BASELINE (1985) HABITAT ESTIMATES FOR THE SETTLED PORTIONS OF THE PRAIRIE PROVINCES

Report #2: Saskatchewan Parkland - Part I

Prairie Habitat Monitoring Project

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ABSTRACT

The current fiscal year, 1987-88, is year two of a five-year program to establish baseline habitat values for various physiographic units in the Prairie Provinces. This report presents data for 18 transects and 13 physiographic units in the eastern part of the Saskatchewan Parkland.

Attempts to analyse the habitat data with standard statistical methods have shown that the data are highly variable and frequently skewed to the point where these techniques cannot be legitimately used. As a result, considerable caution must be used in interpreting apparent habitat differences and habitat values extrapolated from sample means for physiographic units. The application of non-parametric analytical techniques to the data will be attempted in the future.

In assessing the data obtained to date several items are worthy of mention.

1. By far the largest quantities and best combinations of good waterfowl habitat occur in three of the 13 physiographic units, the Minichinas Hills, Ponass Lakes Plain and Touchwood-Beaver Hills.

2. On the basis of the Loreburn transect the Hawarden Hills appear to be the most intensively cultivated of the 13 units.

3. There is considerable variability in habitat values from different transects within the same physiographic unit.

4. Preliminary observations suggest that cover/land use changes are occurring at a fair pace in most of the areas being studied.

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Project Officer - J.B. Millar

I. Objective

The objective of this portion of the Prairie Habitat Monitoring Project is to establish baseline habitat values for long-term monitoring sites and to generate estimates of the current distribution and quality of each of a variety of habitat (cover) and land use classes in individual physiographic units (habitat subregions) within each of the ecoregions in the settled portions of the three Prairie Provinces.

II. Introduction

The quality and quantity of prairie migratory bird habitat has progressively declined since the time of settlement. A variety of studies have documented this decline for specific locations and time periods (Millar 1986a) but the rate of loss (and hence the severity of the problem) across the prairies as a whole is largely unknown. There is a need to monitor trends in habitat loss in the various prairie ecoregions to ensure that habitat conservation programs address the areas of primary concern and that elected officials are equipped with current, factual information as a basis for directing land management policy. The recent initiation of the North American Waterfowl Management Plan will most certainly increase the demand for habitat monitoring information.

Effective measurement of habitat change is dependent upon the availability of a baseline record of current conditions against which future observations can be compared. The establishment of such a baseline record is therefore an essential first step in the development of a habitat monitoring program and the determination of habitat trends. The methods and activities described in this report represent the start of a more comprehensive effort to establish this baseline record, expanding on the results of earlier pilot studies (Millar 1986b).

III. Methods

The methods employed in this project have been described in detail in an earlier report (Millar 1987). Therefore, information presented here will be confined to changes in methodology which have been instituted since that report and which apply directly to the material presented in this report.

A. Delineation of Physiographic Units

Physiographic unit boundaries within Saskatchewan parkland have been mapped on 1:250,000 scale topographic maps with the aid of 1970 aerial photos and newly developed soils and surficial geology maps. Contrary to initial expectations, this mapping has produced many significant changes in the boundaries delineated by Adams (1984). These changes fall into three categories:

1. Boundary shifts between units - These have affected all of the physiographic units covered in this report.

2. Creation of new physiographic units - To date three new units have been added. One of these, the Lower Souris River Plain, is covered in this report and is the result of splitting the Souris River

Plain (4.59) into the Upper Souris River Plain (4.59) and Lower Souris River Plain (4.85) on the basis of differences in soil parent material.

3. Identification of subdivisions within physiographic units - This has been done on the basis of obvious differences in density and distribution of wetlands and, to some extent, topography. These sub-divisions have not been utilized in this report but should provide a basis for more accurate sampling of habitat conditions in the future if resources become available for expanding the sampling network.

B. **Sampling Network**

Further transect splitting has resulted in the creation of an additional eight transects thus increasing the total number of transects in the project to 152. None of these new transects are dealt with in this report and details on them will be presented in a future report. I also anticipate a few more shifts of borderline transects from one ecoregion to another as groundtruthing establishes ecoregion boundaries more accurately.

C. **Data Assembly**

1. Wetland impact and upland secondary cover and feature codes. A few additional categories have been created and will be described in a later report.

2. Preparation of "clean" data records. Our procedures have now been modified so that corrected descriptive data are fed directly into the in-house computer at the Prairie Migratory Bird Research Centre and transferred onto diskettes for transmission to Lands Directorate in Ottawa.

D. Data Analysis

Summarization of all cover/activity combinations for both wetlands and uplands has proven to be a rather cumbersome exercise with many combinations occurring only rarely and contributing little to overall habitat conditions within a sample. In order to simplify evaluation of the occurrence of various cover and activity classes data analysis has been divided into two steps. First, cover classes are summarized without regard to land use activities and, second, land use activities are summarized without regard to cover. In this latter summary a number of minor land use activity classes have been combined.

At the present time wetland margin data are not being analysed and consideration of wetland impacts is being limited to identifying the number of wetlands per quarter section that are affected by one or more permanent impacts.

The calculation of area values by Lands Directorate has been done in terms of acres rather than hectares and we have done our analyses in acres and then converted the results to hectares. The exceptions to this are Tables 11 to 13 which contain statistical values generated from acreage figures. Arrangements are being made with Lands Directorate to produce all future area calculations in hectares so that conversions will not be necessary.

Wetlands in this report are categorized in terms of cover classes established in accordance with the lands Directorate Land Cover Classification. These classes are equated in the following table to the wetland types defined in Millar's (1984) wetland classification system.

Wetland Cover Classes Used in this Report (1)	Wetland Types of Millar (1984) Basin Wetlands	Wetlands Identified as Stream Segments
Cultivated (V1, X0)	0.3	
Shrubs & Trees (W3, W1)	0.2, 1.2	
Grasses, Sedges & Forbs (V3)	1.1, 1.8, 2.1, 2.8	1.9, 2.9
Bulrush & Cattail (V4)	3.1, 3.8	3.9, 9.1, 9.3
Transitional Open Water (Z6)	4.1, 4.8	4.9
Natural Fresh Open Water (Z3)	5.1, 5.2, 5.8, 9.9	5.9, 9.5
Artificial Open Water (Z5)	5.3, 5.4, 5.5, 9.8	5.6, 5.7, 9.2
Saline Open Water (Z4)	6.1	
Other (primarily V2, V5, X - non-cultivated, Z1)	0.3	9.6

(1) Cover codes are in parentheses.

E. Terminology

In this report in the term "unit" is used as an abbreviation for "physiographic unit".

IV. Results and Discussion

A. General Information on the Area Covered in this Report

1. Location and Landform Character of Physiographic Units

This report presents baseline habitat data for 18 sample sites in 13 physiographic units located in the eastern half of the Saskatchewan Parkland (Figure 1). Individual units and the transects located in them are identified in Table 1. Collectively these 13 units comprise an area of approximately 4,776,300 hectares (Table 2), excluding river valleys and lakes, or approximately 38 percent of Saskatchewan Parkland.

Origin of soil parent material, surface form and slope values for the 13 units are summarized in Table 1. Morainal parent material predominates in the area surveyed. Ten of the physiographic units are on this material and one each are on lacustrine, morainal/lacustrine and glacio-fluvial/morainal material, respectively. Landform (surface form) is primarily knob and kettle in five of the morainal physiographic units and the one mixed morainal/lacustrine unit. Mixtures of knob and kettle and hummocky terrain are found in two morainal units, knob and kettle mixed with dissected terrain in a third, and dissected landform in a fourth. The tenth morainal unit has a mixture of undulating and knob and kettle terrain. The one lacustrine unit has dissected landform and the mixed glacio-fluvial/morainal unit is on undulating terrain. Slope values range from 1 to 15 percent. Minimal slopes (1 to 3 percent) occur in five units, 4 to 9 percent slopes in 10 units and 10 to 15 percent in three units.

2. Size of Monitoring Samples in Relation to Physiographic Units

The relative sizes of monitoring samples and the physiographic units in which they occur are presented in Table 2. Samples range from a low of 0.36 percent of the Minichinas Hills to a high of 1.09 percent of the Hawarden Hills. Overall sample size for the 13 physiographic units is 0.62 percent.

Some of the units, particularly the Minichinas Hills, Melfort Plain and Ponass Lakes Plain, contain sufficient well-defined variations in surface form that they can each be divided into two or more sub-units. It would be desirable in the interest of increased accuracy to relate existing transects to the sub-units in which they occur rather than the unit as a whole. However, if this is done there should be additional sampling in other large sub-units which do not presently contain transects.

Any future expansion of the sampling base, whether in sub-units or the physiographic units as a whole, should be done by creating new transects in other sites rather than enlarging the sample within existing transects in order to provide a broader sampling of the units.

B. Sample Results

1. Percent of Total Land Area Occupied by Wetlands and Uplands

The first step in assessing variability in baseline habitat conditions between various physiographic units has been to determine the relative amounts of wetlands and uplands in the landscape. Within the 18 individual transects there is a four-fold variation (4.7 to 18.1) in the percent of total land area occupied by wetlands (Table 3). The degree of variation is reduced somewhat (4.7 to 16.9 percent) for physiographic units when values for two transects within a unit are averaged.

a) **Landform character and wetland area** - The disproportionate representation of knob and kettle terrain in the area studied makes it impossible to make definitive statements about the relationship between all types of landform and the amount of land area occupied by wetlands. Within the knob and kettle morainal category transects with the lowest and strongest relief (1 to 3 and 10 to 15 percent, respectively) have comparable average wetland area values (13.3 and 14.3 percent, respectively). The intermediate relief class (4 to 9 percent slope) has a somewhat lower average land area occupied by wetlands (11.9 percent) but also the widest range in area (6.9 to 18.1 percent). It is also represented in the largest number (7) of transects.

The lowest wetland values (under 5 percent of the land area) occur on undulating glacio-fluvial and morainal terrain with 1 to 3 percent slopes and on dissected morainal land with 4 to 9 percent slopes. Since there is only one sample for each of these categories it is not possible to assess the variability of wetland area between sample sites within these landform types. The amount of wetland area (8.8 percent) in the one hummocky morainal (4 to 9 percent slope) sample is within the lower end of the range observed for knob and kettle morainal terrain with the same slopes. The high wetland area value for the one dissected lacustrine (1 to 3 percent slope) sample is likely due to the fact that that area is underlain by morainal materials and the land surface still reflects the character of those deposits.

b) **Variability in wetland area between samples within the same physiographic unit** - Five of the 13 physiographic units covered in this report each contain two transects. The expectation in such situations is that transects within the same unit should have quite similar habitat values. This appears to hold true for wetland area in three of the five units, Ponass Lakes Plain (4.41), Touchwood-Beaver Hills (4.44) and Last Mountain Plain (4.46), where the difference in land area occupied by wetlands is only 2.5 to 2.9 percent (Table 3) between transects. In the Gainsborough Creek Plain (4.58) there is a difference of 6.3 percent which represents a 60 percent larger area occupied by wetlands at Redvers than at Fairlight. The reason for this difference is not readily apparent since soils and surficial geology maps do not identify any differences in landform character between the two sites. The analysis in 1988 of data from a third transect located in the Manitoba portion of this unit may cast further light on the variability of wetland area values within the unit as a whole.

Transects in the Upper Souris River Plain (4.59) show the greatest difference (7.9 percent) in the land area occupied by wetlands. This difference can be explained by the fact that the Fillmore-East transect (4.9 percent wetlands) is located on undulating ground moraine with 1 to 3 percent slopes while at least half of the Browning transect (12.8 percent wetlands) is located in rougher knob and kettle moraine with 4 to 9 percent slopes. Since undulating ground moraine is the predominant landform in the unit, the data for the Fillmore transect may be considered more representative of the unit as a whole.

c) **Cultivated wetlands** - The amount of land occupied by cultivated wetlands is of particular interest because this is an area which, depending on surface water conditions at the time of surveys, cannot always be interpreted from air photos as being wetlands, and may shift back and forth between wetland and cropland (upland) categories in terms of cover and land use.

The percent of total land area occupied by cultivated wetlands ranges from 0.7 percent at Redvers to a high of 6.7 percent at Loreburn (Table 3) where 76 percent of the total wetland area is cultivated. There is no consistent relationship between landform character and the percent of total land area occupied by cultivated wetlands. The three highest values all occur on morainal terrain with 4 to 9 percent slopes but some of the lowest values also occur on the same landform type. Similarly, morainal sites with lowest relief contain both the lowest and fourth highest values.

Differences between transects in the same physiographic unit in percent of total land area occupied by cultivated wetlands are small because of the size of the percentages involved. They do however range from almost nil in the Gainsborough Plain to a fourfold difference in the Last Mountain Plain.

2. **Wetlands**

a) Area of wetlands in various cover classes - The percent of total wetland area in various cover classes is summarized for all transects and physiographic units in Table 4. Two cover classes, cultivated (cereal crops and summerfallow) and grasses (including sedges and forbs), dominate most of the wetland area (55.1 to 98.2 percent) in the 18 transects. The lowest values occur on three transects in which natural fresh open water and/or saline open water are important elements. If these categories are included with the first two, 78.9 to 98.2 percent of the total wetland area is accounted for.

The percent of wetland area that is cultivated varies in the 18 transects from three percent at Yorkton to 76 percent at Loreburn

(Table 4). Both of those extremes are found on morainal terrain (knob and kettle and hummocky, respectively) with slopes of 4 to 9 percent. Within the 18 transects there is no discernable relationship between landform and the percent of wetland area that is cultivated. The roughest morainal sites do have a consistently low level of cultivation (8 percent of the total wetland area) but equally low values are found in some of the morainal samples which have the lowest relief, i.e., Redvers and Fairlight. Transects on morainal material with 4 to 9 percent slopes have highly variable levels of wetland cultivation while those on non-morainal material have intermediate values.

The most abundant cover class in all but two transects and physiographic units is grass. Both wet meadow and shallow marsh vegetation are represented in this class but the great majority of the area involved is shallow marsh.

Willows and trees are a minor element in wetland cover throughout most of the transects but do attain a level of 11 percent at Hanley and Earl Grey, both knob and kettle morainal areas. The values given in Table 4 for willows and trees includes only cover that can be mapped as polygons and not all the narrow wooded margins that are characteristic of parkland wetlands.

Bulrush and cattail (deep marsh vegetation) also account for a minor part of a total wetland cover and attain a double digit level (13.7 percent) only at Buchanan.

Transitional open water, which can only be identified from ground surveys, is irregular in its occurrence, being recorded as a minor element on only seven transects. This class is useful as an indicator of areas which have recently experienced above-normal water levels, a fact which will be discussed later in regard to the Redvers transect.

Natural fresh open water is highly variable in its occurrence, being absent in measurable amounts from Loreburn, minimally represented at Browning and Hanley (0.9 and 1.1 percent, respectively), and occupying a maximum of 24.6 percent of total wetland area at Yorkton. There is no consistent relationship between the amount of open water and landform characteristics.

The area of artificial open water is consistently low, ranging from 0.1 to 2.8 percent. This is to be expected since most of this cover class occurs as small dugouts and only occasionally as large reservoirs.

Saline open water is present only on the Peterson transect in the Minichinas Hills but is certainly more widely distributed outside of the sample sites. A more accurate measure of the occurrence of this category will be obtained when data are summarized for the area and character of large lakes within the physiographic units.

The percent of wetland area in various cover classes varies widely between transects within the same physiographic unit. In 21 of 35 data pairs the differences are small (less than five percent of the total wetland area) while in the remaining 14, differences range up to 32 percent. Large differences occur most frequently (in four of seven cover classes) in the Ponass Lakes Plain and Last Mountain Plain. The consistently large differences in area of various cover classes between the two transects in the Ponass Lakes Plain reflects the amount of variation in landform character within that unit and reinforces my feeling that that unit should be sub-divided and each of the two transects be placed in different sub-units. The difference in percent of wetland area in transitional open water between the Redvers and

Fairlight transects (6.6 and 0.4 percent, respectively) is of interest in that it reflects documented differences in precipitation between the two sites. The Redvers area has, over a recent two-year period, experienced abnormally heavy rainfall which flooded wetlands well beyond their normal levels while Fairlight has received more normal precipitation.

b) **Numbers of wetlands in various cover classes** - In relating the occurrence of cover classes to numbers of wetlands each wetland was categorized according to the one cover class which dominated the central or deepest part of the basin. This process provides a measure of the distribution of cover units in contrast to the area data in the previous section which gives a measure of the amount of each cover class. Together the two sets of data (Tables 4 and 5) provide a more comprehensive picture of wetland habitat patterns and offer the opportunity to draw some broad inferences about the relationship between cover classes and wetland size.

The apparent relationship between percent of wetland area and percent of wetland numbers in a cover class and the relative size of wetlands in that cover class is as follows. If the percent of total wetland area occupied by the cover class is smaller that the percent of total wetland numbers in that class then the average wetland size is relatively small. On the other hand, if the percent of total wetland area is larger than the percent of total wetlands then average wetland size should be larger. Within this relationship one would expect that size of the ratio between the two percentages would be a further indicator of relative wetland size. The accuracy of the relationship as observed in this study may be dampened somewhat by the fact that a small percentage of wetlands have been sub-divided into two or more cover classes. The overall pattern, however, is still apparent.

At the drier end of the cover spectrum the percent of total wetland area occupied by the cultivated cover class is consistently lower (3 to 76 percent) than the percent of total wetlands (9.6 to 82.7 percent) in all transects and physiographic units. This suggests that this cover class is associated with relatively small wetlands or, in other words, small wetlands are more susceptible to cultivation. This conclusion is consistent with many other field observations taken over the years. Within the 18 samples there is considerable variation in the ratio between percent of area and percent of wetland numbers (1:1.1 to 1:3.2). This suggests that there is considerable variation between transects in the size of cultivated wetlands but the subject requires more investigation. It will be particularly interesting to compare results for the Saskatchewan Parkland with those of the southern grassland where a drier climate makes it possible for larger shallow marsh wetlands to be cultivated.

At the other end of the cover spectrum the relationship is reversed and natural fresh open water occupies a consistently greater percent of total wetland area than it does of wetland numbers (1.1 to 24.6 percent compared to 0.5 to 9.4 percent) in all the transects (17 of 18) in which it is recorded. This indicates that relatively larger wetlands are involved, a fact that is also borne out by other observations. The range in ratios between percents of total area and wetland numbers is much greater (1.4:1 to 8.3:1) for natural open water than it is for cultivated wetlands (1:1.1 to 1:3.2), suggesting that there is much greater variability in the size of natural open water wetlands.

The single sample of saline open water has an area/number ratio of 13.4:1 which far exceeds anything recorded for natural fresh open water. That is consistent with what is generally known about the relative size of such wetlands - that they are usually quite large.

Cover classes that are intermediate in the wetland permanency spectrum do exhibit variable intermediate area/numbers relationships with some tendencies toward the end of the spectrum to which they are closest. For woody vegetation the differences in ranges of percents of total area and wetland numbers are negligible (0.4 to 11.1 and zero to 12.3, respectively). In 13 transects the percent of total wetland area is smaller that the percent of wetland numbers but in five transects the reverse is true. The absence of shrubs and trees in terms of wetland numbers at Loreburn when they are recorded as present as a small area (0.4 percent) is due to the fact that, while measurable areas of this cover class are present, shrubs and trees do not dominate the center of any basins.

The percent of total wetlands dominated by grasses, sedges and forbs varies from 14.7 to 72.7, a comparable but slightly broader range than that for percent of total area (22.2 to 72.2). Transects are evenly divided in terms of which is larger, the percent of total numbers or percent of total area, suggesting that there is a wide variability in the relative size of wet meadow and shallow marsh wetlands. The dominance of grasses as the commonest wetland cover class is not as widespread when viewed in terms of wetland numbers (12 of 18 transects) as it is in terms of wetland area (16 of 18 transects).

As one moves to semi-permanent wetlands dominated by bulrush and cattail the percent of wetland area involved becomes somewhat larger than the percent of wetlands numbers in 15 of the 17 transects in which that cover class occurs, suggesting that the category is associated with somewhat larger wetlands. The disappearance of bulrush/cattail from wetland numbers at Elfros while being recorded for wetland area is due to the fact that no wetlands are centrally dominated by that cover class.

Percentages of wetland area are larger than percentages of wetland numbers for transitional open water in five of the seven transects in which that cover class occurs, indicating that it is most likely to develop in fair-sized wetlands. Observations by the author in other studies on the development of transitional open water indicate that it is the larger, deeper shallow marsh wetlands which are most prone to conversion to that cover class.

Artificial open water accounts for between 0.3 and 5.8 percent of total wetland numbers in the 18 transects and in all cases these percentages exceed those of wetland area. This is indicative that most of the wetlands are small in size and substantiates an earlier observation that most of the artificial open water is in the form of small dugouts rather than large reservoirs.

Percent of total wetland number values for cover classes in different transects within the same physiographic unit show the same degree of variability as data presented earlier for wetland area. Two thirds (23 of 35) of the data pairs have similar percentage values, i.e., there is a difference of less than 5 percent of total wetland numbers, while the remainder exhibit larger differences. Most of the differences (9 of 12) are divided equally between the Ponass Lakes Plain, Last Mountain Plain and Gainsborough Creek Plain. When these results are compared to similarities and differences in percentage values for wetland area, those similarities and differences coincide in their occurrence in 29 of 35 cases. The six cases in which there is no match occur across the spectrum of cover classes but half of them are to be found in one physiographic unit - the Gainsborough Creek Plain. The open water cover class in the Last Mountain Plain sample is particularly interesting because of the results obtained during an earlier effort to relate the ratios between percentages of total wetland area and wetland numbers to relative wetland size. In that calculation the two extremes in the ratios for natural open water (1.5:1 and 8.3:1) were obtained from the two transects in that physiographic unit, suggesting a marked difference in the relative size of open water wetlands in the two transects within the same unit. This matter certainly requires further confirmation.

c) Area of wetland in various land use activity classes - Utilization of wetlands in the 18 transects falls into five major land use activity classes - no use, abandoned cultivation, annual crops, haying and grazing. Collectively these five activity classes occur on 97.8 to 100 percent of the total wetland area (Table 6).

For 17 of the 18 transects the percent of total wetland area that is not being subjected to any obvious or continuous human activity ranges between 40.0 and 83.3 percent. The situation on the Loreburn transect is markedly different due to an extremely high level of wetland cultivation and there only 14.2 percent of the wetland area is unutilized.

The abandoned cultivation land use activity class is a transitory category that is assigned to wetlands which are in a state of flux between being used for annual crops and reverting to an unused condition. Typically this category occurs when higher water levels flood out previously cultivated basins and persist long enough to permit the establishment of disturbed wetland vegetation. Percent of total wetland area values for this category range from 0.8 to 18.7. The maximum value occurs at Redvers and is almost double the next closest value. It reflects the degree to which recent abnormally high levels of precipitation in that area have caused the flooding and temporary abandonment of cultivated wetlands.

Data on wetlands used for crop production are the same as those presented earlier for the cultivated cover class. If the Loreburn transect with its unusually high level of wetland cultivation is excluded, the amount of wetland area being used for crop production varies from 3.0 percent at Yorkton to 52.7 percent at St. Gregor.

Haying of wetlands occurs in all transects on a trace to 21.7 percent of wetland area. In only six transects, however, is it widespread enough to involve more than 10 percent of the wetland area. There is no apparent association between haying and a particular landform type.

Grazing of wetlands occurs in all transects on 0.1 to 22.0 percent of the wetland area. As with haying it involves more than 10 percent of the wetland area in only a few (4) transects. Interestingly, high haying and grazing values occur together in the same transect in only one case yet these are activities which one expects to find associated with one another.

The frequency of substantial differences in land use activities on wetlands in different transects within the same physiographic unit is somewhat greater than that observed for wetland cover and numbers data. Data pairs are evenly divided between those which show small differences (less than 5 percent of wetland area) and those which show larger differences (up to 30 percent of wetland area). The greatest frequency of large differences (4 of 5 data pairs) occurs in the Last Mountain Plain sample followed by the Ponass Lakes Plain (3 of 5 data pairs).

d) **Wetland size distribution** - Variations in the size distribution of wetlands among transects and physiographic units will not be discussed in this report because the total areas of wetlands lying only partially within quarter section sample units cannot be easily generated and analysed within the program set up for the quarter section units. Any attempt to determine wetland size distribution within quarter sections would therefore lack a true representation of larger wetlands. Future manual digitizing of wetlands extending across two or more quarter sections should make it possible to calculate accurate size distribution figures.

e) **Wetlands affected by one or more permanent impacts** - Enough material has been generated on the nature and distribution of permanent, human induced impacts on wetlands in the monitoring samples to provide the basis for a full-scale study on that subject alone. For the present, however, discussion of the effects of impacts on wetlands will be limited to an evaluation of the extent to which wetlands have been affected by one or more such impacts. It should be emphasized here that in this study cultivation is not considered a permanent impact. The percent of wetlands affected by one or more permanent impacts ranges from a low of 8.9 percent at Hendon to a high of 40.4 percent at Buchanan (Table 7). There is no apparent association between rate of impaction and landform character.

Some interesting situations do appear when one looks at differences in the rate of impaction between transects in the same physiographic unit. The two extremes in percent of wetlands impacted occur in transects within the same physiographic unit - the Ponass Lakes Plain. On the other hand, the difference in the Last Mountain Plain sample is less than one percent of total wetlands and this is a unit in which considerable differences in other wetland data have been observed between the two transects.

f) **Distribution of streams** - The presence of stream segments in the data samples has been summarized (Table 8) to provide an indication of the relative importance of this type of water body in the overall habitat picture in different areas. No streams were recorded in seven of the 18 transects and in the remaining 11 the percent of quarter sections containing streams ranged from 4.2 at Craik to 33.3 at Redvers.

In all five physiographic units containing two transects the presence or absence of streams was consistent for transects within the same unit. The large difference in distribution of streams between the Fairlight and Redvers transects may explain some of the variability in wetland data within the Gainsborough Creek Plain which has previously been described in this report.

3. Uplands

a) Distribution of Upland cover classes - Upland cover data have been analysed on the basis of seven classes, four native and three planted, plus a catch-all category for all other classes. Between 97.9 and 99.8 percent of the upland cover falls into those seven classes (Table 9). Annual crops and summerfallow are by far the most dominant cover in all transects, accounting for 68.7 to 96.8 percent of the total upland area. Loreburn has the highest level of cropland at 96.8 percent and with 76 percent of its wetland area also in crop it is unquestionably the most intensively cultivated of the transects covered in this report.

Native grass is the second most common cover class, occurring on 1.7 to 19.5 percent of the uplands. However, it occurs on more than 10 percent of the total upland area only in the two transects in the Gainsborough Creek Plain. Shrubs are a minor element in the landscape with low shrubs (buckbrush) never dominating as much as one percent of the upland and taller shrubs only occupying a maximum of two percent of the area. Native trees cover from a trace to 9.3 percent of the uplands with highest values occurring in the Touchwood-Beaver Hills and Ponass Lakes Plain. They exceed native grass in area in three of the four transects in those two physiographic units. Total native cover occupies from 2.1 to 24.3 percent of total upland area with values exceeding 10 percent in only three physiographic units - Ponass Lakes Plain, Touchwood-Beaver Hills and Gainsborough Creek Plain.

Planted grasses and forbs are found on 0.3 to 8.6 percent of the uplands with highest values occurring in the same three physiographic units as maximum native cover. Planted trees and shrubs are a very minor part of the landscape, accounting for less than one percent of the upland area in any transect.

Upland cover values in transects within the same physiographic unit show relatively little difference, partly because most of the percent of area values are small. In only three cases do differences in the data pairs exceed 5 percent of the upland area. Those are native grass and annual crops in the Gainsborough Creek Plain and annual crops in the Ponass Lakes Plain.

b) **Distribution of upland land use activity classes** - Annual crop production is the predominant land use activity in all transects (Table 10). The same values and comments regarding this class which were given in the preceding discussion on upland cover apply here. Unused and abandoned land together account for 0.6 to 12.1 percent of upland area. Forage production and grazing occur on 0.1 to 5.6 and 0.3 to 14.6 percent, respectively, of the upland area. As one would expect from the data on upland cover, maximum land use values for activity classes associated with native or planted grasses and woody vegetation occur in the same three physiographic units, i.e., Ponass Lakes Plain, Touchwood-Beaver Hills and Gainsborough Plain.

A minor but consistent part of the uplands is devoted to farmsteads (0.2 to 1.8 percent) and roads and railways (0.2 to 3.5 percent). All other land use activities combined occupy one percent or less of the uplands.

Differences in land use activity values in transects located within the same physiographic unit are all less than 5 percent of the upland area except for the two cropland cases cited in the preceding section and grazing in the Gainsborough Creek Plain.

C. Extrapolation of Sampling Results

1. Data Variability

One of the objectives of this baseline habitat study has been to generate estimates of current habitat values for individual physiographic units by extrapolating the sample results obtained in this study to the entire unit. Application of standard statistical procedures to the sample data has, however, shown there to be such a high degree of variability in the data that the mean values generated cannot be considered to provide a consistently accurate estimate of conditions beyond the samples themselves for all habitat factors in all transects. Examples of the variability in the data are illustrated for some major wetland cover, upland cover and upland land use classes in Tables 11 to 13, respectively. One example of the degree of variability encountered is the area of cultivated wetlands (Table 11). At Loreburn for a mean of 11.05 hectares there is a standard error of 6.15 hectares while at St. Gregor with a comparable mean of 10.1 hectares the standard error is a staggering 150.83 hectares! A very common situation which contributes significantly to this sort of data variability is the presence within a sample of one or more quarter sections operated by a landowner whose land use practices, e.g., grazing, are markedly different than those of his neighbors. When this happens the data are strongly skewed and cannot be analysed by standard methods. Possible use of non-parametric statistical methods to analyse such data will be explored in the future.

Examination of standard error and coefficient of variation values obtained when data from two transects within the same physiographic unit are combined indicates that doubling the sample size does little to decrease the variability of the data so expanded sampling on a scale that would be economically feasible is not likely to improve the situation very much.

Although the shortcomings of using limited sampling habitat data from this project to generate estimated habitat values for entire physiographic units have been identified, those extrapolated estimates are still useful. Certain broad conclusions can still be drawn from the more obvious data extremes and the figures can be used to compare the results obtained from this study with those of other studies such as agricultural surveys and Ducks Unlimited's Habitat Inventory. The combination of accurate groundtruth data from the Prairie Habitat Monitoring Project with a total habitat inventory from Thematic Mapper imagery in the Ducks Unlimited program still appears to offer the best possibility for obtaining the most accurate assessment of current habitat conditions.

2. Wetlands

The estimated area of wetland cover classes, the number of wetlands in each cover class and the area of each wetland land use activity class in each physiographic unit are presented in Tables 14 to 16, respectively. The data in those tables show consistently and clearly that three of the 13 units stand out in terms of the quantity and quality of wetland habitat which they possess. Those units are the Minichinas Hills, Ponass Lakes Plain and Touchwood-Beaver Hills. They not only contain both the largest area and numbers of natural fresh open water wetlands which provide secure brood rearing habitat but also contain the greatest area of grassy (seasonal) wetlands for additional breeding pair habitat. Numbers of grassy wetlands are proportionately higher in the Ponass Lakes Plain and Touchwood-Beaver Hills than in the Minichinas Hills suggesting that average wetland size in that class is larger in the latter unit. Maximum areas of unutilized wetland cover also are found in those same three units (Table 16) indicating that wetlands there have the greatest amount of good quality escape cover.

Two other physiographic units, the Gainsborough Creek Plain and Upper Souris River Plain appear to provide quantities of grassy (seasonal) wetlands and undisturbed wetland cover comparable to those in the first three units but have substantially less permanent brood water.

3. Uplands

Estimated areas of upland cover and land use activity classes are presented in Tables 17 and 18. The largest amounts of upland nesting cover in the form of both native and planted grassy cover are found in the Ponass Lakes Plain, Touchwood-Beaver Hills, Gainsborough Creek Plain and Upper Souris River Plain. The first three of those units also have the largest amounts of unused land, with presumably the best nesting cover, and the largest areas devoted to cattle production as indicated by the amount of land in forage production and grazing. The Minichinas Hills appears to have proportionately less grassy upland cover, unused land and forage and grazing land.

D. Cover/Land Use Changes Since May 1985

Cover/land use change is an ongoing process and formal efforts to measure this are scheduled to be conducted at five-year intervals as part of this project. It is possible, however, to obtain a very crude idea of the extent to which change is occurring in the interim by determining the number of quarter sections which have experienced such changes in the interval between the taking of baseline aerial photography and completion of groundtruthing surveys. For 16 of the 18 transects covered in this report the baseline aerial photography was taken in May 1985. The time interval between then and the completion of groundtruthing surveys has varied from 11 to 23 months (Table 19).

Two transects, Cymric and Fairlight experienced no cover/land use changes over a 17 to 18 month period but in the other 14 transects changes have been recorded on 8.3 to 29.2 percent of the quarter sections. These changes were as small as the breaking of a single wetland and as extreme as the clearing and breaking of almost an entire quarter. Frequently the changes were associated with road construction. Temporary interruptions of cultivation in wetlands or uplands were not counted as changes.

Two transects, Redvers and Browning, cannot be evaluated with the rest as aerial photography taken at different times was used for their baseline record. At Redvers July 1986 photography was used and the time span to groundtruthing was only three months. In that interval 4.2 percent of the quarter sections experienced some cover/land use changes. In the case of Browning only May 1982 photography was available so the time interval to groundtruthing was nearly five years (59 months). In that period cover/land use changes occurred on almost half (41.7 percent) of the sample quarters.

V. Current Project Status

As of March 15, 1988, the status of work on the Prairie Habitat Monitoring Project is as follows:

1. Saskatchewan Parkland

-Work on 18 of 41 transects has been completed and data are presented in this report.

-Data assembly has been completed on the remainder of the transects and maps and files are in the hands of Lands Directorate in Ottawa.

2. Saskatchewan Transition

-Data assembly has been completed for one third of the transects and maps and files have been forwarded to Lands Directorate.

3. Manitoba Parkland

-Data assembly for 40 percent of the transects is partially complete and maps and files should be forwarded to Lands Directorate within the next six weeks.

4. Alberta Parkland

-Air photo interpretation of all transects is virtually complete and groundtruthing will begin in April.

VI. Literature Cited

Adams, G.D. 1985. A regional base map for a migratory bird habitat inventory - Prairie Provinces. Can. Wildl. Serv. Unpubl. Rep. 34 pp.

Millar, J.B. 1984. Classification of wetlands on air/ground comparison transects in the Prairie Provinces. Part III. Waterfowl Strata 26 to 29 - Alberta. Can. Wildl. Serv., Unpubl. Rep. 77 pp.

Millar, J.B. 1986a. Observations on the current condition of Canadian prairie wetlands. Paper presented at "Freshwater Wetlands and Wildlife - Perspectives on Natural, Managed and Degraded

Ecosystems". University of Georgia, Savannah River Ecology Laboratory, Ninth Symposium. Charleston, South Carolina. March 24-27, 1986.

Millar, J.B. 1986b. Estimates of habitat distribution in the settled portions of the Prairie Provinces in 1982. Can. Wildl. Serv. Unpubl. Rep. 41 pp.

Millar, J.B. 1987. Baseline (1985) habitat estimates for the settled portions of the Prairie Provinces. Report #1: Methods and project status. Can. Wildl. Serv. Unpubl. Rep. 50 pp.

Figure 1. Location of Transects and Physiographic Units Covered in This Report

Legend:
4.32 to 485 - Identifier Codes for Physiographic Units
▲ - Transect Sites

Table 1. Physiographic Units covered in this report.

No.	Name	Landform Character			
		Origin of Parent Material	Surface Form	Percent Slope[1]	Transects[2]
4.32	Hawarden Hills	Morainal	Hummocky & Some Knob & Kettle	4-9	Loreburn (24)
4.33	Kenaston-Buffalo Pound Upland	Morainal	Knob & Kettle & Some Hummocky, Undulating	4-9	Craik (24)
4.34	Allan Hills	Morainal	Knob & Kettle	10-15 (4-9)	Hanley (24)
4.36	Minichinas Hills	Morainal Lacustrine	Knob & Kettle	4-9 (10-15)	Peterson (24)
4.39	Melfort Plain	Lacustrine	Dissected	1-3	Kinistino (24)
4.41	Ponass Lakes Plain	Morainal	Knob & Kettle & Some Dissected	1-3 (4-9)	Hendon (30)* Buchanan (24)
4.42	Lanigan Creek Plain	Morainal	Knob & Kettle	4-9	St. Gregor (30)
4.44	Touchwood-Beaver Hills	Morainal	Knob & Kettle	4-9 (10-15)	Kelliher (24) Yorkton (24)
4.46	Last Mountain Plain	Morainal	Knob & Kettle	4-9	Cymric (24) Earl Grey (24)
4.50	Touchwood Slope	Morainal	Dissected	4-9	Elfros (24)
4.58	Gainsborough Creek Plain	Morainal	Knob & Kettle	1-3	Fairlight (24) Redvers (24)
4.59	Upper Souris River Plain	Morainal	Undulating & Some Knob & Kettle	1-3 (4-9)	Fillmore-East (24) Browning (24)
4.85	Lower Souris River Plain	Glacio-fluvial Morainal	Undulating	1-3	Elcott (24)

1) Figure in parentheses is the slope class occurring in a minor part of the unit.
2) Figure in parentheses is the number of quarter sections in each sample.

Table 2. Size of Monitoring Samples in Relation to Physiographic Units.

Physiographic Unit		Area in Hectares		Percentage that Sample is of Unit Area
No.	Name	Unit[1]	Sample	
4.32	Hawarden Hills	147,100	1,604	1.09
4.33	Kenaston-Buffalo Pound Upland	146,600	1,588	1.08
4.34	Allan Hills	163,300	1,588	0.97
4.36	Minichinas Hills	449,200	1,598	0.36
4.39	Melfort Plain	328,500	1,591	0.48
4.41	Ponass Lakes Plain	757,600	3,585	0.47
4.42	Lanigan Creek Plain	254,200	1,989	0.78
4.44	Touchwood-Beaver Hills	595,900	3,198	0.54
4.46	Last Mountain Plain	381,400	3,134	0.82
4.50	Touchwood Slope	303,300	1,593	0.53
4.58	Gainsborough Creek Plain	430,100	3,219	0.75
4.59	Upper Souris River Plain	621,600	3,241	0.52
4.85	Lower Souris River Plain	197,500	1,620	0.82
Total		4,776,300[2]	29,548	0.62

[1]To the nearest 100 hectares.
[2]Approximately 38 percent of total Saskatchewan Parkland.

Table 3. Land Area Occupied by Wetlands and Uplands.

Unit	Transect	Sample Size (in ha)[1]	Percent of Total Sample[1]			
			Wetlands			
			Total	Uncultivated	Cultivated	Uplands
4.32	Loreburn	1,604	8.8	2.1	6.7	91.2
4.33	Craik	1,588	6.9	4.7	2.2	93.1
4.34	Hanley	1,588	13.2	12.2	1.0	86.8
4.36	Peterson	1,598	16.9	15.5	1.4	83.1
4.39	Kinistino	1,591	12.7	9.5	3.2	87.3
4.41	Hendon	1,990	11.5	7.7	3.8	88.5
	Buchanan	1,595	14.4	12.9	1.5	85.6
		(3,585)	(12.8)	(10.0)	(2.8)	(87.2)
4.42	St. Gregor	1,989	11.7	5.5	6.2	88.3
4.44	Kelliher	1,589	15.6	14.3	1.3	84.4
	Yorkton	1,609	18.1	17.6	0.5	81.9
		(3,198)	(16.9)	(16.0)	(0.9)	(83.1)
4.46	Cymric	1,587	9.7	5.6	4.1	90.3
	Earl Grey	1,547	7.2	6.4	0.8	92.8
		(3,134)	(8.4)	(5.9)	(2.5)	(91.6)
4.50	Elfros	1,593	4.7	3.2	1.5	95.3
4.58	Fairlight	1,629	10.4	9.6	0.8	89.6
	Redvers	1,590	16.7	16.0	0.7	83.3
		(3,219)	(13.5)	(12.8)	(0.7)	(86.5)
4.59	Fillmore-East	1,654	4.9	3.8	1.1	95.1
	Browning	1,587	12.8	9.4	3.4	87.2
		(3,241)	(8.8)	(6.6)	(2.2)	(91.2)
4.85	Elcott	1,620	4.7	3.6	1.1	95.3

1) Figures in parentheses are composite values for those transects occurring in one physiographic unit.

Table 4. Amount of Wetland Area in Various Cover Classes.

Physio-graphic Unit	Transect	Total Wetland[1] Area In Sample (in ha)	Percent of Total Wetland Area in Cover Class[1]								
			Cultivated	Willows & Trees	Grasses	Bulrush Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
4.32	Loreburn	141	76.0	0.4	22.2	0	0	1.1	0	0	0.3
4.33	Craik	109	32.4	6.7	46.0	2.4	0	10.6	1.0	0	1.0
4.34	Hanley	209	7.6	11.0	72.2	7.3	0	1.1	0.4	0	0.4
4.36	Peterson	270	8.6	1.9	46.5	2.8	2.0	16.5	0.1	21.4	0.2
4.39	Kinistino	202	25.4	2.2	44.0	4.3	2.9	14.2	1.2	0	5.8
4.41	Hendon	228	32.9	3.3	55.6	1.8	0	5.1	0.3	0	0.9
	Buchanan	230	10.4	5.4	45.2	13.7	0	23.3	1.0	0	1.1
		(458)	(21.7)	(4.3)	(50.3)	(7.8)	(0)	(14.2)	(0.7)	(0)	(1.0)
4.42	St. Gregor	232	52.7	1.1	22.3	1.9	0	20.2	1.4	0	0.4
4.44	Kelliher	248	8.5	7.0	61.1	6.1	2.1	14.4	0.4	0	0.3
	Yorkton	291	3.0	3.2	56.3	6.5	6.1	24.6	0.2	0	0.2
		(539)	(5.5)	(5.0)	(58.4)	(6.3)	(4.2)	(19.9)	(0.3)	(0)	(0.2)
4.46	Cymric	153	42.9	3.5	44.4	4.4	0	3.5	0.8	0	0.5
	Earl Grey	111	10.7	11.1	60.1	4.9	0.2	10.0	2.2	0	0.9
		(264)	(29.4)	(6.7)	(51.0)	(4.6)	(0.1)	(6.3)	(1.3)	(0)	(0.6)
4.50	Elfros	74	32.2	5.2	45.2	3.3	0	13.2	0.7	0	0.3
4.58	Fairlight	169	7.5	7.0	69.3	9.3	0.4	3.0	1.6	0	1.8
	Redvers	266	4.1	1.3	70.6	5.2	6.6	7.3	0.9	0	4.1
		(435)	(5.5)	(3.5)	(70.1)	(6.8)	(4.2)	(5.6)	(1.2)	(0)	(3.2)
4.59	Fillmore-East	82	23.0	4.9	58.5	4.2	0	6.9	1.9	0	0.8
	Browning	204	26.2	2.5	70.0	0.1	0	0.9	0.3	0	0
		(286)	(25.2)	(3.2)	(66.6)	(1.3)	(0)	(2.6)	(0.8)	(0)	(0.2)
4.85	Elcott	76	23.6	1.2	68.0	1.5	0	2.3	2.8	0	0.6

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 5. Numbers of Wetlands in Various Cover Classes.

Physiographic Unit	Transect	Total Number of Wetlands In Sample (in ha)[1]	Percent of Total Wetland Numbers in Cover Class[1]								
			Cultivated	Willows & Trees	Grasses	Bulrush Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
4.32	Loreburn	461	82.7	0	14.7	0	0	0	2.2	0	0.4
4.33	Craik	250	42.8	2.0	49.6	1.2	0	1.6	2.4	0	0.4
4.34	Hanley	573	13.9	8.0	72.7	3.0	0	0.5	1.2	0	0.6
4.36	Peterson	377	24.1	6.4	55.4	3.7	1.8	7.1	0.3	1.6	1.0
4.39	Kinistino	557	47.6	3.4	40.2	2.0	0.7	2.7	1.6	0	1.8
4.41	Hendon	642	58.5	3.5	33.9	1.1	0	1.1	0.6	0	1.4
	Buchanan	588	23.5	7.3	55.1	2.7	0	7.7	2.5	0	1.2
		(1,230)	(41.9)	(5.2)	(44.0)	(1.9)	(0)	(4.2)	(1.5)	(0)	(1.3)
4.42	St. Gregor	534	65.7	2.6	22.6	1.5	0	3.4	2.8	0	1.3
4.44	Kelliher	756	16.4	7.4	67.8	2.3	1.1	3.4	0.8	0	0.8
	Yorkton	564	9.6	5.0	67.8	2.6	4.1	9.4	1.1	0	0.3
		(1,320)	(13.5)	(6.4)	(67.8)	(2.4)	(2.4)	(6.0)	(0.9)	(0)	(0.6)
4.46	Cymric	390	51.8	4.1	38.5	1.5	0	2.3	1.1	0	0.7
	Earl Grey	517	17.4	11.8	63.5	2.0	0.2	1.2	2.2	0	0.9
		(907)	(32.2)	(8.5)	(52.7)	(1.8)	(0.1)	(1.6)	(2.2)	(0)	(0.8)
4.50	Elfros	240	66.2	6.6	22.5	0	0	1.7	1.7	0	1.2
4.58	Fairlight	333	18.3	12.3	61.8	1.8	0.6	0.6	1.8	0	2.7
	Redvers	890	11.0	2.2	70.8	3.4	2.5	1.8	1.5	0	6.9
		(1,223)	(13.0)	(5.0)	(68.4)	(2.9)	(2.0)	(1.5)	(1.6)	(0)	(5.7)
4.59	Fillmore-East	239	40.6	3.8	45.2	0.4	0	2.9	5.8	0	1.2
	Browning	383	38.7	1.8	57.7	0.3	0	0.3	1.3	0	0
		(622)	(39.4)	(2.6)	(52.8)	(0.3)	(0)	(1.3)	(3.1)	(0)	(0.5)
4.85	Elcott	223	38.5	1.8	53.0	0.4	0	0.9	5.0	0	0.4

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 6. Area of Wetlands in Various Land Use Activity Classes.

Physiographic Unit	Transect	Total Wetland Area (in ha)[1]	Percent of Total Wetland Area in Land Use Activity Class[1]					
			No Use	Abandoned Cultivation	Annual Crops	Haying	Grazing	Other
4.32	Loreburn	141	14.2	3.3	76.0	6.1	0.4	0
4.33	Craik	109	59.2	3.7	32.4	4.5	0.1	0
4.34	Hanley	209	68.0	1.0	7.6	16.8	6.3	0.2
4.36	Peterson	270	83.3	1.8	8.6	4.8	1.2	0.3
4.39	Kinistino	202	53.9	10.0	25.4	4.0	6.1	0.6
4.41	Hendon	228	45.2	5.9	32.9	10.1	5.5	0.4
	Buchanan	230	67.8	3.3	10.4	6.4	11.3	0.7
		(458)	(56.5)	(4.6)	(21.7)	(8.3)	(8.5)	(0.5)
4.42	St. Gregor	232	40.0	2.8	52.7	0.1	2.4	2.2
4.44	Kelliher	248	75.7	2.4	8.5	5.3	8.1	0.2
	Yorkton	291	68.8	1.0	3.0	16.6	10.5	0.1
		(539)	(71.9)	(1.7)	(5.5)	(11.4)	(9.4)	(0.2)
4.46	Cymric	153	41.0	9.3	42.9	2.1	4.8	0
	Earl Grey	111	70.9	3.5	10.7	10.7	3.4	0.8
		(264)	(53.5)	(6.8)	(29.4)	(5.8)	(4.3)	(0.3)
4.50	Elfros	74	64.0	2.2	32.2	0.3	1.0	0.3
4.58	Fairlight	169	63.1	3.9	7.5	2.6	21.0	2.0
	Redvers	266	66.7	18.7	4.1	T[2]	8.9	1.5
		(435)	(65.4)	(12.9)	(5.4)	(1.0)	(13.6)	(1.8
4.59	Fillmore-East	82	59.0	2.3	23.0	10.5	4.3	1.2
	Browning	204	43.1	1.7	26.2	21.7	7.3	0
		(286)	(47.7)	(1.8)	(25.2)	(18.5)	(6.5)	(0.3)
4.85	Elcott	76	51.7	0.8	23.6	1.7	22.0	0.3

1) Figures in parentheses are composite values for transects occurring within one physiographic unit.
2) Less than 0.05 percent.

Table 7. Wetlands Affected By One or More Permanent Impacts.

Physiographic Unit	Transect	Mean Number of Wetlands/Quarter: Total	Mean Number of Wetlands/Quarter: Affected by one or more Impacts	Percent of Wetlands Impacted
4.32	Loreburn	19.2	4.2	21.9
4.33	Craik	10.4	2.8	26.9
4.34	Hanley	23.9	5.3	22.2
4.36	Peterson	15.7	4.3	27.4
4.39	Kinistino	23.3	3.3	14.2
4.41	Hendon	21.4	1.9	8.9
	Buchanan	24.5	9.9	40.4
		(22.8)	(5.5)	(24.1)
4.42	St. Gregor	17.8	3.6	20.2
4.44	Kelliher	31.5	7.5	23.8
	Yorkton	23.5	6.6	28.1
		(27.5)	(7.0)	(25.5)
4.46	Cymric	16.3	4.9	30.1
	Earl Grey	21.5	6.3	29.3
		(18.9)	(5.6)	(29.6)
4.50	Elfros	10.0	1.1	11.0
4.58	Fairlight	13.9	3.7	26.6
	Redvers	37.1	12.9	34.8
		(25.5)	(8.3)	(32.6)
4.89	Fillmore-East	10.0	2.7	27.0
	Browning	16.0	5.3	33.1
		(13.0)	(4.0)	(30.8)
4.85	Elcott	9.3	2.2	23.7

Table 8. Occurrence of Streams in Data Samples.

Unit	Transect	No. of Quarters in Sample[1]	No. of Quarters Containing Streams[1]	Percent of Quarters Containing Streams[1]
4.32	Loreburn	24	0	0
4.33	Craik	24	1	4.2
4.34	Hanley	24	0	0
4.36	Peterson	24	0	0
4.39	Kinistino	24	4	16.7
4.41	Hendon	30	2	6.7
	Buchanan	24	3	12.5
		(54)	(5)	(9.3)
4.42	St. Gregor	30	3	10.0
4.44	Kelliher	24	3	12.5
	Yorkton	24	4	16.7
		(48)	(7)	(14.6)
4.46	Cymric	24	0	0
	Earl Grey	24	0	0
		(48)	(0)	(0)
4.50	Elfros	24	3	12.5
4.58	Fairlight	24	4	16.7
	Redvers	24	8	33.3
		(48)	(12)	(25.0)
4.59	Fillmore-East	24	0	0
	Browning	24	0	0
		(48)	(0)	(0)
4.85	Elcott	24	3	12.5

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 9. Distribution of Upland Cover Classes.

Physio-graphic Unit	Transect	Upland Area (in ha)[1]	Percent of Total Upland Area in Cover[1]								
			Native					Planted			
			Grass	Low Shrub	Tall Shrub	Trees	Total	Annual Crops[2]	Perennial Grass & Forbs	Trees & Shrubs	Other
4.32	Loreburn	1,462	2.1	0	0	T[3]	2.1	96.8	0.6	0.3	0.2
4.33	Craik	1,478	5.1	0.8	0.1	0.2	6.2	90.8	2.3	0.4	0.3
4.34	Hanley	1,379	7.0	0.8	0.4	1.5	9.7	89.0	0.3	0.1	0.7
4.36	Peterson	1,328	4.5	T	0.1	0.7	5.3	93.0	1.3	0.3	0.2
4.39	Kinistino	1,389	5.5	0.1	0.3	3.2	9.1	87.3	1.5	0.5	1.6
4.41	Hendon	1,762	5.7	0.1	0.9	4.8	11.5	86.7	0.7	0.1	1.0
	Buchanan	1,364	6.2	0.2	1.2	7.3	14.9	78.7	5.5	0.1	.7
		(3,126)	(5.9)	(0.1)	(1.1)	(5.9)	(13.0)	(83.3)	(2.8)	(0.1)	(0.8)
4.42	St. Gregor	1,757	1.7	0	0.4	1.6	3.7	90.5	4.4	0.3	1.1
4.44	Kelliher	1,341	7.3	T	0.8	9.0	17.1	77.9	3.5	T	1.3
	Yorkton	1,318	6.5	0.2	2.0	9.3	18.0	76.4	4.2	0.1	1.3
		(2,659)	(6.9)	(0.1)	(1.4)	(9.2)	(17.6)	(77.1)	(3.8)	(0.1)	(1.3)
4.46	Cymric	1,433	3.4	0.1	0.1	0.5	4.1	93.4	1.4	0.5	0.6
	Earl Grey	1,436	3.3	0.2	0.8	3.9	8.2	89.5	1.6	0.1	0.7
		(2,869)	(3.4)	(0.1)	(0.5)	(2.2)	(6.2)	(91.5)	(1.5)	(0.3)	(0.6)
4.50	Elfros	1,519	5.9	0	0.5	3.0	9.4	87.4	2.3	0.1	0.9
4.58	Fairlight	1,460	19.5	0.2	1.1	3.5	24.3	68.7	4.3	0.7	2.1
	Redvers	1,324	10.4	T	0.8	3.9	15.1	75.0	8.6	0.1	1.1
		(2,784)	(15.2)	(0.1)	(0.9)	(3.7)	(19.9)	(71.7)	(6.4)	(0.4)	(1.6)
4.59	Fillmore-East	1,572	5.3	0.2	0.1	0.9	6.5	89.5	2.0	0.2	1.9
	Browning	1,383	7.5	0.2	0.1	1.1	8.9	87.5	3.1	0.2	0.3
		(2,955)	(6.3)	(0.2)	(0.1)	(1.0)	(7.6)	(88.6)	(2.5)	(0.2)	(1.1)
4.85	Elcott	1,544	14.3	T	T	0.5	14.8	80.8	2.7	0.7	1.0

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.
2) Includes summerfallow.
3) Less than 0.05 percent.

Table 10. Distribution of Upland Land Use Activity Classes.

Physiographic Unit	Transect	Total Upland Area (in ha)[1]	Percent of Total Upland Area in Land Use Activity[1]							
			Unused	Abandoned	Annual Crops[2]	Forage	Grazing	Farmsteads	Roads and Railways	Other
4.32	Loreburn	1,462	0.2	0.4	96.8	0.1	0.3	0.6	1.7	T[3]
4.33	Craik	1,478	1.9	0.3	90.8	0.3	4.0	0.7	2.1	0
4.34	Hanley	1,379	4.4	0.4	89.0	0.2	4.5	1.0	0.5	0
4.36	Peterson	1,328	3.8	0	93.1	0.1	1.3	0.2	1.1	0.3
4.39	Kinistino	1,389	4.1	0.5	87.3	2.0	3.3	1.7	0.9	0.2
4.41	Hendon	1,762	7.4	0.2	86.7	1.6	3.0	0.7	0.3	0.1
	Buchanan	1,364	6.6	0.8	78.8	5.6	6.8	0.6	0.4	0.6
		(3,126)	(7.1)	(0.4)	(83.3)	(3.4)	(4.6)	(0.6)	(0.3)	(0.3)
4.42	St. Gregor	1,757	3.3	0.5	90.5	2.0	2.3	1.3	0.2	T[3]
4.44	Kelliher	1,341	11.7	0.4	77.9	3.1	5.4	0.5	0.5	0.6
	Yorkton	1,318	8.3	0.4	76.4	4.2	8.1	0.9	1.2	0.4
		(2,659)	(10.0)	(0.4)	(77.2)	(3.7)	(6.7)	(0.7)	(0.8)	(0.5)
4.46	Cymric	1,433	1.3	0.1	93.5	0.1	2.7	1.0	1.4	0.1
	Earl Grey	1,436	5.1	0.5	89.5	0.9	2.4	0.7	0.8	0.1
		(2,869)	(3.2)	(0.3)	(91.5)	(0.5)	(2.5)	(0.8)	(1.1)	(0.1)
4.50	Elfros	1,519	4.8	3.9	87.4	0.7	1.1	1.8	0.3	T
4.58	Fairlight	1,460	6.2	1.5	68.7	4.3	14.6	1.1	3.5	0.2
	Redvers	1,324	10.2	1.3	75.0	4.5	6.5	1.1	1.5	T
		(2,784)	(8.1)	(1.4)	(71.7)	(4.4)	(10.7)	(1.1)	(2.5)	(0.1)
4.59	Fillmore-East	1,572	2.3	0.1	89.5	3.5	0.7	0.6	2.3	1.0
	Browning	1,383	3.0	0.1	87.6	1.4	5.8	0.4	1.8	-
		(2,955)	(2.7)	(0.1)	(88.6)	(2.5)	(3.1)	(0.5)	(2.0)	(0.6)
4.85	Elcott	1,544	2.0	0.6	80.8	2.9	8.8	1.5	3.1	0.1

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.
2) Includes summerfallow.
3) Less than 0.05 percent.

Table 11. Examples of Variability in Wetland Cover Data.

		Area in Acres Per Quarter Section								
		Cultivated[1]			Grass[1]			Willows[1]		
Unit	Transects	Mean	S.E.[2]	C.V.[3]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
4.32	Loreburn	11.05	6.15	2.72	3.23	1.98	3.00	0.06	0.01	0.46
4.33	Craik	3.64	2.68	3.61	5.17	3.36	3.19	0.74	0.25	1.65
4.34	Hanley	1.64	0.70	2.08	15.53	8.64	2.72	2.37	2.26	4.67
4.36	Peterson	2.38	1.20	2.47	12.91	9.33	3.54	0.53	0.18	1.67
4.39	Kinistino	5.27	5.77	5.36	9.12	11.12	5.98	0.45	0.13	1.45
4.41	Hendon	6.19	5.07	4.48	10.45	13.25	6.95	0.62	0.28	2.49
	Buchanan	2.47	1.54	3.05	10.67	14.01	6.44	1.24	1.00	3.95
		(4.54)	(2.98)	(4.83)	(10.54)	(9.46)	(6.59)	(0.89)	(0.42)	(3.43)
4.42	St. Gregor	10.10	150.83	81.80	4.26	3.11	3.99	0.20	0.06	1.70
4.44	Kelliher	2.16	2.03	4.60	15.63	8.98	2.82	1.79	0.91	2.49
	Yorkton	0.89	0.17	0.95	16.84	14.68	4.27	0.96	0.88	4.47
		(1.53)	(0.82)	(3.73)	(16.24)	(8.24)	(3.52)	(1.38)	(0.64)	(3.24)
4.46	Cymric	6.77	2.64	1.91	7.01	2.74	1.91	0.56	0.27	2.37
	Earl Grey	1.22	0.53	2.13	6.86	2.89	2.06	1.26	0.59	2.28
		(4.00)	(2.23)	(3.87)	(6.93)	(1.95)	(1.95)	(0.91)	(0.32)	(2.40)
4.50	Elfros	2.46	1.44	2.86	3.45	3.81	5.42	0.39	0.12	1.54
4.58	Fairlight	1.32	0.73	2.73	12.06	12.83	5.21	1.21	0.37	1.50
	Redvers	1.12	0.30	1.33	19.28	16.69	4.24	0.35	0.15	2.07
		(1.22)	(0.36)	(2.05)	(15.67)	(12.13)	(5.36)	(0.78)	(0.21)	(1.84)
4.59	Fillmore-East	1.93	0.74	1.87	4.91	4.44	4.44	0.41	0.20	2.36
	Browning	5.49	5.86	5.23	14.68	12.98	4.33	0.50	0.13	1.24
		(3.71)	(2.75)	(5.13)	(9.79)	(9.55)	(6.76)	(0.46)	(0.11)	(1.71)
4.85	Elcott	1.84	2.14	5.70	5.30	8.92	8.25	0.09	0.02	0.89

[1]Figures in parentheses are composite values for these transects occurring within one physiographic unit.
[2]S.E. = Standard Error.
[3]C.V. = Coefficient of Variation.

Table 12. Examples of Variability in Upland Cover Data.

		Area in Acres Per Quarter Section								
		Cropland[1]			Native Grass[1]			Native Trees[1]		
Unit	Transects	Mean	S.E.[2]	C.V.[3]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
4.32	Loreburn	145.56	10.31	0.35	3.11	1.73	2.73	0.09	0.01	0.60
4.33	Craik	138.05	71.11	2.52	7.76	59.80	37.74	0.36	0.08	1.05
4.34	Hanley	126.30	170.51	6.61	9.99	110.48	54.16	2.14	0.86	1.96
4.36	Peterson	127.09	144.65	5.58	6.18	22.94	18.17	0.91	0.39	2.11
4.39	Kinistino	124.74	70.68	2.78	7.92	15.73	9.73	4.51	6.77	7.35
4.41	Hendon	125.86	94.33	4.11	8.24	23.79	15.82	6.98	16.02	12.58
	Buchanan	110.56	434.24	19.24	8.67	19.61	11.08	10.24	55.71	26.64
		(119.06)	(172.12)	(10.62)	(8.43)	(15.38)	(13.41)	(8.43)	(23.01)	(20.07)
4.42	St. Gregor	130.80	234.30	9.81	2.46	5.65	12.59	2.32	4.59	10.84
4.44	Kelliher	107.46	230.69	10.52	10.14	7.94	3.84	12.46	65.73	25.84
	Yorkton	103.56	176.80	8.36	8.84	13.23	7.33	12.65	44.38	17.19
		(105.51)	(141.56)	(9.30)	(9.49)	(7.39)	(5.39)	(12.55)	(38.10)	(21.03)
4.46	Cymric	137.79	28.84	1.03	5.05	16.95	16.44	0.68	0.25	1.77
	Earl Grey	132.19	60.89	2.26	4.86	8.31	8.37	5.74	16.08	13.73
		(134.99)	(32.21)	(1.65)	(4.96)	(8.74)	(12.22)	(3.21)	(6.59)	(14.23)
4.50	Elfros	136.56	207.25	7.44	9.22	164.66	87.46	4.66	7.36	7.73
4.58	Fairlight	103.21	381.92	18.13	29.21	237.36	39.81	5.19	13.95	13.16
	Redvers	102.26	248.06	11.88	14.22	43.39	14.95	5.38	10.23	9.31
		(102.73)	(218.03)	(14.70)	(21.71)	(105.43)	(33.64)	(5.29)	(8.37)	(10.97)
4.59	Fillmore-East	144.72	95.01	3.22	8.58	19.48	11.12	1.47	1.70	5.65
	Browning	124.58	157.06	6.18	10.68	54.79	25.14	1.62	1.98	5.99
		(134.65)	(102.18)	(5.26)	(9.63)	(25.86)	(18.61)	(1.55)	(1.28)	(5.71)
4.85	Elcott	128.40	395.24	15.08	22.63	304.80	65.99	0.79	0.53	3.26

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.
2) S.E. = Standard Error.
3) C.V. = Coefficient of Variation.

Table 13. Examples of Variability in Upland Land Use Data.

		Area in Acres Per Quarter Section								
		Unused[1]			Grazing[1]			Roads and Railways[1]		
Unit	Transects	Mean	S.E.[2]	C.V.[3]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
4.32	Loreburn	0.25	0.02	0.42	0.46	0.51	5.46	2.48	1.01	1.99
4.33	Craik	2.81	4.86	8.47	6.05	72.64	58.77	3.21	0.44	0.68
4.34	Hanley	6.18	10.28	8.15	6.43	152.25	115.93	0.67	0.32	2.33
4.36	Peterson	5.15	13.48	12.82	1.83	16.36	43.86	1.61	0.49	1.50
4.39	Kinistino	5.91	8.58	7.11	4.72	25.64	26.60	1.31	0.89	3.34
4.41	Hendon	10.78	39.72	20.19	4.31	19.38	24.65	0.40	0.29	3.89
	Buchanan	9.28	32.26	17.02	9.49	100.49	51.87	0.53	1.37	12.67
		(10.11)	(25.61)	(18.61)	(6.61)	(37.90)	(42.12)	(0.46)	(0.51)	(8.22)
4.42	St. Gregor	4.71	10.10	11.74	3.33	15.60	25.66	0.22	0.13	3.20
4.44	Kellihar	16.13	59.97	18.22	7.40	94.97	62.91	0.69	0.48	3.41
	Yorkton	11.29	15.57	6.75	11.03	125.51	55.75	1.59	0.82	2.51
		(13.71)	(27.00)	(13.64)	(9.21)	(76.78)	(57.75)	(1.14)	(0.48)	(2.91)
4.46	Cymric	1.84	0.52	1.39	3.90	17.28	21.71	2.00	1.76	4.31
	Earl Grey	7.53	17.37	11.31	3.51	25.59	35.70	1.21	0.59	2.40
		(4.69)	(7.38)	(10.92)	(3.71)	(14.84)	(27.75)	(1.61)	(0.84)	(3.61)
4.50	Elfros	7.45	17.88	11.75	1.79	4.35	11.88	0.43	0.34	3.86
4.58	Fairlight	9.29	39.47	16.06	21.91	341.43	76.33	5.26	3.23	3.01
	Redvers	13.89	78.32	27.62	8.80	112.64	62.67	1.98	0.92	2.27
		(11.59)	38.42)	(22.96)	(15.36)	(163.45)	(73.73)	(3.62)	(1.83)	(3.50)
4.59	Fillmore-East	3.79	7.46	9.64	1.13	4.45	19.32	3.65	3.26	4.37
	Browning	4.27	6.02	6.92	8.21	131.31	78.37	2.52	1.17	2.26
		(4.03)	(4.67)	(8.04)	(4.67)	(48.83)	(72.47)	(3.09)	(1.58)	(3.54)
4.85	Elcott	3.23	3.10	4.71	14.04	325.00	113.39	4.99	4.50	4.42

[1] Figures in parentheses are composite values for those transects occurring within one physiographic unit.
[2] S.E. = Standard Error.
[3] C.V. = Coefficient of Variation.

Table 14. Estimated Area of Wetland Cover Classes in Physiographic Units.

Physiographic Unit		Estimated Area in Thousands of Hectares									
No.	Name	Total Wetland Area	Cultivated	Willows & Trees	Grasses	Bullrush Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
4.32	Hawarden Hills	12.9	9.8	0.1	2.9	0.1	0	0	0	0	T[1]
4.33	Kenaston-Buffalo Pound Upland	10.2	3.3	0.7	4.7	0.2	0	1.1	0.1	0	0.1
4.34	Allan Hills	21.5	1.6	2.4	15.5	1.6	0	0.2	0.1	0	0.1
4.36	Minichinas Hills	75.9	6.5	1.5	35.4	2.1	1.5	12.5	0.1	16.3	0.2
4.39	Melfort Plain	41.7	10.6	0.9	18.3	1.8	1.2	6.0	0.5	0	2.4
4.41	Ponass Lakes Plain	97.0	21.0	4.2	48.8	7.5	0	13.8	0.7	0	1.0
4.42	Lanigan Creek Plain	29.8	15.8	0.3	6.6	0.6	0	6.0	0.4	0	0.1
4.44	Touchwood-Beaver Hills	100.7	5.5	5.0	59.0	6.4	4.3	20.0	0.3	0	0.2
4.46	Last Mountain Plain	32.0	9.4	2.2	16.3	1.5	T	2.0	0.4	0	0.2
4.50	Touchwood Slope	14.2	4.6	0.7	6.4	0.5	0	1.9	0.1	0	T
4.58	Gainsborough Creek Plain	58.0	3.2	2.0	40.7	3.9	2.4	3.2	0.7	0	1.9
4.59	Upper Souris River Plain	54.7	13.8	1.7	36.6	0.7	0	1.4	0.4	0	0.1
4.85	Lower Souris River Plain	9.3	2.2	0.1	6.3	0.1	0	0.2	0.3	0	0.1

1) Less than 50 hectares.

Table 15. Estimated Numbers of Wetlands by Cover Class in Physiographic Units.

Physiographic Unit			Estimated Numbers of Wetlands (in Thousands)								
No.	Name	Total Number of Wetlands	Cultivated	Willows & Trees	Grasses	Bullrush Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
4.32	Hawarden Hills	42.3	35.0	0	6.2	0	0	0	0.9	0	0.2
4.33	Kenaston-Buffalo Pound Upland	23.2	9.9	0.5	11.4	0.3	0	0.4	0.6	0	0.1
4.34	Allan Hills	59.1	8.2	4.7	43.0	1.8	0	0.3	0.7	0	0.4
4.36	Minichinas Hills	104.7	25.2	6.7	56.6	3.9	1.9	7.4	0.3	1.7	1.0
4.39	Melfort Plain	116.0	55.2	4.0	46.6	2.3	0.8	3.1	1.9	0	2.1
4.41	Ponass Lakes Plain	261.7	109.7	13.6	115.1	5.0	0	11.0	3.9	0	3.4
4.42	Lanigan Creek Plain	68.5	45.0	1.9	15.5	1.0	0	2.3	1.9	0	0.9
4.44	Touchwood-Beaver Hills	244.5	33.0	15.6	165.7	5.9	5.9	14.7	2.2	0	1.5
4.46	Last Mountain Plain	110.6	35.6	9.4	58.3	2.0	0.1	1.8	2.4	0	1.0
4.50	Touchwood Slope	45.3	30.0	3.0	10.2	0	0	0.8	0.1	0	0.5
4.58	Gainsborough Creek Plain	163.1	21.2	8.2	111.4	4.7	3.3	2.4	2.6	0	9.3
4.59	Upper Souris River Plain	119.6	47.1	3.1	63.1	0.4	0	1.6	3.7	0	0.6
4.85	Lower Souris River Plain	27.2	10.5	0.5	14.4	0.1	0	0.2	1.4	0	0.1

Table 16. Estimated Area of Wetland Land Use Activity Classes in Physiographic Units.

Physiographic Unit No.	Name	Total Wetland Area	No Use	Abandoned Cultivation	Annual Crops	Haying	Grazing	Other
		Estimated Area in Thousands of Hectares						
4.32	Hawarden Hills	12.9	1.8	0.4	9.8	0.8	0.1	0
4.33	Kenaston-Buffalo Pound Upland	10.2	5.9	0.4	3.3	0.5	T[1]	0
4.34	Allan Hills	21.5	14.7	0.2	1.6	3.6	1.4	T
4.36	Minichinas Hills	75.9	63.2	1.4	6.5	3.7	0.9	0.2
4.39	Melfort Plain	41.7	22.4	4.2	10.6	1.7	2.6	0.2
4.41	Ponass Lakes Plain	97.0	54.9	4.4	21.0	8.0	8.2	0.5
4.42	Lanigan Creek Plain	29.8	11.9	0.8	15.7	T	0.7	0.7
4.44	Touchwood-Beaver Hills	100.7	72.3	1.7	5.5	11.5	9.5	0.2
4.46	Last Mountain Plain	32.0	17.1	2.2	9.4	1.8	1.4	0.1
4.50	Touchwood Slope	14.2	9.2	0.3	4.6	T	0.1	T
4.58	Gainsborough Creek Plain	58.0	37.9	7.5	3.1	0.6	7.9	1.0
4.59	Upper Souris River Plain	54.7	26.1	1.0	13.8	10.1	3.5	0.2
4.85	Lower Souris River Plain	9.3	4.8	0.1	2.2	0.2	2.0	T

[1]Less than 50 hectares.

Table 17. Estimated Area of Upland Cover Classes in Physiographic Units.

Physiographic Unit No.	Name	Total Upland Area	Grass	Low Shrub	Tall Shrub	Trees	Total	Annual Crops	Perennial Grass and Forbs	Trees & Shrubs	Total
		Estimated Area in Thousands of Hectares									
4.32	Hawarden Hills	134.2	2.9	0	0	T[1]	2.9	129.8	0.8	0.4	0.3
4.33	Kenaston-Buffalo Pound Upland	136.4	7.0	1.1	0.2	0.3	8.6	123.9	3.1	0.5	0.4
4.34	Allan Hills	141.8	10.1	1.1	0.6	2.1	13.9	126.2	0.5	0.2	1.0
4.36	Minichinas Hills	373.3	16.9	T	0.3	2.5	19.7	347.3	4.7	1.0	0.6
4.39	Melfort Plain	286.8	15.9	0.1	0.9	9.1	26.0	250.4	4.3	1.4	4.7
4.41	Ponass Lakes Plain	660.6	39.0	0.7	7.3	38.9	85.9	550.2	18.5	0.7	5.3
4.42	Lanigan Creek Plain	224.4	3.8	0	1.0	3.6	8.4	203.0	9.9	0.6	2.5
4.44	Touchwood-Beaver Hills	495.2	34.1	0.5	6.9	45.6	87.1	381.9	18.8	0.5	6.9
4.46	Last Mountain Plain	349.4	11.8	0.5	1.6	7.6	21.5	319.6	5.2	0.9	2.2
4.50	Touchwood Slope	289.1	17.1	0	1.4	8.6	27.1	252.6	6.6	0.3	2.5
4.58	Gainsborough Plain Creek	372.1	56.4	0.5	3.4	13.7	74.0	266.9	23.7	1.4	6.1
4.59	Upper Souris River Plain	566.9	35.8	1.1	0.3	5.8	43.0	502.1	14.3	1.1	6.4
4.85	Lower Souris Plain River	188.2	26.8	T	T	0.9	27.7	152.2	5.0	1.4	1.9

1) Less than 50 hectares.

Table 18. Estimated Area of Upland Land Use Activity Classes in Physiographic Units.

Physiographic Unit		Estimated Area in Thousands of Hectares								
No.	Name	Total Upland Area	Unused	Abandoned	Annual Crops	Forage	Grazing	Farmsteads	Roads Railways	Other
4.32	Hawarden Hills	134.2	0.2	0.6	129.8	0.1	0.4	0.8	2.2	0.1
4.33	Kenaston-Buffalo Pound Upland	136.4	2.5	0.4	123.9	0.4	5.4	1.0	2.8	0
4.34	Allan Hills	141.8	6.2	0.6	126.2	0.3	6.4	1.4	0.7	0
4.36	Minichinas Hills	373.3	14.1	T[1]	347.3	0.4	5.0	0.9	4.4	1.2
4.39	Melfort Plain	286.8	11.9	1.5	250.3	5.7	9.5	4.8	2.6	0.5
4.41	Ponass Lakes Plain	660.6	46.7	2.9	550.2	22.1	30.5	4.1	2.1	2.0
4.42	Lanigan Creek Plain	224.4	7.3	1.0	203.0	4.6	5.2	2.9	0.3	0.1
4.44	Touchwood-Beaver Hills	495.2	49.7	2.1	381.9	18.1	33.4	3.4	4.1	2.5
4.46	Last Mountain Plain	349.4	11.1	1.0	319.6	1.9	8.8	2.9	3.8	0.3
4.50	Touchwood Slope	289.1	13.9	11.3	252.6	2.1	3.3	5.1	0.8	T
4.58	Gainsborough Plain Creek	372.1	30.1	5.1	266.9	16.2	39.9	4.1	9.4	0.4
4.59	Upper Souris River Plain	566.9	15.0	0.6	502.1	14.3	17.5	2.8	11.5	3.1
4.85	Lower Souris River Plain	188.2	3.8	1.1	152.2	5.5	16.6	2.9	5.9	0.2

1) Less than 50 hectares.

Table 19. Frequency of Land Use/Cover Changes Between May 1985 and Time of Groundtruth Survey.

Physiographic Unit	Transect	No. of Quarters[1] In Sample	No. of Quarters[1] Affected by Land Use/Cover Change	Percent of Quarters Affected[1]	Time Interval from May 1985 to Groundtruth Survey (in months)
4.32	Loreburn	24	6	25	11
4.33	Craik	24	3	12.5	18
4.34	Hanley	24	5	20.8	18
4.36	Peterson	24	4	16.7	18
4.39	Kinistino	24	5	20.8	17
4.41	Hendon	30	6	20	15
	Buchanan	24	7	29.2	16
		(54)	(13)	(24.1)	
4.42	St. Gregor	30	5	16.7	15
4.44	Kelliher	24	4	16.7	17
	Yorkton	24	5	20.8	17
		(48)	(9)	(18.8)	
4.46	Cymric	24	0	0	18
	Earl Grey	24	4	16.7	18
		(48)	(4)	(8.3)	
4.50	Elfros	24	3	12.5	16
4.58	Fairlight	24	0	0	17
	Redvers	24	1	4.2	3[2]
		(48)	(1)	(2.1)	
4.59	Fillmore-East	24	2	8.3	23
	Browning	24	10	41.7	59[3]
		(48)	(12)	(25.0)	
4.85	Elcott	24	5	20.8	23

1) Figures in parentheses are composite values for those transects occurring within one physiographic unit.
2) July 1986 photography was used for the Redvers transect. Therefore the time interval between photography and groundtruth survey was three months.
3) May 1982 photography was used for the Browning transect. Therefore the interval between photography and groundtruth survey was 59 months.