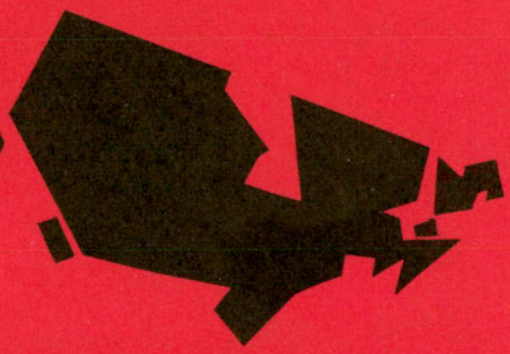
LANDOWNERS and LAND USE in the TANTRAMAR AREA, NEW BRUNSWICK



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LANDOWNERS and LAND USE in the TANTRAMAR AREA, NEW BRUNSWICK

Prepared by C. I. Jackson and J. W. Maxwell

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Preface

In November 1967, the Government of New Brunswick requested the Federal Government to carry out an investigation of land use in the Tantramar area of the province under Part VIII of the Agricultural and Rural Development Act. Subsequently, an interdisciplinary team consisting of staff members of the federal Departments of Forestry and Rural Development, Indian Affairs and Northern Development, and Energy, Mines and Resources, was organized to carry out the study. On completion of the work a report outlining the principal findings and recommendations was submitted to the New Brunswick Government. This publication is based on the original study report. It has been published jointly by the Canada Land Inventory (C.L.I.), Department of Regional Economic Expansion, and the Policy Research and Coordination Branch, Department of Energy, Mines and Resources, as an example of the integrated use of the C.L.I. land capability analysis and socio-economic studies in development planning of land resources. It is believed that the report, besides being of interest to the people of the Tantramar area, should be a useful methodological guide to land resource planners.

The following officers conducted the original study and their cooperation in the preparation of this report is gratefully acknowledged: C. Raymond and R. Cox, formerly of the Department of Energy, Mines and Resources; N. Williams and C. Demings, Engineering Services, Atlantic Region, Department of Regional Economic Expansion; N. Ball, Implementation Division, Department of Regional Economic Expansion; P. Dean and A. Smith, Canadian Wildlife Service; P. Rogers, formerly Regional Coordinator, Recreation Sector, Canada Land Inventory, Department of Regional Economic Expansion.

J.W. MacNeill
Director, Policy Research and Coordination Branch
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Abstract

This report presents an indicative land-use plan for the marshland area at the head of the Bay of Fundy in the Province of New Brunswick. The plan is based on analyses of the general economic conditions affecting Maritime agriculture, the land ownership structure, the present land-use pattern, the role which land resources currently play as income generators for their owners, and the physical potential of the land for different uses.

The introductory section outlines the historical development of agriculture in the area. It is followed by an examination of the landowner structure and of the socio-economic characteristics of the landowners possessing five or more acres. Agricultural land use and farming activity are then described; included is a discussion of the structural and economic problems facing the area's farmers. The next section, entitled "Remedying the situation" outlines the development possibilities for agriculture, waterfowl habitat and outdoor recreation, and the report concludes with the presentation of the indicative land-use plan.

Préface

En novembre 1967, le gouvernement du Nouveau-Brunswick demandait au gouvernement fédéral d'effectuer une étude de l'utilisation des terres dans la région de Tantramar aux termes de la partie VIII de la Loi de l'expansion rurale et agricole. Ultérieurement était constitué un groupe d'étude interdisciplinaire formé de représentants des ministères fédéraux des Forêts et du Développement rural, des Affaires indiennes et du Nord canadien et de l'Énergie, des Mines et des Ressources. A l'issue des travaux, un rapport faisant état des principales constatations et recommandations du groupe était présenté au gouvernement provincial. La présente publication s'inspire de ce rapport publié conjointement par le service de l'Inventaire des terres du Canada du ministère de l'Expansion économique régionale et la Direction de l'étude des politiques et de la coordination du ministère de l'Énergie, des Mines et des Ressources, afin d'illustrer l'avantage qu'il y a à tirer de l'intégration des services d'analyse de la division de l'Inventaire et des études socio-économiques dans la planification de la mise en valeur des terres. Outre son grand intérêt pour les habitants de la région de Tantramar, le rapport servira de guide méthodologique aux planificateurs de l'utilisation des terres.

Nous tenons à remercier les personnes suivantes, qui ont bien voulu collaborer à la préparation du présent rapport: MM. C. Raymond et R. Cox, anciennement du ministère de l'Énergie, des Mines et des Ressources; MM. N. Williams et C. Demings, de la Direction des services techniques, région de l'Atlantique, et M. N. Ball, de la Division des services de mise en oeuvre, ministère de l'Expansion économique régionale; MM. P. Dean et A. Smith, du Service canadien de la faune; M. P. Rogers, anciennement coordonnateur régional, Secteur de la récréation, Inventaire des terres du Canada, ministère de l'Expansion économique regionale.

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Résumé

Le présent rapport offre un plan indicateur de l'utilisation des terrains marécageux situés au fond de la baie de Fundy, dans la province du Nouveau-Brunswick. Le plan est fondé sur l'analyse des conditions économiques d'ordre général qui régissent l'agriculture des provinces Maritimes, du régime de propriété et des tendances actuelles dans l'utilisation des terrains ainsi que du rôle qu'ils jouent à l'égard des revenus et du potentiel des terres à diverses fins.

L'introduction relate l'évolution historique de l'agriculture dans la région à l'étude. Vient ensuite un examen de la structure de la propriété et des caractéristiques socio-économiques de propriétaires de terrains de cinq acres ou plus. Suivent des descriptions de l'utilisation des terres agricoles et du genre de culture, y compris l'étude des problèmes de structures et de nature économique que connaissent les cultivateurs de la région. La section suivante, qui traite des remèdes possibles, fait état des possibilités de développement agricole, de mise en valeur du milieu naturel des oiseaux aquatiques et d'aménagements récréatifs. Le rapport se termine avec la présentation du plan indicateur de l'utilisation des terrains.

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LANDOWNERS AND LAND USE IN THE TANTRAMAR AREA, NEW BRUNSWICK

A study of land utilization and land development possibilities in Sackville and Westmorland parishes, Westmorland County, New Brunswick

Prepared by C.I. Jackson and J.W. Maxwell**

Introduction

The tidal marshes of the Tantramar area at the head of the Bay of Fundy form one of the most distinctive physical units in the Maritime Provinces. Straddling the New Brunswick-Nova Scotia boundary on the Chignecto Isthmus, the fingers of low reclaimed land present a landscape which, in microcosm, is more akin to the grasslands of the Canadian Prairies than the rock-and-forest Appalachian landscape that typifies much of New Brunswick and Nova Scotia. Several distinct marsh bodies exist in the New Brunswick section of the area, the largest being located in the Tantramar River watershed. Smaller, but still significant, marshes are located east of the Tantramar River in the watersheds of the Aulac and Missaguash rivers (see Figure 1). Together, these marshes form the largest single block of marshland in the Maritimes and, as the site of early Acadian settlement, have an agricultural history that dates back almost 300 years.

The marshes consist of silts deposited in their present location by the high tides at the head of the Bay of Fundy (Aalund and Wicklund, 1949, pp. 14 and 95). Before they could be adapted for agriculture it was necessary to devise a means of protecting them from further tidal inundation. The Acadians, who arrived in the area in 1672, applied an ingenious method of water control which permitted them to utilize the marshes for grain and forage production. By constructing dykes along the foreshores and by building tidal dams, called aboiteaux, across the mouths of streams, they succeeded in preventing the tidal penetrations while still permitting freshwater run-off. Marsh reclamation was continued by the New Englanders and British immigrants who replaced the French settlers after the Acadian expulsion of 1755. Additional areas of marsh were protected in successive decades and the Tantramar became an important agricultural unit. The most recent reclamation work, carried out under the Maritime Marshland Rehabilitation Act, 1948 (MMRA)**, replaced many of the earlier structures and provided protection for virtually all the marsh bodies in the Tantramar area.

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Policy Research and Coordination Branch,
Department of Energy, Mines and Resources

**This Act enabled the Government of Canada to undertake the construction, reconstruction and maintenance of dykes, aboiteaux and breakwaters in the three Maritime Provinces. Such work was dependent on the willingness of these provinces to provide the lands necessary for the works, to undertake the reconditioning, construction and maintenance of the internal drainage systems and eventually to assume the operation and maintenance of all protective works. By the end of the 1968-69 fiscal year, a total of 232 miles of dyke, 404 aboiteaux, 5 major tidal dams and 20 miles of river bank control installations had been constructed in the Maritime Provinces under the Act. Federal expenditures amounted to nearly $19,000,000 for construction projects and maintenance, and $9,000,000 for engineering, supervision and administrative services (Canada, Department of Regional Economic Expansion, 1970, pp. 32 and 45).

When responsibility for maintaining the MMRA network of dykes, aboiteaux, dams and breakwaters was transferred to the provinces in April 1970, there were more than 82,000 acres of protected marshland in the three Maritime Provinces. Nearly 22,000 acres (27%) are located in Sackville and Westmorland parishes which also represents over 70 per cent of New Brunswick's total acreage of reclaimed marsh. About $1.9 million, or one-tenth of the total federal MMRA expenditure on construction, was spent in the Tantramar area. The Tantramar, therefore, has a long history of water management for agriculture and has received major investments for the construction of protective works and internal drainage systems.

The agricultural economy of the Tantramar area has known periods of considerable prosperity, particularly during the 19th century. The first half of the century saw the rise of the Maritime Provinces' flourishing "wind, wood and water" economies (timber, shipbuilding, carrying trade and fisheries). Dyked marshland was ideally suited for forage production and the marshland farmers prospered by supplying livestock products for a growing population and hay for the horse-drawn transport used in the timber industry. During the second half of the century, the forage markets dependent on the declining timber industry contracted; however, profitable alternate outlets were provided by the expanding hay markets in the rapidly growing metropolitan centres of the Atlantic seaboard.

After the turn of the century the demand for hay began a secular decline with the emergence of the automobile. Declines in the values of dyked land and marshland husbandry followed. World War I, although stimulating the demand for agricultural products and thus temporarily boosting marshland agriculture, also saw the inauguration of mass production of motor vehicles. This latter development effectively ended the era of prosperity based on the cash sale of hay. Moreover, innovations in transportation technology at this time permitted meat from other parts of Canada to compete with local beef. This increased the difficulties of all Maritime livestock producers, including the marshland farmers already in beef production as well as those who were attempting to diversify their operations by going into beef production. The severe price depression which followed World War I seriously affected the cattle industry and resulted in a considerable reduction in livestock on marshland farms and had a consequent impact on land use (Haase, 1954, p. 13).

The interwar period was a difficult one for Maritime agriculture generally, and, although the economy of the Tantramar area performed favourably, relative to most mixed-farming areas in New Brunswick and Nova Scotia, very little work was done to maintain or extend the protective works; in fact, the physical condition of the dykes was permitted to deteriorate (Haase, 1954, p. 13).

With World War II came a new and rigorous demand for agricultural commodities and the opportunity for the marshland farmers to regain former levels of prosperity However, a new problem emerged to replace the long-standing market problem. Before the former levels of marshland productivity could be regained, considerable reconstruction and replacement of the protective works was required. Many of these works had been seriously damaged in the previous two decades because of inadequate maintenance, and several marsh bodies had "gone to sea". When attempting to rehabilitate their marshlands to take advantage of the war-time markets, farmers found that the same war economy that was creating new markets for their products was also making the task of maintaining and improving the protective works increasingly more difficult. As Haase noted:

> . . . forces associated with the changing economy of the country were operating to expedite the decline of the marshes. The wages of labour and the opportunities for industrial employment resulted in a substantial migration of agricultural workers to manufacturing regions. Dyke construction and maintenance was largely done with hand labour, and a scarcity of this labour raised the cost of this work considerably above its previous levels. This increase in costs, together with migration and demise of skilled dyke workers, resulted in the decline in the condition of the protective works. (Haase, 1954, p. 13)

Marshland farmers found it difficult to carry out normal maintenance on the remaining well-preserved protective works, let alone undertake major reconstruction on works which had been seriously damaged. The physical condition of the marshes degenerated to the point that in 1943-44 emergency aid was given to the marshland owners by the provincial and federal governments for the maintenance of the protective works. The program of emergency aid was replaced by a more substantial program of public assistance with the passing of the Maritime Marshland Rehabilitation Act in 1948. The program of construction and reconstruction of protective works carried out under the MMRA was well conceived and was very effective in retaining the marshes for agriculture. However, the MMRA engineering program could not protect the marshland farmers from the technological and economic changes of the post-war period which were having an adverse effect on Maritime agriculture generally. Economic studies carried out in the 1960s indicated that the agricultural utilization of marshlands was once again on the decline (Retson, 1966; Buckley and Tihanyi, 1967).

As D.W. Carr (1969) has noted, the North American agricultural industry has been characterized by rapidly

changing technological and marketing environments since World War II. These new environments require large enterprises, high levels of farm management and marketing expertise. The Maritimes, with their many small-scale enterprises, have found great difficulty in adjusting to these new environments.

Evidence of the lagging response of Maritime agriculture to new agricultural research findings and technological innovations has been recorded in a recent report on the industry:

> Increases in agricultural efficiency and output are related to the use made of the products of research and technology. One indication of the extent of such use by farmers is provided by the record of their expenditures for machinery, power equipment, fertilizers, lime, pesticides, herbicides, better feeds, improved seed and other such inputs. In the period 1946-65 such expenditure increases on the whole were less in the Maritime Provinces than elsewhere. The increase in Quebec was 139 per cent, Ontario 124 and for all of Canada, 129 per cent. Maritime area increases were: Prince Edward Island 98 per cent, Nova Scotia 75 and New Brunswick 59 per cent. Production increases were of a similar order, from 2.5 to 3.3 per cent annually in all areas from Quebec to British Columbia, compared with 0.8 per cent for the Maritime Provinces. (Booth, Retson and Heighton, 1970, p. 5).

The lower utilization of the products of research and technology in Maritime agriculture is reflected in labour productivity and net farm income. Booth *et al.* have noted that:

> . . . the gross value of production per farm worker on Maritime farms, 1961-65, averaged $3,459 compared with $5,512 for Canada as a whole. Agricultural labour productivity, 1946 to 1965, in the Maritime area indicated a growth rate of 3.6 per cent annually compared with a national rate of 4.6 per cent. Net farm income (in the Maritimes) declined 5 per cent in the period 1941-65 while at the all Canada level it was up 59 per cent. (Booth, Retson and Heighton, 1970, p. 10).

Some progress has been made towards improving the competitive position of Maritime agriculture, but additional major changes in the structure of the industry, and upgrading of management skills and marketing systems must be made if agriculture is to remain an important sector in the regional economy. Physical improvements to the land resource will not alone be sufficient to improve the competitive position of the industry. They must be associated with the creation of larger and better managed farm units and with a realistic evaluation of markets.

It was against this background that the New Brunswick Government was faced in 1967 with new appeals by the Tantramar marshland owners for additional improvement work not already scheduled for implementation under the MMRA program. The provincial government decided that a thorough evaluation of future prospects for farming and other land uses in the Tantramar area was required before any additional inputs of public funds were committed to further works. Consequently, in November 1967, the Agricultural and Rural Development Administration (ARDA) Atlantic Regional Office, Canada Department of Forestry and Rural Development, was requested by the Province of New Brunswick to carry out a preliminary study of land use and tenure in the area under the terms of Part VIII of the Agricultural and Rural Development Act, with the object of evaluating the need for, and the feasibility of implementing, a watershed development plan.

The ARDA Regional Office enlisted the services of several federal agencies to form an interdisciplinary group to conduct the study. Surveys were carried out between November 1967 and September 1968 and a detailed report was submitted to the Government of New Brunswick on completion of the study. The present account draws on that report but concentrates on the man-land relationship and on the integration of the various surveys into an indicative land-use plan for the watershed area.

The study design

To ensure that all the relevant factors affecting present and potential land use in the Tantramar area were considered, the research program involved an analysis of the ability of the landowners in the area to take advantage of land development projects, as well as an analysis of the area's physical potential for different uses. To obtain the data required in these analyses, special surveys of present land use and potential use for agriculture, recreation and wildlife were made; large scale property maps of the marshlands and adjacent uplands were prepared; and landowners possessing five acres or more were interviewed. Finally, because landowner attitudes are conditioned by the community social environment, a sociological study of the community structure and an examination of local trade and service areas were made. Existing economic studies of agriculture in the Maritimes and the Tantramar area were used to supplement the economic data collected in the interview program.

The areas examined in the various surveys differed slightly. The evaluation of the physical base covered all the area within the main watersheds, whereas the

property mapping, land-use survey and interview programs were mainly restricted to the marshlands and the adjacent uplands. The focus of the analysis was the social and economic aspects of the man-land relationship and the identification of land development possibilities. The results of the analyses were then used to prepare an indicative land-use plan for the area.

It should be noted that the surveys dealt only with the rural lands and with landowners possessing five acres or more. Consequently, the conclusions reached, and the indicative land-use plan developed, do not consider the conditions, needs and opportunities of the urban centres and their populations, or of the rural people who own no land or hold parcels less than five acres in size. Additional studies would be required to produce a truly comprehensive development plan for the area that would embrace both urban and rural development possibilities.

Responsibility for the various tasks was accepted by the following federal agencies:

1. Department of Forestry and Rural Development.*
   - (a) Engineering Services, Atlantic Regional Office.
     - (i) Analysis of the area's soil, climate and drainage characteristics with particular emphasis on the evaluation of land capability for agricultural use.
     - (ii) Review of the history of marshland utilization.
   - (b) Regional Coordinator, Recreation Sector, Canada Land Inventory.
     - (i) Evaluation of the area's potential for outdoor recreation activity.
     - (ii) Identification of the recreation development possibilities.
   - (c) Program Development Section, Atlantic Regional Office.
     - (i) Sociological study of the community structure.
     - (ii) Analysis of landowner attitudes towards area development.
2. Department of Indian Affairs and Northern Development, Maritime Field Office, Canadian Wildlife Service.
   - (i) Evaluation of the wildlife habitat.
   - (ii) Identification of possibilities for improving or reclaiming wildlife habitat and specifications for management programs.
3. Department of Energy, Mines and Resources, Economic Geography Division, Geographical Branch.*
   - (i) Preparation of maps showing properties of five acres or more in size.
   - (ii) Completion of socio-economic interviews with landowners having properties five acres or more in size.
   - (iii) Evaluation of present land use and tenure.
   - (iv) Preparation of an indicative land-use plan for the area in consultation with the other agencies participating in the study.
   - (v) Preparation of a summary report incorporating the findings of the specialized analyses and including recommendations on resource development.

The Tantramar area

The marshlands and adjacent uplands are located within an area of 177 square miles occupied by the watersheds of the Tantramar, Aulac and Missaguash rivers in Sackville and Westmorland parishes of Westmorland County, New Brunswick (see Figure 1). Most of the population of these parishes is concentrated in the centres of Sackville and Port Elgin and along the upland fringes bordering the marshes. The greater part of the upland is forested, is in relatively large holdings and is sparsely settled.

Traditionally, the marshland owners have located their farmsteads on upland at the marsh edges and have combined both upland and marshland within their holdings. Consequently, the rural population is strung out in a linear pattern along the narrow ridges that run between the marshes, and on the western margin of the main marsh bodies between Sackville and Cookville. The most prominent ridge, Fort Cumberland Ridge, separates the Aulac and Missaguash watersheds. The nucleus of the early Acadian settlement was centred on this ridge and Fort Beausejour, the early fortress that maintained the French presence in the area, was constructed at its southern end. Today, most of the population in the eastern part of the area is still located on this ridge where it forms a distinctive rural community. A rather larger rural community is located on the western side of the Tantramar marsh and between them these two groups contain most of the active marshland farmers in the two parishes.

In 1966 the population of Sackville and Westmorland parishes was slightly over 8,000 people (Table I). The rural population numbered approximately 4,300 and the towns of Sackville and Port Elgin contained the remaining 3,700. Although the rural population

*This department ceased to exist in April 1969 and these agencies were then transferred to the new Department of Regional Economic Expansion.

*In April 1968 the Geographical Branch was disbanded; the Division is now the Economic Geography Section in the Policy Research and Coordination Branch.

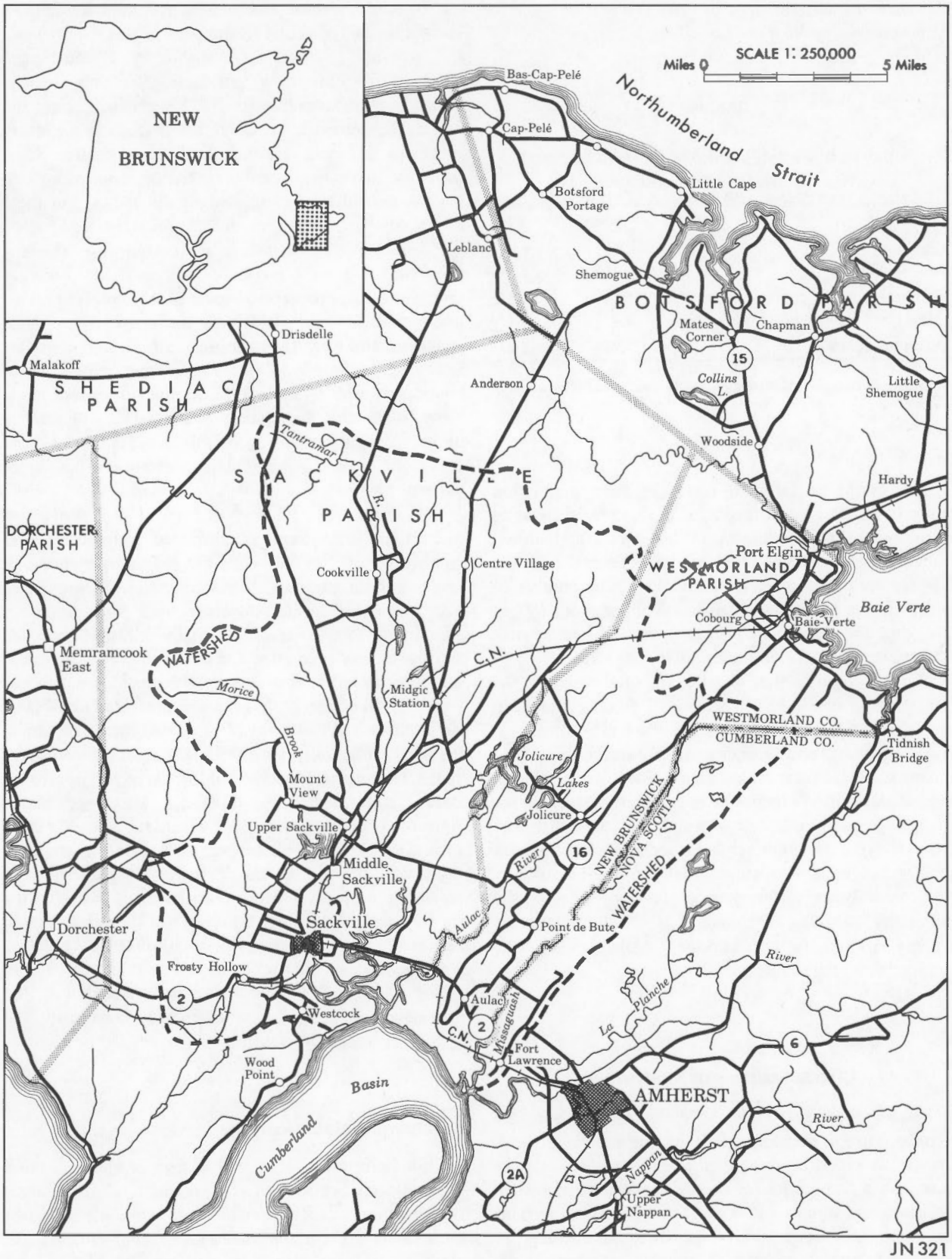

FIGURE 1. Tantramar area, New Brunswick.

remained virtually the same in 1966 as it was in 1931, its composition showed a marked change.

Table I

Population: Sackville and Westmorland parishes, New Brunswick, 1931 and 1966*

	1931	1966
Rural farm	3,131	1,004
Rural non-farm	1,112	3,341
Rural total	4,243	4,345
Urban (Port Elgin and Sackville)	2,971	3,774
Total population	7,214	8,119

*Dominion Bureau of Statistics, 1931 and 1966 Censuses of Canada.

The ratio of farm to rural non-farm population shifted significantly in favour of the non-farm group in response to major changes in the area's agricultural industry and in the national economy generally. In the 35-year period between 1931 and 1966, the number of census farms in the two parishes declined from 692 to 216, and the acreage of farmland was reduced by over 40 per cent, from 77,000 acres to 46,000 acres.

Table I suggests that many of the rural people in the Tantramar have been successful in finding non-farm employment in the towns of Sackville and Amherst, or, if not successful in this endeavour, are suffering reduced incomes. This means, in turn, that many of the landowners may no longer be dependent on the land for their major source of income and that their attitudes towards land development have probably undergone a major change. It also means that, for the landowners who have been suffering a decline in income, the possibility of taking advantage of any land development activity is remote because they probably lack the required financial resources.

Characteristics of landowners

The land-use pattern in the Tantramar area is mainly a reflection of decisions made by the individual landowners. A practical land development program must be based on a recognition of the importance of individual decisions and intentions. It must also take into account the willingness and ability of these landowners to respond to such a program. A major component of the research study was, therefore, an interview survey of all landowners holding five or more acres.

To identify these landowners and their holdings, a knowledge of the actual tenure pattern was required and this was not immediately available. As in most rural areas of the Maritime provinces, the only official cadastral maps available for the Tantramar area are the original land-grant maps which are frequently a century or more old and are hopelessly out-of-date. Some property maps had been prepared in connection with MMRA marshland reclamation in the 1950s, but these cover only part of the area and also are outdated.

As an interim measure, a working map showing properties five acres and larger was constructed for use in the project. Property boundaries were plotted on air photographs in the field with the assistance of local residents, and were then transferred to a base map at a scale of 1:15,840 (4 inches to one mile). These boundaries were rechecked during the subsequent interviews with the individual landowners. Although a property map compiled in this way is not a legal document, it does give an adequate picture of the tenure pattern.

On the basis of the map of landholdings, a program of personal interviews was conducted during the winter and spring of 1967-68 with the aim of contacting all landowners in the area. Interviews were obtained from 372 households which together hold 960 properties containing 58,945 acres. Virtually all the improved marshland was accounted for in the interview program. The interviewed landowners hold through ownership or lease 13,000 of the 22,000 acres of protected marshland. An additional 2,100 acres of protected marshland are in the local community pasture; 3,800 acres are contained in the Tintamarre National Wildlife Area and approximately 1,200 acres of the 6,000-acre Missaguash Marsh Waterfowl Management Area, which straddles the New Brunswick-Nova Scotia border, are located in the New Brunswick portion of the Missaguash watershed. The remaining acreage of protected marshland is accounted for by roads, waterways, holdings less than five acres in size and properties owned by school districts, churches, governments and non-residents who could not be contacted. The 46,000 acres of upland reported in the interviews include all the improved acreage on the upland fringes of the marshes.

Landowner classification

Fundamental to the investigation of the social and economic implications of the present landowner structure was the classification of socio-economic status of the owners. This status was based on four criteria: age, place of residence, size of income and source of income. Six landowner groups were distinguished and are defined as follows:

Table II

Land and landowners in the Tantramar area, New Brunswick, 1967-68*

	LANDOWNER GROUPS						
	Commercial farmers	Non-commercial farmers	Non-farmers I	Non-farmers II	The elderly	Non-residents	All owners
1. Number of owners	39	27	104	34	139	29	372
2. Per cent of all owners	10.5	7.3	28.0	9.1	37.4	7.8	100
3. Number of properties	244	84	201	66	330	35	960
4. Average number of properties per owner	6.3	3.1	1.9	1.9	2.4	1.2	2.6
5. Acreage held	19,829	4,782	10,442	2,680	18,888	2,324	58,945
6. Per cent of total acreage	33.6	8.1	17.7	4.6	32.0	4.0	100
7. Improved acreage	9,574	1,846	2,635	646	4,170	31	18,902
8. Per cent of total improved acreage	50.6	9.8	13.9	3.4	22.1	0.2	100
9. Improved marshland acreage	5,208	824	1,020	233	1,570	15	8,876
10. Per cent of total improved marshland acreage	58.7	9.3	11.5	2.6	17.7	0.2	100
11. Improved upland acreage	4,366	1,022	1,615	413	2,594	16	10,026
12. Per cent of total improved upland acreage	43.5	10.2	16.1	4.1	25.9	0.2	100
13. Average acreage per owner	508	177	100	79	136	80	158
14. Average improved acreage per owner	246	68	25	19	30	1	51
15. Average improved marshland acreage per owner	134	30	10	7	11	0.5	24
16. Average improved upland acreage per owner	112	38	15	12	19	0.5	27

*The table refers to the owners contacted in the interview program and their reported acreage. Because some non-resident owners could not be contacted, the table underestimates the number of owners and acreages for this landowner group.

Commercial farmers (CF):

:Gross crop, livestock* and woodlot income of $3,750 or more per annum.
:No age limit.

Non-commercial farmers (NCF):

:Gross crop, livestock* and woodlot income of less than $3,750 per annum.
:Agriculture major source of income.
:Owner less than 60 years of age.

Non-farmers I (NFM):

:Non-farm income of $3,000 or more per annum.
:Non-farm work major source of income.
:Owner less than 60 years of age.

Non-farmers II (NFL):

:Non-farm income of less than $3,000 per annum.
:Non-farm work major source of income.
:Owner less than 60 years of age.

The elderly (E):

:Gross crop, livestock* and woodlot income of less than $3,750 per annum.
:Owner 60 years of age or over.

Non-residents (NR):

:Owners living outside the study area, including owners residing in the local service centres of Sackville, Amherst, and Port Elgin.
:Estates, government, school and church properties.

It should be stressed that this classification system was used only as a tool of analysis and has no legal or similar significance. The actual classification of individuals may be erroneous in certain cases; e.g., a farmer classed as non-commercial may on more detailed exam-

*Includes income from the sale of livestock and livestock products.

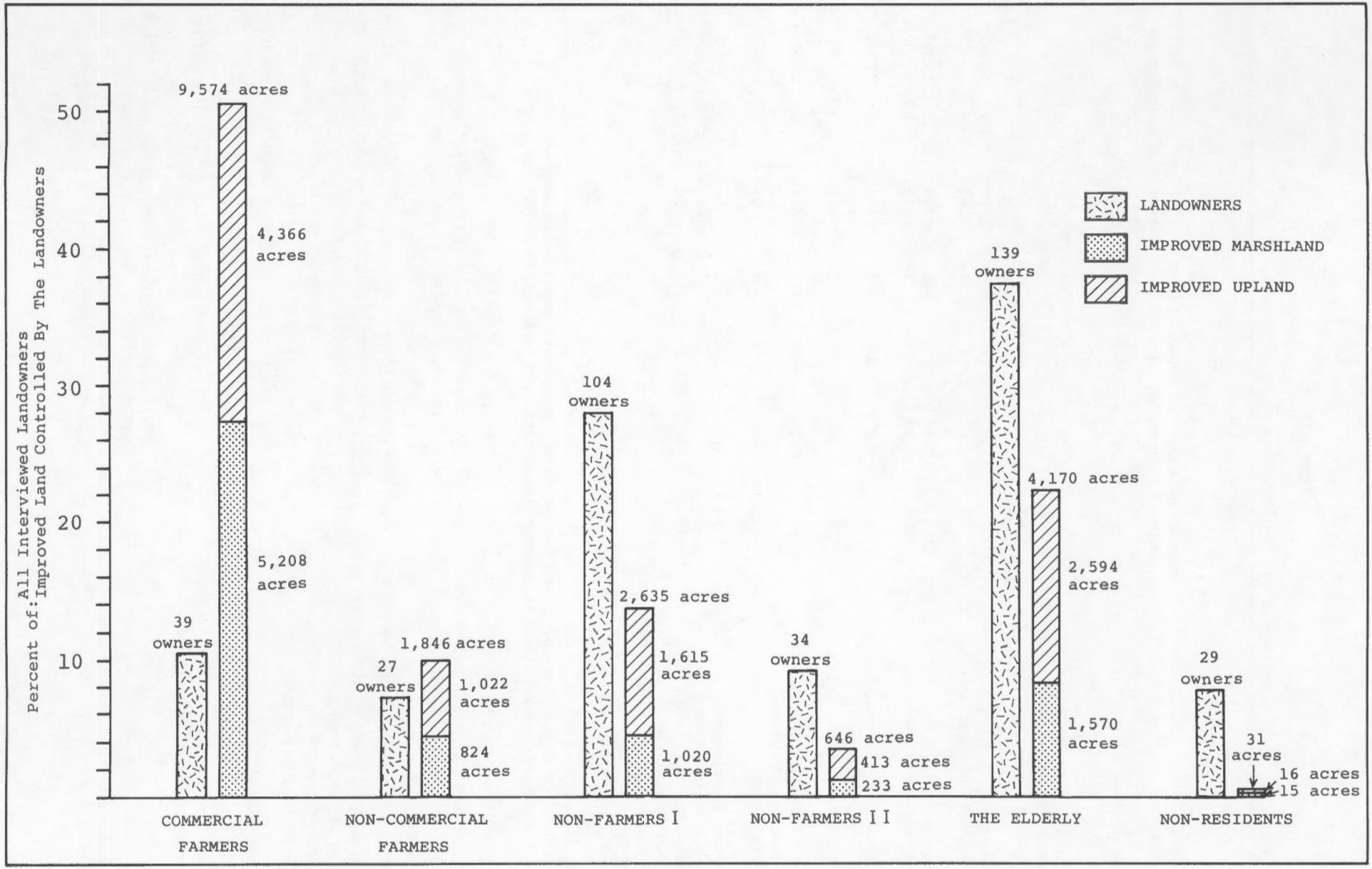

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FIGURE 2. Land and landowners in the Tantramar area, New Brunswick, 1967-68.

ination prove to be commercial (and vice versa). Such a classification is, however, a useful guideline in the analysis of the relative importance of agriculture and other activities. It also has important implications for the development of a realistic land-use plan.

Table II and Figure 2 provide a summary view of the area's landownership structure. As is to be expected from the method of classification, some clear contrasts emerge among the landowner groups in average size of holding and level of land utilization. What is immediately noteworthy, however, is the small number of commercial farmers. This is particularly striking because a very low threshold value of gross farm and woodlot income ($3,750) was chosen. This was done deliberately, to ensure that the commercial farmer category included all landowners who could conceivably lay claim to a profitable farm operation. Despite this very generous definition, only 11 per cent of the landowners qualified for this commercial farmer group.

In terms of acreage, this group is much more significant, as commercial farmers control about half the improved upland acreage and over half the improved marshland. The average farm unit for this group has 508 acres, of which 245 acres are improved. These holdings, however, usually consist of many separate parcels exhibiting wide differences in the intensity of use. This land fragmentation tends to lead to under-utilization and most farmers in this group have larger acreages than they are at present using effectively.

In marked contrast to the holdings of the commercial farmers are those of the 27 non-commercial farmers. The land they control is, again, more than proportional to their numbers, but it is much less than the holdings of commercial farmers; these marginal farmers average only 177 acres each, of which 68 are improved. Together, the two farmer categories have nearly 42 per cent of the acreage reported in the interview program. This includes 60 per cent of the total improved land and over two-thirds of the improved marshland.

Landowners under 60 years of age who depend primarily on non-farm sources of income form the next two categories. Comprising 37 per cent of all owners, they control only 14 per cent of the improved marshland and 20 per cent of the improved upland. As will be seen later, they appear to make little effective use of such land. For many of those in the NFM category this is probably a matter of small concern; their income is assured from off-farm sources and the holding may be retained for sentimental reasons, or because the farmstead attached to it is still the family home, and sometimes for no obvious reason at all. Those in the NFL category are in a different position; their off-farm earnings are low and, if they are unable to supplement these earnings significantly by farming, they are likely to constitute poverty households.

The largest group of landowners, more than 1 in 3 of all interviewed, consists of persons 60 years of age or more who are not commercial farmers. They own 26 per cent of the improved upland and 18 per cent of the improved marshland, but this represents an average of only 136 acres in total, of which only 30 are improved. Most members of this elderly group will probably cease to farm when they become eligible for old age pensions. Many have stopped farming already, and the remainder face an early decision regarding the future of their landholdings.

Because of the difficulties of contacting non-residents, the total acreage held by them is under-represented in Table II. However, much of the land held by non-residents is unimproved and the deficiency of interviews in this group is not a serious weakness in the survey. Most of the individual non-resident owners live in Sackville and Amherst; those who were contacted tended to have a relatively high average age (60.3 years) and many expressed an interest in selling their holdings.

In summary, most of the improved land is held by the commercial farmers, the viable non-farmers (NFM) and the elderly. The two low income groups, the non-commercial farmers (NCF) and the non-farmers (NFL), and the non-residents (N-R) account for less than one-quarter of all owners, control only 17 per cent of the total acreage and have less than 14 per cent of the improved acreage.

Several conclusions can be readily drawn from this analysis of the area's landowners. Non-farmers and the elderly now constitute the majority of landowners (82%), hold over half the total acreage (58%) and, although as individual landowner groups do not control a large percentage of the improved land, together they control a significant portion of the improved acreage (40%). In contrast, commercial farmers are only a small minority of landowners (11%). This dominance of the non-farmer groups in the ownership structure suggests that investments designed to improve agriculture which tend to benefit all landowners equally are likely to be less efficient than schemes which concentrate on the lands of farmers who are now running a commercial operation or who have a reasonable expectation of doing so with such assistance. It may also be desirable to avoid schemes which may attract the large number of elderly or part-time farmers to seek short-term gains without significantly improving the long-term status of agriculture in the area. The realization of permanent benefits that might accrue from additional assistance to agriculture must come mainly from the activities of that small group of owners who have been classified as commercial farmers.

Landowner income

The preceding section showed that the majority of landowners do not nowadays depend on land resources

Table III

Landowners' gross income from primary resource activities, 12-month period, 1967-68
Tantramar area, New Brunswick

LANDOWNER GROUPS		GROSS FARM INCOME				GROSS WOODLOT INCOME				GROSS FISHING INCOME				TOTAL GROSS INCOME FROM PRIMARY RESOURCE ACTIVITIES			
			Aggregate income				Aggregate income				Aggregate income				Aggregate income		
Group*	No. of households	No. of households reporting	$	% of total gross primary resource income	$ per household reporting	No. of households reporting	$	% of total gross primary resource income	$ per household reporting	No. of households reporting	$	% of total gross primary resource income	$ per households reporting	No. of households reporting	$	% of total gross primary resource income	$ per household reporting
CF	39	39	515,510	95.7	13,218	11	22,998	4.3	2,091	–	–	–	–	39	538,508	100	13,808
NCF	27	27	49,075	92.2	1,818	7	4,173	7.8	596	–	–	–	–	27	53,248	100	1,972
NFM	104	34	28,533	91.6	839	4	1,905	6.1	476	2	700	2.3	350	39	31,138	100	798
NFL	35	8	4,305	95.6	538	–	–	–	–	1	200	4.4	200	8	4,505	100	563
E	138	39	54,562	93.4	1,396	10	3,833	6.6	383	–	–	–	–	44	58,295	100	1,325
N-R	29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
All owners	372	147	651,885	95.1	4,435	32	32,909	4.8	1,028	3	900	0.1	300	157	685,694	100	4,367

*CF: Commercial farmers
NCF: Non-commercial farmers
NFM: Non-farmers I
NFL: Non-farmers II
E: The elderly
N-R: Non-residents

for their primary source of income. It did not, however, indicate in detail either the relative importance of the various sources of income, or the distribution of total income among the different landowners. Tables III, IV and V provide a summary of this information.

Primary resource income comes from three activities in the Tantramar area: farming, forestry and fishing (Table III). However, forestry and fishing are insignificant income sources; together they account for less than 5 per cent of the gross income from resource-based activity. Income derived from fishing was reported only by three landowners who engage part-time in the lobster fishery of nearby Northumberland Strait. The low forestry income, however, is noteworthy because over 50 per cent of the acreage reported by the landowners is forested and in earlier days the operators of small farms in the Maritimes derived a significant proportion of their income from woodlot operations.

One of the reasons for the low level of utilization made of the area's forest resource is the fact that those who derive little income from farming appear to have an equally low interest in efficient woodlot operation. In addition, the area has a relatively low physical potential for commercial forest production and certain marketing and pricing difficulties also exist for forest products. Another important reason, however, is the predominance of small woodlots. Property fragmentation has led to the creation of numerous woodlots for which it is very difficult to justify regular forest improvements or management on a sustained yield basis. The problem of a small woodlot operation was described succinctly a few years ago:

> . . . these small properties are simply not economic units and most owners do not consider themselves to be in the business of producing timber crops for the market . . .
>
> The volume of production and hence the income from forest crops is simply too small and periodic to engage more than passing attention. (Stoddard, 1960)

Because of the problems associated with small woodlot operations, most landowners do not regard their woodlots as a source of regular income. Many owners only harvest when they require funds to meet unexpected expenses or to make major purchases. For them, the woodlot represents an asset that can be used to see the family through a financial crisis. When used in this way, the woodlot serves a similar function to the cash surrender value of a life insurance policy. Although such use of the forest resource serves the owner well in a financial emergency, it has led to a general deterioration of forest quality. Timber harvesting for immediate gains, including the cutting of immature trees, has tended to deplete the prime timber. In the absence of adequate forest management designed to ensure the regeneration of prime commercial species, tree species less desirable in terms of quality and commercial value have replaced much of the harvested timber. Continuation of the present forest utilization practices will inevitably lead to a further reduction in the income-generating capacity of the resource. From the individual woodlot operator's viewpoint, it is very difficult to see how this management problem can be overcome. In fact, it may well be insoluble at that level. Because woodlot size is the critical factor determining whether it is feasible to introduce proper management techniques, a woodlot consolidation program is a necessary prerequisite to better forest management in the area. Only by creating much larger forest ownerships can sustained yield management be justified. Such a woodland consolidation program could be achieved either through the accelerated acquisition of woodlots by the provincial government and private corporations, or through the creation by the woodlot owners of a cooperative organization to manage their individual woodlots as one large forest holding. Caution should be applied, however, before a woodlot consolidation program is launched in the area. As is noted later in this report, the physical capability of the area to produce commercial forests is not high. When compared with other forested areas in the province, the Tantramar's woodlots may receive a low priority in government or company woodlot acquisition and consolidation programs. Even the local woodlot owners should exercise caution before placing major inputs into forest management through a cooperative organization. Before this is done a feasibility study should be carried out to determine if additional management and financial inputs placed in the area's forestry will produce returns comparable with returns from other available investment opportunities.

The distribution of primary resource income among the landowner groups is, of course, affected by the method of owner classification. It is to be expected that the farmers (CF and NCF groups) will account for the larger share of this type of income. Table III indicates that this is the case; over 85 per cent of the primary resource income is earned by the two farmer groups. What is more unexpected is the great difference between the farmers in their levels of resource-based income. Almost 80 per cent of all gross primary resource income is shared among the 39 commercial farmers, yielding them an average of over $13,000 per annum. Given the low threshold for entrance to this group, the implication is that returns to a few major operators are far above this average. In marked contrast are the non-commercial farmers; their average gross income from resource-based activity is not quite $2,000 per annum. When it is remembered that resource-based activities are the prime sources of income for these farmers, their economic plight becomes only too clear. Even the elderly owners who report some primary resource income have, in aggregate, higher receipts from such resource-based

Table IV

Estimates of landowners' total net cash income, 12-month period, 1967-68

Tantramar area, New Brunswick

LANDOWNER GROUPS		HUSBAND'S OFF-FARM INCOME				WIFE'S OFF-FARM INCOME				GOVERNMENT TRANSFER PAYMENTS				OTHER OFF-FARM INCOME				ESTIMATED NET PRIMARY RESOURCE INCOME**				ESTIMATED TOTAL NET CASH INCOME			
			Aggregate income				Aggregate income				Aggregate income				Aggregate income				Aggregate income				Aggregate income		
Group*	No. of households	No. of households reporting	$	% of estimated total net cash income	$ per household reporting	No. of households reporting	$	% of estimated total net cash income	$ per household reporting	No. of households reporting	$	% of estimated total net cash income	$ per household reporting	No. of households reporting	$	% of estimated total net cash income	$ per household reporting	No. of households reporting	$	% of estimated total net cash income	$ per household reporting	No. of households reporting	$	% of estimated total net cash income	$ per household reporting
CF	39	2	4,000	2.4	2,000	2	6,000	3.5	3,000	19	9,612	5.7	505	11	22,382	13.2	2,034	39	127,598	75.2	3,272	39	169,592	100.0	4,439
NCF	27	12	10,580	21.0	881	1	600	1.2	600	13	8,388	16.7	645	4	2,317	4.6	579	27	28,401	56.5	1,052	27	50,286	100.0	1,862
NFM	104	99	412,673	83.3	4,168	10	32,900	6.6	3,290	78	35,193	7.1	451	8	6,828	1.4	854	39	7,784	1.6	200	104	495,378	100.0	4,763
NFL	35	19	33,150	63.1	1,744	1	400	0.8	400	25	16,226	30.9	649	3	1,630	3.1	543	8	1,126	2.1	141	35	52,532	100.0	1,501
E	138	28	79,075	27.6	2,824	3	7,960	2.8	2,653	101	141,026	49.2	1,396	13	26,369	9.2	2,028	44	32,455	11.2	738	138	286,885	100.0	2,079
N-R	29	4	19,800	68.7	4,750	1	2,000	6.9	2,000	5	5,544	19.2	1,108	1	1,500	5.2	1,500	–	–	–	–	8†	28,844	100.0	3,606
All owners	372	164	559,278	51.6	3,410	18	49,860	4.6	2,770	241	215,989	20.0	896	40	61,026	5.6	1,526	157	197,364	18.2	1,257	351	1,083,517	100.0	3,087

*CF : Commercial farmers
NCF : Non-commercial farmers
NFM: Non-farmers I
NFL : Non-farmers II
E: The elderly
N-R : Non-residents

**Only gross primary resource income was determined in the household survey; therefore, net primary resource income had to be estimated. It was calculated according to the following rules: Selection of the percentage figures used was based on an examination of several farm business studies. The per cent of gross primary resource income used to estimate net income has been increased with decreasing gross income on the assumption that fewer inputs, proportionately, are purchased by small operators than by large ones. For example, fertilizer application is usually more intensive on large commercial operations than on small marginal farms.

(A) For landowner groups CF, NCF and E:

Gross primary resource income	Net primary resource Income† as per cent of gross
over $10,000	20%
$5,000 – $10,000	30%
$2,000 – $ 4,999	50%
Less than $ 2,000	65%

†Income from labour, management and investment return.

(B) For landowner groups NFM, NFL, and N-R:

Net primary resource income is estimated to be 25 per cent of gross primary resource income. It was assumed that, because of non-farm employment, little time would remain for the part-time operators to produce many of their own inputs; therefore, purchased inputs would consume a major part of gross income.

activities than the non-commercial farmers and they average a gross income from these activities that is only $647 less than the average receipts reported for the non-commercial farmers.

Only 8 of the 35 owners in the low-income non-farm category (NFL) reported receipts from resource-based activities and their average gross income from these sources is only $563 per annum. This suggests that the owners in this group have been unable to supplement significantly their low non-farm incomes by farming and forestry operations. Indeed, they have been less successful in this endeavour than the non-farmers with much larger non-farm incomes (NFM); the owners in the NFM group who reported resource-based activities derive, on average, a gross income of nearly $800 per annum from these sources.

Income from off-farm sources is reported in Table IV. The table also shows income from primary resource activity and gives an estimate of total net cash income for the landowner groups. It should be noted that Table IV is not directly comparable to Table III since the latter is concerned with gross and not net income. To permit a comparison of the importance of all income sources to be made and to obtain total net cash income per owner, it was necessary to derive estimates of net resource income from the gross income figures collected during the interviews. The assumptions used in converting gross income to net figures are stated in the notes accompanying Table IV. It will be apparent that the method of estimation is open to several objections. Not only is the method very simple and arbitrary but it can also be argued that off-farm income should not be considered as wholly net income; certain costs, for instance, are involved in custom work. These objections are valid, but are mitigated to some extent by the fact that most of the area's farms are similar in character to each other, and because the bulk of non-farm income is truly net income (i.e., wages and government transfer payments). It would be wrong to base much reliance on the details of Table IV, but it is probably sufficiently accurate to give a realistic picture of the relative importance of the various sources of income.

A summary view of the landowners' total income flow can be quickly gained from an examination of Table IV and Figure 3. The striking fact revealed by the table is the dominant position of non-resource-based sources of income. Nearly 83 per cent of all income is derived from these sources. Even the commercial farmers depend on these sources for one-quarter of their net income and the non-commercial farmers derive nearly half their income from off-farm activity. To some extent the wide margin between the levels of income derived from primary resource activity as opposed to other income sources may be due to errors in estimating net primary resource income. However, if any systematic bias exists in the estimates, it is believed to be in favour of the primary income sources. In other words, the estimates of net resource-based income may be somewhat higher than the actual income figures. The magnitude of the difference leaves little doubt that primary resource activity plays a secondary and very subordinate role as an income generator for the majority of the area's landowners. It would be difficult to argue that the importance of agriculture is underrated because its multiplier effect on the local economy is ignored; in fact no agricultural processing plants exist locally. All the secondary benefits produced by the Tantramar farmers are realized by other areas. It must be admitted, however, that income-in-kind, which was also ignored in the analysis, is a significant factor for some landowners. This is particularly true for the non-commercial farmers and the elderly landowners.

In aggregate, "husband's off-farm income" and "government transfer payments", the latter including government pensions, welfare payments, family allowances etc., are the most important sources of non-resource-based income. "Husband's off-farm income" accounts for over half of the estimated total net cash income and is, not unexpectedly, the most important source of income for the non-farmer (NFM and NFL) and the non-resident (N-R) categories. However, even the non-commercial farmers and the elderly landowners derive an important proportion of their total net income from this source. The non-commercial farm households obtain over 20 per cent of their total net cash income from the husband's off-farm work and the elderly owners obtain nearly 30 per cent of their total net cash income from this source. Only for the commercial farmers is husbands' off-farm work of little importance; it accounts for less than 3 per cent of this group's total net cash income.

The importance of "government transfer payments" is particularly noteworthy; one-fifth of the estimated total net cash income to the landowners is derived from these payments. What is even more striking, government transfer payments exceed the estimated net cash income from farming and other resource-based activities. These payments assume the greatest importance for the elderly owners, many of whom receive payments under the Canada Pension Plan. However, they are also important for the two low income groups (NCF and NFL) and the non-residents (N-R).

Few of the landowners' wives are engaged in off-farm employment and they make only a minor contribution to the total net income. Of particular interest is the very small number of employed wives in the low-income households where a strong incentive might be expected to exist for wives to seek work in order to supplement the low family income. Only 2 of the 62 households in the NCF and NFL categories reported income from working wives.

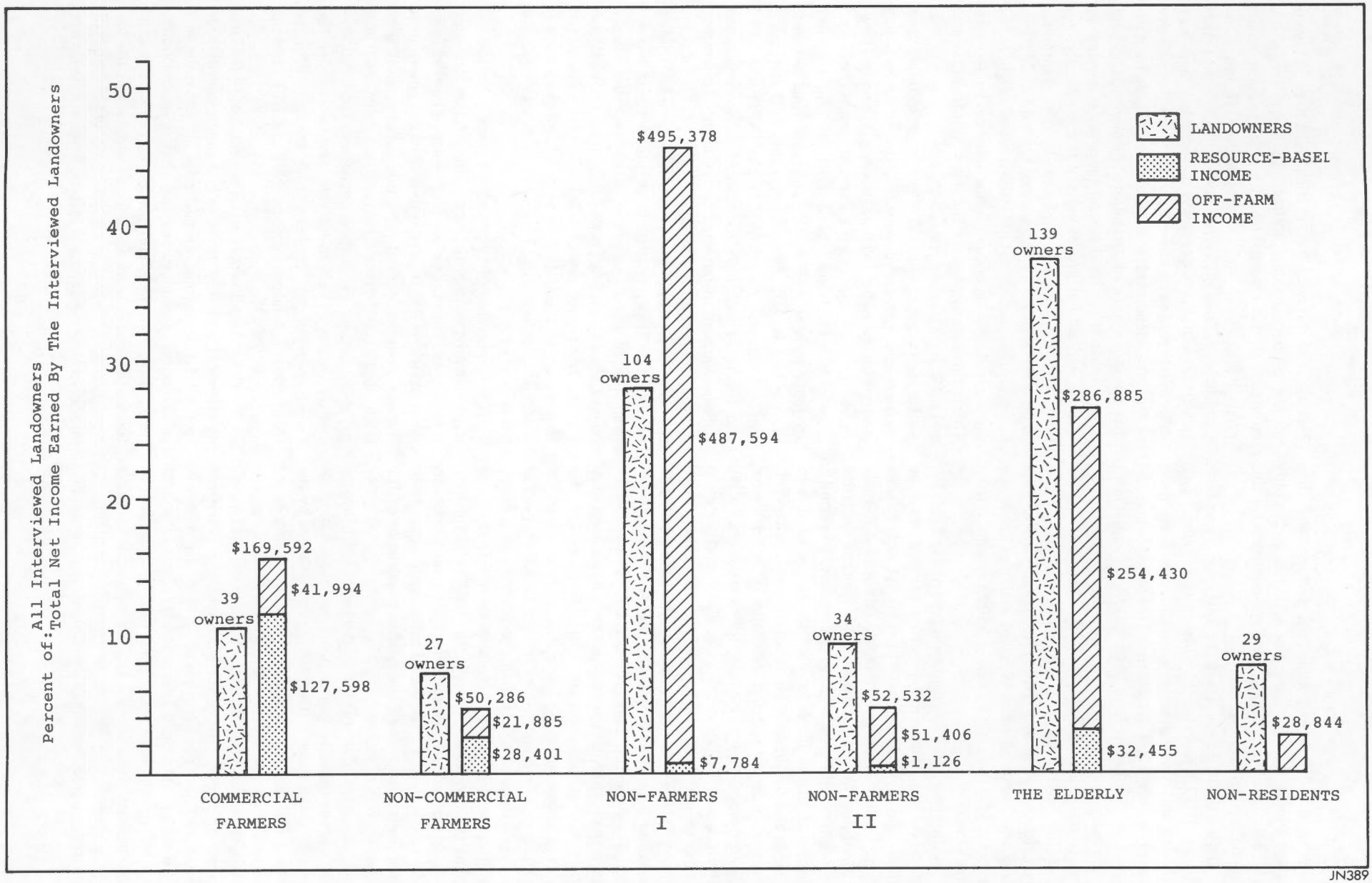


FIGURE 3. Estimates of landowners' total net cash income, 12-month period, 1967-68. Tantramar area, New Brunswick.

In Table V and Figure 4, the data on total net cash income have been rearranged to show the distribution of households by income classes. Because of the small number of non-residents who were interviewed, they have been excluded from the table, and a simple threefold classification is used which distinguishes between farmers (CF and NCF), non-farmers (NFM and NFL) and the elderly (E).

Of the 343 households included in the table, only 9 per cent have incomes of $6,000 or more, whereas 74 per cent receive less than $4,000 per annum. The latter group includes 90 per cent of the elderly landowners, the vast majority of whom receive under $3,000 per annum. However, it must be remembered that many of the households in the elderly category contain very few people and expenses for many of these households may be met from the existing income flow without great hardship.

The distribution of farming households also shows a clear mode at the lower income end of the spectrum. Eighty-six per cent receive less than $4,000 per annum and 61 per cent less than $3,000. Included in this latter group are virtually all (25 of 27) the households in the NCF category and almost half (18 of 39) the "commercial" farmers (CF). The frequency of farm households with low total cash income indicates that difficulties must exist for many of them in meeting their expenses. Their expense levels are usually much higher than those of the elderly group as their average size of household is larger. Such farms are highly unlikely to be able to generate or raise adequate capital for the improvement of their operation.

Of the 3 landowner groups, the non-farmers appear to have the highest median incomes; only 25 per cent receive less than $3,000 per annum. Even in this group, however, the majority of households receive less than $4,000.

The final feature of significance, especially for the future of the area, is the clear break in the incomes of farmers which exists between $5,000 and $8,000. Seven households had total incomes exceeding $8,000 suggesting that there is a very substantial gap between truly commercial operations and the marginal and non-commercial farmers.

Other social factors affecting area development

Although the emphasis in this report is on the development of the indicative land-use plan for the Tantramar area, the original study included analyses of landowner age, educational levels, community organization and housing as well as of landowner income. A brief commentary on these aspects is included in this section

Table V

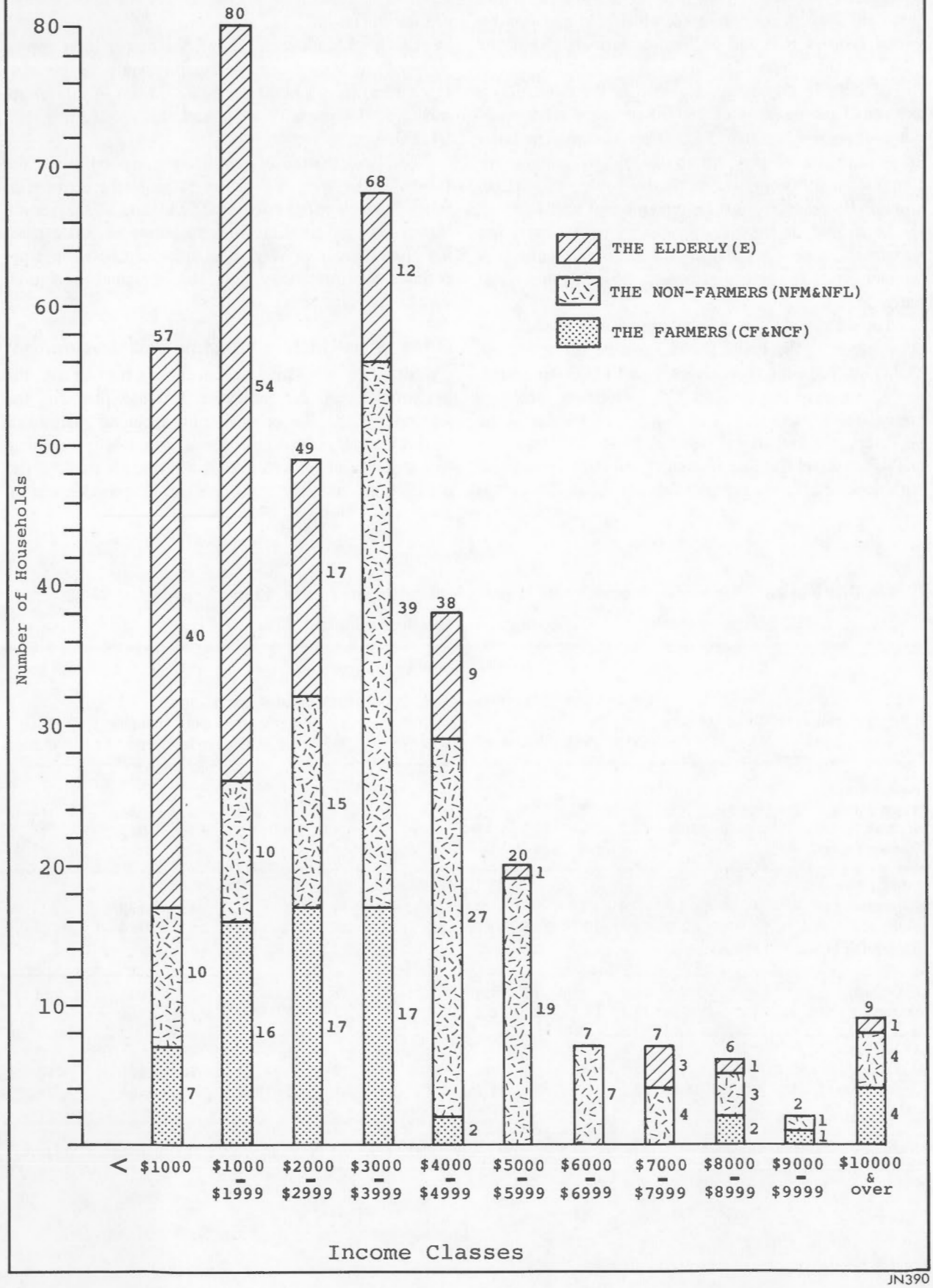
Distribution of landowner households by estimated total net cash income, 12-month period, 1967-68

Tantramar area, New Brunswick

Landowner groups*		INCOME CLASSES (dollars) Under 1,000	1,000 – 1,999	2,000 – 2,999	3,000 – 3,999	4,000 – 4,999	5,000 – 5,999	6,000 – 6,999	7,000 – 7,999	8,000 – 8,999	9,000 – 9,999	10,000 and over	All households reporting	Total households
Farm activity major source of income (Groups CF and NCF)	No.	7	16	17	17	2	–	–	–	2	1	4	66	66
	%	10.6	24.2	25.8	25.8	3.0	–	–	–	3.0	1.5	6.1	100%	
Non-farm activity major source of income (Groups NFM and NFL)	No.	10	10	15	39	27	19	7	4	3	1	4	139	139
	%	7.2	7.2	10.8	28.1	19.4	13.7	5.0	2.9	2.2	0.7	2.9	100%	
The elderly (Group E)	No.	40	54	17	12	9	1	–	3	1	–	1	138	138
	%	29.0	39.2	12.3	8.7	6.5	0.7	–	2.2	0.7	–	0.7	100%	
All owners in groups CF, NCF, NFM, NFL and E	No.	57	80	49	68	38	20	7	7	6	2	9	343	343
	%	16.6	23.3	14.3	19.8	11.1	5.8	2.1	2.1	1.7	0.6	2.6	100%	

*Income estimates for non-resident owners (Group N-R) were not included because of the small number of respondents in the group who provided income data.

FIGURE 4. Distribution of landowner households by estimated total net cash income, 12-month period, 1967-68. Tantramar area, New Brunswick.



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in the hope that it may assist in any future efforts made towards the area's development.

Age

As the discussion on the owner groups has shown, age structure of the landowners is heavily weighted towards the higher age brackets. Of the 309 male respondents who reported their ages, 82 per cent were over 45 years of age and 42 per cent were over 60 years of age. This age structure is a major reason for the rapid decline in the number of farms between 1961 and 1966. The decline in the number of farm operators due to retirement can be expected to continue, and at a higher rate than either the New Brunswick or Canadian average. In 1966 more than a third (36%) of the census farms in Westmorland and Sackville parishes had operators who were 60 years of age or older. In contrast, only 29 per cent of the farm operators in New Brunswick and only 21 per cent of those in Canada are in this age class.* Of the 79 interviewed landowners who depend on sales of crop and livestock products for their major source of income, 63 are over 45 years of age and 28 are over 60. Therefore, on the basis of age alone, there are very few farmers in the Tantramar area with any real prospects for maintaining operations beyond the next few years. Moreover, the predominance of the elderly owners suggests that no major change will occur in land use on the non-farm holdings under the present ownerships.

Educational levels

From the interview program, it became apparent that throughout the Tantramar area grade 8 represents both the norm and the maximum educational level of most landowners In the two areas designated (for other reasons) as the agricultural nodes however, a significant number of landowners have completed at least one year of high school. In view of the high average age of many farmers in the Tantramar, there seems to be no need to attempt to raise general educational levels; what is necessary are specific programs aimed at improving particular skills, especially in farm management. While they might be made available to all, the primary targets of such programs would be the commercial farmers and their expected successors. Because of the high proportion of Tantramar residents whose main income is from non-farm sources, similar non-agricultural training programs might be considered. Existing provincial and other programs might be extended or adapted to meet this potential need, and they should concentrate initially on those younger members of the area's population who are unlikely to be successful farmers but who lack other occupational training.

*DBS, 1961 and 1966 Censuses of Canada

Social organization

The social organization in the Tantramar area is weak to non-existent. Most of the landowners interviewed stated that no existing organization is of importance to them. The few landowners who did believe community organizations to be important are located in the Point de Bute and Middle-Upper Sackville areas and the organization they most frequently mentioned was the Federation of Agriculture.

As part of the implementation program of the MMRA, organizations representing the landowners were created to cover the various marshlands. These organizations, called marsh bodies, are now largely inactive or defunct. If the Tantramar's people are to be involved in any future development program some new form of community organization will be required. The MMRA marsh bodies, even if they could be revived, would not be an appropriate means of securing such participation, since development programs in the area should involve the whole community, not just the marshland owners. It seems likely, therefore, that it would be necessary to establish a form of community organization which does not at present exist in the Tantramar area, for example, an area development council.

Housing

The interview program included a subjective appraisal of the age and quality of housing in the study area. In general, housing quality is low and many of the structures are of considerable age. This suggests that a more detailed examination of the need for improved housing would be worthwhile. The needs of the elderly and those on low incomes should receive priority.

Agricultural land use and farming activity

Land use

Table VI shows the use of the marshland and upland as reported in the landowner interviews. In review, there are nearly 19,000 acres of improved land on the marshes and in the uplands; these are distributed, as we have seen, among several landowner groups that vary greatly in their ability and desire to utilize the land for agricultural purposes. The 39 commercial farmers control approximately half the improved acreage, and an additional 10 per cent is in the hands of persons who depend primarily on the land for their support (NCF), although their ability to continue in active agriculture is clearly doubtful. The remaining 40 per cent of the improved acreage is in the hands of the elderly and

Table VI

Land use in the Tantramar area,
New Brunswick, 1967-68*

	MARSHLAND		UPLAND		STUDY AREA	
	Acres	%	Acres	%	Acres	%
Improved land						
Barley	18	0.2	213	2.1	231	1.2
Oats	385	4.3	972	9.7	1,357	7.2
Mixed grains	45	0.5	86	0.9	131	0.7
Corn	–	–	70	0.7	70	0.4
Seeded hay	5,581	62.9	4,243	42.3	9,824	52.0
Improved pasture	2,846	32.1	4,182	41.7	7,028	37.2
Other field crops	1	0.1	144	1.4	145	0.8
Blueberries	–	–	116	1.2	116	0.6
Total improved land	8,876	100%	10,026	100%	18,902	100%
Unimproved land						
Woodland	525	12.7	30,932	86.1	31,457	78.6
Wetland	963	23.4	416	1.2	1,379	3.4
Rough pasture	1,511	36.6	4,572	12.7	6,083	15.2
Wild-marsh hay	1,124	27.3	–	–	1,124	2.8
Total unimproved land	4,123	100%	35,920	100%	40,043	100%
Total acreage reported	12,999	100%	45,946	100%	58,945	100%
Improved land	8,876	68.3	10,026	21.8	18,902	32.1
Unimproved land	4,123	31.7	35,920	78.2	40,043	67.9

*Compiled from data reported in the landowner interviews.

persons deriving their major share of income from non-farm sources. The elderly alone control 22 per cent of the improved acreage; much of their land is currently idle and in the process of abandonment.

Virtually all the improved marshland and most of the improved upland is used for forage crop production and pasture. Although the acreage in various uses can be readily determined from the interview data, little indication is given by these data of the quality of use. As may be anticipated from the analysis of land ownership and income, considerable variation exists in the quality of use. Even the casual observer becomes aware very quickly of the large acreage of under-utilized and idle land in the area. It appears that much of the land reported to be in forage production and pasture is, in fact, used only intermittently, if used at all.

In order to determine the incidence and location of the idle and under-utilized improved land, and of the regularly used agricultural land, a field by field appraisal was made of the improved land throughout the study area. The survey confirmed the high degree of under-utilization of the improved land. Idle and under-utilized improved land accounts for over 7,000 acres or 37.5 per cent of the improved acreage reported in the landowner interview. Figure 5 (end pocket), which was compiled from this survey, shows the areas where evidence of regular agricultural use was found.

To some extent the active agriculture is dependent on soil type. Other factors, however, also appear to be significant in determining the present pattern of land use. These include drainage conditions, quality of access roads, distance from farmstead to field, field size and the scale of farm operation. On the marshland, intensively used fields do not occur at random; they occur in well-defined concentrations related to these various factors. From Figure 5 and on the basis of additional evidence collected during the survey, it is possible to delineate two clearly defined nodes of agricultural activity in the study area; the Middle-Upper Sackville area and the Point de Bute area.

The Middle-Upper Sackville area, on the west flank of the marsh, is the largest and most productive agricultural zone in the study area. Traditionally, the farms have consisted of three distinct units: a marshland parcel, an upland section on which the farmstead is located and a woodlot. Farm enlargement efforts have been focused on marshland acquisition so that most farms now consist of a relatively small acreage of improved upland and a larger acreage of improved marshland. The marshlands are divided into many small

parcels and the farmers find it difficult to acquire sizable marsh properties adjacent to their existing marsh holdings. Consequently, farm fragmentation has accompanied the farm enlargement process with the result that the marshland holdings of the area's farmers are scattered on the fringe of the Middle-Upper Sackville farming community and in the eastward extension of this area into the centre of the Tantramar Marsh.

This agricultural node contains 30 per cent of the total acreage reported in the landowner interviews; it has nearly 20 per cent of all the improved upland and over 60 per cent of the study area's improved marshland. Thirteen of the 81 landowners possessing five acres or more in the node are commercial farmers and they control nearly two-thirds of the improved land. These commercial farmers also account for most (88 per cent) of the node's gross agricultural income which contributes nearly half (46 per cent) of the gross farm income produced in the Tantramar area.

The only other agricultural concentration of significance is in the Point de Bute area. Many of the upland portions of the area's farms merge directly with the marshland holdings on the flanks of Cumberland Ridge, resulting in better access and less fragmentation than is usual elsewhere. As in the other agricultural node, moderately well-drained soils predominate in the improved upland and the marshland soils are also generally good and well protected. This node, with 5,636 improved acres, has a smaller agricultural base than the Middle-Upper Sackville area which has 7,349 acres of improved land. A difference also exists between the areas in the relative importance of upland and marshland. Nearly three-quarters of the improved acreage in the Middle-Upper Sackville node is on marshland in contrast to less than 40 per cent in the Point de Bute area. Once again, the commercial farmers are the dominant landowners, controlling approximately half of the improved acreage. The remaining acreage is shared among 85 owners. The 14 commercial farmers in the area have gross incomes averaging $10,000 and it is they who largely account for the 28 per cent of the study area's gross farm receipts generated in the Point de Bute area.

Together, these two nodes account for about three-quarters of the gross farm income generated in the study area. Aside from the community pasture and one major operation, there is no important farm development outside these agricultural nodes.

Agricultural activity

The agricultural economy of the study area is based on three types of enterprises: beef, dairy and hay production for cash sale, in that order of importance. Hay production for cash sale was the principal enterprise until the 1920s, but thereafter declined rapidly with the disappearance of the lucrative forage market in the urban areas on the eastern seaboard of the United States. The loss of this market caused both a major decline in marshland agriculture and a greater emphasis on beef production. In recent years there has been some expansion in dairy farming, but the typical farm still emphasizes beef production and cash sale of hay in its operation. (Retson, 1966, p. 21)

The prospects for significantly higher income levels from the traditional beef-hay operation are not promising, particularly when considered against the general background of such enterprises in the Maritimes and elsewhere in Canada. Although some of the basic physical data on yields and other parameters are not available in adequate detail for firm conclusions, Carr was able to suggest from Sonntag's budget analysis (1969) of beef enterprises that:

> . . . beef production based on hay or grass silage or both, plus purchased grain, cannot be pursued in the Maritimes in profitable competition with other areas. (Carr, 1969, p. 151)

Two alternative possibilities for profitable beef production do exist in the Maritimes, in Carr's opinion:

> One relates to the possibility of corn silage production in the Maritimes both for beef feeding and for providing the winter feed requirements of cow-calf enterprises. The other major possibility appears to be a feeder production system in which calves would be dropped early in the year, January or February, so that when the pasture season begins in late May or early June these calves would be large enough to utilize such pasture most effectively . . . However, it is unlikely that these enterprises can ever be as profitable as in Ontario and western Canada where physical conditions are more favourable. (Carr, 1969, p. 151)

The prospects for increasing income from the dairy operations are equally dim. Sonntag's budget analysis of manufacturing milk enterprises indicates generally unsatisfactory levels of income from this enterprise in the Maritimes.

> Manufacturing milk prices are generally too low to provide satisfactory returns to both labour and capital. Labour incomes are low even in relatively large enterprises (75 to 90 cows and 900,000 to 1,000,000 pounds of milk) especially when the labour force is large enough to permit workers to enjoy the social amenities considered essential for comparable employment elsewhere. For example, with 75 cows and three men (two hired) a satisfactory level of operator labour income ($6,000 or more) was not achieved until the price of milk reached $5 per cwt. With a 90-cow enterprise and the same labour force this level of income was generated with a price of $4.50 per cwt. At $4 per cwt. an enterprise would need 90 cows and could afford only one hired man if it were to achieve this level of operator labour income. (Carr, 1969, p. 148)

Although returns from fluid milk are higher than those from manufacturing milk, there is little room for expanding fluid milk production because the market is restricted to the Maritime Provinces. This market is not expanding, in fact the total volume of fluid milk sales declined slightly in the last ten years despite an increase in population (Sonntag, 1969, p. 19).

One feature of farming in the Tantramar area is a general lack of diversification. This is not in itself necessarily undesirable, as Carr has pointed out:

> It has been traditional to promote mixed farming or diversified agriculture in the Maritimes. This was because it was thought that diversification reduced the risk and uncertainty. But under current conditions it is also evident that diversification reduces the opportunities for increasing the farm income by specialization and in many cases virtually ensures that income will remain low. (Carr, 1969, p. 71)

The export of hay for horses' forage before 1920 is an excellent example of Carr's point. By specializing in hay production for cash sales, the marshland farmers enjoyed considerable prosperity. But the collapse of the hay markets also seems to illustrate the disadvantage of too great a concentration on a single market.

If it is indeed the case that beef production is a marginal activity, then diversification into an allied field may assist the overall profitability of the farm enterprise. Obvious gaps in the major activities in the Tantramar operation are hogs and grain. It is tempting to assume that such operations, not inconsistent with beef and hay production, could aid in the development of a more profitable agricultural industry. However, once again Carr's conclusions are not optimistic:

> The budget analysis of hog enterprises [in the Maritimes] indicated generally satisfactory operator labour incomes at prices of $30 or more per cwt. for Grade A hogs. Much higher labour returns were indicated for similar enterprises in other areas (of Canada) . . . Yet so long as wheat production in the Prairies is so much more profitable than hogs, it may be expected that major wheat regions such as Saskatchewan will leave hog production to the Maritime provinces even though net profits in hogs are higher in Saskatchewan than in eastern provinces. The risk to Maritime hog farmers lies in the possibility that wheat markets may shrink soon and wheat stocks build up again on prairie farms. If they do, expect hog prices to drop below the break-even point in the Maritimes. (Carr, 1969, p. 156)

Since that passage was written, the collapse of the prairie wheat market has underlined the force of his comment. Similarly for grains:

> The budget analysis of specialized grain enterprises indicated that this enterprise is not likely to provide Maritime farmers with satisfactory levels of income . . . Limitations of climate, soil and topography make grain production relatively costly and risky in the region. As a supplementary enterprise on potato and other types of farms it may have some potential. (Carr, 1969, p. 153)

Most of the potential which Carr envisaged was, however, for grain and hog combinations on Prince Edward Island.

It is clear from Carr's analysis that there is no single factor which is the key to a more profitable farm economy in the Maritime provinces. Most of the region's land-based enterprises tend to be marginal. Even with the rationalization of the structure of these enterprises and better management, a major challenge will still continue to exist in maintaining and improving the competitive position of Maritime agriculture. Given this context, and the fact that the introduction of better management practices and farm enlargement and consolidation is time consuming and costly, it is very unlikely that a dynamic expansion of agricultural activity will occur in the Tantramar area in the foreseeable future unless a major public program of land rationalization and farm management training is introduced.

Land fragmentation

One of the structural problems of Maritime agriculture and one which is particularly severe in the Tantramar area is land fragmentation. Property fragmentation is characteristic of almost all landholdings, but it is especially severe among the commercial farmers. The 39 commercial farmers control 244 separate parcels of land, each farm on average consisting of more than six physically separate parcels of land. Figure 6 (end pocket) shows the fragmentation of five representative farm units. One operation in the area includes 35 unconnected parcels, and there are several with more than 20 parcels scattered over a radius of several miles.

Within the areas of more intensive use there are major fragmentation problems. Apart from the time wasted in travelling between scattered holdings, many parcels are too small to permit the efficient use of modern farm machinery or to encourage improved land use. Tiers of parcels in the five- to ten-acre range, such as those in the central part of the main Tantramar Marsh, unnecessarily complicate cooperative arrangements with respect to drainage ditches. While it would be impossible in the Middle-Upper Sackville area to adjust the tenure pattern so as to provide each farmer with one consolidated upland-marshland holding, much could be done to rationalize the marshland portion of these holdings, provided that their owners were willing

One experiment in land consolidation has been undertaken in the area, but so far it has not been particularly rewarding. In 1965 the provincial government agreed to develop a community pasture of 2,100 acres in a badly run-down area of the main Tantramar Marsh. In 1967 there were 411 cattle on the pasture

(five acres per animal) and with further improvements this number should increase. However, the cost of development has been high; of the first $105,000 spent on the project, most went on drainage and little on improving cultivation. Although the consolidation of the marshland ownerships is desirable, the area and objective selected for the consolidation exercise were perhaps not the best; the same money invested in consolidation and improvement schemes for individual farms in the two agricultural nodes might have yielded greater benefits. This was recognized by the New Brunswick Department of Agriculture and Rural Development, but as funds were not available at the time for a program of land consolidation and improvement for individual farmers, such schemes could not be undertaken. Such a program has subsequently been formulated and the Department of Agriculture and Rural Development intends to implement it in the near future.

The remainder of the study area is, for the most part, agriculturally idle. These idle improved lands are unlikely to merit additional inputs for continued maintenance so long as foreseeable farmland needs can be met within the two agricultural nodes.

Despite the rather pessimistic conclusions reached by Carr and Sonntag regarding the profitability of beef operations in the Maritimes, the governments of both Nova Scotia and New Brunswick have recently received numerous inquiries from large beef producers located elsewhere in Canada who are interested in establishing operations in the Maritime Provinces. These producers appear convinced that they can establish profitable operations in the region provided they can acquire large enough units of improved land. Prices of improved land, which are relatively low compared to the prevailing prices for agricultural land elsewhere in Canada, are, undoubtedly, a chief attraction to these operators. The major problem in establishing these larger enterprises, and the one that makes most inquirers lose interest in the proposition, is the great difficulty encountered in attempting to assemble sufficient acreage on which to build the enterprise. If the acreage required for a large-scale operation is to be assembled, numerous landowners must agree to sell, property boundaries must be resurveyed and field and road patterns re-arranged. A few landowners who are unwilling to sell their holdings can ruin a land assembly scheme. The endeavour can be a long and expensive one, and for most individual entrepreneurs, it is not feasible. Thus, most proposals for establishing large-scale beef operations in the region, particularly those designed for the marshlands, die when the initiators become aware of the magnitude of the land assembly problem.

One means of overcoming this problem would be to have a public agency initiate a land assembly program with the objective of consolidating improved idle or under-utilized land into holdings of sufficient size to support large-scale beef operations. These holdings could be leased on a long-term basis to entrepreneurs interested in establishing large-scale livestock operations in the area.

If such a program is considered, care should be taken in its formulation to ensure that the costs of the program to the public treasury are adequately reflected in the terms of the lease agreements. Subsidized rentals in the long-run could result in uneconomic units being created and could add to the area's problems rather than alleviate them. Care should also be taken to ensure that the potential of the assembled lands for uses other than agriculture is considered. Specifically, it may be possible on some of these lands to develop the resource for waterfowl and agriculture concurrently. Finally, it must be recognized that although some large-scale beef producers believe viable operations can be established in the Maritimes, this has not yet been done on a significant scale. Any land assembly scheme which is undertaken should initially be seen as a pilot venture.

If a pilot land consolidation program is undertaken, the first efforts should be directed towards the idle and under-utilized lands within the designated agricultural nodes. This would act to strengthen the existing centres of agriculture since any external benefits of the program, such as improved drainage systems, would benefit the existing viable farmers in the nodes.

If the introduction of large-scale beef operations does prove to be economic, the program could be extended to cover the idle farmlands of high capability outside the nodes.

Remedying the situation: an outline development plan

In describing the present state of the study area, stress has been laid on the social and economic situation of the present landholders. In preparing an outline development plan for the future of the area, social and economic aspects remain vital, if planning is indeed intended primarily for people. In addition, however, it is essential to consider the physical framework of the area and its development possibilities.

Land capability analysis

The analysis of the area's physical capability for resource development and the identification of development possibilities were based on information derived from the Canada Land Inventory and data obtained in the special surveys.

Under the program of the Canada Land Inventory (C.L.I.) the lands within the settled part of Canada are being assessed and rated in terms of their physical capability for sustaining agricultural, forestry, recre-

Table VII

Canada Land Inventory land capability classification, Tantramar area, New Brunswick

	RESOURCE SECTORS									
	AGRICULTURE				FORESTRY		RECREATION		WILDLIFE (Waterfowl)	
Capability class	Total area Acres	%	Cleared land* Acres	%	Acres	%	Acres	%	Acres	%
1	nil	–	nil	–	nil	–	nil	–	nil	–
2	nil	–	nil	–	nil	–	nil	–	1,053	0.9
3	40,052	35.3	21,847	70.4	nil	–	nil	–	14,796	13.0
4	22,169	19.5	5,022	16.2	34,201	30.1	2,522	2.2	42	0.1
5	41,387	36.5	3,359	10.8	42,442	37.4	5,066	4.5	10,704	9.4
6	nil	–	nil	–	7,447	6.6	88,637	78.1	78	0.1
7	6,123	5.4	665	2.1	26,877	23.7	14,742	13.0	84,294	74.3
Organic soils**	1,236	1.1	144	0.5						
Water area	2,531	2.2		–	2,531	2.2	2,531	2.2	2,531	2.2
Total area	113,498	100%	31,027	100%	113,498	100%	113,498	100%	113,498	100%

*All non-forested land, including unimproved, abandoned and idle cleared land as well as land considered to be improved at the time the C.L.I. land-use maps were prepared. The C.L.I. land-use maps were compiled through air-photo interpretation.

**Mapped separately for the agricultural classification only.

ational and wildlife uses (C.L.I., 1965a). In addition, the present use of land is being mapped. Manuscript maps showing land capability by a 7-class rating system are prepared at the 1:50,000 scale for each sector and generalized sector capability maps are published at the 1:250,000 scale.

Descriptions of the capability classes for each sector are included in the appendix.* The classifications for all sectors allocate the lands with the highest physical potential to Class 1; lands with no potential are placed in Class 7. For example, in the agricultural capability classification, mineral soils are grouped according to their potentialities and limitations for agricultural use. "The first three classes are considered capable of sustained production of common cultivated crops, the fourth is marginal for sustained arable culture, the fifth is capable of use only for permanent pasture and hay, the sixth is capable of use only for wild pasture, while the seventh class is for soils and land types . . . considered incapable of use for arable culture or permanent pasture." (C.L.I., 1965b, p. 3).

*Detailed descriptions of the sector classification systems are available in C.L.I. publications (1965b, 1967a, 1970).

Table VII, which was derived from the analysis of the C.L.I. land capability maps covering the watersheds of the study area, shows the acreage breakdown by capability class for each resource sector. Except for a relatively small acreage with high capability for waterfowl use (14 per cent of the area), high capability ratings (Classes 1 and 2) are not found in the area. This is not unusual and does not necessarily mean that the area has limited development potential. The absence of lands with agricultural capability ratings of Class 1 or 2, for example, is not necessarily significant in the context of the Maritime Provinces because Class 1 land for agriculture is not found anywhere in the region and the area of Class 2 land is limited, particularly in New Brunswick and Nova Scotia. This absence does mean, however, that management practices must be particularly good on the lower capability lands if reasonable yields are to be obtained.

The relatively large acreage (35 per cent of the area) with an agricultural capability rating of Class 3 provides the study area with a significant land base for agriculture which, with good management to overcome the moderately severe physical limitations, can produce acceptable yields of common field crops. Poor drainage, high acidity and moderately low fertility levels are the chief limitations of these soils.

In addition to the 40,000 acres with an agricultural capability rating of Class 3, there are 22,000 acres rated as Class 4 and 41,000 acres rated as Class 5 for agriculture. The Class 4 soils tend to be of limited value for arable culture because of severe physical limitations, and Class 5 soils can be used effectively only for permanent forage production. Despite their severe limitations, Class 4 and even some Class 5 and Class 7 lands have been used for agriculture in the Tantramar area.

There is a total of 31,027 acres of cleared land in the Tantramar area (Table VII). Over half of the Class 3 land (21,847 acres), 23 per cent of the Class 4 land (5,022 acres), 8 per cent of the Class 5 land (3,359 acres), and 11 per cent of the Class 7 land for agriculture (655 acres) is cleared. However, as was shown earlier, only part of this total cleared land acreage is utilized regularly for agriculture. The Census of Canada reported an improved land acreage of only 19,588 acres in Sackville and Westmorland parishes in 1966; the landowner interview program of 1967-68 recorded only 18,902 acres of improved land, and the 1968 land-use survey showed that only 11,800 acres were used regularly for agricultural uses. The high degree of under-utilization which is found even on the improved land with the highest capability rating (Class 3), indicates that at least in terms of physical capability, no shortage of land for farm expansion exists in the area.

Waterfowl is the only other resource which appears to have any significant potential for development in the area. Capability ratings for commercial forestry production and outdoor recreation uses are particularly low; nearly 70 per cent of the area is rated Class 5 or lower for forestry and over 90 per cent is rated as Class 6 or Class 7 for recreation. As mentioned earlier, the low capability rating for forestry explains, in part, the low level of income derived by the area's landowners from their forest resources.

In order to identify the areas with the highest capability for each sector, an integrated capability map of the study area was compiled using information from the C.L.I. present land-use and resource sector capability maps (Figure 7, end pocket). This was done by plotting the following data in the sequence indicated.

a) Improved land with agricultural capability ratings of Class 3 or Class 4.*

b) Land with waterfowl capability ratings of Class 2 or Class 3.

c) Forested land with a forestry capability rating of Class 4.

d) Land with recreational capability ratings of Class 4 or Class 5.

e) Forested land with agricultural capability ratings of Class 3.

Besides showing the areas with high capability ratings, for all resource sectors covered by the C.L.I., Figure 7 permits those areas which have a high capability rating for more than one sector to be identified. In some of these areas more than one land use may be possible. In others, however, the indicated potential uses may be incompatible and integrated land use (i.e. two or more land-based activities occurring simultaneously in one area) will lead to land-use conflicts.

The improved land with agricultural capability ratings of Class 3 or Class 4 extends northward across the marshland from the dykes along Cumberland Basin to the freshwater bogs that run northwestward from Sunken Island bog, past the Jolicure Lakes to Long Lake in the upper reaches of the Tantramar River. It also extends into the adjacent better-drained upland soils, notably on the flanks of Fort Cumberland and Jolicure ridges and on the flanking western upland from southwest of Sackville to Upper Sackville. As noted earlier, this area of improved land is much larger than the area used regularly for crop and pasture production. Most of it is rated as Class 3 for agriculture; the limited acreage of Class 4 land is restricted mainly to the uplands.

The high potential areas for waterfowl use are centred on the freshwater bogs in the middle and upper reaches of the watersheds and on the marshland areas south of the Trans-Canada Highway between the Missaguash River and Sackville. With the establishment of the Tintamarre National Wildlife Area and the Missaguash Marsh Waterfowl Management Area, part of this high potential zone for waterfowl has received a prime use designation as waterfowl habitat.

Some of the acreage in these high potential waterfowl areas also has a relatively high agricultural capability rating (Class 3) and some of it has been improved for agricultural use. Consequently, the original waterfowl habitat has been reduced in size. With much of the improved agricultural land now idle, some opportunities exist for improving the utilization of the area's resources by expanding the waterfowl habitat to include some of these idle lands.

The forested areas with the highest capability ratings for commercial forest production are found on the western uplands and on the uplands north of the Jolicure Lakes. Some of this forested upland has a

*The area of improved land shown in Figure 7 is considerably larger than the area of improved land regularly used for agriculture (see Figure 5). The improved land pattern of Figure 7 was taken from the C.L.I. present land-use maps which were compiled through air-photo interpretation. This improved land pattern includes lands which, although once cultivated, are now under-utilized or idle, as well as those lands regularly used for agriculture.

relatively good potential for agriculture (Class 3) but in light of current market and economic conditions and the surplus of improved agricultural land in the area, large-scale land clearing for agriculture will probably not be required in the foreseeable future. The marshland soils are completely unsuited for forest production and rank as Class 7 in the forestry classification.

It has already been noted that the area does not enjoy high capability ratings for outdoor recreation. In the western part of the area, the modest potential that does exist (Class 4) is centred on the shorelands of Morice Lake, on the wildlife habitat around Long Lake, and on the Mount View area west of Morice Lake near the Trans-Canada Highway. To the east, some recreation potential related to historic sites, and pastoral and wild landscapes exists. However, these areas are not suited for, or capable of, sustaining intensive recreation use. Unlike the waterfowl-agricultural land-use combination, any land-use combination proposed for this area that involves recreation should not involve a land-use conflict because the recreation potential is derived either from existing cultural or wild landscapes.

In summary, it is clear that a considerable acreage of the land formerly used regularly for agriculture is now used only intermittently if at all. It is also clear from the land-capability and present land-use data that some of the idle lands formerly used for agriculture have a considerable physical potential for waterfowl habitat. Given these circumstances and the projected market and economic conditions for the area's agricultural enterprises, farming should be considered only as one of several possible components to be considered in the preparation of a land-use plan for the area. Agriculture may be the most important component, whether measured by the employment it provides, or by the value of its products. But the purpose of the plan should be to provide for commercial agricultural developments only in those areas where it makes good social and economic sense to do so.

Indicative land-use plan

Figure 8 (end pocket) is an indicative land-use plan for the Tantramar area. The plan was compiled on the basis of the analyses described in the earlier sections. It is an outline plan, in that it does not seek to designate optimum use for every acre in the study area; it shows only those areas which appear to be especially suited to a particular form of land use in the future. In the remaining areas various forms of land use are taking place at present, and will continue to take place in the future; there seems no reason to prohibit or restrict such uses, but equally the absence of any indicated land use implies that public funds should not be invested in the development of these areas without a close study of the specific project in order to ensure its desirability and viability.

In the following section, the different indicated land uses are described in more detail.

Agriculture

Two areas only are proposed as those in which a priority should be given to the preservation and development of agriculture. They coincide to a large extent with the two present agricultural nodes of Middle-Upper Sackville and Point de Bute. Although these areas contain only part of the improved agricultural land on Class 3 soils, they include the bulk of present productive agriculture. As noted earlier, 27 of the 39 landholders in the "commercial farmers" group are contained in these nodes, and the nodes account for approximately three-quarters of the gross farm income generated in the study area. It is this group of commercial farmers which is most likely to remain in agriculture, or which will be able to sell its enterprises as commercial units, and it is here that any forthcoming assistance for agriculture should be concentrated.

As mentioned above. this designation does not imply that agriculture outside these nodes should be deliberately stifled, or that it should not be given assistance to develop. What is implicit, however, is that requests for agricultural assistance outside the indicated agricultural nodes should be the subject of careful study; agricultural programs should not be equally available to all enterprises in the study area, whatever their profitability, viability or location. If assistance is provided to applicants outside the indicated zones, it could be achieved in several ways: (1) treat such situations as special ones; (2) redraw the agricultural zone in the land-use plan so as to include such enterprises; (3) encourage a farmer to relocate on better agricultural lands inside the zone.

Within the area designated as agricultural, the elimination of land fragmentation and the consolidation of farm units should be given priority. In order to achieve fully commercial operations, the active farmers may in some cases require more land, but there is no doubt that in most cases a more rational arrangement of their existing farm units and the lands which they own or lease away from these units is of more importance.

Present circumstances indicate that normal market forces are unlikely to lead to such rationalization, unless it were to take place through the introduction of highly capitalized farm enterprises quite unlike the present character of most successful Tantramar farmers. The latter would probably best be assisted through the creation of a provincial land development corporation with power to buy, sell, lease or hold land for

development. Such corporations have been suggested or created in similar situations elsewhere in the Maritimes: the Prince Edward Island Land Development Corporation is designed to tackle similar problems within the framework of that province's Development Plan. In the Tantramar area, and elsewhere, such a corporation would also be of great assistance to the development of the land resources for other sectors such as forestry, recreation and wildlife which suffer through the existing fragmentation and difficulties of rational land assembly. It would, of course, be a requirement of such a corporation that it ensure the uses of land sold or leased by it were compatible with the overall land-use plan once the latter had been clearly defined and officially accepted.

An alternative means of achieving the necessary land consolidation and development work would be to give this responsibility to the New Brunswick Farm Adjustment Board which already has the authority to undertake land consolidation. However, if the board is given this responsibility, provision should be made to ensure that the Board receives arguments from all the resource sectors that may be affected by the Board's land acquisition and allocation decisions.

Agricultural assistance should be limited to viable farmers. These are probably even fewer in number than is implied by the figure of 39 provisionally indicated up to now as "commercial farmers". That group was defined solely on the basis of gross farm and forest income. From the interview data it is possible to make closer estimates of the number of truly viable farm enterprises, and this is summarized in Table VIII. This table includes only those landowners who depend on the sale of crop and livestock products for their major source of income. Most of them comprise the commercial farmer (CF) and non-commercial farmer (NCF) groups of Table II; in addition, there are a number from the elderly (E) category. Together, these 79 "full-

Table VIII

"Viability index": 79 full-time farm operators in the Tantramar area, New Brunswick, 1967-68

Viability index*	Farmers	Average improved acreage	Average number of cattle	Average gross crop and livestock income	Total improved marshland	Total improved upland	Total improved land	Total beef cattle	Total dairy cattle	Total cattle	Total crop and livestock income
	(no.)	(acres)	(no.)	$	(acres)	(acres)	(acres)	(no.)	(no.)	(no.)	$
Viable farms: Long term[1] . .	14	319	98	16,241	2,083	2,389	4,472	921	447	1,368	227,381
Viable farms: Short term[2] . .	8	456	99	28,321	2,662	987	3,649	462	329	791	226,566
Questionable viability[3] . . .	9	145	36	3,832	589	716	1,305	199	125	324	34,488
Doubtful viability[4]	31	60	19	1,583	824	1,022	1,846	464	133	597	49,075
Non-viable[5] . .	17	90	23	2,002	696	826	1,522	286	108	394	34,037
All farms	79**	162	44	7,235	6,854	5,940	12,794	2,332	1,142	3,474	571,547
Per cent of total for area					77%	59%	68%	74%	84%	77%	88%
Total for area					8,876	10,026	18,902	3,131	1,361	4,492	651,885

*Viability scale:
1. Over $5,000 gross crop and livestock income per annum; operator is young or has a son who is a prospective farmer.
2. Over $5,000 gross crop and livestock income per annum; elderly operator and no obvious successor.
3. Gross crop and livestock income between $3,750 and $5,000 per annum; operator may be able to expand.
4. Gross crop and livestock income less than $3,750 per annum and agriculture main source of income; operator less than 60 years of age.
5. Gross crop and livestock income less than $3,750 per annum and agriculture main source of income; operator 60 years of age or over.

**This figure includes 4 viable farmers conducting their operations on land belonging to relatives who are also viable farmers; hence 79 farm operators, but only 75 land owners. Note that woodlot income is not considered in this classification scheme.

time" farmers received 88 per cent of the total gross farm income recorded ($651,885), leaving just $80,000 to be shared among the 80 "part-time" farmers.

Table VIII shows, however, the wide disparities which exist between the full-time farmers. Only the first two groups are truly viable enterprises at the present time. All the 14 farmers in category 1 cross the threshold of $5,000 gross farm income per annum and the overall average is more than three times this figure. All are either comparatively young or have sons interested in farming and are therefore considered to be viable for the foreseeable future. The 8 farms in the second category have a still higher average gross crop and livestock income but the age of the farmer and the lack of an obvious successor, cast doubt on future operations.

Nine farm units grossing between $3,750 and $5,000 comprise the third category. Some of these farm operations might be expanded, or the farmer encouraged or assisted to relocate, but substantial inputs would be required. A further 31 full-time farmers are doubtfully viable. The persons in this group are less than 60 years old, but are grossing less than $3,750 per annum from crop and livestock sales. They constitute, by definition, the NCF category but, in addition, include 4 farm operators who qualified for the CF category by virtue of income from woodlot operations, which is neglected in the present agricultural analysis. Finally, there are 17 "non-viable" full-time farmers, all 60 years of age or over and all having individual gross farm incomes of less than $3,750.

Table VIII also shows the share of agricultural activity of each group of full-time farmers. They can quickly be summarized: the 22 farmers recognized as viable in the long or short term control 63 per cent of the improved land held by the full-time farmers, own 62 per cent of the cattle, and account for 80 per cent of the gross farm income.

If the two areas shown on the indicative land-use plan as agricultural represent the key areas where farming is worth supporting, the hierarchy of Table VIII gives a similar order of priority to the farmers themselves in terms of assistance. One of the main merits of the interview program carried out in the Tantramar area is its ability to identify the relatively small number of farm operators on whom a viable agricultural pattern for the future can be based. The long-term viable category should have the first claim on agricultural assistance. There is little economic justification for such assistance to be extended to the 48 full-time farmers in the two lowest categories. Nor, for that matter, is there much social justification either; it may well be that some, perhaps most of them, need assistance in order to achieve a reasonable standard of living, but this assistance is likely to be wasted if it is intended to help them to improve their returns from *agriculture*. As said before in a broader context, there is no point in encouraging people to remain in enterprises that are not profitable, have not been profitable for many years and are unlikely ever to become profitable in the future. There are more appropriate ways of helping such people.

For the farmers whose viability seems reasonably assured, and particularly for those in the first category of Table VIII, agricultural assistance is likely to be rewarding. New Brunswick's agricultural extension program, should focus closely on these operators. Together with more rational farm layouts, many members of this group would benefit from the development of specific farm management plans appropriate to future agricultural prospects in the Maritimes and to the specific needs and opportunities of the individual farm unit. These plans would presumably include physical aspects, such as the need for improved drainage works, and the appropriate management of the marshland and upland areas. They will also involve other considerations, such as scale of investment needed and the management scales required. Ideally, they should also involve the formulation of appropriate targets and expected economic returns from different aspects of the farm enterprise.

Wildlife

Waterfowl and the Tantramar Marsh are closely associated with each other. The name of the Marsh itself is derived from the French "Tintamarre", meaning racket or hubbub and referring here to the noise created by the great flocks of waterfowl using the marshland during migration periods. The marshland is located on one of the major lanes of the Atlantic migratory bird flyway; the maintenance and development of this wildlife habitat is of considerable importance.

Approximately 15 per cent of New Brunswick migratory bird hunters reside in Westmorland County. The Tantramar Marsh is the only sizeable wetland within the county and hunting pressure is intense. In order to preserve the waterfowl resource and to perpetuate a harvestable surplus, sufficient quantities of suitable habitat must be maintained or developed. Through restoration of once productive marshes and the development of marshes on land unproductive for other purposes, sufficient waterfowl habitat can be maintained on the Tantramar.

From the Acadian period to the present day, human activities have greatly reduced the amount of wildlife habitat. Dyking and ditching practices have forced present day populations of waterfowl into limited areas at the head of the marshes. Together with increasing pressure from hunters, this reduction in area has caused a great reduction in the numbers of breeding and

migrant waterfowl in the Tantramar area. Up to the present, therefore, waterfowl and agriculture have been in competition with each other.

There now exists an opportunity to end this competition; foreseeable agriculture needs for land in the Tantramar area can largely be satisfied within the two nodes shown on the indicative land-use plan, and the increasing public awareness of the need to preserve and enhance wildlife resources suggests that a high priority should be given to waterfowl conservation outside these nodes. These developments should include the preservation of salt-marsh habitat, the development of additional wildlife mangement areas, the ponding of waterfowl production units and the establishment of a nature interpretation centre.

In more detail, the salt-marsh habitat recommended for preservation for migrating waterfowl is the Ram Pasture-Coles Island Salt Marsh. This marsh occupies approximately 1,500 acres outside the dykes along Cumberland Basin (see A-1, Figure 8) and provides high-quality migration habitat for thousands of Canada geese and black ducks. In addition, small open "potholes" within the marsh annually produce broods of black ducks and provide good hunting opportunities throughout the fall.

Three wildlife management areas are proposed, in addition to the 3,800 acres which has already been designated as the Tintamarre National Wildlife Area and the 1,200 acres in the New Brunswick portion of the Missaguash watershed which are in the Missaguash Marsh Waterfowl Management Area. Like the existing management areas, they lie in the freshwater bogs in the upper reaches of the watersheds. The total area involved is 3,700 acres. Included are 800 acres in the marsh body south of the village of Midgic, part of which was drained for agriculture under the MMRA program in the mid-1950s (B-1, Figure 8). Conversion of this area to a high-quality waterfowl and muskrat marsh would involve reflooding; the result would be the creation of a prime area for hunting and trapping. A second and larger area in the vicinity of the Dave Lake-Patterson Lake area occupying 2,500 acres of wetland also has considerable potential for waterfowl (B-2, Figure 8). Areas of cattail marsh interspersed with sections of bog and some 20 small lakes and potholes currently provide favourable habitat for waterfowl and muskrat in this area. Through the construction of a dyke and a water-control structure, the quantity and quality of prime wetland can be increased markedly. The third site includes 400 acres in the Log Lake Marsh area (B-3, Figure 8). It has excellent potential for the creation of a wildlife management area; the marsh lends itself well to the establishment of a controlled water-level impoundment which can be created through the construction of three short sections of dyke, a water control structure and a fishway.

The third component of the wildlife development proposal shown on the indicative land-use plan involves waterfowl production. It is proposed that nine locations within the reclaimed marshland should be used for this purpose. All nine areas are small units of ten to thirty acres in size and have good potential for the creation of small man-made ponds (C-1 to C-9, Figure 8). Simple rock-filled dams would be adequate to retain run-off water. It is anticipated that these sites, located on good soils, will produce abundant aquatic vegetation and will be utilized highly by nesting waterfowl. These areas will increase hunting opportunities during the early fall.

In many instances, the lands adjacent to these production units will be used for pasture and the ponds may serve also for stock watering. It is essential, however, to provide fencing along the ponds to prevent grazing to the water's edge and thus permit emergent aquatic plants to flourish. This vegetation provides protective cover for waterfowl as well as food.

Three larger areas are also proposed for waterfowl production. They include the Sunken Island bog located in the Aulac River watershed (C-10, Figure 8), a large area of cattail marsh adjacent to the northwest corner of the community pasture (C-11, Figure 8) and a large area of the main Aulac Marsh (C-12, Figure 8).

Sunken Island bog is a prime example of a natural peat bog and has a high ecological importance. In addition, the two ponds located in it are heavily utilized as waterfowl loafing sites. To ensure the preservation of the bog, it is proposed that a 25-acre site of drained cattail marsh on its southwest corner be reflooded and a control structure installed. The marsh area adjacent to the community pasture is near the existing and proposed water management areas and, with the installation of some dyking to hold spring run-off, would provide considerable additional productive habitat.

Of particular significance is the area C-12 located on the reclaimed marshland between the lower reaches of the Aulac and Missaguash rivers. As can be seen from Figure 5, the amount of regularly cropped land is negligible in this 2,200-acre area.

Three possibilities exist for this area. It could be devoted entirely to waterfowl production, entirely to agriculture, or managed on a multi-use basis for waterfowl and agriculture. If the 700-acre portion of the area lying between the Canadian National railway line and the dyke along the Aulac River were reflooded with 18-20 inches of water, and 50 or more nesting islands were created, the area could be transformed into prime wetland habitat for waterfowl production. A "high culvert" type of water-control gate would be required in the dyke to allow a slight flushing of high-tide water on to the marsh, and to permit freshwater run-off. A brackish, shallow-water marsh would result; this marsh type is one of the most highly productive waterfowl habitats.

Alternatively, the marshland could be used entirely for agricultural production, as is the case with other improved Class 3 agricultural lands in the study area. With improved drainage and land consolidation the area could be utilized for the production of hay or forage crops for livestock. Both of these alternatives, however, would result in a complete loss of one of the resources, so a third possibility of multi-use for both agriculture and waterfowl production should be investigated. The slightly higher and better drained portions of the marsh could be used for agriculture while the lower sections and drainage systems could be managed for waterfowl. If investigations found it feasible, small dams could be constructed to hold water at appropriate levels in the low lands and drainage systems. This would allow optimum marsh conditions to be created, and increase waterfowl production. The wildlife habitats should be fenced off from the agricultural area, except for specific places for stock watering, in order to protect nesting sites and to avoid the destruction of the vegetation by livestock. This multi-use approach would permit the area's potential for waterfowl use to be developed without affecting the greater part of the idle, but improved, Class 3 agricultural land which conceivably could be used to accommodate large-scale beef operations in the future.

Lastly, there is a proposal for a nature interpretation centre, which is considered with the recreational proposals in the next section.

Recreation

The physical character of the study area does not provide a suitable basis for intensive popular recreational uses. None of the area is rated higher than Class 4 or Class 5 for recreation by the Canada Land Inventory. These classes are distinguished from higher categories chiefly by the fact that land units in Classes 1 to 3 permit varying degrees of intensive recreational uses; recreation on Class 4 and Class 5 land is based usually on dispersed activities. In the Tantramar area this is likely to take the form of viewing, driving-for-pleasure, collecting, hunting, recording, walking, bird-watching and landscape interpretation. Many of these activities depend on the maintenance or improvement of the wetland ecology of the idle lands; others are related to the historical significance of the area.

Three recreational areas are shown on the indicative land-use plan. The dispersed character of the potential and its association or dependence on wildlife or other characteristics of the area are reflected in the fact that these areas are not physically distinct from the areas recommended for agricultural or wildlife development. Area No. 1 (Figure 8) combines the shoreline and waters of Morice Lake with the upland area west of Mount View. This area is attractive for public boating, bathing, camping and private cottages: angling is also possible but is subordinate to the other recommended uses, which implies careful management of the shoreline environment. The recreational use of this area is likely to be closely related to the length of the normal tourist season, although the area should attract both local and touring users.

Recreation area No. 2 includes the sites of the historic Fort Beausejour on Cumberland Ridge and Fort Lawrence on the nearby Fort Lawrence Ridge in Nova Scotia. Fort Beausejour is already designed as a national historic park and its location close to the Trans-Canada Highway suggests that it is capable of considerable development as a centre for a tour program of historic points and wildlife habitat. The actual focus of this tourist centre might be constructed closer to or adjacent to the Trans-Canada Highway in the vicinity of Aulac. The Canadian Wildlife Service has indicated its willingness to contribute to such a centre in the form of live and described displays, models, film strips and literature. In addition, the project might include the designation of a circular route through the outstanding ecological sites and demonstration areas in the marshes. It would encompass the better viewpoints, cultural patterns and recreational and historical sites in a broad band from Frosty Hollow through the Tantramar Marsh to the Jolicure Lakes and back along the Cumberland Ridge to the sites of Fort Lawrence and Fort Beausejour before returning to Aulac. It is worth emphasizing that this tour could include a demonstration and explanation of the marshland reclamation itself from Acadian times up to the present. In view of the changes which are implied by the present report, it is desirable that the pattern of settlement and way of life which has characterized the marsh for such a long time should not be forgotten in the future.

The third recreation area proposed (No. 3, Figure 8) is closely related to the proposal for a wildlife management area at the head of the Tantramar River. Such management might include provision for recreational development of the "wilderness and sportsman" character, including the use of canoes for wildlife viewing or hunting and for angling. Additional opportunities for limited recreational potential exist in association with other wildlife recommendations, for example, in the Cumberland Basin and Aulac Marsh. Because of the dispersed and seasonal nature of such activities, however, designation of specific areas and proposals for their development seem unnecessary at the present time.

Conclusion

The indicative land-use plan outlined in the preceding section recognizes the challenges facing

marshland farmers within the context of the national agricultural economy. The economic problems facing the area's farmers are caused by local structural problems including the fragmentation of holdings, small field size, high average age of farmers and the lack of interest in farming by succeeding generations of landowners. But above all, their problems are caused by the weak competitive position in which much of Maritime agriculture finds itself in the markets of the late 20th century.

The greatly reduced area proposed as the main land to be devoted to agriculture is a recognition of what is the effective situation at present. The agricultural industry of the Tantramar area represents in microcosm the situation Carr found to exist throughout the Maritimes from his study of the competitive position of the region's agricultural industry:

> . . . a major proportion of the Maritime farms were not profitable in terms of an adequate return to both capital and labour invested in the enterprise. Only a small proportion of the total enterprises were large enough and efficient enough to provide satisfactory returns to labour and capital. But in each of the three provinces there were excellent examples of efficient, well-managed and highly profitable enterprises that would serve as a guide to others in techniques, organization and management. At the same time, a great many of the medium-sized farms . . . were still relatively small and inefficient. Because these medium-sized farms were generally yielding only a low return for the operator's labour with nothing left for a return on the capital invested, it might be expected that many would not survive the retirement of their present operators. (Carr, 1969, p. 142)

The Tantramar indicative land-use plan is based on a recognition of these characteristics. Despite the great difficulties in Maritime agriculture, it seems probable that a small number of farmers will be able to succeed in the study area and, with assistance, can develop farm units and adopt practices which will enable them to obtain returns from agriculture which exceed anything previously seen in the area. This, however, can only be true of a relatively small number.

As already mentioned the structural limitations confronting agriculture in the area include the highly fragmented property pattern and the landownership structure. A shortage of land physically suited for farming is not a primary limiting factor. Even if some of the idle improved land is reconverted to wetland habitat, there would still remain sizable areas which could be added to the agricultural nodes if demand warranted this. The results of the interview program, however, suggest that at present there are only 14 farm enterprises which are clearly viable in the long term and, even if to these are added those farms which could be made viable with a moderate amount of financial or other assistance, the total number of farms involved is only about 30. This, in passing, is the main reason why comparatively little specific attention has been paid to features such as soil character and drainage in the present report. To a large extent, of course, such factors are incorporated into the land capability assessment of the Canada Land Inventory. More detailed studies were undertaken during the field program and are reported on in the limited distribution report referred to earlier on which this publication is based. But the task in the Tantramar is not to find enough suitable areas for agriculture; it is to resolve the land fragmentation problem and to find enough farm candidates with the ability to create a viable enterprise in the area in future.

In light of the trends in Canadian agriculture, it can be expected that the availability of public funds for agricultural development will become increasingly more concentrated on programs dealing with the problems of structural rationalization and the promotion of intensification within the nation's best agricultural areas. For this reason, it has been recommended that the funds available for agricultural development in the Tantramar area be directed towards farm rationalization, land improvement and management programs for the viable farm operators in those areas where most of the successful farmers are located, i.e., in the two agricultural nodes. Programs of land improvement should not be undertaken in isolation, but only in association with farm rationalization and management programs for individual farm enterprises.

The indicative land-use plan also recognizes that the area's waterfowl habitat is very significant, even when judged at the national level. This is recognized by New Brunswick, and the provincial Department of Agriculture and Rural Development has cooperated with the Canadian Wildlife Service and Ducks Unlimited in the implementation of waterfowl habitat improvement programs. A major step towards maintaining and improving the waterfowl habitat was taken with the establishment of the Tintamarre National Wildlife Area and Missaguash Marsh Waterfowl Management Area. Additional areas, however, are also ideally suited for waterfowl development. These are identified on the indicative land-use plan. For the most part they are areas unsuited for agriculture. Some, however, are located where land has been improved for agriculture in the past, but is now idle. In several of these areas it would be possible to develop a resource-use program which would permit the joint use of the land resource for both agriculture and wildlife. Such a program is currently being followed in the Tintamarre National Wildlife Area. This would permit much of the idle improved land in those areas where waterfowl development is proposed to be used again for agricultural purposes if the demand for agricultural land increases in future years.

The plan, finally, identifies those areas where priorities should be assigned for the expenditure of develop-

ment funds available for improving the utilization of land resources in the Tantramar area. It should not be construed as an inflexible document which will remain unchanged for all time and which bars any development other than that suggested. The plan is based on present and foreseeable conditions affecting resource use in the area. As these conditions change, so the indicative land-use plan should be modified to reflect these changes. To be effective, planning must be an iterative process, not a "one-shot job".

Several questions of vital importance obviously remain. The implementation of a land development program based on the indicative land-use plan would result in a land-dependent population much smaller than at present. Considerable social adjustment would inevitably accompany such a program. This adjustment combined with the existing problems arising from the high incidence of low incomes, the weak social organization and the dominance of the elderly in the area's population could produce social stress of some magnitude. These issues could be resolved with the creation and adoption of a comprehensive development plan encompassing both the natural and human resources of the area.

The study on which this report was based was limited to an investigation of the need and feasibility of implementing land development planning in the Tantramar area, and the development of an indicative land-use plan for the area. However, in the course of the study, much data were collected which bear on the social problems besetting the people of the Tantramar. These data would be of value in the preparation of human development plans for the area's people, but additional work is necessary if a comprehensive plan for the whole area and all its people is to be adopted. At the outset of this report it was emphasized that major components of the population were omitted from the study; all the population of Sackville, Port Elgin and also those rural residents owning less than five acres of land have been ignored. Any assistance given to those who are likely to leave the farm population of the study area should be given in the context of the plans developed for the future of the non-farm population as a whole. Nevertheless, it seems reasonably certain that further analysis, presumably mainly social in character, is unlikely to reach conclusions which would necessitate fundamental changes in the indicative land-use plan which has been described above. Adoption of this plan as a guideline to land resource development need not wait upon the completion of such further studies.

Summary and recommendations

A principal objective of the study on which this report is based was the development of an outline indicative land-use plan for the Tantramar area of New Brunswick. In developing this plan the physical capability of the land for different uses was assessed, and the socio-economic characteristics of the major landowners examined to determine the economic importance of the area's land resources to the present landowners. The basic data for evaluating the land's physical potential were derived from the Canada Land Inventory, and the socio-economic information on landowners was compiled by interviewing the land-owners holding five or more acres. The analyses of these data and information on the general economic conditions affecting Maritime agriculture were then used to develop the indicative land-use plan.

Although this report has been published primarily to provide an illustration of how the Canada Land Inventory data and socio-economic information on landowners can be applied in land-resource planning, the study on which it is based made a series of recommendations which will be of interest to the people of the Tantramar area. These recommendations and the principal findings of the study are summarized below.

Principal findings

1. The Tantramar area was once one of the most important and prosperous agricultural areas in New Brunswick. Now, however, only 79 of the 372 interviewed landowners holding five acres or more in the area are dependent on the sale of crop and livestock products for their major source of income. Only 22 of these 79 landowners reported gross farm incomes exceeding $5,000 per annum, and they account for 80 per cent of the area's gross farm income. Eight of these 22 owners are over 60 years of age and will soon leave the agricultural industry. This leaves the area with only 14 farm operators who can be considered as having long-term viability.

Substantial inputs of capital and of management training would be required to raise the incomes of the other farm operations to acceptable levels. Given the magnitude of the inputs required and the current technological and economic conditions affecting Canadian agriculture, it is unlikely that such allocations would prove to be economic.

2. Three groups of landowners, those who derive the major share of their income from non-farm sources, landowners over 60 years of age but not in commercial agriculture, and non-resident owners, together account for 82 % of the landowners interviewed. They control 58 per cent of the total acreage and 40 per cent of the improved agricultural land reported in the landowner interviews.

3. Resource-based income is derived from farming, forestry and fishing; however, forestry and fishing account for less than 5 per cent of the total gross income from resource-based activities.

4. Income from non-resource-based activity accounts for nearly 82 per cent of the estimated total net cash income earned by the landowners for all sources. Government transfer payments alone account for 20 per cent of total net cash income and exceed agriculture and the other resource-based activities as an income producer.

5. Landowner incomes tend to be very modest; only 9 per cent of the interviewed landowners have net cash incomes exceeding $6,000 per annum, whereas 74 per cent earn less than $4,000 per annum. The non-farmers under 60 years of age, as a group, have larger net cash incomes than the farmers. Only 25 per cent of the non-farmers have net cash incomes less than $3,000 per annum in contrast to 61 per cent of the farmers.

6. The Canada Land Inventory data indicate that 31,000 acres of cleared land are located in the study area. However, the landowner interviews which accounted for virtually all of the improved farm land, revealed that there are only 19,000 acres of improved farm land. Furthermore, a detailed survey of present land use carried out in 1967-68 indicated that only 11,800 were used regularly for agricultural uses. These figures indicate that a considerable portion of the 31,000 acres of cleared land in the area is idle or has been abandoned by agriculture.

7. The present pattern of agricultural land use is related to soil quality, drainage conditions, quality of access roads, distance from farmsteads to fields, field size, scale of farm operation and the age and management ability of the farm operators. Two clearly defined agricultural nodes can be delineated on the basis of an analysis of the present pattern of agricultural land use and the factors underlying it. These are:

(a) the Middle-Upper Sackville area,
(b) the Point de Bute area.

Together these two agricultural nodes produced nearly three-quarters of the gross farm income generated in the Tantramar area in 1967-68.

8. Fragmentation of land holdings presents a major obstacle to the promotion of more effective use of the area's land resources. A major program of land consolidation would be required before the optimum agricultural use of the area's resources could be achieved.

9. The waterfowl habitat of the Tantramar area is of major significance, even when judged at the national level. The marsh area contains some of the most productive waterfowl habitat in eastern Canada and is located on a major lane of the Atlantic migratory bird flyway.

10. The social and community structure of the area is in a state of disorganization. The social mechanisms of the area appear to be unable to cope with intergroup communication and cooperation, and with community problem-solving. Social and organizational development would be a necessary prerequisite for any future program of resource development requiring the support and participation of the area's people.

Recommendations

The following recommendations were made in the original study report which was submitted to the Province of New Brunswick. They were provided as guidelines for any future development activity that may be undertaken in the Tantramar area. It was recognized, however, that such development should take place within an overall framework of provincial goals and priorities.

1. *General*

(a) It is recommended that immediate steps be taken to adopt an official land-use plan for the area using the indicative plan prepared in this study as a basis. This plan would specify land-use regulations for urban, industrial, transportation, agricultural, forestry, wildlife and recreational development.

(b) Land fragmentation has impeded development of the area's agricultural, wildlife and recreational potential because of the difficulties it poses to land acquisition and assembly. Consideration should be given to the formation of a land development corporation capable of facilitating the reallocation of the area's land resource. This corporation should be given the power to buy, sell, lease or hold land for development. A priority should be placed on parcel consolidation and measures to ensure that the uses of land sold or leased for development were compatible with the land-use plan. If the creation of a public corporation charged with the responsibility of carrying out a land consolidation program is not feasible, an alternative means of achieving the necessary land consolidation and development work might be to give this responsibility to the New Brunswick Farm Adjustment Board. If the Board were given this responsibility, provision should be made to ensure the Board gives appropriate consideration to all resource sectors that may be affected by its land acquisition and allocation decisions.

2. *Agriculture*

(a) Two principal nodes of agricultural activity have been delineated; the Middle-Upper Sackville area and the Point de Bute area. In light of current economic conditions affecting agriculture, the goals of present landowners, and the important wildlife potential of the idle marshland, there is little justification for stimulating farm development outside these existing agricultural nodes.

(b) The elimination of land fragmentation and the consolidation of farm units should be given priority in the two agricultural nodes. This activity should be associated with the introduction of a program of detailed farm planning for viable and newly consolidated farm units which incorporates the following elements:

(i) Detailed physical investigations leading to recommendations for drainage works, land cultivation layouts, and conservation practices.

(ii) The development of farm management plans appropriate to specific farm units.

(iii) The Province's agricultural extension program should support this adoption of new farm practices and management techniques. This program should be directed primarily at those farmers considered to have long-term viability.

(c) To assist the successful implementation of such improved farming methods, further research should be undertaken on:

(i) the drainage methods and systems required for the most efficient agricultural production on marshland soils,

(ii) the types of equipment most suitable for the needs of marshland agriculture,

(iii) the types and varieties of crops which are best suited to marshland agriculture and which possess good market prospects.

3. *Wildlife*

Because forseeable needs for agricultural land can be satisfied within the specific nodes, and because of an increasing awareness of the importance of preserving and enhancing wildlife resources, it is recommended that:

(a) Development of the wildlife habitat should be given a high priority in that part of the area outside the agricultural nodes.

(b) The developments should include the preservation of salt-marsh habitat, the development of additional management areas, the ponding of wildfowl production units, and the establishment of a nature interpretation centre.

4. *Recreation*

The area's recreational potential should be developed as a complement to the proposed wildlife projects. The historic sites of the area should be made more accessible and attractive through an improved program centred on Fort Beausejour National Historic Park, in conjunction with the proposed nature interpretation centre. The following sites and projects are suggested for recreational development:

(a) The waters and shoreland of Morice Lake: installation of boating and cottage facilities.

(b) The upland area west of Mount View: construction of camp grounds, nature trails and horseback-riding facilities.

(c) The Fort Beausejour National Historic Park: (i) preparation of an improved museum presentation, (ii) provision of a visitor-orientation centre, (iii) provision in conjunction with the Canadian Wildlife Service of an interpretive tour program to include the history and wildlife habitat of the Tantramar area.

(d) The Jolicure Lakes area: (i) provision of access for canoeing, angling and hunting, (ii) construction of facilities to support these activities in accord with management policies of the Tintamarre National Wildlife Area.

5. *Human resource programs*

The socio-economic survey of landowners revealed that a large proportion of the area's inhabitants are elderly, that housing is old and frequently substandard, that a significant number of landowners work in the neighbouring towns and that there is a high level of social disorganization in the area. Because of this situation, the following proposals are made.

(a) Action be initiated to assist the people of the area to study their development problems with the objective of identifying solutions to these problems and initiating action to achieve these solutions.

(b) The New Brunswick Housing Corporation be requested to determine the need for low rental and senior citizen housing in the study area.

(c) The feasibility of introducing programs of farm management training and trades training, related to the needs of the area's people, be studied.
management training and trades training, related to the needs of the area's people, be studied.

(d) A rural development officer be appointed for this area, responsible to the New Brunswick Department of Agriculture and Rural Development. His main task would be to achieve:

(i) the broad dissemination and understanding of the contents and implications of this report,

(ii) the revitalization of the organizational and community structure of the area,

(iii) the full utilization in the Tantramar area of existing public programs for individual and community development.

Appendix

Canada Land Inventory Land Capability Classifications: Descriptions of Main Classes

Agricultural land capability classification:

In this classification the mineral soils are grouped into seven classes on the basis of soil survey information. Soils in classes 1, 2, 3 and 4 are considered capable of sustained use for cultivated field crops, those in classes 5 and 6 only for perennial forage crops and those in class 7 for neither.

Some of the important factors on which the classification is based are:

The soils will be well managed and cropped, under a largely mechanized system.

Land requiring improvements, including clearing, that can be made economically by the farmer himself, is classed according to its limitations or hazards in use after the improvements have been made. Land requiring improvements beyond the means of the farmer himself is classed according to its present condition.

The following are not considered: distances to market, kind of roads, location, size of farms, type of ownership, cultural patterns, skill or resources of individual operators, and hazard of crop damage by storms.

The classification does not include capability of soils for trees, tree fruits, small fruits, ornamental plants, recreation, or wildlife.

The classes are based on intensity, rather than kind, of their limitations for agriculture. Each class includes many kinds of soil, and many of the soils in any class require unlike management and treatment.

CLASS 1: SOILS IN THIS CLASS HAVE NO SIGNIFICANT LIMITATIONS IN USE FOR CROPS

The soils are deep, well to imperfectly drained, hold moisture well, and in the virgin state were well supplied with plant nutrients. They can be managed and cropped without difficulty. Under good management they are moderately high to high in productivity for a wide range of field crops.

CLASS 2: SOILS IN THIS CLASS HAVE MODERATE LIMITATIONS THAT RESTRICT THE RANGE OF CROPS OR REQUIRE MODERATE CONSERVATION PRACTICES

The soils are deep and hold moisture well. The limitations are moderate and the soils can be managed and cropped with little difficulty. Under good management they are moderately high to high in productivity for a fairly wide range of crops.

CLASS 3: SOILS IN THIS CLASS HAVE MODERATELY SEVERE LIMITATIONS THAT RESTRICT THE RANGE OF CROPS OR REQUIRE SPECIAL CONSERVATION PRACTICES

The limitations are more severe than for Class 2 soils. They affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. Under good management they are fair to moderately high in productivity for a fair range of crops.

CLASS 4: SOILS IN THIS CLASS HAVE SEVERE LIMITATIONS THAT RESTRICT THE RANGE OF CROPS OR REQUIRE SPECIAL CONSERVATION PRACTICES OR BOTH

The limitations seriously affect one or more of the following practices: timing and ease of tillage; planting and harvesting; choice of crops; and methods of conservation. The soils are low to fair in productivity for a fair range of crops but may have high productivity for a specially adapted crop.

CLASS 5: SOILS IN THIS CLASS HAVE VERY SEVERE LIMITATIONS THAT RESTRICT THEIR CAPABILITY TO PRODUCING PERENNIAL FORAGE CROPS, AND IMPROVEMENT PRACTICES ARE FEASIBLE

The limitations are so severe that the soils are not capable of use for sustained production of annual field crops. The soils are capable of producing native or tame species of perennial forage plants, and may be improved by use of farm machinery. The improvement practices may include clearing of bush, cultivation, seeding, fertilizing, or water control.

CLASS 6: SOILS IN THIS CLASS ARE CAPABLE ONLY OF PRODUCING PERENNIAL FORAGE CROPS, AND IMPROVEMENT PRACTICES ARE NOT FEASIBLE

The soils provide some sustained grazing for farm animals, but the limitations are so severe that improvement by use of farm machinery is impractical. The terrain may be unsuitable for use of farm machinery, or the soils may not respond to improvement, or the grazing season may be very short.

CLASS 7: SOILS IN THIS CLASS HAVE NO CAPABILITY FOR ARABLE CULTURE OR PERMANENT PASTURE

This class also includes rockland, other non-soil areas, and bodies of water too small to show on the maps.

O: ORGANIC SOILS

(Not placed in capability classes.)

Forestry land capability classification:

In this classification all mineral and organic soils are grouped into one of seven classes based upon their inherent ability to grow commercial timber. The best lands of Canada for commercial tree growth will be found in Class 1 and those in Class 7 cannot be expected to yield timber in commercial quantities; these represent the extremes. Because of unsuitable climate no Class 1 land will be found in several regions of Canada and in certain regions the Class 2 areas will be too small to show at the chosen scales of mapping.

Some of the important factors on which the classification is based are:

All known or inferred information about the unit including subsoil, soil profile, depth, moisture, fertility, landform, climate and vegetation.

Associated with each capability class is a productivity range based on the mean annual increment of the best species or group of species adapted to the site at or near rotation age. Productivity classes are expressed in gross merchantable cubic foot volume to a minimum diameter of four inches. Thinnings, bark, and branch wood are not included. The productivity as expressed is that of "normal", i.e., fully-stocked stands. It may be assumed that only good management would have produced stands of this nature.

The following are not considered: location, access, distance to markets, size of units, ownership, present state or special crops such as Christmas trees.

The classes are based on the natural state of the land without improvements such as fertilization, drainage or amelioration practices. It is realized that with improved forest management the productivity may change; to the extent that the limitations shown in the symbol may be altered, class changes may also take place. However, significant changes will only be achieved through costly and continuing practices.

CLASS 1: LANDS HAVING NO IMPORTANT LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils are deep, permeable, of medium texture, moderately well-drained to imperfectly drained, have good water-holding capacity and are naturally high in fertility. Their topographic position is such that they frequently receive seepage and nutrients from adjacent areas. They are not subject to extremes of temperature or evapotranspiration. Productivity will usually be greater than 111 cubic feet per acre per year.

When required this class may be subdivided on the basis of productivity into classes 1 (111 to 130), 1a (131 to 150), 1b (151 to 170), 1c (171 to 190), 1d (191 to 210), and by 20 cubic foot classes thereafter, as necessary.

CLASS 2: LANDS HAVING SLIGHT LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils are deep, well-drained to moderately well-drained, of medium to fine texture and have good water-holding capacity.

The most common limitations (all of a relatively slight nature) are: adverse climate, soil moisture deficiency, restricted rooting depth, somewhat low fertility and the cumulative effects of several minor adverse soil characteristics.

Productivity will usually be from 90 to 110 cubic feet per acre per year.

CLASS 3: LANDS HAVING MODERATE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils may be deep to somewhat shallow, well to imperfectly drained, of medium to fine texture with moderate to good water-holding capacity. They may be slightly low in fertility or suffer from periodic moisture imbalances.

The most common limitations are: adverse climate, restricted rooting depth, moderate deficiency or excess of soil moisture, somewhat low fertility, impeded soil drainage, exposure (in maritime areas) and occasional inundation.

Productivity will usually be from 71 to 90 cubic feet per acre per year.

CLASS 4: LANDS HAVING MODERATELY SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils may vary from deep to moderately shallow, from excessive through imperfect to poor drainage, from coarse through fine texture, from good to poor moisture-holding capacity, from good to poor structure and from good to low natural fertility.

The most common limitations are: moisture deficiency or excess, adverse climate, restricted rooting depth, poor structure, excessive carbonates, exposure, or low fertility.

Productivity will usually be from 51 to 70 cubic feet per acre per year.

CLASS 5: LANDS HAVING SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

Soils are frequently shallow to bedrock, stony, excessively or poorly drained of coarse or fine texture, may have poor moisture holding capacity and be low in natural fertility.

The most common limitations (often in combination) are: moisture deficiency or excess, shallowness to bedrock, adverse regional or local climate, low natural fertility, exposure particularly in maritime areas, excessive stoniness and high levels of carbonates.

Productivity will usually be from 31 to 50 cubic feet per acre per year.

CLASS 6: LANDS HAVING SEVERE LIMITATIONS TO THE GROWTH OF COMMERCIAL FORESTS

The mineral soils are frequently shallow, stony, excessively drained, of coarse texture and low in fertility. A large percentage of the land in this class is composed of poorly drained organic soils.

The most common limitations (frequently in combination) are: shallowness to bedrock, deficiency or excess of soil moisture, high levels of soluble salts, low natural fertility, exposure, inundation and stoniness.

Productivity will usually be from 11 to 30 cubic feet per acre per year.

CLASS 7: LANDS HAVING SEVERE LIMITATIONS WHICH PRECLUDE THE GROWTH OF COMMERCIAL FORESTS

Mineral soils are usually extremely shallow to bedrock, subject to regular flooding, or contain toxic levels of soluble salts. Actively eroding or extremely dry soils may also be placed in this class. A large percentage of the land is very poorly drained organic soils.

The most common limitations are: shallowness to bedrock, excessive soil moisture, frequent inundation, active erosion, toxic levels of soluble salts, and extremes of climate or exposure.

Productivity will usually be less than 10 cubic feet per acre per year.

Recreational land capability classification:

Seven classes of land are differentiated on the basis of the intensity of outdoor recreational use, or the quantity of outdoor recreation, which may be generated and sustained per unit area of land per annum, under perfect market conditions.

"Quantity" may be measured by visitor days, a visitor day being any reasonable portion of a 24-hour period during which an individual person uses a unit of land for recreation.

"Perfect market conditions" implies uniform demand and accessibility for all areas, which means that location relative to population centres and to present access does not affect the classification.

Intensive and dispersed activities are recognized. Intensive activities are those in which relatively large numbers of people may be accommodated per unit area, while dispersed activities are those which normally require a relatively larger area per person.

Some important factors concerning the classification are:

The purpose of the inventory is to provide a reliable assessment of the quality, quantity and distribution of the natural recreation resources within the settled parts of Canada.

The inventory is of an essentially reconnaissance nature, based on interpretation of aerial photographs, field checks, and available records, and the maps should be interpreted accordingly.

The inventory classification is designed in accordance with present popular preferences in non-urban outdoor recreation. Urban areas (generally over 1,000 population with permanent urban character), as well as some non-urban industrial areas, are not classified.

Land is ranked according to its natural capability under existing conditions, whether in natural or modified state; but no assumptions are made concerning its capability given further major artificial modifications.

Sound recreation land management and development practices are assumed for all areas in practical relation to the natural capability of each area.

Water bodies are not directly classified. Their recreational values accrue to the adjoining shoreland or land unit.

Opportunities for recreation afforded by the presence in an area of wildlife and sport fish are indicated in instances where reliable information was available, but the ranking does not reflect the biological productivity of the area. Wildlife capability is indicated in a companion series of maps.

CLASS 1: LANDS IN THIS CLASS HAVE VERY HIGH CAPABILITY FOR OUTDOOR RECREATION

Class 1 lands have natural capability to engender and sustain very high total annual use based on one or more recreational activities of an intensive nature.

Class 1 land units should be able to generate and sustain a level of use comparable to that evident at an outstanding and large bathing beach or a nationally known ski slope.

CLASS 2: LANDS IN THIS CLASS HAVE A HIGH CAPABILITY FOR OUTDOOR RECREATION

Class 2 lands have natural capability to engender and sustain high total annual use based on one or more recreational activities of an intensive nature.

CLASS 3: LANDS IN THIS CLASS HAVE A MODERATELY HIGH CAPABILITY FOR OUTDOOR RECREATION

Class 3 lands have natural capability to engender and sustain moderately high total annual use based usually on intensive or moderately intensive activities.

CLASS 4: LANDS IN THIS CLASS HAVE MODERATE CAPABILITY FOR OUTDOOR RECREATION

Class 4 lands have natural capability to engender and sustain moderate total annual use based usually on dispersed activities.

CLASS 5: LANDS IN THIS CLASS HAVE MODERATELY LOW CAPABILITY FOR OUTDOOR RECREATION

Class 5 lands have natural capability to engender and sustain moderately low total annual use based on dispersed activities.

CLASS 6: LANDS IN THIS CLASS HAVE LOW CAPABILITY FOR OUTDOOR RECREATION

Class 6 lands lack the natural quality and significant features to rate higher, but have the natural capability to engender and sustain low total annual use based on dispersed activities.

CLASS 7: LANDS IN THIS CLASS HAVE VERY LOW CAPABILITY FOR OUTDOOR RECREATION

Class 7 lands have practically no capability for any popular types of recreation activity, but there may be some capability for very specialized activities with recreation aspects, or they may simply provide open space.

Waterfowl land capability classification:

In general, the needs of all waterfowl are much alike; each individual and species must be provided with a sufficient quality and quantity of food, protective cover, and space to meet its needs for survival, growth, and reproduction. The ability of the land to meet these needs is determined by the individual requirements of the species or group under consideration, the physical characteristics of the land, and those factors that influence the plant and animal communities.

On this map the land is divided into units on the basis of physiographic characteristics important to waterfowl populations. The degree of limitation associated with each unit determines its capability class. The subclass denotes the primary factor that causes the limitation.

This classification system is based on two important considerations.

Capability ratings are established on the basis of the optimum vegetational stage (successional stage) that can be maintained when good wildlife management is practiced.

Capability ratings assigned do not reflect present land use (except in extreme cases such as heavily populated urban areas), ownership, lack of access, distance from cities, or amount of hunting pressure.

CLASS 1: LANDS IN THIS CLASS HAVE NO SIGNIFICANT LIMITATIONS TO THE PRODUCTION OF WATERFOWL

Capability on these lands is very high. They provide a wide variety and abundance of important habitat elements; rolling topography is well suited to the formation of wetlands. Predominant water areas on these lands are both shallow and deep permanent marshes, and deep, open water areas with well-developed marsh edges.

CLASS 1S: WATER AREAS IN THIS SPECIAL CLASS ARE CLASS 1 AREAS THAT ALSO SERVE AS IMPORTANT MIGRATION STOPS

CLASS 2: LANDS IN THIS CLASS HAVE VERY SLIGHT LIMITATIONS TO THE PRODUCTION OF WATERFOWL

Capability on these lands is high but less than Class 1. Slight limitations are due to climate, fertility, or permeability of the soils. Topography tends to be more undulating than rolling; a higher proportion of the water areas than in Class 1 are small temporary ponds or deep, open water areas with poorly developed marsh edges.

CLASS 2S: WATER AREAS IN THIS SPECIAL CLASS ARE CLASS 2 AREAS THAT ALSO SERVE AS IMPORTANT MIGRATION STOPS

CLASS 3: LANDS IN THIS CLASS HAVE SLIGHT LIMITATIONS TO THE PRODUCTION OF WATERFOWL

Capability on these lands is moderately high, but productivity may be reduced in some years because of occasional droughts. Slight limitations are due to climate or to characteristics of the land that affect the quality and quantity of habitat. These lands have a high proportion of both temporary and

semipermanent shallow marshes poorly interspersed with deep marshes and bodies of open water.

CLASS 3S: WATER AREAS IN THIS SPECIAL CLASS ARE CLASS 3 AREAS THAT ALSO SERVE AS IMPORTANT MIGRATION STOPS

CLASS 3M: LANDS IN THIS SPECIAL CLASS MAY NOT BE USEFUL FOR WATERFOWL PRODUCTION, BUT ARE IMPORTANT AS MIGRATION OR WINTERING AREAS. THIS CLASS HAS NO SUBCLASSES

CLASS 4: LANDS IN THIS CLASS HAVE MODERATE LIMITATIONS TO THE PRODUCTION OF WATERFOWL

Capability on these lands is moderate. Limitations are similar to those in Class 3, but the degree is greater. Water areas are predominantly temporary ponds, or deep, open waters with poorly developed marsh edges, or both.

CLASS 5: LANDS IN THIS CLASS HAVE MODERATELY SEVERE LIMITATIONS TO THE PRODUCTION OF WATERFOWL

Capability on these lands is moderately low. Limitations are usually a combination of two or more of the following factors: climate, soil moisture, permeability, fertility, topography, salinity, flooding, and poor interspersion of water areas.

CLASS 6: LANDS IN THIS CLASS HAVE SEVERE LIMITATIONS TO THE PRODUCTION OF WATERFOWL

Capability on these lands is very low. Limitations are easily identified. They may include aridity, salinity, very flat topography, steep-sided lakes, extremely porous soils, and soils containing few available minerals.

CLASS 7: LANDS IN THIS CLASS HAVE SUCH SEVERE LIMITATIONS THAT ALMOST NO WATERFOWL ARE PRODUCED

Capability on these lands is negligible or nonexistent. Limitations are so severe that waterfowl production is precluded or nearly precluded.

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