An analysist report of land use change in Edmonton, Alberta between 1966 and 1976 with a focus on agriculture land use change and ecology

Produced for Edmonton, AB City Council

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Geob 479

Executive Summary

Agriculture is an important industry for the city of Edmonton, and the land used in agriculture related activities takes a visible part of Edmonton landscape. Agriculture land including cropland, land used for horticulture, and land used for pasture and forage crops (improved and unimproved). Between the year of 1966 and 1976, the total agricultural using land consist at about similar area with some obvious structural change, such as 21224 hectares decrease in cropland while the horticulture land increased by 706 hectares. The decrease of unimproved pasture and forage land is significant (from 75893 to 45145, which is 30748 hectares difference) while the improved pasture and forage cropland also experienced some decrease (about 6%), which indicates some positive exchange in land use pattern in Edmonton's agriculture industry.

Introduction

The city of Edmonton was about 600 square kilometers in 1960s and 1970s. In this not very populated city, land used for agriculture such as crop land and pastureland take significant part of the whole area, just as this industry was an important member of the whole economy in Edmonton. Agricultural land and the land use change associated with agricultural is closely related to the ecological condition of the local area. From an economic perspective, agricultural activities and related land use change bring both positive and negative externalities in social and environmental fields. For example, cropland is managed annually, thus, compare natural vegetational land or even human-managed forest, cropland can possibly bring about biodiversity loss and water storage capacity decrease. It is also not likely to provide much resource for recreation compare to parks or natural environment with more various landscape. Also, agricultural land usually occupies a large area of land, so the social service that it can provide have a lower density. However, the agricultural land such as cropland pastoral area under good management can increase the local and neighbor area's environment condition or ecological index if planning scientifically or transformed from worse condition of land use.

Due to Edmonton's city plan and the need of development, the land use pattern experienced notable changes from 1966 to 1976. A small part agricultural land turned to urban build-up area, some pastureland and forage cropland was improved, and horticulture used land was new to the Edmonton's land use. All those changes have impacts on the local society and ecological.

Results and Further Discussion

To proceed this analysis, I used archive land use data map of Edmonton in the year of 1966 and 1976, with fourteen land use types marked out. Because this project has a focus on agricultural land, some unrelated or too minor land use changes were ignored and removed from my result table, but still include in two complete Edmonton city land use maps (see Figure 3 and figure 4).In order to acquire a clear comparison in data, I proceeded calculation in class matrices and landscape metrics using Fragstats software, all the metrics used are listed below with description in table 1.

According to this assessment's results (summarized in Table 2, Figure1 and Figure 2), the greatest land use change does not happened in agricultural land. The urban area was expanded especially around the most populated area close to the North Saskatchewan River. Forestry industry and mining industry associated land use shows the development in these two category- large area of non-productive woodland transformed to productive woodland, and mines quarries and pits also had great increase in percentage. However, agriculture land including cropland, horticulture area, pastureland and forage cropland took the greatest part in total land use and the use changes in Edmonton. The land used for cropland is the largest portion in Edmonton, this catogar experienced a decrease from 284295 hectares to 263071 hectares. The improved pasture and forage cropland decreased from 46698 hectares to 44298 hectares while the unimproved pasture land and forage crops land decrease significantly from 76893 to 45145 hectares, which shows and improvement in planning and city development. The new category, horticulture , which does not play an very big part, but

can be a very good supplement to recreation service provide by the city with outdoor creation area which also increased a lot from 1966 to 1976.

Resource

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Table1: Units and description of metrics used in this analysis.

Class metrics	Class metrix are calculated for each class type on the landscape
Total Area	Area of each class
Percentage of Landscape	Percentage of the areas of all landscape comprised of the patch type
Total Edge	The sum of the length in meters of the edge segments involving in the patch type
Coefficient of Variation of Patch Area	The standard deviation in patch area divided by the meacn patch area of th corresponding patch type.
Perimeter_ Area Fractal Dimension	2 times the logarithm of patch perimeter (m) divided by the logarithm of patch area (m2)
Shape index -- mean	The average shape index (SHAPE) of patches of the corresponding patch type.
Shape Index -- area-weighted mean	The average shape index (SHAPE) of patches of the corresponding patch type, weighted by patch area so that larger patches weigh more than smaller patches.
Tatal Core Area	the sum of the core areas of each patch (m2) of the corresponding patch type, divided by 10,000 (to convert to hectares).
Core Area Percent of Landscape	The percentage of the landscape which is core area for each class
Number of Disjunct Core Areas	The number of disjunct core areas contained within the patch boundary.
Number of Patches	The number of patches of the corresponding patch type (class)
Total Edge	The sum of the lengths (m) of all edge segments in the landscape
Number of Patches	The number of patches in the landscape divided by total landscape area, multiplied by 10,000 and 100 (to convert to 100 hectares).
Patch Density	The number of patches of the corresponding patch type divided by tatal landscape area(to convert to 100 hectares)

Table2: Percentage changes in different types of land use in Edmonton between 1966 and 1976.

1966 \ 1976	Cropland	Horticulture	Improved pasture and forage crops	Mines quarries sand pits	Non-productive woodland	Outdoor recreation	Productive woodland	Swamp marsh or bog	Unimproved pasture and range land	Urban built-up area	Water areas	Grand Total
Cropland	82.3%	0.2%	0.0%	0.7%	0.3%	0.2%	1.7%	0.4%	6.7%	7.5%	/	284295
Horticulture	/	/	/	/	/	/	/	/	/	/	/	0
Improved pasture and forage crops	1.0%	/	94.5%	0.1%	0.3%	/	0.8%	0.2%	2.2%	1.0%	/	46698
Mines quarries sand pits	4.4%	/	/	42.7%	3.8%	5.4%	9.1%		13.5%	21.1%	/	1676
Non-productive woodland	12.6%	/	/	0.3%	8.5%	2.3%	51.7%	0.5%	13.3%	10.9%	/	19065
Outdoor recreation	/	/	/	/	/	85.8%	/	/	/	14.2%	/	1727
Productive woodland	14.9%	/	/	0.4%	1.4%	2.1%	63.9%	0.3%	7.3%	9.7%	/	28406
Swamp marsh or bog	17.7%	/	/		7.8%	1.0%	12.9%	28.3%	26.2%	6.1%	/	11301
Unimproved pasture and range land	26.1%	0.1%	0.1%	0.2%	4.5%	1.6%	32.3%	2.3%	22.9%	9.8%	/	75893
Urban built-up area	/	/	/	/	/	/	/	/	/	100.0%	/	19588
Water areas	/	/	/	/	/	/	/	/	/	/	100.0%	19861
Grand Total	263071	706	44298	3107	7314	4511	59305	6221	45145	54971	19861	508510

Figure1: Land use map of Edmonton in 1966 with one detail partial map

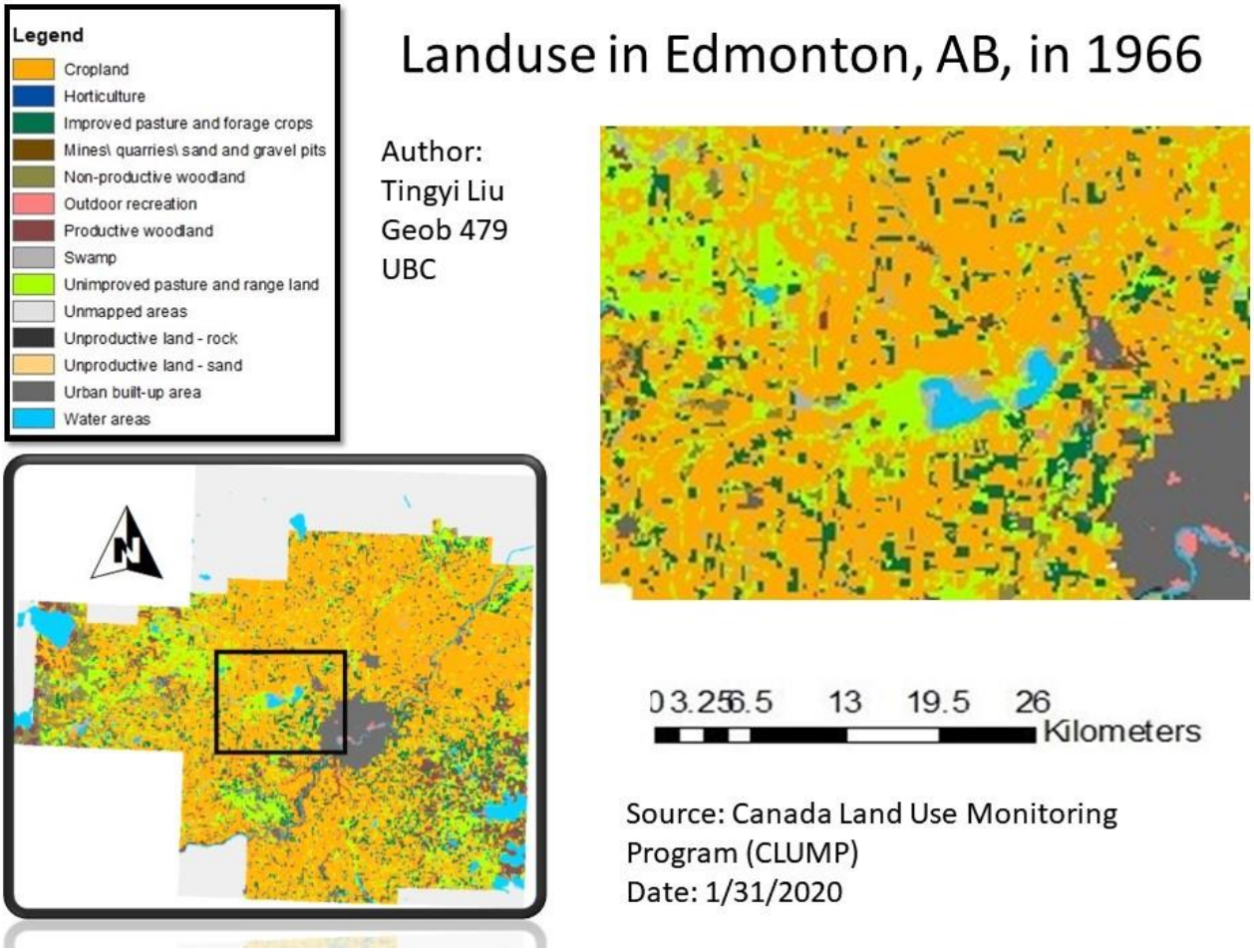


Figure2: Land use map of Edmonton in 1976 with one zoom-in detailed partial map

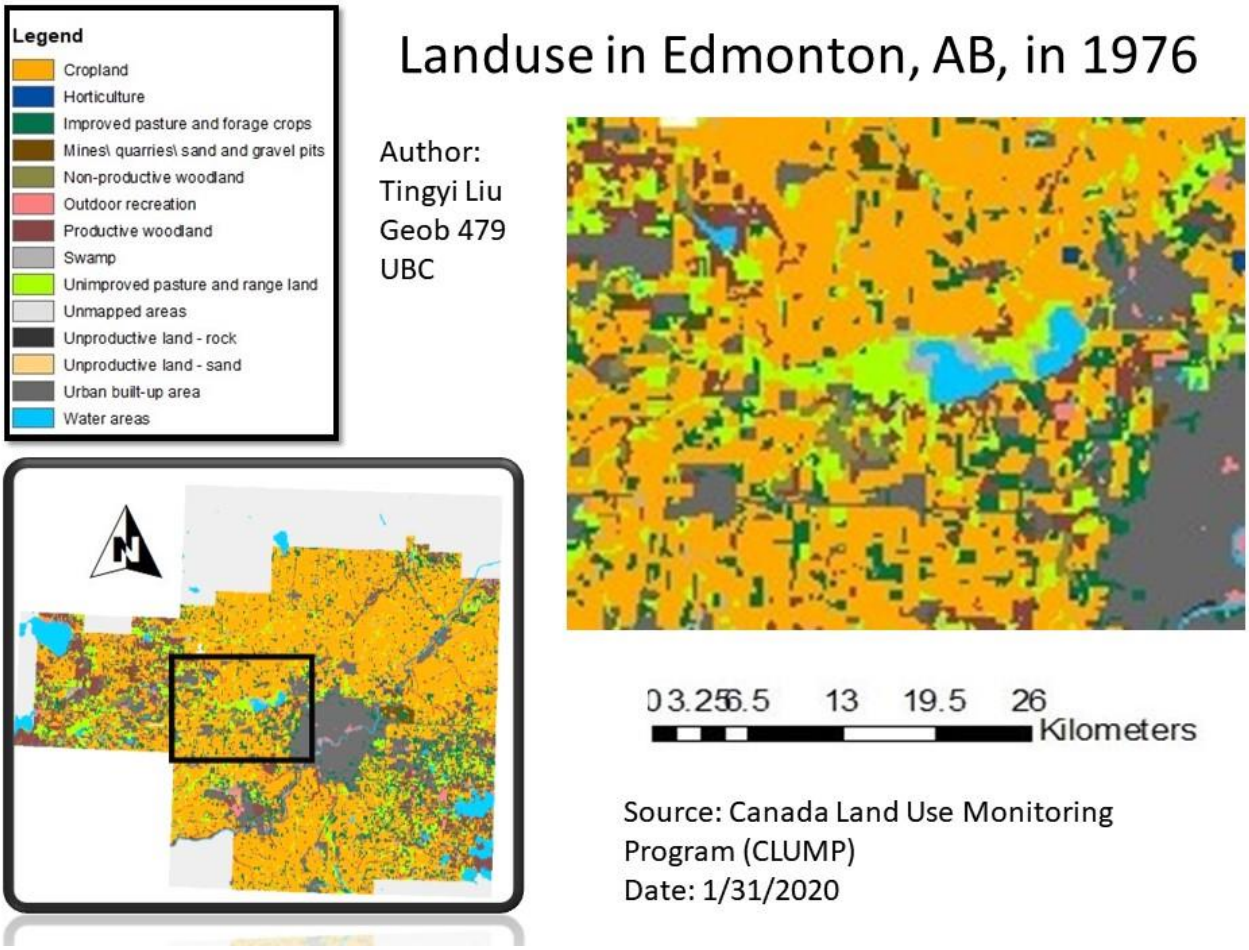
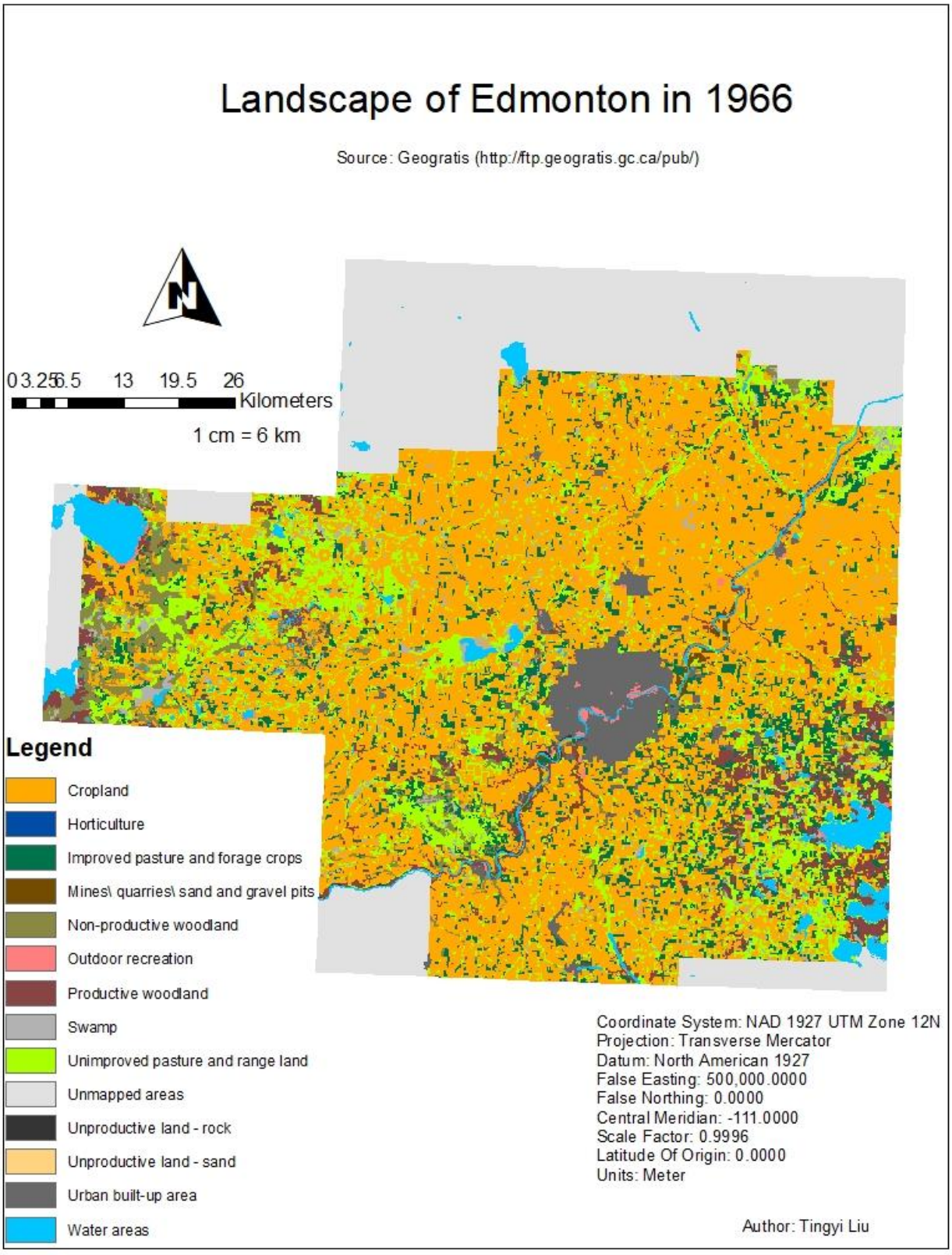


Figure3: Land use map of Edmonton, AB in 1966



Date: 2020-01-31

Figure4: Land use map of Edmonton, AB in 1976