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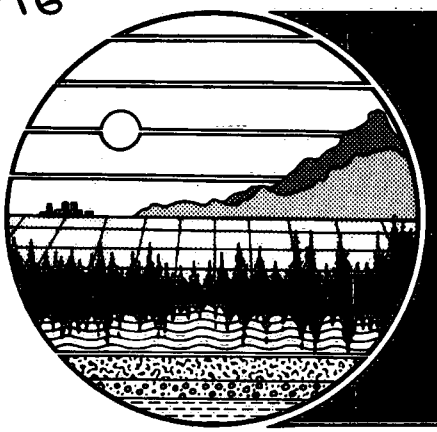

LANDS DIRECTORATE

DIRECTION GÉNÉRALE DES TERRES

PROBLEMS IN MAPPING NON-PRODUCTIVE WOODLAND USING THE CLI PRESENT LAND USE CLASSIFICATION IN HALIFAX COUNTY, NOVA SCOTIA

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PROBLEMS IN MAPPING NON-PRODUCTIVE WOODLAND USING THE CLI PRESENT LAND USE CLASSIFICATION IN HALIFAX COUNTY, NOVA SCOTIA

Peter N. Duinker
February 1981

Lands Directorate
Environment Canada

Working Paper No. 16

Disponible en français sous le titre:

Problèmes associés à la cartographie des boisés improductifs utilisant le système de classification de l'utilisation des terres de l'ITC: région d'Halifax, Nouvelle-Ecosse.

ABSTRACT

The mapping of Non-productive Woodland (U) using the CLI Present Land Use Classification in Halifax County, Nova Scotia, has been inconsistent. The land use interpretations of 1968 and 1973 were compared for four woodland test sites, each of approximately 11 km^2. In two of the four cases, substantial changes in the amount and location of Non-productive Woodland delineations were indicated by the maps. Field checking and photo comparison for these two sites revealed that no detectable change in forest cover had occurred.

Three factors are suggested to have contributed to these inconsistencies, namely a) different scales of photography, b) different interpreters, and c) difficulties in consistently applying the woodland class definitions of the classification. This last factor is considered the most important, and possible solutions for this problem include a change in the definitions for woodland classes, or use of the same classification scheme in conjunction with data from the rather detailed Nova Scotia Forest Inventory.

RÉSUMÉ

Certaines incohérences ont été notées lors de la cartographie des terres boisées improductives, utilisant les normes du système de classification de l'Inventaire des terres du Canada dans la région d'Halifax en Nouvelle-Ecosse. Les interprétations de 1968 et 1973 ont été comparées en utilisant un échantillonnage de quatre sites boisés d'une superficie d'environ 11 km^2 chacun. Sur les cartes de l'utilisation des terres, deux des quatre sites étudiés dénombraient des changements majeurs dans la quantité et la délimitation des boisés improductifs. Or après une vérification sur le terrain et une comparaison entre les photos aériennes de ces deux sites, aucun changement apparent dans la couverture de ces régions boisées n'a eu lieu.

Trois facteurs ont contribué à marquer ces incohérences; a) différentes échelles des photos aériennes, b) différents photo-interprètes, c) difficulté d'appliquer la présente définition de la classe "boisés improductifs" de façon uniforme. Le dernier facteur est sans aucun doute le plus important et des solutions possibles à ce problème impliquent: des modifications dans la définition de la classe "terres boisées", ou une combinaison du présent système de classification avec les données de l'Inventaire Forestier de la Nouvelle-Ecosse.

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1. INTRODUCTION

Land use/land cover maps have the primary purpose of providing information to improve decision-making in land resource management (Baker et al., 1979). Land use information is essential in areas where change is imminent and where planners seek to encourage the orderly development of land resources. Land use information must of necessity have a high degree of accuracy and reliability. Indeed, an accuracy determination should be part of any well-planned land use mapping exercise (Baker et al., 1979).

The Canada Land Inventory (CLI) Present Land Use Classification (McClellan et al., 1968) has been applied twice in Halifax County, Nova Scotia, within the past 15 years and is being used once again in the preparation of a land use update. Problems have been noted in applying the definition of the Non-productive Woodland (labelled U) class of the classification (N. Prout, pers. comm.). Trees in this class are distinguished from trees in the Productive Woodland class by being shorter and dominated by species known to be unsuitable for commercial purposes (see Appendix B). The purpose of this study is to investigate inconsistencies in the mapping of U in the 1968 and 1973 applications of the CLI Land Use Classification in Halifax County, to determine possible factors contributing to the problem, and to suggest alternative solutions to improve mapping of woodland for land use purposes.

2. BACKGROUND TO THE CLI LAND USE CLASSIFICATION

The present land use mapping program using this classification scheme began in 1950, and was administered by the Geographical Branch of the Canada Department of Energy, Mines and Resources (Anon., 1970). According to Ryerson and Gierman (1975), the CLI land use mapping was the largest and most detailed mapping program of its kind ever undertaken. It was designed as a reconnaissance scheme to be applied across the highly variable Canadian environment. The intention was to use low to medium scale black and white aerial photography with a minimum of field checking, and to map the country as fast as possible with a minimum of resources (D. Gierman, pers. comm.). Other sources of information include Census of Canada data and assessment field sheets (Anon., 1970). The classification was applied in the settled portions of Canada at a scale of 1:50,000 and is summarized in Appendix A.

3. THE STUDY AREA - LOCATION AND FORESTS

Figure 1 shows the location of the study area in Nova Scotia. It comprises the area surrounding the city of Halifax covered by National Topographic Index 11D/11,-12,-13, and -14. This area contains most of the western portion of Halifax County.

An understanding of the forests of Halifax County is essential to appreciate the problems in woodland mapping discussed later. The forests of the study area belong to the Acadian forest region of Rowe (1972). Loucks (1959) provides a more detailed description of Maritime forests, and is the source of the

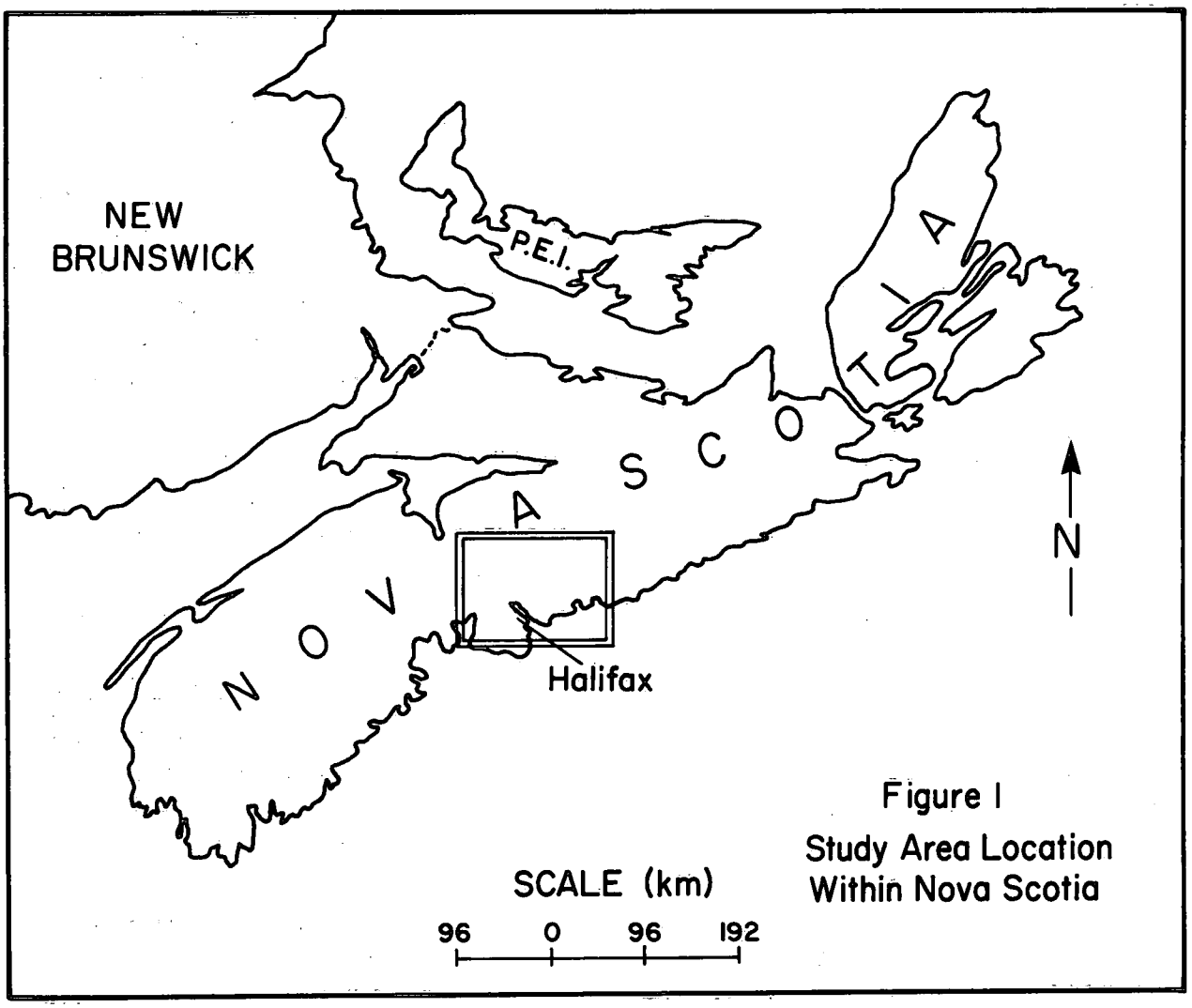

Figure 1
Study Area Location
Within Nova Scotia

following text. The concept of Ecoregion in the classification of Loucks (1959) refers to a geographic unit in which the relationships between tree species and sites are essentially similar throughout the unit, and in which silvicultural treatments at various sites within the unit would be expected to obtain similar results.

As shown in Figure 2, the coastal part of the study area falls into the Atlantic Shore Ecoregion of the Spruce-Fir Coast Zone. This zone is characterized by late springs, cold summers, and frequent fog. Where winds are strong the trees are stunted. In the Atlantic Shore Ecoregion, white and black spruce and balsam fir predominate, with red maple and yellow birch locally common on better soils. Stands are generally open with bare bedrock common. Bedrock is largely argillite and slate, and soils are generally shallow and coarse. Fire is a common occurrence, as evidenced by a few stands of jack pine. Silviculture in this region is limited by severe coastal wind effects.

Much of the western portion of the study area lies in the Clyde River-Halifax Ecoregion of the Red Spruce-Hemlock-Pine Zone. In this ecoregion, the predominant associations include red spruce, hemlock, white pine, balsam fir, and red maple. White birch and red oak are common on ridges. Barrens, probably pyrogenic, are plentiful. Bedrock includes granite, slates and argillite, and soils are coarse sands to loams. Potential evapotranspiration is high in this ecoregion, and silviculture is again limited by high winds, and fire. In the portion of this ecoregion covered by the study area, shallow, loamy soils derived from granites predominate, and the terrain is relatively flat with numerous swamps and lakes.

East of the Clyde River-Halifax Ecoregion within the study area is the Maritime Lowlands Ecoregion of the same Zone. In this ecoregion red spruce, black spruce, balsam fir, red maple, hemlock and white pine predominate. Jack pine is often found on sandy areas, and fire types include red maple and grey birch. Soils are heavy-textured and poorly drained. The study area portion of this ecoregion is comprised of low, rugged hills and upland flats. Bedrock consists of slates, argillite and granite, and soils are variable, commonly sandy loams.

Finally, the northern portion of the study area is predominated by the Maritime Uplands Ecoregion of the Sugar Maple-Yellow Birch-Fir Zone. In this zone hardwoods are most common, with yellow birch formerly abundant. The ecoregion consists mainly of sugar maple, beech and yellow birch on hill tops, white spruce, red spruce, fir and maples on slopes, and spruces, fir and white pine in the valley bottoms. Vigorous shrub competition hinders silvicultural operations. Bedrock in the study area portion of this ecoregion is largely granite, argillite and quartzite, and soils are commonly sandy podzols, moderately deep and loamy.

The N.S. Department of Lands and Forests Forest Inventory provides useful data in understanding the forests of the study area. Table 1 shows that for all of Halifax County about 75% of the surface area is forested, and of that more than half is predominated by softwoods (conifers).

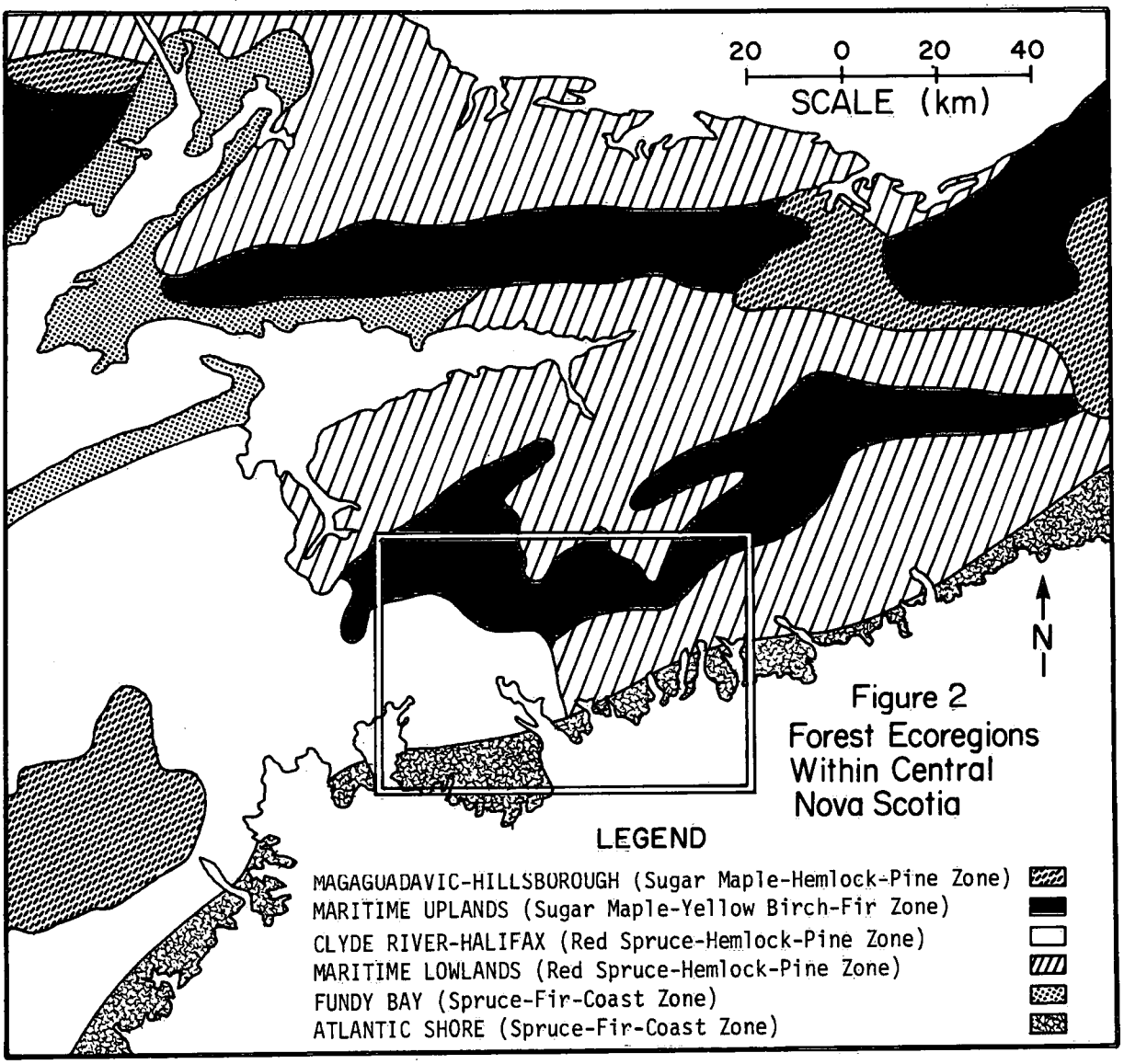

Figure 2
Forest Ecoregions
Within Central
Nova Scotia

SOURCE: Forest Research Branch, Canada Department of Forestry. 1961. Forest Classification of the Maritime Provinces (map).

Table 2 provides a comparison of Halifax County and Hants County directly to the north in terms of land capability for forestry. It is notable that almost 80% of the land in Halifax County is rated poor or less than poor in capability for forestry, while in Hants County about 90% of the land area is rated average or better in capability for forestry. About 30% of the land in Halifax County is rated as having no capability for forestry, and this reflects on the amount of barrens and unproductive land in the county.

4. METHODS

To serve as base maps of the study area, topographic sheets at a scale of

Table 1 - Land Classes of Halifax County

	ha.	%
FOREST		
Softwood	289,040	49.0
Mixedwood	107,450	18.2
Hardwood	44,150	7.5
(Total)	(440,640)	(74.7)
NON-FOREST	84,060	14.2
WATER & FLOWAGE	65,720	11.1
TOTAL	590,420	100.0

SOURCE: Nova Scotia Dept. of Lands and Forests, 1977.

Table 2 - Land Capability for Forestry in Halifax and Hants Counties

Capability Class	Hants		Halifax	
	ha.	%	ha.	%
II (very good)	530	0.2		
III(good)	9,630	4.1	1,090	0.2
IV (average)	205,510	86.2	92,920	21.1
V (poor)	22,620	9.5	212,790	48.3
VI (very poor)			133,750	30.4
TOTAL	238,290	100.0	440,550	100.0

SOURCE: Nova Scotia Dept. of Lands and Forests, 1977.

Table 3 - Background Information on the Land Use Map Sets and Photos

Completed by:		Geographical Branch, Dept. of Energy, Mines and Resources	Ecolcon, Belleville, Ontario
Photos:	dates	May-July, 1966	July-August, 1973
	type	black & white	black & white
	scale	1:15,840	1:33,000
	contractor	Capital Air Surveys, Ottawa	Capital Air Surveys, Ottawa

1:50,000 were obtained. Land use information from the 1968 and 1973 interpretations was procured in the form of blueprint maps, also at a scale of 1:50,000. Table 3 gives a summary of important background information about these interpretations.

Four test sites were chosen for intensive study of the U category, Non-productive Woodland. Selection of these sites was based on visual inspections of the 1968 and 1973 land use maps to identify areas where substantial differences, either in amount or location, in U delineations were evident. The area of each test site is approximately 10,800 ha., measuring 18 cm X 24 cm on the 1:50,000 maps.

A dot planimenter was used to estimate the areas of U-delineations in the test sites. The planimeter used had 1,750 dots covering the 10,800 ha. test site area, giving 6.54 ha./dot on the 1:50,000 maps. All measurements were done twice, the planimeter being placed in a different orientation, and values given for absolute areas or percentages are averages of the two measurements.

5. RESULTS

Areas of Non-productive Woodland delineation in the test sites are given in Table 4. Of note is that the interpretations show a rise in U areas for the Dollar Lake site, a very small rise for the Ingram River site, and substantial decreases in U area for the Herring Cove and Airport sites.

Further data on U area for two of the test sites are given in Table 5. These test sites were examined with respect to the amounts of U delineation that were common to both the 1968 and 1973 interpretations, and the amounts of forest land classified U in at least one of the two interpretations. The data show that for the Herring Cove site, of all the forest land mapped U on at least one of the interpretations, less than one quarter was interpreted as U on both. Similarly, for the Airport site, about one tenth of the forested land mapped U on at least one of the interpretations is common to both.

6. DISCUSSION

In any land use mapping exercise it is essential that a high degree of accuracy be attained. If the user of land use maps

Table 4 - Areas Mapped Non-productive Woodland in Four Test Sites in Halifax County

TEST SITE	AREA CLASSIFIED U			
	1968		1973	
	ha.[1]	%[2]	ha.[1]	%[2]
Dollar Lake	1,995	18.5	2,475	22.9
Ingram River	1,010	9.4	1,089	10.1
Herring Cove	2,884	26.7	2,099	19.4
Airport	1,066	9.9	409	3.8

[1] Hectare values are averages of two area measurements made with a dot planimeter.

[2] Percentage values represent the hectare value divided by the area of the test site (ca. 10,800 ha.), times 100.

Table 5 - Areas of U Common to both 1968 and 1973 Interpretations for Two Test Sites where Little or No Change in Forest Cover Occurred

TEST SITE	A[1]		B[2]	C[3]
	ha.	(%)	ha.	%
Herring Cove	925	(8.6)	4,058	23
Airport	137	(1.3)	1,338	10

[1] A = Areas mapped U which are common to both the 1968 and 1973 interpretations. The percentage figures are percent of total site area.

[2] B = Areas mapped U on at least one of the 1968 and 1973 interpretations (or, area U (1968) plus area U (1973) minus A).

[3] C = A/B x 100

notes a change in use in a particular area which did not in reality take place, then the function of the information is lost. Land use maps at a scale similar to that used for the maps in this study (that is, 1:50,000) should be at least 90% accurate (Baker et al., 1979). The following discussion shows that the mapping of Non-productive Woodland in Halifax County does not meet this objective.

For the two test sites where substantial change in forest cover is evident from an examination of the photos used for the land use interpretation (Dollar Lake and Ingram River), some consistency in the application of the U definition appears to have taken place. Perhaps the easiest part of the definition to apply, and the easiest to recognize on black and white aerial photographs is cutover forest (whether cutover forest should be labelled "Non-productive" Woodland is discussed later). Table 4 shows that for both Ingram River and Dollar Lake test sites, the amount of land delineated Non-productive Woodland increased, and the photos of these sites show that substantial amounts of clearcutting took place in the interim between dates of photography.

However, in the two test sites for which an examination of the photos shows virtually no change in forest cover, the 1973 interpretation shows a much decreased amount of U compared to the 1968 interpretation (see Table 5).

Most of the area not mapped U in these sites was mapped T (Productive Woodland). A cursory conclusion may be that what appeared as short, non-commercial woodland on the photos for the 1968 interpretation appeared as taller, commercially viable woodland on the photos used in 1973. In other words, the woodland actually changed from that falling in the Non-productive Woodland definition to that within the Productive Woodland definition. However, comparison of the photos shows little or no change in the characteristics of the forest cover.

An overall decrease in U area is not all that is apparent in the Airport and Herring Cove sites. Not only did areas mapped U in 1968 become T in 1973, but many areas mapped T in 1968 became U in 1973 in areas where the photos showed no change in forest cover. The data in Table 5 support this observation in that only a small proportion of the area of U on at least one of the maps (1968 or 1973) was common to both. The maps would indicate that most of the Non-productive Woodland changed place, while the photos show no change in the location of woodland types!

The question that arises is why are the interpretations so different and incorrect. There are a number of possible factors. One factor is the different photography used in each interpretation. It is obviously much easier to judge the height and type characteristics of a forested area on large-scale black and white photographs, such as the 1966 photos at 1:15,840, than on similar photos of half that scale (the 1973 photos at 1:33,000). However, consistency in land use mapping cannot rely on having available the same photo types and scales.

Another factor may be different interpreters. A land use classification scheme such as the CLI scheme of national breadth, should be designed so that consistent accuracy can be obtained by any trained photo interpreter (Baker et al., 1979).

The factor most applicable in this case is the inadequacy of the classification scheme. In designing a land use mapping program using data from aerial photography, the critical objective is to allow for the separation of land uses into meaningful categories which can be identified consistently (Baker et al., 1979; emphasis added). It is recognized that clear class definitions for land cover are difficult; however, if category descriptions are complete and guidelines well explained, the inventory process can be repeated (Anderson et al., 1976). If remotely sensed images are the primary data source, then only classes of use/cover that can be identified on such images should be included in the classification.

It is evident that the U category, Non-productive Woodland, cannot be applied consistently in Halifax County. The full description of U as would be available to interpreters, is found in Appendix B. In short, the class includes recent clearcuts, recent burns, natural regeneration on former agricultural land, and tree scrub (short, immature or stunted trees). The most difficult portion of the description to apply is probably that of tree scrub. A considerable amount of what might be called "tree scrub" exists in Halifax county, but also much of the land in the county is characterized by pyrogenic barrens and exposed bedrock. It is suggested here that interpreters have differed in opinion of what the dividing line should be between tree scrub at the upper end of the height range and "productive woodland" at the lower end of its height range, and between tree scrub in the lower portion of its height range and cover range, and barrens and unproductive land. In fact the classification as it stands now has no adequate place for barrens such as those of Halifax County. Since they support vegetation, they are not Unproductive Land. Rough Grazing and Rangeland includes areas of non-woody vegetation in which woody plants may cover up to 25% of the area. Barrens often have cover over 25%, dominated by ericaceous shrubs. Most barrens in the study area have been mapped U, although they hardly resemble "scrub trees". The Nova Scotia Forest Inventory (unpublished data, 1974-75) uses categories of Alders and Brush, and Rock Barrens, with areas in Halifax County of 9,790 ha. and 15,300 ha. respectively. Considering that the land use maps of Halifax County show very little of the Unproductive Land category, it follows that much of the "rock barren" category of the Nova Scotia Forest Inventory has likely been mapped Non-productive Woodland on the land use maps.

In considering ways to alleviate the problem, it is useful first to examine the U category and its title, Non-productive Woodland. The term productivity in this sense has been used to denote a rate of biological productivity so low so as not to result in the growth of merchantable forest products. The prefix "non", then, is better replaced by "low". Perhaps "non-commercial woodland" is a better descriptor. In the definition height is used as an indicator of whether the woodland is productive. Height of trees or shrubs, however, is not necessarily a good indicator of productivity. For instance, good, young regeneration in clearcuts or burned areas would be considered productive by most forest managers. Yet clearcuts and burned areas are to be included in the U category. Certainly some of the forest types implied in the definition, such as stunted, conifer growth on rocky, exposed sites, could

conceivably be considered of rather low productivity, but other types could not be considered non-productive.

7. CONCLUSIONS

Both the definition and the application of the Non-productive Woodland category are not without difficulties in relation to the woodland of Halifax County. It has been shown that the category has not been applied consistently in this area. Two approaches toward relieving the difficulties are now discussed.

The best solution would be a change in the classification of woodland. Recent U.S. (Anderson et al., 1976) and Canadian (Ryerson and Gierman, 1975) efforts in the direction of nationwide land use classification schemes for use with remotely sensed data have classified forests at this scale (medium scale) by type - that is, forests are mapped as predominantly evergreen, deciduous or mixedwood. These forest types are separable on medium scale, black and white photographs with relative ease, and require much less subjectivity on the part of the interpreter compared to the Non-productive Woodland category.

If it is necessary and/or desired to continue the use of the current land use classification then it seems appropriate for areas such as Halifax County, with large proportions of forest land, to take advantage of an already completed inventory of forest lands. For Halifax County such an inventory, in map form, was completed by the Nova Scotia Department of Lands and Forests at a scale of 1:15,840, using 1966 black and white photography (1:15,840) and 1967 field observations. Such maps are considered valid for periods of 20 years or even longer (F. Wellings pers. comm.), except for areas of anthropogenic or natural disturbance (fire and

Table 6 - Classes within the Nova Scotia Forest Inventory

CLASS		MAP SYMBOL
Height (m)	0-5	A
	5-9	B
	9-15	C
	15+	D
	Mixed	E
Density (% crown closure)	to 40	1
	41-60	2
	51-100	3
Species (% hardwood)	to 25	S
	26-75	M
	76-100	H
Site Class	Good	III
	Average	IV
	Poor	V

clearcutting being the most common). The inventory maps provide four types of information for each delineation - height class (5 classes), density class (3 classes), type (3 classes) and site class (3 classes). These are given in Table 6. As well, brushland areas and barrens are marked separately.

In making use of this information for a land use mapping exercise with the CLI Land Use Classification, the interpreter could consult briefly with local foresters to decide, for a particular area, which delineations on the forest inventory maps should be included in the Productive Woodland (T) and Non-productive Woodland (U) categories of the land use classification. For example, inclusions in the land use category U might contain all forest inventory delineations of site class V and/or height classes A and B, as well as brushland areas and barrens. Once this step is completed, the interpreter could then use current photos to identify areas of clearcutting and recent burns. Depending on the original cover type and known management inputs after the disturbance, these areas could be appropriately placed into the T or U categories. For instance, if clearcutting took place in an area considered only marginally productive (say an area marked SIC IV on the forest inventory map - see Table 6), and it is known through field observations that no efforts were made to enhance regeneration, then the area may be considered U. If, on the other hand, planting is known to have taken place, then the area might better be in the T category.

By making use of an existing, reliable interpretation of forest cover such as the Nova Scotia Forest Inventory, land use mappers are assured of an accuracy in woodland mapping much greater than is likely to be produced by attempting to delineate Productive Woodland and Non-productive Woodland directly from photographs. If land use maps are produced in succession, as in the case studied here, then the above procedures will prevent significant differences in the mapping of woodland in areas where there has been essentially no change in forest cover over the period from one mapping exercise to the next.

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APPENDIX A

Summary of Classification for
Present Land Use*

Category		Symbol
I	URBAN	
	Land used for urban and associated non-agricultural purposes.	
	1. Built-up Area (Parks and other open spaces within built-up areas are included).	B
	2. Mines, Quarries, Sand and Gravel Pits (Land used for the removal of earth materials).	E
	3. Outdoor Recreation (Golf courses, parks, beaches, summer cottage areas, game preserves and historical sites).	O
II	AGRICULTURAL LANDS	
	1. Horticulture, Poultry and Fur Operations Land used for intensive cultivation of vegetables and small fruits including market gardens, nurseries, flower and bulb farms, and sod farms. Large scale commercial fur and poultry farms are also included because of their specialized agricultural nature.	H
	2. Orchards and Vineyards Land used for the production of tree fruits, hops and grapes.	G
	3. Cropland Land used for annual field crops: grain, oilseeds, sugar beets, tobacco, potatoes, field vegetables, associated fallow and land being cleared for field crops.	A
	4. Improved Pasture and Forage Crops Land used for improved pasture or for the production of hay and other cultivated fodder crops including land being cleared for these purposes.	P
	5. Rough Grazing and Rangeland	K
	(a) Areas of natural grasslands, sedges, herbaceous plants and abandoned farmland whether used for grazing or not. Bushes and trees may cover up to 25 per cent of the area. If in use, intermittently-wet, hay lands (sloughs or meadows) are included.	
	(b) Woodland grazing: If the area is actively grazed and no other use dominates, in some grassy, open woodlands, bushes and trees may somewhat exceed 25 per cent cover.	

*SOURCE: Anon. 1970. The Canada Land Inventory: Objectives, Scope and Organization. CLI Rep. No. 1 (Revised), Lands Directorate, Environment Canada, Ottawa. 61 pp.

Category		Symbol
III	WOODLAND	
	Land covered with tree, scrub or bush growth, including:	
	1. Productive Woodland Woodland with trees having over 25 per cent canopy cover and over approximately 20 feet in height. Plantations and artificially reforested areas are included regardless of age.	T
	2. Non-Productive Woodland Land with trees or bushes exceeding 25 per cent Crown cover, and shorter than approximately 20 feet in height. Much cut-over and burned-over land is included.	U
IV	WETLAND	
	Swamp, Marsh or Bog Open wetlands, except those which frequently dry up, and show evidence of grazing or hay cutting. (See K Agricultural Lands).	M
V	UNPRODUCTIVE LAND	
	Land which does not, and will not, support vegetation. e.g. eroded soil or rock and active depositional features.	
	1. Sand (Sand bars, sand flats, dunes, beaches).	S
	2. Rock and Other Unvegetated Surfaces (Rock barrens, badlands, alkali flats, gravel bars, eroded river banks, mine dumps).	L
VI	WATER	Z

APPENDIX B

Woodland Class Definitions of the CLI Land Use Classification*

WOODLAND

Land covered with tree or scrub growth.

Map Symbol

(a) PRODUCTIVE WOODLAND

T

Land bearing forest of a commercial nature.

Include:

(i) Tracts of wooded land on which the crown cover or canopy density exceeds 25 per cent and on which the bulk of the trees could be used as sawlogs, pulpwood, fence posts, or fuelwood of commercial value at the time of the photography or field work. Most of the trees in this category are over 20-30 feet in height. Trees shorter than this range are seldom of a commercial character and are not classed as productive woodland unless some immediate commercial use is made of them, e.g., small pulpwood logs or cedar fence posts. (The regional economic situation may be the deciding factor in whether or not such economically marginal trees are utilized). This minimum height range stipulation is somewhat arbitrary but should encourage consistent mapping.

(ii) Artificially restocked tracts or plantations, regardless of age or height.

Do Not Include:

(i) Land where the crown cover of trees over 20-30 feet in height is less than 25 per cent. This is classed either as Non-Productive Woodland or as Rough Grazing and Rangeland respectively, depending on whether the balance of the unit is wooded or grassland.

(ii) Other open woodland which is steadily grazed and where no other use dominates; this is classed as Rough Grazing and Rangeland.

(iii) Areas of trees shorter than the 20-30 foot range unless actively exploited. These are classed as Non-Productive Woodland.

(b) NON-PRODUCTIVE WOODLAND

U

Land with a growth of short trees or bushes.

* SOURCE: McClellan, J.B., L. Jersak, and C.L.A. Hutton. 1968. A Guide to the Classification of Land Use for the Canada Land Inventory. Policy and Planning Branch, Dept. Energy, Mines and Resources, Ottawa. 18 pp.

Include:

(i) Tracts of land where bush and tree scrub cover exceeds 25 per cent. "Tree scrub" consists of short (immature or stunted) trees, i.e., less than 20-30 feet in height. (Tree scrub is seldom of a commercial nature but when mapping a tract of scrub trees of a type known to be actively exploited for wood products in the general map area, such tract may be classed as Productive Woodland).

Willows, alder, saskatoon bushes, juniper, sumac, ironwood and dwarf conifers are examples of types commonly occurring in the Unproductive Woodland category. Much of the tree cover in this category is second or third growth found in cut-over or burned-over area. Other is stunted growth found in rocky, alpine or poorly drained muskeg sites. Some is former agricultural land in an advanced stage of reversion to forested land.

For marginal examples, where trees are near the lower end of the 20-30 foot range, it is helpful to consider site conditions. In the poorer sites with shallow soils, poor drainage or rock out-crops, Non-Productive Woodland is the more appropriate designation. Borderline types growing under better site conditions may be classed as Productive.

(ii) Tracts of land recently logged-off or cut-over, and tracts of forest land recently burned over.

Do Not Include:

(i) Artificially reforested areas; these are classed as Productive Woodland.

(ii) Wetlands with a cover of bushes shorter than approximately four feet.

(If drainage conditions in these areas are too poor to support heavier cover, such units are classed as Wetland).

APPENDIX C

Common and Scientific Names of Trees Mentioned in the Text

birch, grey	*Betula populifolia* Marsh.
birch, white	*Betula papyrifera* Marsh.
birch, yellow	*Betula lutea* Michx.f.
fir, balsam	*Abies balsamea* (L.) Mill.
hemlock	*Tsuga canadensis* (L.) Carr.
maple, red	*Acer rubrum* L.
maple, sugar	*Acer saccharum* Marsh.
oak, red	*Quercus rubra* L.
pine, jack	*Pinus banksiana* Lamb.
pine, white	*Pinus strobus* L.
spruce, black	*Picea mariana* (Mill.) B.S.P.
spruce, red	*Picea rubens* Sarg.
spruce, white	*Picea glauca* (Moench) Voss

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