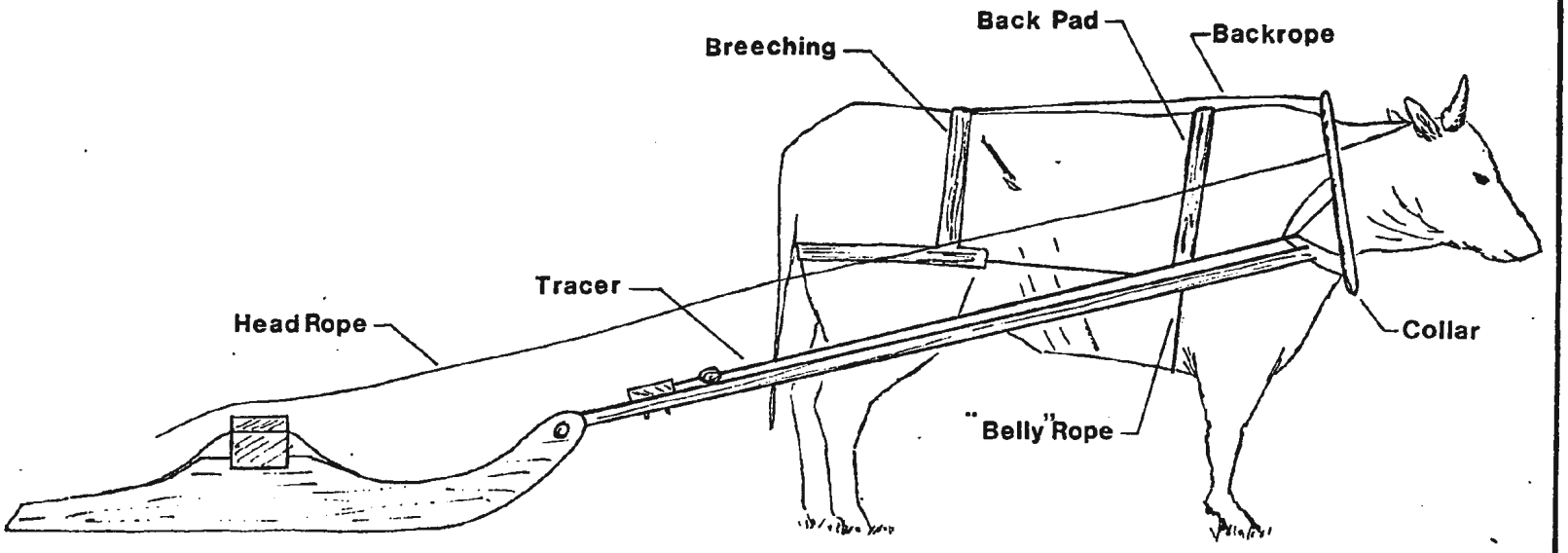

Figure 4-2

A Set Of Ox Sleds

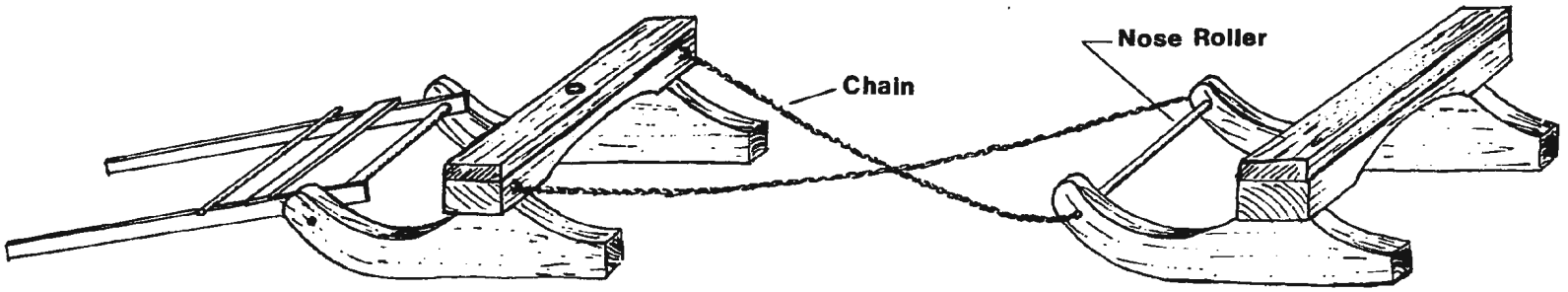

Figure 4-3

With this effective use of oxen, loggers became convinced that the innovation kept logging economically feasible at greater distances than hand-logging and simultaneously ended the difficult task of hauling. The decline in the relative cost of log transportation meant that the value of logs diminished less rapidly with distance than the value of those hauled by hand-loggers. Decline in the porportional cost of log transportation using draft animals generally quadrupled feasible hauling distances over those of hand-loggers.

When shaft sleds came into use, hand logging distances along the more intensively used access routes had already increased to half a mile. At this distance, loggers with large families generally had difficulty in obtaining sufficient logs to remain solvent. Therefore they were practically forced to use the merchant's oxen on his terms since he would not usually provide them with winter supplies if he felt they were possible liabilities.

In addition to hauling distances, the topography affected log transportation. The land rises from the shoreline in Bay d'Espoir at varying degrees to heights ranging from 200 to 500 feet generally within a half mile of the sea except up river valleys. At that elevation the land usually levels out for distances up to and exceeding a half mile. Where this was the case within hand-logging distances, hauling increased in difficulty

which in turn encouraged the use of draft animals.

The more the half-mile strip of forest along the coast became depleted of saw timber, the farther up river valleys did logging extend. With high spring run-offs, log driving usually required less than a week. A low spring run-off, on the other hand, commonly resulted in log jams, particularly at the top of rapids, on sharp bends and on tributaries. Because it was not feasible for the several crews on each river to build dams, loggers occasionally spent up to a month driving logs on several small rivers, or they waited for autumn rains which did not always fall in sufficient quantities or in sufficient time to market the logs. Thus to log the same areas and to avoid such risks, they had to haul logs downstream to points where these problems were practically eliminated. Often these distances to new landings were beyond feasible hand-logging range. Therefore the hauling and driving factors forced loggers to seek new locations or change transporting technology, if they were to depend upon logging for a living, particularly the increasingly more important winter operations.

The use of draft animals in providing logging areas closer to home in locations formerly inaccessible because of hauling distances, permitted loggers to live at home. This incentive caused a greater use of the ox between 1906 and 1912; however, the factors influencing

logging locations discussed in Chapter III were of extreme importance in loggers' decisions.

With the ox, "winter logging" began in the autumn when logs were cut and piled by the paths. This had to be done in the fall because in winter deep snow prevented the piling of logs with oxen. To maximize the use of oxen during the winter "haul off" the animals were employed transporting logs to shore or river landings. Thus an extended logging period became a necessity.

Figure 4-4 and Table 4-1 show the hauling distances increasing in the transition period for both hand-logging and draft animal crews. As the number of hand-logging crews declined from 1906 to 1912, their hauling distances changed little. The rising numbers of draft animal crews, however, gradually increased their hauling distances during the same period; there was a decline in the number hauling between one-half and three-quarters of a mile after 1909, an increase in the number for distances between three-quarters and one mile until 1911, and a continued increase in greater distances to the end of the period. Hauling distances for hand-logging crews peaked between one-quarter and one-half mile which was the most common feasible distance for that form of logging. The draft animal crews peaked between three-quarters and one mile, the areas immediately beyond most

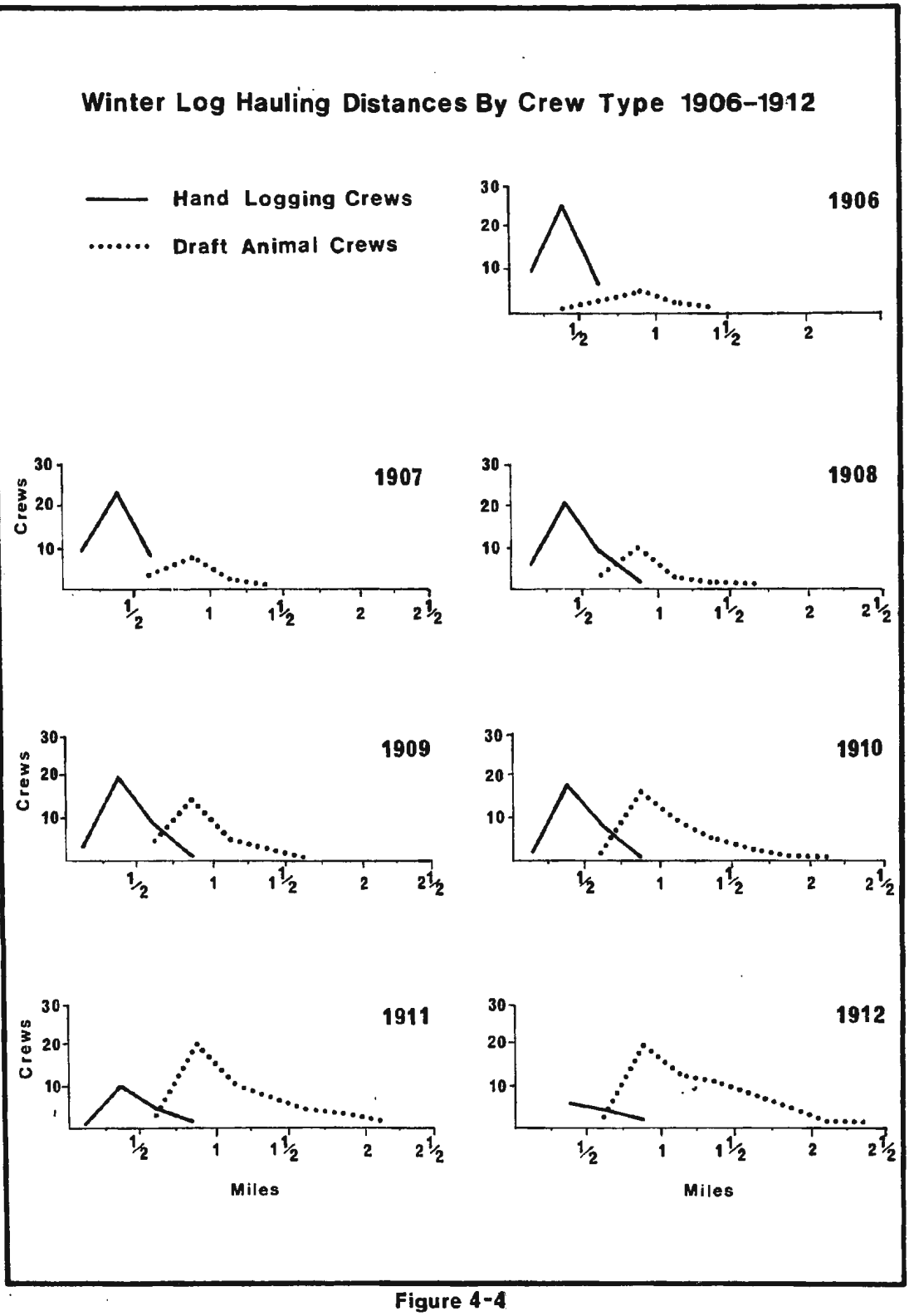
Winter Log Hauling Distances By Crew Type 1906-1912
Hand Logging Crews
Draft Animal Crews
1906
1907
1908
1909
1910
1911
1912
Crews
Miles
30
20
10
½
1
1½
2
2½

Figure 4-4

TABLE 4-1

Distances Winter Logs Transported by Men (Hand Loggers) and Animals

Distances in Miles	0 - ¼		¼ - ½		½ - 3/4		3/4 - 1		1 - 1¼		1¼ - 1½		1½--1 3/4		1 3/4 - 2		Over 2		Total Crews with Oxen	Total Hand Logging Crews
Means of Transport	Oxen	Men	Oxen	Men	Oxen	Men	Oxen	Men	Oxen	Men	Oxen	Men	Oxen	Men	Oxen	Men	Oxen Only			
Year																				
1906	--	9	1	25	3	7	5	-	2	-	1	-	--	-	--	-	--		12	41
1907	--	9	-	22	4	8	7	-	3	-	1	-	--	-	--	-	--		15	39
1908	--	6	-	20	4	8	10	1	3	-	2	-	1	-	--	-	--		20	35
1909	--	3	-	19	5	9	13	1	5	-	3	-	1	-	--	-	--		27	32
1910	--	2	-	17	3	8	15	1	9	-	5	-	2	-	1	-	--		35	28
1911	--	2	-	10	4	5	18	2	10	-	7	-	4	-	3	-	1		47	19
1912	--	-	-	6	3	5	17	3	11	-	10	-	7	-	5	-	2		55	14

hand-logging areas. More crews were at these locations in this period because crews in different parts of the Bay began using the ox at different times. Towards the end of this period, distances in excess of a mile became more prominent for draft animal crews while a small number of hand-loggers quit their very limited amount of logging because of the increased hauling distances. This was particularly true for the Micmacs who had logged earlier as indicated in 1912 by Governor William MacGregor:

> Formerly they [Micmacs] cut logs for it [mill] but the trees that grew near the water have, they say, all been used up and there are none left within their reach that they could bring to the water.[2]

The use of the ox generally reduced commuting distances to cutting areas, since most could then log inland from their homes instead of farther along the coast. Figure 4-5 shows this reduction from the beginning to the end of the transition period. Although the number of crews with oxen increased and the hand-logging crews decreased, the overwhelming majority of hand-loggers commuted in excess of two miles up to 1909, exceeding by far the commuting distances of draft animal crews for the same years (Table 4-2). From 1910, when crews with

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[2]Governor William MacGregor, Report on a Visit to the Micmac Indians at Bay D'Espoir, 1912, Newfoundland Room, Memorial University Library, p. 9.

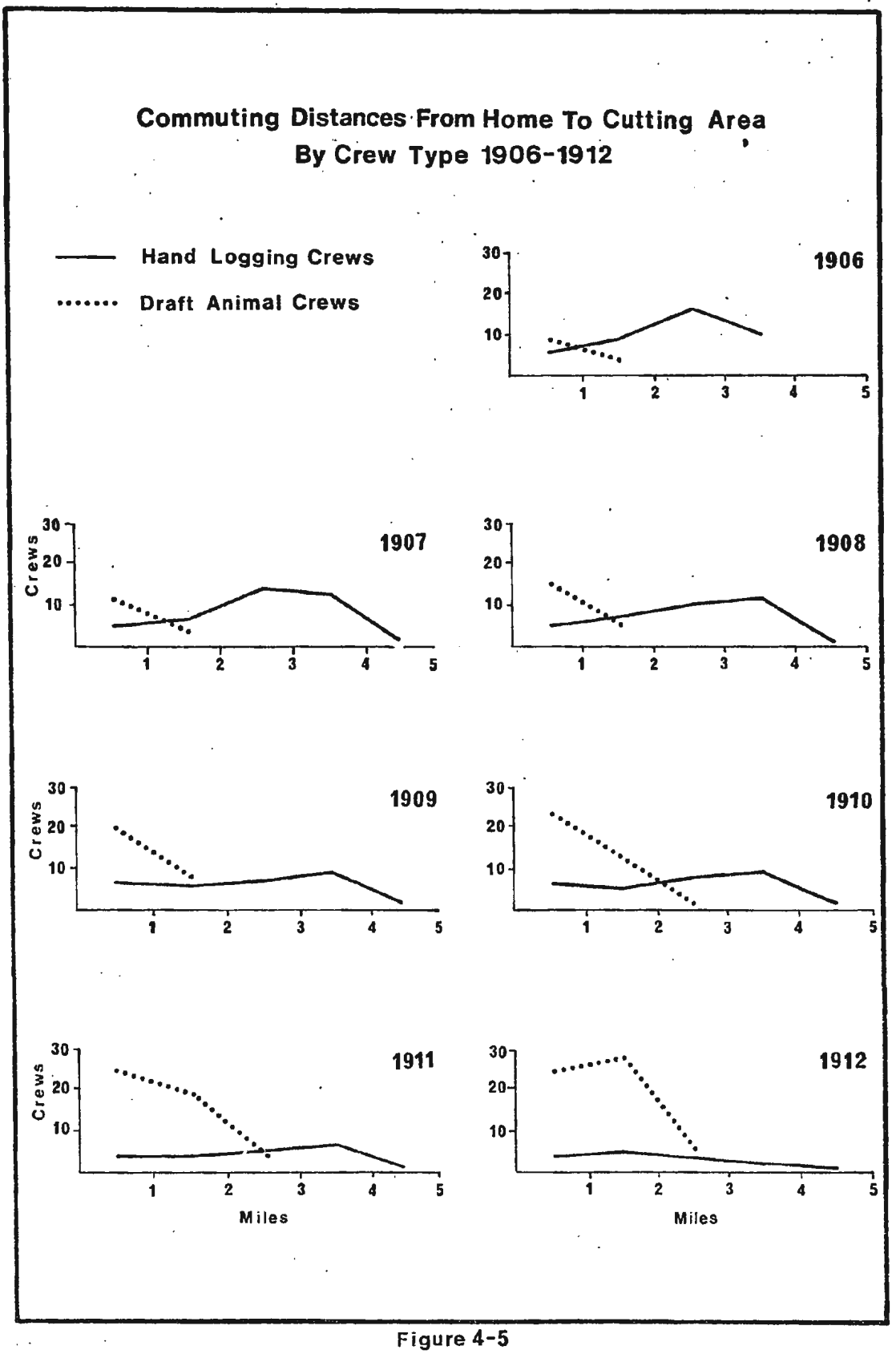
Commuting Distances From Home To Cutting Area
By Crew Type 1906-1912
Hand Logging Crews
Draft Animal Crews
1906
1907
1908
1909
1910
1911
1912
Crews
Miles
30
20
10
1
2
3
4
5

Figure 4-5

Table 4-2

Commuting Distances from Home* to Cutting Areas, 1906-1912

Year	Within one mile		Between 1 and 2 miles		Between 2 and 3 miles		Between 3 and 4 miles		Over 4 miles	
	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals
1906	9	6	3	9	-	16	-	10	-	-
1907	11	6	4	7	-	13	-	12	-	1
1908	15	6	5	7	-	10	-	11	-	1
1909	19	7	8	6	-	7	-	10	-	2
1910	22	6	12	5	1	7	-	8	-	2
1911	24	4	19	5	4	4	-	5	-	1
1912	23	4	27	5	5	3	-	2	-	0

* Home includes winter houses with families.

oxen first exceeded the number of hand-logging crews, to 1912, commuting distances between one and two miles became more prevalent for the former than distances within a mile. During those three years a small number of hand-logging crews cut at locations at various commuting distances (Table 4-2).

The demands for greater numbers of large logs* had been one of the initial reasons for leasing oxen. These logs were more numerous in virgin forest, little of which was accessible to hand-loggers by 1905; also such heavy logs made logging more difficult, particularly for the hand-logging crews. These large logs were needed to fill special orders for sawn timber eight inches square and even a foot square. In addition, the merchant sought a greater volume of logs to increase his profits from his oxen, lumber sales, and supplies to loggers.

In 1905, the merchant built his third sawmill in Bay d'Espoir but within a year his monopolization of the industry was broken. By 1912, the number of sawmills had increased to six; the fourth was built in 1906, the fifth in 1908, and the last for that period in 1911. These three sawmills were owned by three separate

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*Generally all logs transported by oxen before 1905 were in excess of eight inches at the top and more than 25 feet long.

businesses. The owners of two of the mills were indigenous logging crews each of three brothers, who had formed family partnerships.

These crew owners continued logging nearly a decade after building their sawmills. They always had at least one salaried crew member each with them, commonly recruited from the fishing settlements to the south. The yearly turnover of these recruits was high, resulting from their decision to switch to non-salaried logging and to settle in the Bay.

The mill owners who logged generally sought the largest logs, which in turn necessitated the use of draft animals. They made an effort to have the majority of their logs in excess of ten inches in diameter because among those bought from hand-loggers, their first suppliers, there were few logs sufficiently large to fill special orders. This very selective cutting, however, resulted in a faster than normal increase in hauling distances which in turn caused more frequent moving from one area to another.

The increased demand for logs from the extra sawmills did not entail a proportional increase in the number of loggers. There were two reasons for this: first, one of the mills was a small operation for the first two years (1906 and 1907), employing the owners only, and another mill did not saw until 1912; secondly,

the increase in the number of oxen caused more loggers to lengthen their winter logging season, while all except the teamsters remained cutting during the hauling season.

Figure 4-6 shows that the rate of increase in the number of loggers for the seven year transition phase was higher than in the preceding and succeeding phases of the industry down to 1922. There was an average yearly increase of 9.1 loggers in the 1906-1912 phase as compared to approximately 5.5 for the 1895-1905 phase and 4.0 in the 1913-1922 period.

The exact number of logs cut each year is not known but as the number of draft animal crews increased and the number of hand-logging crews declined, the average number of logs per logger increased. Therefore estimations of the total number of logs cut per year are calculated on the basis of a yearly average of 400 logs per man in a hand-logging crew and 700 per man in a draft animal crew.* Thus the 1906 cut was probably between 70,000 and 80,000 logs while the 1912 cut rose to between 140,000 and 150,000. The Newfoundland Census for 1911 records four sawmills at Bay d'Espoir and a fifth at Pushthrough. The latter sawmill was at Bay d'Espoir but the owner

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*Average size logs of hand logging crews were smaller.

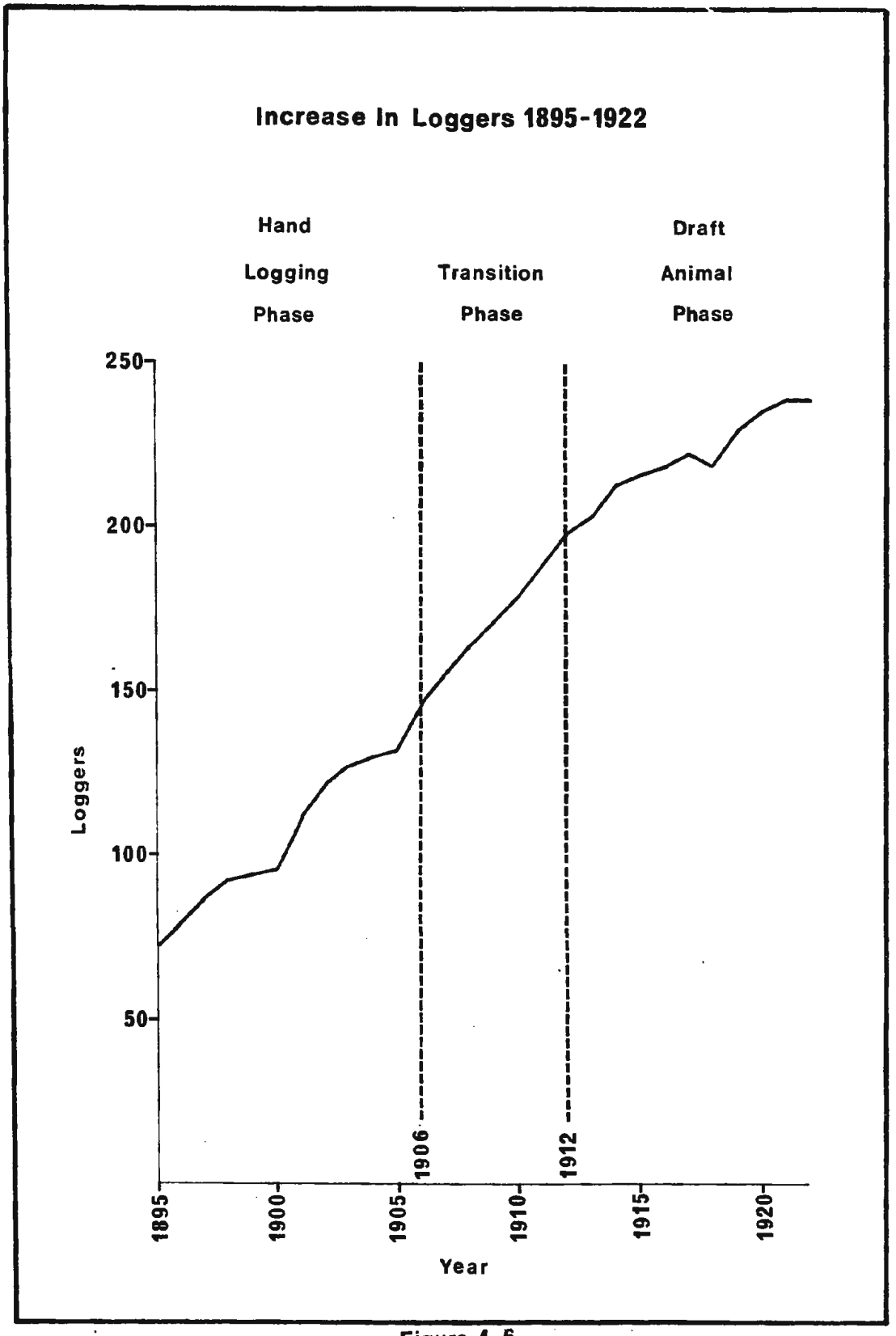
Increase In Loggers 1895-1922
Hand
Logging
Phase
Transition
Phase
Draft
Animal
Phase
250
200
150
100
50
Loggers
1906
1912
1895
1900
1905
1910
1915
1920
Year

Figure 4-6

lived at Pushthrough. The Census for 1911 gives a total of 68,000 sawlogs cut at Bay d'Espoir including the 12,000 incorrectly recorded as cut at Pushthrough. According to merchant informants only half or less than half of all logs they bought were either recorded or reported because of the royalty charge per log imposed by the government. The doubling of the census total comes close to the estimation given above.

Towards the end of this period, competition among mill owners raised log prices, especially for large logs. This price increase became an incentive to seek the more distant, larger logs, thus promoting the greater use of the ox. Competition also tended to relax the merchants' rigorous terms for leasing oxen. By 1912, out of the twenty privately owned oxen, twelve had been bought from merchants; however, all loggers were not successful in persuading merchants to sell draft animals, even by barter. Although a dozen loggers had persuaded merchants to sell oxen, entrepreneurs were reluctant because of losing the "man's share". Owning oxen placed loggers in bargaining positions for log prices among the competing merchants. A mill owner, however, could claim sufficient logs from loggers to cover any debts.

With the increase in hauling distances, the ownership of an ox meant security for loggers. Before buying one from a merchant nevertheless, a crew normally

worked the animal for a winter to test its capabilities. Other crews reared their own and by 1912 there were eight home-raised oxen. The use of oxen by different crews resulted in different average size logs; the larger the average size of a crew's logs the faster its penetration of the virgin forest because of a higher degree of selectivity. Therefore, the advance of the logging front in a location with a smaller number of crews was sometimes just as fast as at other locations where more intensive cutting took place. Generally, following the first wave of cutters came a second, in a year or two, seeking the smaller logs left by the first cutters.

Crews with draft animals were generally larger than the common two-man, hand-logging crew. This larger crew was necessary to provide sufficient logs for the hauling season. The average size of draft animal crews, however, decreased from approximately four (4.2) to just over three (3.1) from 1906 to 1912, mainly as a result of increased hauling distances; yet the average size of the combined "crew types" was slightly larger by 1912 (2.9) than in 1906 (2.8), resulting from increased numbers of oxen (Table 4-3). The ox-crew ratio tended to be larger at Head Bay d'Espoir, Milltown and St. Alban's than for all other settlements (Table 4-4). This was not only because these places formed the core of the logging settlements but also because the areas exploited by hand-logging crews

Table 4-3

Winter Logging Crews

1906-1912

Year	Lone Loggers	Fathers and Son(s)	Brothers	Brothers and Their Sons	Friends	Salaried Merchant Crews	In-Laws	Draft Animal Crews	Hand Logging Crews	Total Crews	Total Loggers
1906	11	15	13	5	4	3	2	12	41	53	146
1907	9	15	15	6	4	3	2	15	39	54	154
1908	10	16	13	6	5	3	2	20	35	55	161
1909	10	21	14	5	4	3	2	27	32	59	171
1910	12	27	11	4	3	3	2	35	28	63	178
1911	7	31	12	4	6	3	3	47	19	66	184
1912	7	35	15	3	2	4	3	55	14	69	197

Table 4-4

Ox-Crew Ratio by Community, 1906-1912

Year	Community	Loggers	Crews	Oxen		
				Total	Privately Owned	Merchant Owned
1906	Head Bay d'Espoir	24	8	3		3
	Milltown	21	6	4		4
	St. Alban's	69	29	5		5
	All Others *	32	10			
1907	Head Bay d'Espoir	25	8	3	1	2
	Milltown	21	6	5		5
	St. Alban's	72	29	7		7
	All Others	36	1		1	
1908	Head Bay d'Espoir	25	8	4	2	2
	Milltown	23	7	5		5
	St. Alban's	73	28	11	2	9
	All Others	40	12	3	2	1
1909	Head Bay d'Espoir	28	10	5	2	3
	Milltown	24	8	8		8
	St. Alban's	76	29	14	4	10
	All Others	43	12	3	2	1

Table 4-4 (Continued)

Year	Community	Loggers	Crews	Oxen		
				Total	Privately Owned	Merchant Owned
1910	Head Bay d'Espoir	28	10	8	2	6
	Milltown	23	9	9	1	8
	St. Alban's	80	30	17	5	12
	All Others	47	14	6	2	4
1911	Head Bay d'Espoir	29	10	9	3	6
	Milltown	22	8	9	1	8
	St. Alban's	85	32	23	8	15
	All Others	48	16	8	3	5
1912	Head Bay d'Espoir	32	11	11	5	6
	Milltown	26	9	11	3	8
	St. Alban's	90	33	25	8	17
	All Others	49	16	10	4	6

Note: Some crews used two draft animals.

* See Figure 4-1.

of "other settlements" were less depleted of saw timber.

The change in the technology of transporting logs generally increased income from winter logging. The winter's logging therefore became more important as a source of income for the majority of the settlers than any other seasonal occupation by the end of the transition period. Increased income was also a major factor in breaking the barriers of conservatism. This in turn resulted in a merging of the majority of workers from all groups into a common group - winter loggers with draft animals; however, there was a continuing trickle down through the years of hand-loggers, trappers, fishermen and farmers. The hand-loggers generally worked the closer areas of low density saw timber between summer logging range and the winter range of draft animal crews.

The set of sleds used with oxen required the widening and straightening of hand-sled paths. When descending hills with slopes approximately fifteen degrees and over, paths were cut diagonally across them. The lower sides of these paths were provided with measures where necessary to prevent the sleds from leaving the tracks. Paths, particularly those over which full loads were transported followed the routes of least resistance. Where possible, they were confined to valleys of streams, crossing and re-crossing the water courses as often as necessary to maintain the desired grade. Secondary paths

were usually inferior in construction and were normally used for one winter only; however, with the spatial extension of loggers, some of them eventually became main paths.

Animal use required paths to have a firmer roadbed, which resulted in the construction of stronger and wider bridges, and the corduroying of unfrozen swamps. In addition sufficient snow and temperatures rarely above freezing point were necessary for successful log transportation with draft animals.

The steeper the hill, the greater the risk of injuring or killing an animal when descending it with loads. This risk was greatest on the longer and generally steeper hills within a half mile of river and shore landings. Icy hills, failure to engage braking systems, and breakage of vital parts of hauling equipment, were common causes of animal deaths or injury. Consequently, these hills were avoided until the more accessible areas had been logged.

Excessive time needed for bridge construction along routes to some areas delayed logging in these locations until the more accessible areas had been logged. Since logging was still pursued by labor intensive methods, as much time as possible had to be devoted to the cutting and hauling operations. All extra activities lowered their level of income. A certain

amount of corduroying usually had to be done, but when snow fell before bog had frozen solidly enough to permit hauling with draft animals, they were insulated from freezing temperatures. Where possible, these soft spots were eliminated by churning snow into them for freezing by hauling logs over them. Otherwise bogs had to be corduroyed which was very time consuming - a factor which delayed the logging of areas beyond swamps that did not freeze.

Regardless of topographic factors, and the firmness of paths, hauling conditions were seldom favourable until the latter half of December. Possibly one or two short breaks per winter occurred as a result of rain or snow storms, but hauling usually continued until the spring breakup normally late in March or early in April.

The greater emphasis on winter logging with draft animals resulted in a change in the pattern of cutting. Although the coastal/riverine strips continued to widen near settlements and extend up river valleys as a result of cuttings by hand-loggers, the greatest changes were deep penetrations into the virgin forest. These penetrations by the end of the transition period consisted of two shapes, elongated, and bulging. The elongated expansion was caused by single crews working in separate valleys for two or more years. Bulgings were caused by

either a number of crews working in the same general areas or single crews radiating and not restricted by valleys.

Figure 3-8 showed the beginnings of these penetrations. Figure 4-7 shows the results of the increased dependency on oxen. The separate advances had become so numerous in most areas that they had merged, causing the previously narrow strips to widen from an approximate average of one half to one and a half miles from 1906 to 1912. Within this advance the less accessible areas - those atop steep hills; those across unfrozen swamps; and those which required uphill hauls - were avoided; however, such areas are so small and numerous that few show on the accompanying map (Figure 4-7).

Logging Pattern

To explain the characteristics of the pattern of cutting for the whole area, it has to be broken into sections exploited by the different settlements. Most of these communities, because of their growth and development, exploited the forest at different rates both near home and miles away in river valleys. Thus St. Alban's loggers, in addition to logging near home, also logged inland from Swanger Cove, and in the valleys of Conne River and Little River. In fact, the watersheds of these two rivers began attracting proportionately more

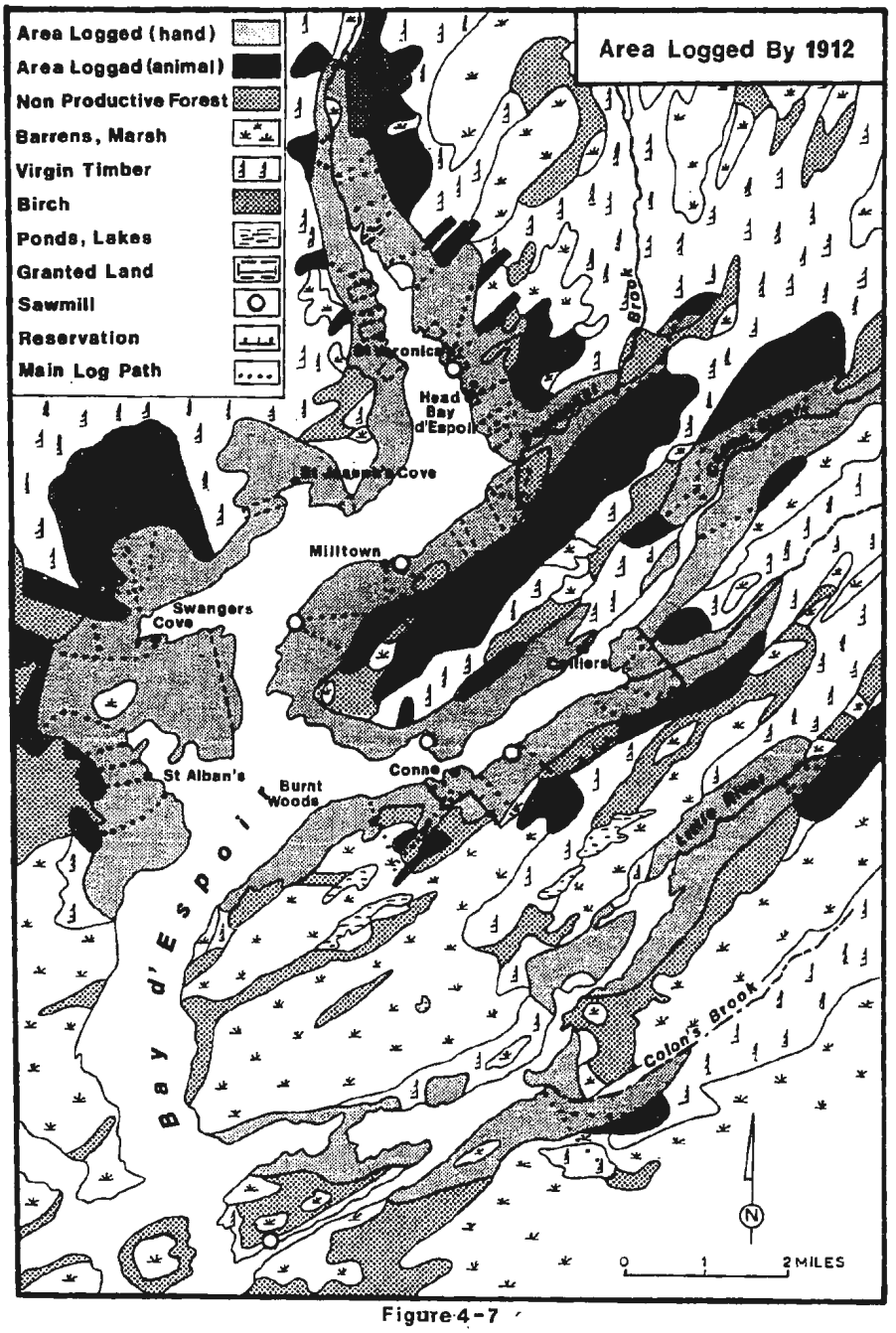
Area Logged By 1912
Area Logged (hand)
Area Logged (animal)
Non Productive Forest
Barrens, Marsh
Virgin Timber
Birch
Ponds, Lakes
Granted Land
Sawmill
Reservation
Main Log Path
Head Bay d'Espoir
Milltown
Swangers Cove
St Alban's
Burnt Woods
Bay d'Espoir
Colan's Brook
N
0 1 2 MILES

Figure 4-7

St. Alban's loggers after 1908 than the Swanger Cove area. Although there were sufficient logs inland from the above cove to employ all loggers from St. Alban's throughout this whole period, the average hauling distances had quadrupled in the ten years before 1912. Therefore about one-third of the loggers from the settlement resumed moving their families to the mouths of Conne River and Little River for winter logging at shorter hauling distances.

The men of St. Joseph's Cove on the other hand faced a completely different situation. Loggers were few in relation to a large area of forest accessible to hand-loggers. The four loggers of 1895 had only increased to ten by 1912. The forest not only bordered the settlement on three sides, but flowing through the centre of the village was a river on which logs were floated during the spring run-off from at least three-quarters of a mile to the sea. Although the men logged for roughly three months per year, they also reared cattle and usually trapped. These two occupations, as already noted in Chapter III, were deterrents to winter logging with oxen, but with a larger than normal area accessible near home for the number of loggers, there was no need of animal draft during this transition period as in the majority of other locations (Figure 4-7).

Northeast and north of St. Joseph's Cove were the cuttings of loggers from St. Veronica and Head Bay d'Espoir. Logging had penetrated fairly evenly inland from both settlements and up Northwest River for at least two miles. The watershed of Southeast Brook was logged by both Head Bay d'Espoir and Milltown men. By 1912, the peninsula between the mouths of South East Brook and Conne River because of its accessibility, was one of the most intensively logged areas, extending back to the divide in several locations, particularly inland from the sawmill at Milltown.

At Conne River was a mill that had been operating since 1901. This accounted for the exploitation in the surrounding area, particularly in the valleys of Conne River and South East Conne Brook. Even though by 1910 loggers of European descent at Colliers, Conne River and Burnt Woods had used oxen, the Indians did not adopt the winter logging practice during this period.

The amount of logging in the Little River and Colon's Brook watersheds had expanded and had become more intensive as a result of a sawmill built in the area in 1905. Hand-loggers and crews using animals often cut in the vicinity of each other; however, animals hauled to the sea while hand-loggers hauled to the river.

The increased demands for logs therefore resulted in increased hauling and commuting distances. Also the

eventual selling of oxen by merchants and the efficient use of animals resulted in an increase of animals for draft. This efficient use of oxen became so obviously superior for log transportation by the beginning of the transition period that practical considerations had virtually overcome conservatism and only token reservations of tradition were apparent by 1912.

Manpower for hauling logs, a low capital/high labor method, was replaced by oxen which caused the operation to become more capital intensive and less labor intensive in log transportation.

CHAPTER V

LOGGING WITH DRAFT ANIMALS, 1913 - 1922

This chapter discusses the influences of economic, physical, cultural and political factors upon the logging pattern in Bay d'Espoir for the 1913-1922 period when the draft animal became an integral part of the woods industry. Oxen, and to a lesser degree horses in the latter half of this period, were essential in the logging operations, mainly because of the increasing distances involved in the transporting of logs on both land and river.

The Physiographic Factor

The physiography became increasingly more influential throughout this logging period than during the transition phase. This influence resulted primarily from an intensification of impediments to log transportation, particularly as distance increased. Besides the hindrances imposed by topography and terrain, climatic factors sometimes produced adverse hauling conditions the effects of which intensified with distance.

As pressure on virgin forest increased with the growing number of draft animal crews, slopes too steep

(in excess of thirty to thirty-five degrees) for animal use were occasionally hand-logged up to distances of approximately 200 yards from the paths. Normally logs were slid to the bottom of the slopes and then hauled by draft animals. There were, however, several cases where slopes between the cutting sites and the landings were too steep for animals to transport logs. In such cases logs were hauled by oxen to the hilltops, rolled to the bottom and either reloaded or piled for later hauling. Because of the extra work involved, these less accessible logging sites were exploited normally only when it was less economical to travel to more distant logging sites. These unusual practices were pursued in the Little River area and north of Swanger Cove.

Ascents increased in number in this period. Grades of approximately three to five degrees were rarely over 100 to 200 feet long. A half dozen or so ascents were about a quarter of a mile long but only two to three degrees steep while those slopes of approximately one degree grade and up to a half mile in length were commonly confronted by 1920. Ascents usually forced load lightening in the main access routes generally used continuously throughout this logging period, resulting in a slower rate of expansion in the affected areas.

At the top of ascents, loads were usually increased to normal sizes with logs that had been piled

there from trips which had terminated at these points. "Half trips" or "inside hauling" in approximately half of the paths with ascents often amounted to as high as fifty percent of the total number of trips to landings. Although these circumstances tended to restrict the amount of cutting in such areas as compared to areas with routes free of ascents, such grades could rarely have been avoided, especially when hauling from one watershed to another.

Bridges that could withstand ice-charged flood waters were too expensive even for five or six crews to construct jointly. When logs had to be transported across waterways, crews built temporary bridges. These structures often lasted two to three years, depending upon the frequency of ice-charged floods. Usually the piers of the structure situated on the river banks survived, reducing the cost of reopening the route. Bridges with spans greater than fifteen or twenty feet were usually too expensive for a single crew to construct.

When a bridge was destroyed during the winter, the decision to rebuild it for the remainder of the hauling season depended upon the number of logs left across the river. If the structure were not replaced until the next autumn, the remaining logs were usually hauled the following winter. When there was risk of losing a bridge through a mid-winter flood, each crew,

particularly if only one were involved, hauled its logs across the river and piled them. After the majority of logs had been transported to the other side, hauling to the landing began on a full time basis. Except for the small percentage of logs transported directly from the cutting areas to the landings, all other logs had to be reloaded - a task which along with bridge construction greatly reduced a crew's productivity. Only those crews which sought large logs exploited these less accessible areas before the more accessible smaller logs were cut.

Little swamp was encountered in the majority of log paths until distances increased. Swamps tended to shorten the hauling season because they froze late in the fall and thawed early in the spring. As long as the remainder of a path remained amenable to hauling, swamps had to be corduroyed. Snow on corduroyed swamps usually melted before that on dry portions of paths. The lack of snow in path sections over forty to fifty feet long meant the lightening of loads unless the corduroy was re-covered with snow using shovels - a time consuming practice. In addition, snow coverings generally had to be repeated at least daily, since it melted by the warming effect of the open swamps underneath the corduroy whenever mild weather persisted late in the hauling season.

When confronted with crossing marshes to reach logging sites, crews often logged elsewhere or, where

feasible, cut paths around the marshes. After other areas had been logged greater distances than the marshes encountered earlier, crews returned and crossed them. This point clearly illustrates how optimum decisions made at one point in time were later rendered obsolete by forest depletion and increasing distance.

Marsh crossings had three main disadvantages; first, the tendency of paths to drift over with snow requiring the lightening of loads and more numerous trips across marshes; second, they increased distances without yielding logs along the way, in contrast to paths through the forest; third, they presented the same problems as swamps but on a scale too large for a crew of two to three men to overcome.

The lack of snow restricted hauling distances to within a half mile, drastically reduced load sizes, and forced the abandonment of the effective set of sleds on snow for a crude "bobsled" without "iron shoes" to reduce friction. In addition, a larger number of logs were hauled to the nearer river landings where applicable instead of to the more distant shore landings which had been planned to avoid risks of poor driving conditions. The lack of sufficient snow also reduced the chances of spring floods. This situation greatly increased the risks of log jams not only because of the absence of melt water but because of large logs transported to river

landings from where only small logs could normally be driven.

The occurrence of unfavourable hauling conditions with hauling distances in excess of approximately two and a half miles tended to require a change in crew size or the seeking of a cutting site with shorter hauls. Crew sizes changed by the addition of another animal or a decrease in the number of crew members.

Large snowfalls were detrimental to hauling. The use of log paths after large snowfalls was strenuous for draft animals. When two or more animals were used to reopen snow filled paths, each was given turns at the front to prevent overworking. Except for one salaried, merchant crew equipped for snow ploughing, all log paths were reopened by compacting the snow. The use of one sled allowed one end of a load of logs to drag over the snow. For two to three days, therefore, loads had to be smaller than normal. In rainy and extremely mild periods hauling generally ceased, primarily to prevent the destruction of the compacted snowbed in the path. These delays continued normally until temperatures dropped below freezing and the remaining slushy snow in log paths hardened.

The accumulated snow for the winters from 1900 till the 1920s ranged from two to three inches up to four feet excluding drift; however, snow depths normally

averaged between one and a half to two feet by mid-winter. In addition to being a hindrance in moving through the forest, snow had to be compressed around each tree cut to utilize as much of the trunk as possible for a log. This was followed by the difficulty of moving through the snow when limbing trees and hauling logs to the paths.

The Tenurial Factor

Forest tenure at Bay d'Espoir was restricted to small coastal farm lots apart from a twenty-five square mile timber lease. The remainder of the forest was Crown Land, the most accessible part of which was within the "three mile limit".

> The term "three mile limit" is applied to lands lying within three miles of tidal water. It came into use subsequent to the alienation of Crown Lands to various persons and companies. Timber licences given to these persons and companies were subject to a clause which stated that the area included should terminate within three miles of tidal water.[1]

The three mile limit is neither a continuous strip nor does it have a surveyed boundary inland. There has never been any legislation passed to establish such a limit, but Section 59 of the Crown Lands Act

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[1]G. Tunstell, "The Forests of the Island of Newfoundland," Department of Mines, Agriculture and Resources, Forestry Division, St. John's, Newfoundland. (Unpublished Report, Nov. 1957), Memorial University Library, Newfoundland Room.

refers to it.[2] The Act states in part that "A licence to cut timber on Crown Lands ... may not be granted within three miles of tidal water."

Forested lands within three miles of the sea had been reserved for the needs of settlers; however, no legal rights to such land were given, nor was the timber use restricted only to settlers' fuel and building material requirements.[3] In Bay d'Espoir this coastal strip was exploited primarily for sawlogs without permits from the Newfoundland government during the study period.

The exploitation of forest on Crown Land had no tenure restrictions, but customary practices or temporary logging rights developed at Bay d'Espoir. These rights appear to have developed on a "first come, first served" basis. The first to mark off a block of forest during the summer or autumn for the following winter's logging held rights to it for a season. Generally only a portion of forest large enough to supply a "winter's work" was marked. Once a logger cut a path to a logging site, he commanded that route. Only if another logger approached the same area from another route or obtained permission to use the path did he have the right to share the logging site. In areas where crews logged in the vicinity of each

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[2] Ibid., p. 9.

[3] Ibid., pp. 9,10.

other, one crew would rarely cut within the area claimed by another crew for that winter without permission; however, once a crew logged an area year after year, others generally recognized its rights to the location and moved in only after such a crew vacated it. When crews moved from an area they automatically lost their customary rights to the timber there and rarely tried to prevent anyone from using the paths they had cut. The system operated therefore on the customary principle of usufruct, common to many traditional societies around the world.

Unlike farmers, and sometimes even fishermen, who held traditional rights and continuously exploited a particular location, the forest was subject to temporary depletion over wide areas which resulted in continual shifting of loggers; hence, the practice of an extensive type of utilization of a widely distributed resource. Even if logging crews had been offered timber rights to a tract of forest large enough to continuously support their logging operations, it is likely that few could have afforded the leasing or buying of it. If a minority of crews had acquired permanent logging rights to more than half of the accessible forest, considered by the loggers as common property, the remaining crews would have protested encroachment on their livelihood.

The dozen or so loggers who had residual forest on their granted farm lots generally kept it as reserves in case they were prevented from transporting logs cut elsewhere. In addition to the common constraints mentioned earlier, others were the injury or death of the draft animal, and the necessity of having to stay at home. Since all granted forest land was within a half mile of the sea, it could have been hand-logged at the loss of services of an animal.

More influential than the small family woodlots was the twenty-five square mile timber lease obtained by the Lake interests in 1907. This licensed tract of timber extended across four watersheds and restricted cutting to those loggers who sold their logs to the Licensee. Since practically all who logged these watersheds until 1913 cut for the Lake interests, little or no friction resulted until crews logging within the vicinity of the boundaries of the licensed tract sold their logs to other merchants. Disputes arose from 1914 to 1917 when increasing numbers of crews logging for Lake's competitors were accused of cutting within the boundaries of the licensed timber. None of the accusations were proven, mainly because there was no manifest boundary around the land; however, the question arose that much of the claimed forest was within the three-mile limit (Figure 5-1). When a sawmill competitor of the Licensee protested

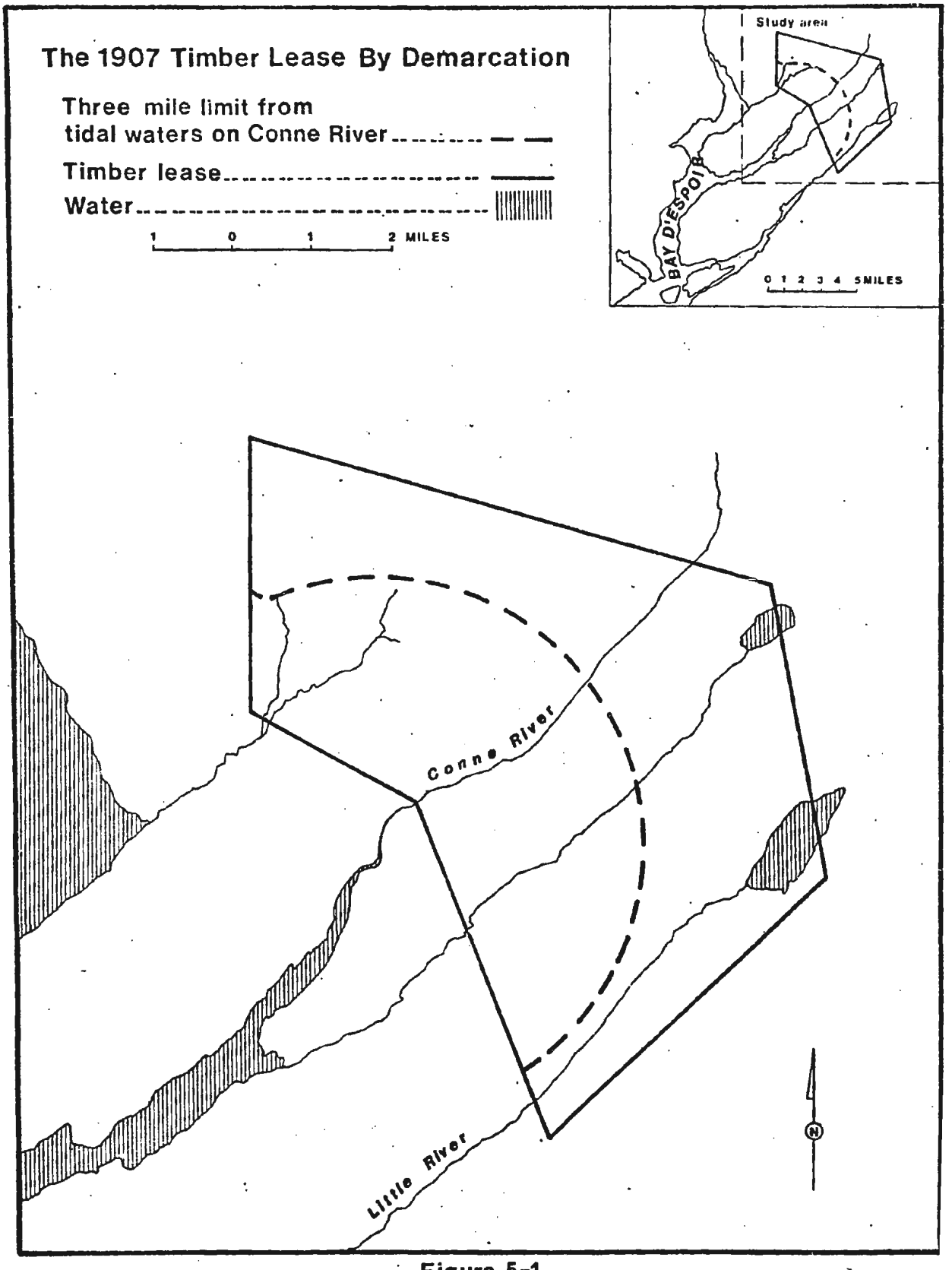
The 1907 Timber Lease By Demarcation
Three mile limit from tidal waters on Conne River
Timber lease
Water
1 0 1 2 MILES
Study area
BAY D'ESPOIR
0 1 2 3 4 5MILES
Conne River
Little River
N

Figure 5-1

the supposed location of the unmarked boundary to the government in 1917 on the grounds that timber could not be licensed within three miles of tidal water, his protests failed to rectify the situation.

Even though the boundary of the licensed area was surveyed and mapped, the route followed was poorly marked and disappeared within a few years; however, when dimensions and directions used in 1907 are plotted on an accurate map[4] (Figure 5-2), the tract of land differs in location and size from that mapped in 1907[5] (Figure 5-3) which in turn differed from the boundaries claimed by the Licensee (Figure 5-1). Figures 5-2 and 5-3 each show the licensed timber tract as including in excess of thirty square miles whereas the terms of the lease stated "twenty-five square miles more or less".[6]

Numerous cases arose where the lease holder accused men, who were logging for his competitors, of cutting within the boundaries of his timber tract. In such cases, he claimed the logs. Most of the affected loggers, uncertain of their location because of an unmarked

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[4]National Topographic Series, produced and printed by the Surveys and Mapping Branch, Department of Mines and Technical Surveys, 1957, from aerial photographs taken in 1950. Scale 1:50,000.

[5]Volume 2, Folio 87, Crown Lands Division, Department of Mines, Agriculture and Resources, Confederation Building, St. John's, Newfoundland.

[6]Ibid.

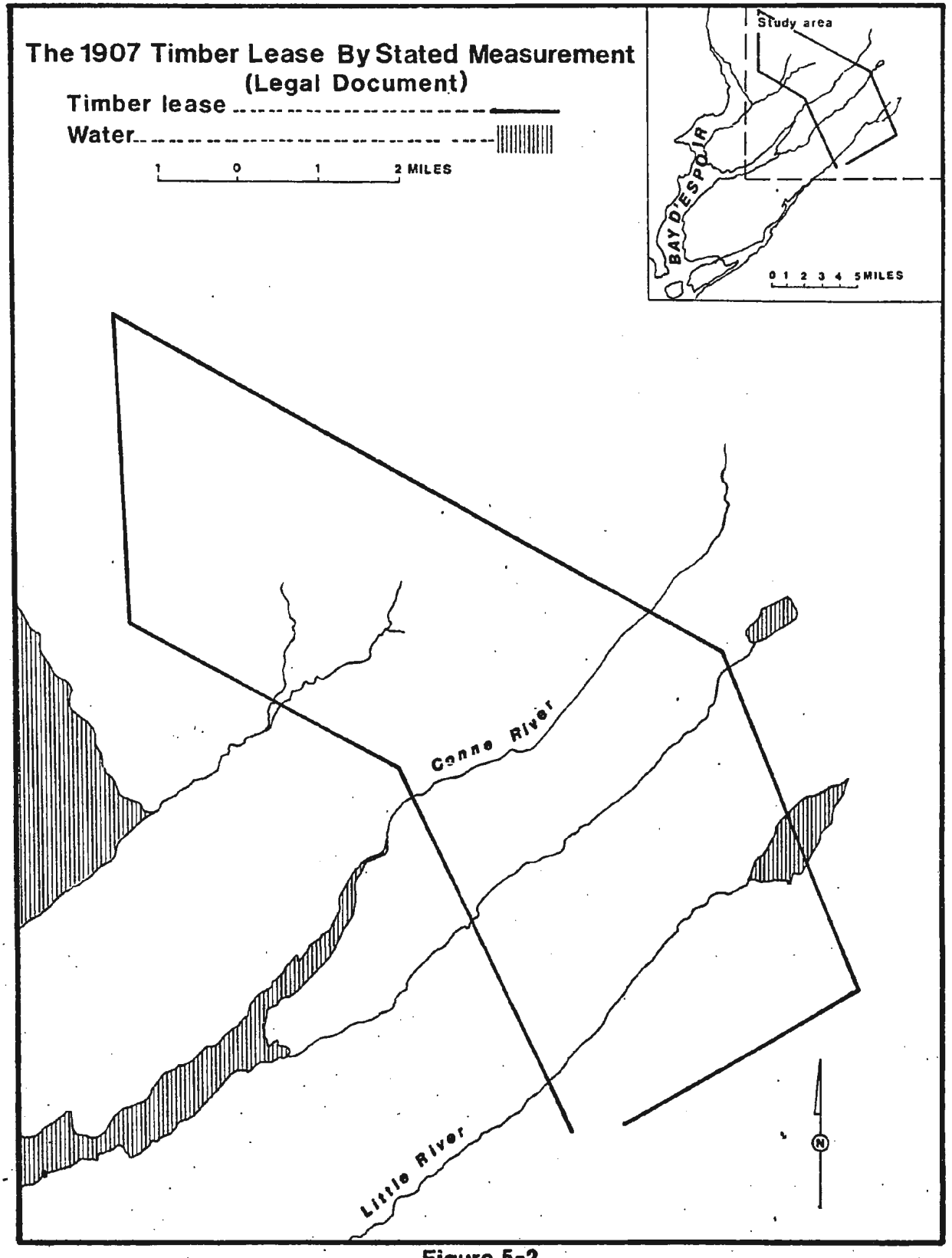
The 1907 Timber Lease By Stated Measurement
(Legal Document)
Timber lease
Water
1 0 1 2 MILES
Study area
BAY DESPOIR
0 1 2 3 4 5MILES
Canne River
Little River
N

Figure 5-2

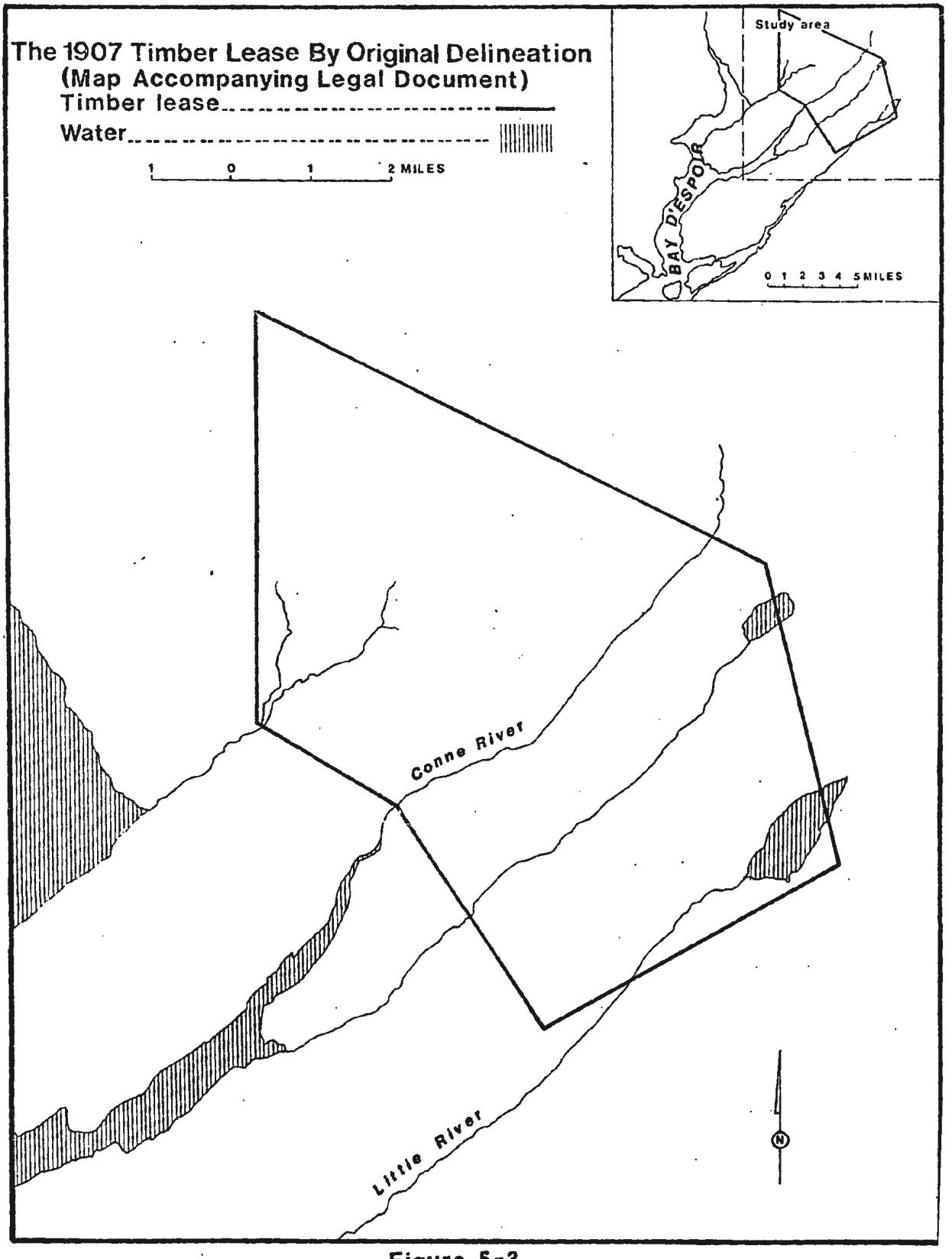
The 1907 Timber Lease By Original Delineation
(Map Accompanying Legal Document)
Timber lease
Water
1 0 1 2 MILES
Study area
BAY D'ESPOIR
0 1 2 3 4 5MILES
Conne River
Little River
N

Figure 5-3

boundary did not contest the issue and had some of their logs confiscated. Others waged verbal battles which usually prevented the confiscation of any of their logs.

This friction generally caused the majority of affected crews to vacate the disputed areas which led to greater logging pressure in other locations and thus the resulting change in the pattern of exploitation. The best example of this change in logging pattern resulted from specific developments in 1917. A salaried logging crew of a Lake competitor had apparently reached the boundary of the licensed timber that year. The owner of the timber rights accused his competitor of encroaching upon this restricted area. Despite vigorous official protests by the accused on the grounds of the three-mile limit, the crew ceased logging in the vicinity of the boundary in the valley of Southeast Conne Brook. Because it was not proven that the crew cut within the restricted area, this study considers the cutting as having ended at the boundary. The abandonment of that area resulted in the crew logging in the valley of Conne River inland from the licensed timber (Figure 5-3). In so doing they by-passed virgin timber inland from the logging front, but because of terms in the Timber Licence, could not be prevented from cutting a path through the licensed tract to haul logs downstream past points of possible log jamming.

The Economic Factor

Logging crews fell into two distinct groups during this period: those who cut primarily large logs in virgin forest, and those who cut smaller logs both in areas vacated a year or two earlier by crews of the former group and on other sites ready for more cuttings. Crews who cut at the logging front took pride in harvesting large logs and built up a reputation for it. To retain this reputation, which most desired, they had to continuously penetrate virgin forest and therefore formed the majority of crews who pushed the logging front inland.

Log sizes at the beginning of this period averaged twenty-five feet long and seven inches at the top. Large logs were up to thirty-five feet long with top diameters in excess of seven inches. The small logs ranged from approximately eighteen to twenty feet long and six inch tops, up to the average size.

As the forest was logged back two to three miles from landings throughout the 1913-1922 period, the number of loggers who cut in virgin timber began to decline. Those who ceased logging at the front joined the other group in harvesting logs from areas ready for secondary cuttings. Although the logs were fewer per unit area

than in virgin forest,* the hauling distances were shorter and there was little path cutting required. This caused a gradual decrease in the number of larger logs and a proportionate increase in smaller logs. This trend resulted in the average log size decreasing by approximately twenty-five percent - down to about twenty-three feet in length with a six inch top diameter - by the early 1920s.

Crews who sought large logs were cutting at distances of three to four miles from landings towards the end of this period, for the purpose of holding bargaining power with merchants. To achieve a bargaining position with the merchant, a logger had to be free of debt. Since the demand for large logs was greater than for small ones, crews with the most valuable saw timber generally refused to sell their product until granted the price sought. Generally, the longer a merchant waited for large logs to fill orders such as eight inch square balk, the higher the prices he had to give for such logs.

Loggers in such positions tended to accumulate credit in merchant businesses. This enabled them to buy a second draft animal to continue harvesting large logs from increasing distances. The strong bargaining power of these crews was greatly assisted by the competition

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*Log density ranged from a low of approximately ten per acre in areas of repeated cuttings to a high of approximately 200 per acre in the best virgin timber stands.

among mill owners. These two interrelated factors were primary causes for merchants to begin leasing their draft animals to loggers on more favourable terms. In return for the cancellation of the "man's share" received for leasing their animals, merchants asked crews to provide hay and to sell them all logs hauled by their animals, and encouraged them to harvest as many large logs as possible.

Crews using merchant oxen were not in a favourable position to bargain for higher log prices regardless of log sizes, so the cutting of large logs did not necessarily guarantee a higher income because of the greater distances involved in hauling them. Decisions on optimum logging locations varied among crews but when insufficient logs remained in an area for a winter's work, a crew's decision on whether to return depended upon two factors: whether a tilt and barn were needed in the second location for the remainder of the winter, and whether a second main path had to be opened in mid-winter when snow was deep and normally had frozen layers.

The number of logs per man per winter ranged from 200 to 1400. The normal range, however, was between 400 and 800 logs per man. The fewer the logs per man, the larger, generally, their average size. To maintain a profitable income, crew members per animal declined with log transporting distances. The man-ox ratio of different

crews varied even with equivalent hauling distances primarily as a result of varying capabilities of animals and loggers, and hauling conditions. Because of these variations, it is impossible to give accurate comparisons of different crew sizes but approximations are derived from generalizations (Table 5-1). In addition to the proportionate decrease of the man-animal ratio with distance, the table shows that the larger the number of animals used by a crew, generally the greater the overlap of equivalent distances within the one and one half to three and one half miles range. The greater the number of oxen used by a crew accounted for the greater the range in the number of members. Moreover, the rate at which the number of daily trips declined diminished with increased distance because of less time used for loading and unloading (Figure 5-4). Throughout this period loggers tended to become increasingly more efficient by reducing the animal-teamster ratio, releasing more men for log cutting. For example, a combination of experienced teamsters and well trained animals permitted, under favourable topographic conditions, the ratio to drop as low as one man per three animals, each individually loaded; however, the normal ratio dropped to one teamster per animal. Although such efficiency was exceptional, it contrasted sharply with that of earlier phases.

Table 5-1

Man-Ox Ratio in Relation to Hauling Distances

	Oxen : Men	Average Hauling Distance			
		5-7 Trips 1 Mile	3-4 Trips 2 Miles	2 1/2 Trips 3 Miles	2 Trips 4 Miles
	1 : 1			x	x
*	1 : 2		x	x	
*	1 : 3	x	x		
	1 : 4	x			
	2 : 2			x	x
	2 : 3		x	x	x
	2 : 4		x	x	
	2 : 5	x	x		
	2 : 6	x	x		
	3 : 2				x
	3 : 3			x	x
	3 : 4		x	x	
	3 : 5		x	x	
	3 : 6		x	x	
	3 : 7	x	x		
	3 : 8	x	x		

Working day ranged from 10 - 12 hours

* More common crew size

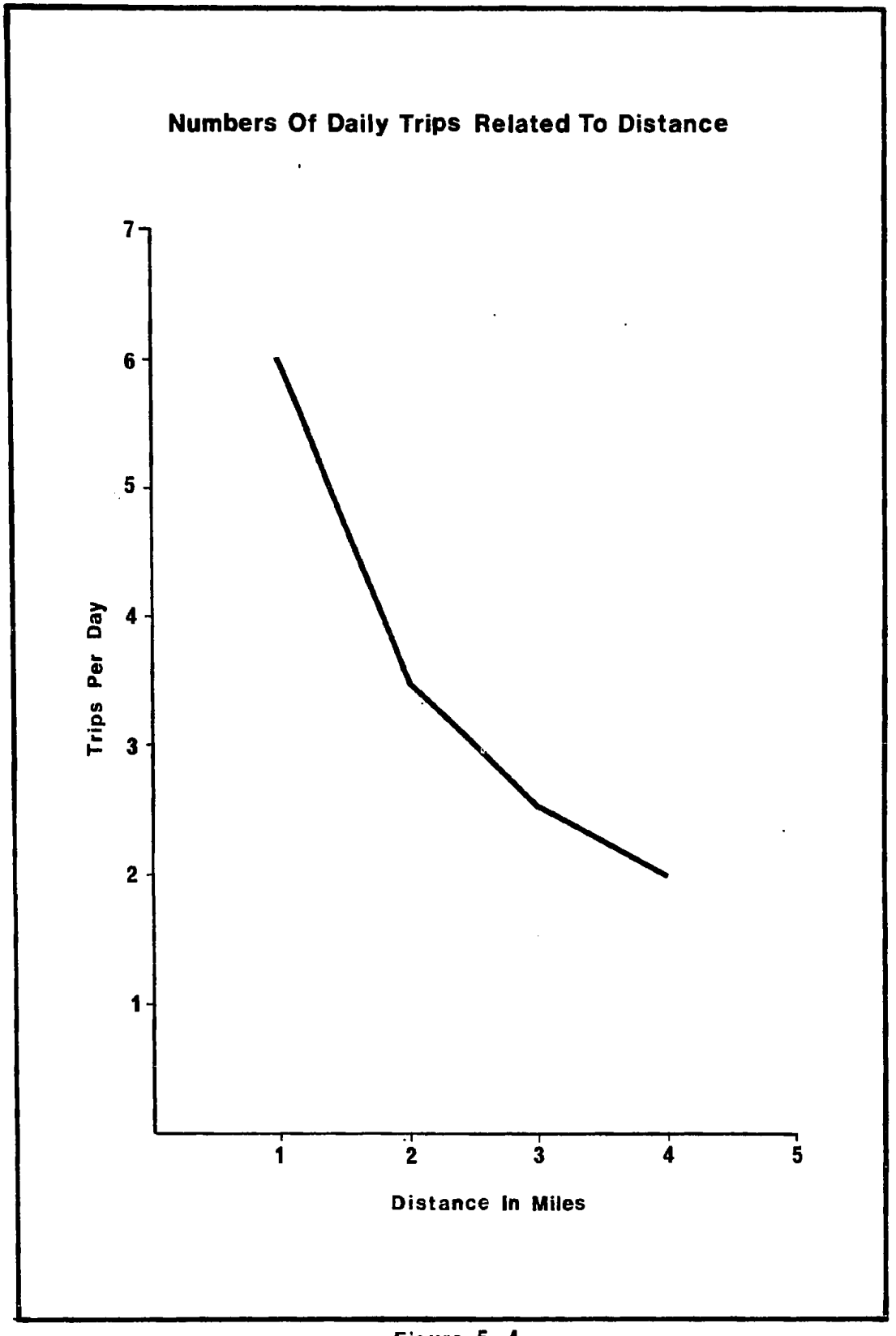
Numbers Of Daily Trips Related To Distance
Trips Per Day
7
6
5
4
3
2
1
1
2
3
4
5
Distance In Miles

Figure 5-4

During this period hauling distances from the logging front continued to increase but at lessening rates, primarily because of fewer crews cutting in virgin timber. Figure 5-5 and Table 5-2 show that in 1913 the majority of crews had draft animals and their hauling distances were normally less than two miles. By 1922, however, the majority of crews transported logs more than two miles with a larger number of loggers cutting in a strip between three and four miles from landings than any other strip of equivalent width. The table and graph also show that the small number of surviving hand-logging crews declined further but their hauling distances remained the same.

The distances of landings upstream determined the distance up river valleys logs were cut. Landing locations varied depending on river width and depth. According to the logger's experience, the nine rivers on which logs were driven fall into three categories: large, medium and small. On the large river, the Conne, were driven all log sizes; on the medium rivers, Colon's Brook, Little River, Northwest River, and Southeast Brook, all except the largest logs - in excess of thirty feet in length and fifteen inches in the butt - were driven; and on the small rivers, St. Joseph's Cove Brook, Southeast Conne Brook, Southwest Conne Brook and Swanger Cove Brook, only small logs were driven.

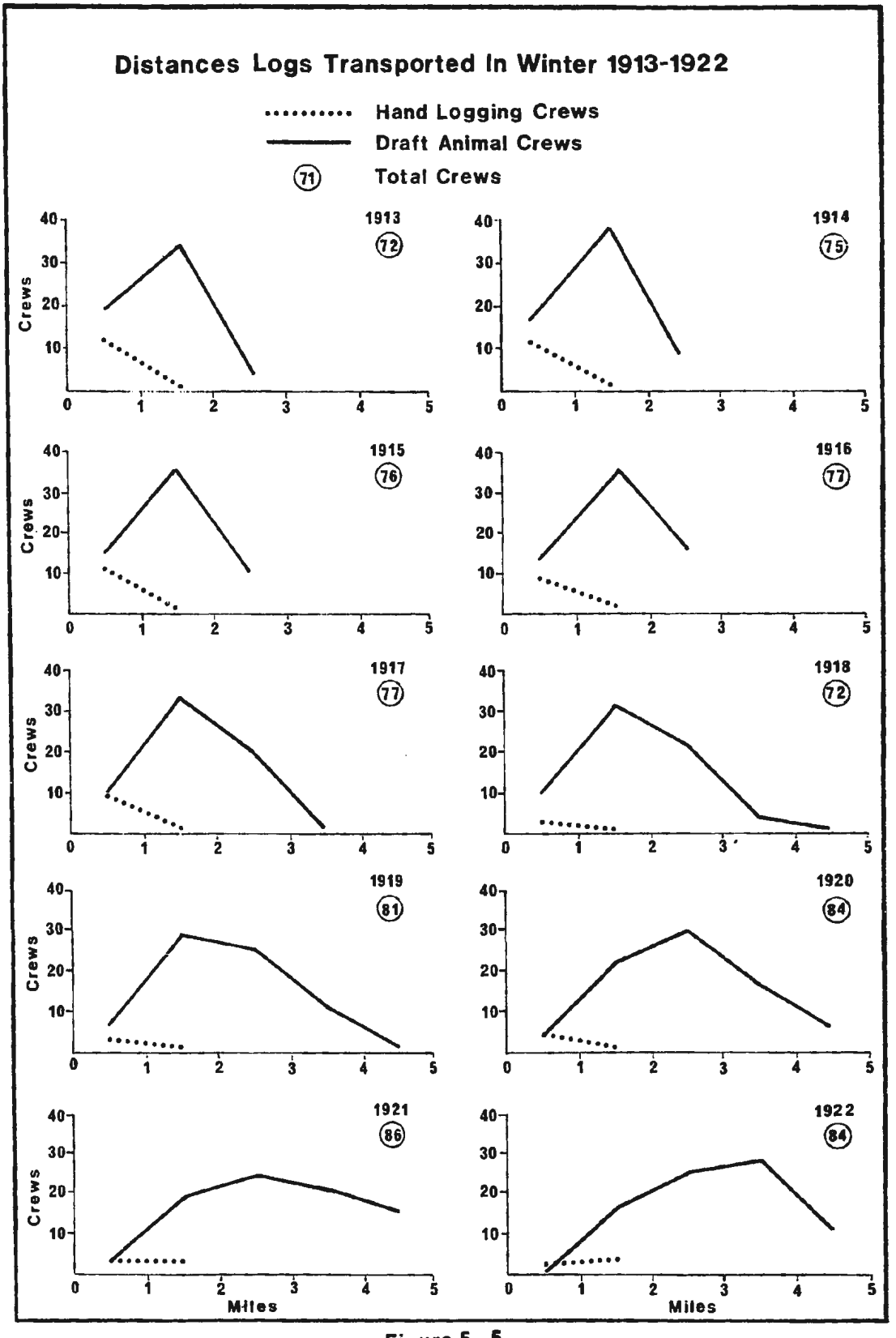
Distances Logs Transported In Winter 1913-1922
Hand Logging Crews
Draft Animal Crews
(71) Total Crews
1913 (72)
1914 (75)
1915 (76)
1916 (77)
1917 (77)
1918 (72)
1919 (81)
1920 (84)
1921 (86)
1922 (84)
Crews
Miles

Figure 5-5

Table 5-2

Winter Transporting Distances of Logs, 1913-1922 (By Crews)

Distance	Within One Mile		Between 1 and 2 mi.		Between 2 and 3 mi.		Between 3 and 4 mi.		Between 4 and 5 mi.	
Means of Transport	Animals	Men	Animals	Men	Animals	Men	Animals	Men	Animals	Men
1913	19	13	37	1	4	-	-	-	-	-
1914	17	12	38	1	8	-	-	-	-	-
1915	14	11	37	2	11	-	-	-	-	-
1916	13	10	36	2	17	-	-	-	-	-
1917	10	9	34	1	21	-	2	-	-	-
1918	10	3	32	1	21	-	3	-	2	-
1919	7	4	29	2	25	-	11	-	2	-
1920	4	4	22	2	28	-	16	-	6	
1921	3	3	19	3	24	-	21	-	13	-
1922	1	2	16	3	24	-	27	-	11	-

Log driving was done on the lower courses of rivers, generally below points where risks of log jams were minimal. Above these points any logs driven normally related in size to the capacity of the river for driving. Thus on medium size rivers there were three landings for different log sizes: one furthest upstream for small logs, a second for relatively large logs farther downstream, and a third category at the head of the tidal estuary for the largest logs (Figure 5-6).

Landings along Conne River by 1922 were concentrated along the half mile tidal estuary where logs could be rafted; otherwise crews had the problem of river-mouth booms breaking when collecting logs driven on the river. The cost of a boom to withstand the tides and floods at the mouth of the Conne was beyond the joint financing of crews or individual entrepreneurs. Boom breakages occurred most often during spring floods, especially when accompanied by falling tidal waters. These breakages resulted in the scattering of unrafted logs over the Bay. The loss of logs to the Atlantic Ocean was greatest with falling tides accompanied by a northerly wind. After the break of a boom, loggers rowed around the bay in dories collecting drifting logs and those on the shore.

The landings along the tidal section of Conne River were large, particularly on the northern side and held up to 5000 logs each by the middle of the 1913-22

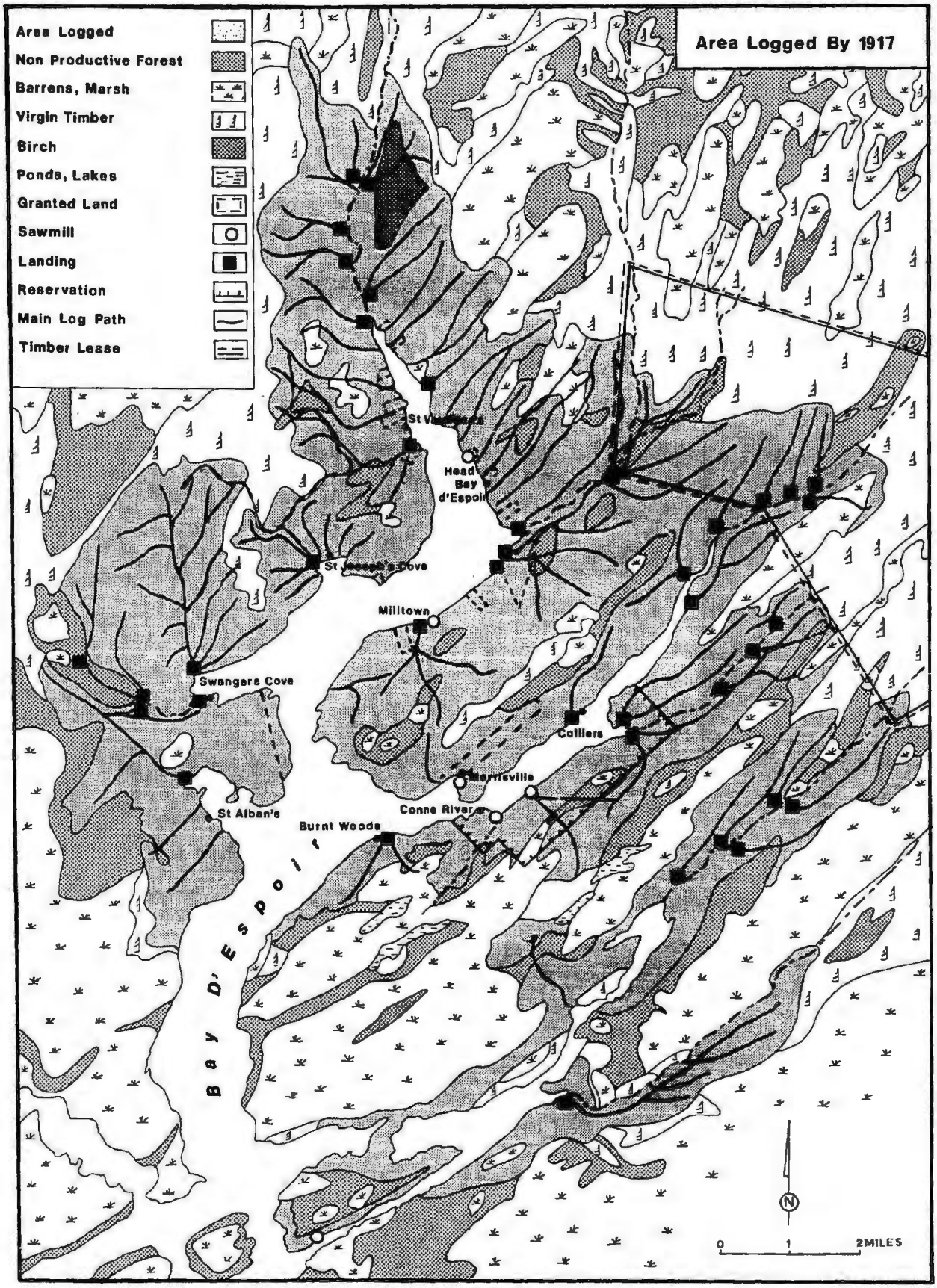
Area Logged
Non Productive Forest
Barrens, Marsh
Virgin Timber
Birch
Ponds, Lakes
Granted Land
Sawmill
Landing
Reservation
Main Log Path
Timber Lease
Area Logged By 1917
Head Bay d'Espoir
Milltown
Swangers Cove
Colliers
Morrisville
Conne River
St Alban's
Burnt Woods
Bay D'Espoir
N
0
1
2MILES

Figure 5-6

period; however, by that time landings upstream within two miles of the estuary began to gain prominence. These later landings were necessary to shorten the hauling distances of crews logging in virgin forest up the river valley. By the early 1920s the logging front ranged between four and five miles from the sea in most river valleys. Hauling distances in excess of four miles were rare - distances at which only the most valuable logs could have been profitably logged with draft animals.

The increased demand for sawn products during the First World War continued to 1920. This in turn raised the value of logs, and was reflected in a deeper penetration of the forest. This penetration was slowed in 1918 when a dozen or so of the most productive loggers were conscripted into the British Armed Forces. This vacuum was partially filled by boys in their early teens. Since most of the dozen or so conscripted men had logged for the leading sawmill operation, the management agreed before the start of the 1918 winter logging to purchase all logs on the landings including those upstream, beyond points with high risks of log jams. Previously logs had been scaled normally after being towed to the sawmill. This change was made to ensure the harvesting of sufficient logs for the following sawing season. Scaling on landings made it economically feasible for loggers, particularly those whose logs had to be floated down rivers, to extend

their cuttings an extra half mile or more further inland. For that winter, most of the remaining hand loggers became members of crews with animals. Table 5-3 also shows that during 1919, draft animal crews increased by six and animals by eight which meant an increase in the number of crews with more than one animal from three to five.

The increase in draft animal crews, accompanied by the advance inland of cutting sites particularly at the back of loggers' homes, resulted in a substantial increase in commuting distances after 1912 when compared with log transporting distances. Figure 5-7 and Table 5-4 show the increases in commuting distances during this period. There was a gradual shift from a predominance of commuting distances of less than two miles at the beginning to over three miles at the end of the period. The change in commuting distances of the dwindling hand-logging crews, however, was of little significance since they logged within the same areas.

Apart from St. Alban's crews, the majority of others living away from home were within five miles of their communities. The St. Alban's loggers, who exploited the forests of the Conne River and Little River watersheds, were on the opposite side of the Bay and there were periods when the ice was unsafe for crossing. The alternative was the land route around the Bay, which was

Table 5-3

Logging Crews 1913-1922

Year	Loggers	Draft Animals			Crews without Animals	Crews with Animals	Total Number of Crews
		Oxen	Horses	Total			
1913	204	61		61	14	58	72
1914	211	65		65	13	62	75
1915	214	66		66	13	63	76
1916	218	68	1	69	12	65	77
1917	221	69	2	71	10	67	77
1918	219	69	2	71	4	68	72
1919	230	75	4	79	7	74	81
1920	236	79	4	83	6	78	84
1921	238*	80	5	85	6	80	86
1922	237	80	4	84	5	79	84

* Same as 1921 Newfoundland Census Returns

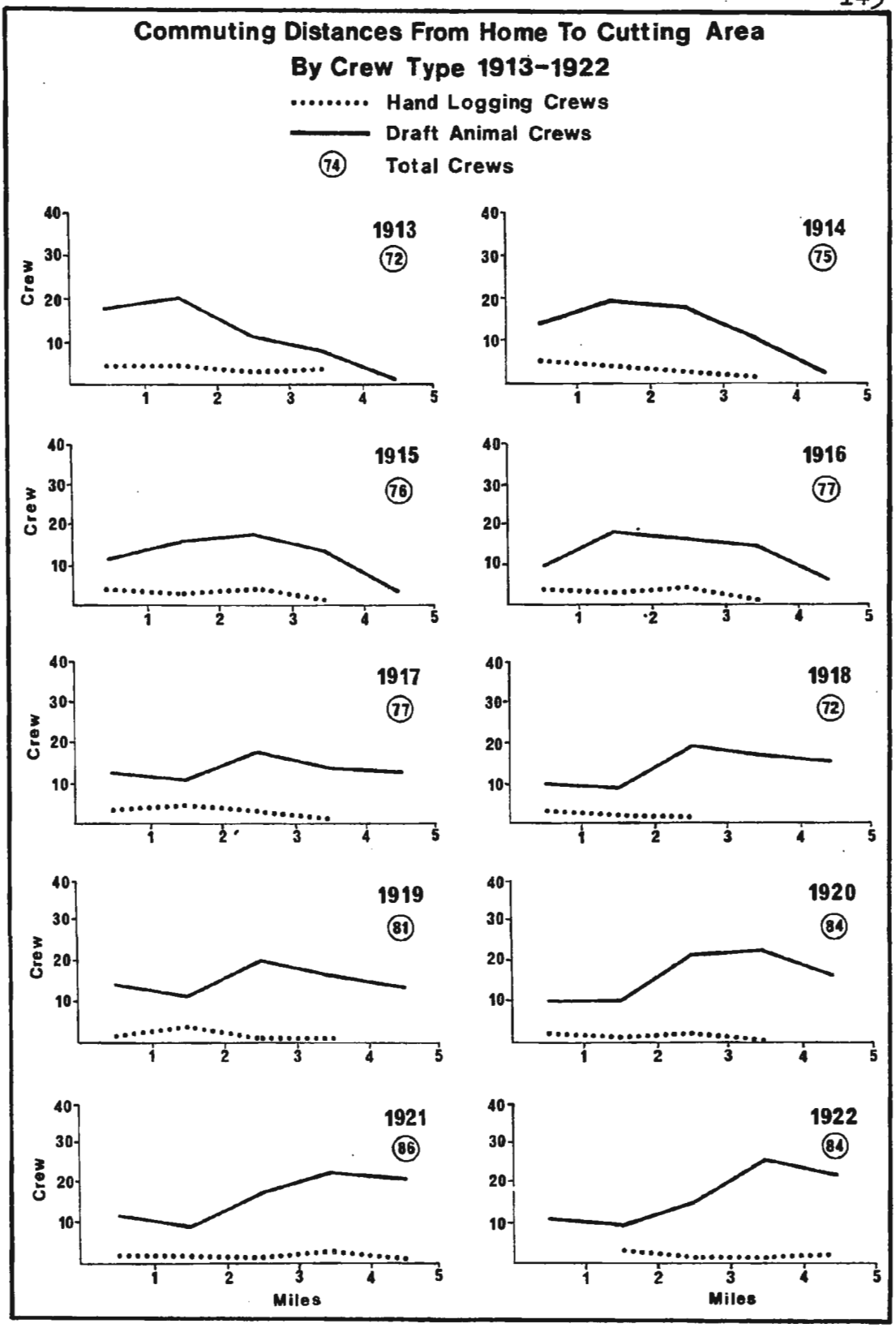
Commuting Distances From Home To Cutting Area
By Crew Type 1913-1922
Hand Logging Crews
Draft Animal Crews
(74) Total Crews
1913
(72)
1914
(75)
1915
(76)
1916
(77)
1917
(77)
1918
(72)
1919
(81)
1920
(84)
1921
(86)
1922
(84)
Crew
Miles

Figure 5-7

Table 5-4

Commuting Distances from Home to Cutting Areas, 1913-1922

Year	Within one mile		Between 1 and 2 miles		Between 2 and 3 miles		Between 3 and 4 miles		Over 4 miles		Total Crews with Animals	Total Crews without Animals
	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals	Crews with Animals	Crews without Animals		
1913	17	4	20	4	12	3	8	3	1	-	58	14
1914	13	4	19	4	18	3	10	2	2	-	62	13
1915	12	4	16	3	17	4	14	2	4	-	63	13
1916	10	4	17	3	16	4	15	1	7	-	65	12
1917	12	3	11	4	17	2	14	1	13	-	67	10
1918	10	2	9	1	18	1	16	-	15	-	68	4
1919	13	2	11	3	20	1	16	1	14	-	74	7
1920	10	2	10	1	21	2	21	1	16	-	78	6
1921	12	1	9	1	16	1	22	2	21	1	80	6
1922	11	-	8	2	14	1	25	1	21	1	79	5

approximately sixteen miles from Conne River and twenty miles from Little River. This route meant crossing unbridged rivers. These loggers, therefore, moved their families to their logging areas for the winter. By 1916 there were fourteen families from St. Alban's wintering at the mouth of Conne River and nine in the Colon's Brook-Little River area. Other loggers who lived in tilts left their families at home but visited them regularly.

Patterns of Timber Exploitation

Forest exploitation by 1917 had expanded to the point where individual cutting areas had merged on virtually all of the divides (Figure 5-6). Apart from the Little River-Colon's Brook and St. Joseph's Cove Brook watersheds, there was a single front which had advanced inland at varying rates in different parts of the Bay. By this time increasing numbers of marshes and expanses of low density sawlog and shrub forest were encountered. These interrupted the more uniform spread, resulting in irregular penetrations inland. When these non-productive areas had been by-passed, the fragmented front became more continuous again and, except up the Conne River Valley, had advanced into much of the sawlog producing forest.

By 1917, forest between rivers and their principal tributaries had been exploited relatively little by draft animal crews. Logs had either been transported to shore

landings or downstream past junctions of rivers and their tributaries. Forests between these waterways were less accessible for crews with draft animals because of risks of log jams on the tributaries. These could only be avoided, however, by hauling the logs downstream. The degree of cutting between each pair of tributaries at their lower reaches had been done mainly by hand-loggers who risked log jams by placing their logs in the waterways either at their junctions or above these points. Until the demand for logs warranted the crossing of these tributaries, crews with draft animals penetrated these valleys only on the more accessible side. This caused earlier contact with loggers who advanced to the same stands of forest from other routes. This is clearly the case in both the St. Joseph's Cove Brook and Southeast Brook watersheds (Figure 5-6). The first bridge across the eastern tributary of Southeast Brook prior to 1917 had been destroyed by a flood three years after it had been constructed, thus ending the first draft animal crew exploitation.

St. Joseph's Cove loggers had exploited a smaller area than either the St. Alban's or St. Veronica crews not only because they were fewer in number but also because they did not use draft animals until 1914-15. By then, logs in the upper reaches of the river flowing

through their settlement were being cut on one side by crews from St. Alban's and on the other by those from St. Veronica.

Loggers from St. Veronica and Head Bay d'Espoir had cut from a relatively large area, much of it in the Northwest River Valley. Crews from the latter settlement and Milltown by 1914 had cut back to the divide between Southeast Brook and Conne River. By 1917 cutting from the Conne River side met the earlier cuttings on an approximate three mile stretch. Harvesting between South East Conne Brook and Little River, however, had not met, but cutting in the Colon's Brook-Little River area had expanded into a large part of these watersheds.

Figure 5-8 shows that the extent of cutting by 1922 had increased considerably over that of 1917, particularly from Swanger Cove around the Bay to the Conne River Valley. Much of the logging front had ended at barrens, marshes, and unmerchantable timber on the plateau varying from two to five miles from the sea, except up river valleys. The relatively small amounts of virgin timber on the western side of Bay d'Espoir were in narrow strips of varying widths overlooking Long Pond and at the extremities of watersheds except for that of Northwest River. The comparatively large block of very productive forest logged by crews from that side of the Bay had little virgin timber left unharvested. In fact,

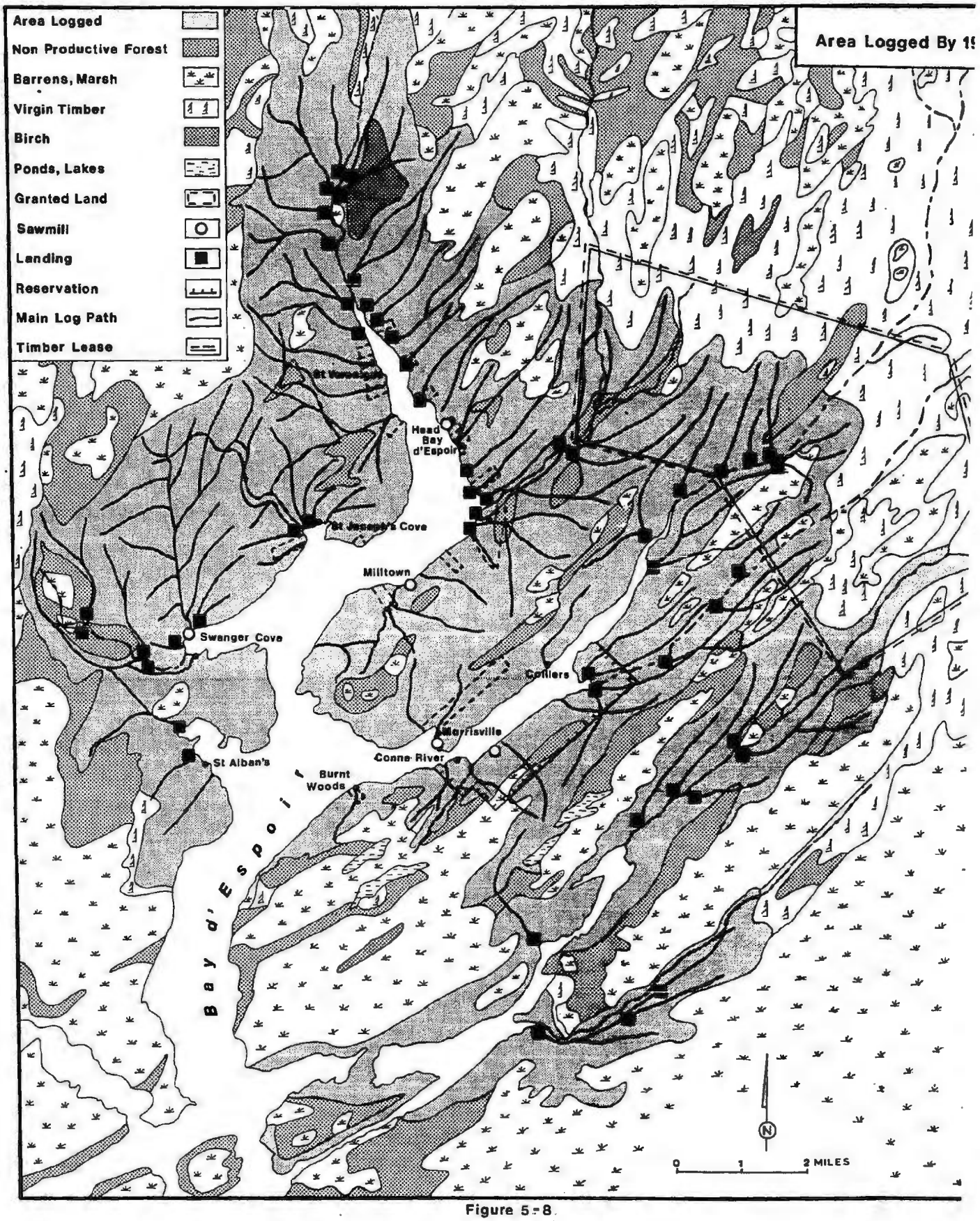
Area Logged
Non Productive Forest
Barrens, Marsh
Virgin Timber
Birch
Ponds, Lakes
Granted Land
Sawmill
Landing
Reservation
Main Log Path
Timber Lease
Area Logged By 19
Head Bay d'Espoir
St Joseph's Cove
Milltown
Swanger Cove
Colliers
Morrisville
Conne River
St Alban's
Burnt Woods
Bay d'Espoir
N
0 1 2 MILES

Figure 5-8

towards the end of this period, one or two crews from each of the communities involved logged within an area about a half of a square mile in size (1 mile by 1/2) and hauled the logs in three different directions. The advances made by crews on both sides of the St. Joseph's Cove loggers continually reduced virgin timber that was more accessible to the latter. This resulted in a faster penetration of the narrowing strip of untouched forest by the St. Joseph's Cove loggers.

In areas of comparable accessibility, the penetration by loggers varied. This was caused by differences in log quantity and quality. The most common small-scale examples are represented in Figure 5-8 by bulges on the logging front while the principal large-scale case was the shorter distances logging extended west of Swanger Cove in relation to the greater distances north of the Cove where timber was larger.

The St. Joseph's Cove and contiguous loggers eventually crossed the river tributaries but generally at their upper reaches where the risk of losing their bridges in spring flood was non-existent. The degree of exploitation between the branched Southeast Brook was proportionately less than that between the above tributaries. This resulted primarily from the more costly bridge construction and reconstruction. Distances from landings and bridge expenses prevented timber

exploitation between the branches of Northwest River, determining part of the cutting boundary in that watershed. Larger than normal penetrations up the valley of the latter river were caused by the demand of a Head Bay d'Espoir sawmill which was restricted from buying more logs from the Southeast Brook watershed because the tract of licensed timber owned by the Lake interests covered part of the watershed. Moreover, the Northwest River forest tended to produce a higher percentage of rot-free timber than the other watersheds.

The Lake-owned sawmill at Little River ceased operating in 1917, thus relaxing the winter logging pressure on the forests of the Colon's Brook-Little River area. Although the pattern of logging in these watersheds changed little between 1917 and 1922 as a result of winter logging, summer crews increased their exploitation there as is shown by the narrow strips along the banks of Little River upstream to the pond.

The largest tracts of virgin forest remaining in Bay d'Espoir by the early 1920s were concentrated in the upper valleys of Northwest River, Southeast Brook and to a lesser degree Little River, but especially up the valleys of Conne River and its two large tributaries where forests of choice timber extended north to the stands of the Gander River watershed. The exploited area by 1922 was within the two- to-five mile coastal slopes

and lower courses of river valleys. This had changed from a linear expansion of coastal/riverine strips of the hand-loggers to a more lateral expansion with the use of draft animals.

CHAPTER VI

SUMMARY AND CONCLUSIONS

Bay d'Espoir is by far the most forested part of the South Coast of Newfoundland. Long before permanent settlement was established there, the timber was used to serve the needs of the migratory fishery. Merchants located on the coast sent crews up the Bay in winter to procure timber for: ship building and repair, homes and other buildings, wharves and flakes. Moreover, an increasing number of self-employed, independent fishermen travelled up the Bay for timber. The nature of the local resources were well known by the early 1850s, when the first permanent settlements were established. In 1857 there were 85 settlers, 55 of whom were Indians, but by 1891, there were 350. Those of European descent were mainly South Coasters with a sprinkling of West Country English immigrants who had worked for South Coast fish merchants for a decade or so. They quickly established a diversified economy based essentially on commercial logging, subsistent farming, some trapping, hunting and fishing.

An increased demand for timber along the South Coast during the latter half of the nineteenth century

increased the amount of logging at Bay d'Espoir. This resulted in the extension of the selective cutting areas into narrow coastal/riverine strips, a pattern determined by accessibility and timber size and quality.

The degree of forest depletion at Bay d'Espoir was restricted by 1894 to the large trees within a half mile of the sea. The relatively small amount of depletion rarely exceeded the annual increment of forest growth except in the more accessible and productive areas within approximately 200 yards of the coast and river estuaries. Thus by the beginning of the sawmill industry in 1895, even the narrow coastal riverine strips of exploited forest had a fairly high density of log-size trees.

Sawmill demands on the forest involved greater numbers of men, both old and new settlers (post 1894), on a commercial basis. These demands were filled approximately equally by both summer and winter logging for the first five or six years; subsequently winter logging became dominant. Apart from a few crews with draft animals after 1900, all hauling was done manually. Practically all the settlers who came after the sawmill was built, were heavily dependent upon commercial logging for a living, but the majority of earlier settlers continued their more diversified economy. Moreover, the old settlers continued filling demands for timber products in markets along the South Coast established before the sawmill

came. This group, however, tended to become involved more in winter logging after 1900, when the requirement of barking logs in winter was dropped.

The addition of a second sawmill at the beginning of the twentieth century greatly increased the demand for logs, which resulted in a second influx of men from fishing villages to the south. By this time log cutting near settlements was out of the normal summer logging hauling range of a quarter mile. During winter, however, logs were transported on hand sleds for distances up to a half mile. Although summer logging continued throughout the 1895-1922 period, very little was done in virgin forest, except in the upper reaches of Little River towards the end of the study period. With minor exceptions, then, only winter logging was done in areas of virgin timber.

As areas were logged back to the feasible limits of a half mile, the majority of hand-loggers gradually moved along the coast and up river valleys. This increased commuting distances. When commuting time exceeded an hour, loggers normally lived in tilts at logging sites and returned home at mid-week and on week-ends. It was still customary between 1895 and 1905 for loggers to move their families to winter sites to eliminate commuting time.

By 1905, hauling distances around most of the bay had increased to approximately a half mile inland from the waterways. By this time, also, commuting distances ranged up to four miles, and the pattern of cutting had exceeded the limits of the pre-1895 cuttings in a number of areas. Such areas were normally inland from settlements and up river valleys but still cuttings had expanded in long, narrow coastal/riverine strips.

Draft animals, introduced in 1900 and monopolized by a single merchant, were not accepted by the majority of logging crews, at least before 1905. This resistance resulted primarily from economic and cultural influences - the ineffective use of the ox for the first three to four years, unfavourable leasing terms offered by the merchant for oxen, and the apparent conservatism in the way of life of the loggers. This delay in the acceptance of the ox increased the lengths of the coastal/riverine logging strips which in turn increased commuting distances and the number of winter tilts.

Although poorly adapted to animal draft, manually-operated sleds were used with oxen, a result of inexperience in the use of proper sleds. With experience came expertise and in 1904 loggers adopted a more efficient sled type. In addition, as transporting distances increasingly exceeded hand-logging range, loggers had to incur the extra cost of leasing, buying or

rearing oxen to maintain their level of income. The use of the ox not only permitted log cutting at greater hauling distances but made commuting distances generally equivalent to transporting distances since men went into the woods along pathways used for hauling. Even though the practicability of animal draft was realized by all loggers, the use of the ox resulted in the additional work of cutting wider paths, constructing stronger bridges, and the corduroying of unfrozen swamps. Regardless of additional tasks, the ox assured the logger of greater economic security. The change in the technology was also essential for the continued expansion of the sawmilling industry after 1905 because of increased hauling distances.

The increased winter log production during the transition period, a result of the greater use of the ox, began to change the linear expansion of cutting from narrow coastal/riverine strips to inland penetrations. These individual penetrations, often radial in pattern in relation to settlements, had merged by 1912 into a logging front which continued advancing inland.

Physiographic conditions tended to become proportionately less favourable with increased transporting distances. The driving capacities of rivers, except the Conne, were also exploited to the upstream limit, where there were high risks of log jams.

Although Crown Land forest far exceeded the combined total of small forest grants to individual families and the twenty-five square mile licensed tract, cuttings were proportionately more numerous on Crown Land. Much of the Crown Land forest was within more accessible routes than the licensed tract and also permitted unconditional cutting, while the granted forest lots were rarely as depleted of their saw timber as Crown Lands. Repeated cuttings were made in most areas between five and ten years, depending on the forest growth.

Throughout the War Years and into the early 1920s the price for logs continued to increase above previous rates of increase. With rising prices, it became feasible for crews to haul logs greater distances. Since the number of logs hauled per animal declined with increasing distance, only the increasingly larger logs, which were more valuable per cubic unit, were hauled. The advantage to the logger was that the rate with which the number of daily trips declined lessened as distances increased. Even though the reduced yield of logs per input at greater distances was primarily the result of increased distances, the author attributes the diminution of logs hauled (to some degree) to the intensification of physiographic obstacles.

When distances to seaside landings exceeded approximately three miles, riverside landings nearer the

logging sites were used. Thus full advantage of spring run-offs was taken for log driving. As distances to logging sites up river valleys increased, commuting time became so great for a minority of loggers, even for weekend travel, that they resumed moving their families to winter logging areas. The proportionate number of families who moved to these winter houses was smaller than during the hand-logging phase, primarily because more children were attending school in the latter period.

By making accessible most of the forest within four miles of waterways, draft animal use had by 1922 resulted in quadrupling the area exploited in 1905. Thus the pattern of log cutting had changed as hypothesized: that change in the technology of log transportation from manual labor to the utilization of draft animals in Bay d'Espoir early in the present century resulted in the change from a linear pattern of log cutting along the shore and lower courses of rivers to a lateral pattern of expansion. In the simplest terms, the changed cutting pattern at Bay d'Espoir can be seen as the product of the draft animal, without which logging could not have continued beyond the level of production it had reached by 1905. There were other factors, however, which contributed to the continued increase in logging until 1922, when a temporary decline occurred. The primary factor was market demand, particularly the increase during

the War Years and after.

The cutting and transporting of a heavy bulky and cheap raw material, such as logs, from wilderness areas by means of relatively primitive technology was a time consuming and expensive process. Faced with the key problem of hauling, the Bay d'Espoir loggers gradually developed expertise in wilderness transportation. Using a hand-sled, a man could move up to four logs, depending on their size and on the hauling conditions. A draft animal load was generally four to five times the size of a man's load. Hauling time, except for distances in excess of three miles, rarely exceeded cutting time, but there was a greater capital investment involved in the transportation of logs.

Although there were differences in labor efficiency and working conditions, the differences in the costs in time and labor in obtaining logs from equivalent distances were relatively minor. The difference in costs of hauling from varying distances was of critical importance in determining the spatial patterns of cutting; however, local variations in the density of suitable trees were also significant.

In the traditional logging economy of Bay d'Espoir, timber was abundant but labor expensive and the major consideration of the logger was not so much the depletion

of the local resource as was the reduction in time consumed in harvesting it. Capital for investment in improved technology was scarce, and methods of hauling remained primitive and labor intensive. Like most pioneer economies in frontier North America, the premium was more on labor than on the resource, which was spatially vast, and the pattern of exploitation was land extensive. Self-employment in a labor intensive occupation caused loggers to minimize their cost of labor. The basic concern in Bay d'Espoir, where men lived on the brink of subsistence, was to think in terms of how much time it took to obtain sufficient logs to pay for their food and supplies. If the loggers could have reduced considerably the demand on time and labor in overcoming distance by the utilization of a more advanced technology, they would have become quite wealthy.

The distances logs were transported on land were influenced in varying degrees by changing combinations of interrelated physiographic, economic, technological, cultural and political factors. The logger faced a variety of physical impediments: ascents, descents, swamps including marshes, rivers, the sizes of logs, and climatic variations in winter. The cost of improving the primitive technology was a major economic deterrent. Moreover, the innate conservatism or inertia of tradition

retarded the rate of innovation. The allocation of a timber lease also resulted in a change in logging sites for a number of loggers.

Given the level of technology and environmental constraints, the author feels that the locational strategies of logging crews were preceptive if not always optimal. Very rarely were logging locations chosen without all the potential influencing factors being taken into account. There were always risks involved. Such risks were low spring run-offs for log driving, lack of sufficient snow, and insufficient frost to freeze large swamps and marshes.

If logging had been a twelve month operation instead of being seasonal and part of a multiple-base economy, it would have been to the loggers' advantage to have lived at the logging sites. Instead, the best locations for farming determined the locations of permanent settlements. Such sites were on the more level and fertile pockets of land by the sea, a location that also allowed for fishing and easy transportation. A pattern of small loosely agglomerated settlements dispersed in a linear fashion around the Bay evolved. Although settlement did not expand to all the habitable foreshore, the spreading of settlement along the shore was strategic in terms of logging expansion inland.

The boundaries of cutting were virtually set by 1922 and since there were no changes in the technology of hauling until the 1950s, most logging remained within that area. Sawmilling declined rapidly after the late 1940s and despite the utilization of machinery on a small scale in the woods operation throughout the 1950s, the industry virtually disappeared. The amount of exploitation in virgin forest as a result of mechanization was relatively insignificant. The decline in the sawmill industry actually started in the early 1920s with the cutting of pit props and pulp wood although lumber production increased during the Second World War and for several succeeding years.

It was only through extremely detailed knowledge of every logging crew that a study such as this could be done. The author feels that the material gathered serves as a basis for understanding the spatial patterns of a relatively primitive type of woods operation. This study has attempted to show how the location of cutting operations in non-mechanical technology worked with a handful of loggers in a small area.

There are few studies of locational attributes of primary resource exploitation at the micro-level. There is need for analogous studies, not only in forest exploitation but in other resource areas such as agriculture and in the fishery, where there are parallel

problems. Chisholm indicated that the study of location problems have emphasized almost exclusively industrial and urban situations. It is hoped that this thesis will spark further research on primary resource exploiters.

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