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

Report #4: Alberta Parkland

Prairie Habitat Monitoring Project

March 31, 1992

J.B. Millar
Contractor
Canadian Wildlife Service
115 Perimeter Road
Saskatoon, Saskatchewan
S7N 0X4
Canada

ABSTRACT

This report presents data for 19 transects in 16 physiographic units in the Alberta Parkland. One additional unit has been sampled in the Saskatchewan portion of that unit. These 17 units account for 73.2 percent of the total area of the ecoregion. Two units occur as outliers within the Mixedgrass and Fescue Prairie. One of these, the Strathmore Plain, is essentially artificial parkland created as a result of irrigation.

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, caution must be used in interpreting apparent habitat differences and habitat values extrapolated from sample means for physiographic units.

Distribution of sampling amongst major landform categories parallels quite closely the level of occurrence of those categories within the Alberta Parkland Ecoregion.

For the ecoregion sample as a whole:

a) Wetland area averages 9.9 percent of the total land area of sampled physiographic units. This compares to 9.5 percent recorded for Saskatchewan Parkland.

b) All but two of the transects are located on knob and kettle or undulating morainal landforms. Therefore comparison of wetland area and numbers between those and non-morainal landforms is not possible for this ecoregion. Knob and kettle and undulating morainal landforms comprise over four fifths (81.9 percent) of the

total area of the ecoregion, exclusive of lakes, rivers and urban areas.

c) An overwhelming proportion of wetland numbers (89.8 percent) and wetland area (73.3 percent) are temporary or seasonal in nature.

d) Almost one fifth (18.5 percent) of the wetland area and 5.4 percent of wetland numbers are classed as permanent water (natural, fresh open water). This is over double the level recorded for Saskatchewan parkland.

e) Almost half of the wetland area is not subjected to any human use. Grazing occurs on 38.2 percent of the wetland area, over triple the amount in Saskatchewan Parkland.

f) Almost two thirds (63.8 percent) of the total upland area is in annual crops compared to 79 percent in Saskatchewan Parkland. Native cover occurs on 28.0 percent of the upland compared to 16.4 percent in Saskatchewan Parkland.

g) Grazing occurs on 21.5 percent of the uplands compared to 8.2 percent in Saskatchewan Parkland.

h) Two morainal physiographic units, the Rumsey Upland and Hazeldine Plain, are rated as having the best habitat for waterfowl production in the sampled portion of the ecoregion. They are also two of the smallest of the sampled units. Units rated as one or two for waterfowl production comprise almost two fifths (38.3 percent) of the sampled portion of the ecoregion and 29.5 percent of the total area of all physiographic units in the ecoregion.

TABLE OF CONTENTS

LIST OF TABLES

## LIST OF FIGURES

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

Report #4: Alberta Parkland

Prairie Habitat Monitoring Project

Project Officer 1985/91 - 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 1989a) 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 one segment of a more comprehensive effort to establish this baseline record, expanding on the results of earlier pilot studies (Millar 1986).

## III. Methods

Most of the methods employed in this project have already been described in detail in Report #1 of this series (Millar 1987). Changes in methodology developed since that time have been identified, or at least referred to, in Report Nos. 2 and 3 (Millar 1988, Millar 1989b). These changes are summarized in their entirety in this report and will apply to results recorded in all future reports on this phase of the project. In future reports only methodology relating specifically to the contents of individual reports will be discussed.

### A. Delineation of Physiographic Units

Physiographic unit boundaries within most of the settled portion of the three Prairie Provinces 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. Some northern fringes of settlement have not been mapped. 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 in the mapped area to a greater or lesser degree.

2. **Redefinition of physiographic units** - These changes will be identified in each report for the area under discussion in that report. In Alberta Parkland five physiographic units have been redefined. Four of these, Neutral Upland (4.88), Rumsey Upland (4.90), Monitor Hills (4.92) and Coronation Plain (4.93), were originally considered to be mixedgrass prairie units (Nos. 2.35, 2.40, 2.37 and 2.38, respectively) by Adams but have been transferred to parkland on the basis of a redefinition of the grassland-parkland boundary. Their new numerical designations are as indicated above. Oyen Upland North (4.94) is a new unit created out of a portion of the mixedgrass prairie unit Oyen Upland (2.33) as it forms a parkland outlier within the mixedgrass prairie.

3. **Identification of sub-divisions within physiographic units** - This has been done on the basis of obvious differences in density and size distribution of wetlands and, to some extent, topography and soils. These sub-divisions are not utilized in this and other reports on this phase of the project but should provide a basis for more accurate sampling of habitat conditions in the future.

B. Sampling Network

The number of transects in the sampling network remains at 152 as previously reported (Millar 1988). Six of the 19 transects

discussed in this report are the products of transect splitting which involves one split into two parkland units, two splits between parkland and mixedgrass prairie and one each between parkland and fescue prairie and parkland and transition forest.

C. Data Assembly

1. **Wetland impact and upland secondary cover and feature codes** - A number of new categories have been created as new situations requiring special identification were encountered. They are as follows:

Wetland Impact and Qualifier Codes

| Code | Category or Description |
|---|---|
| AS | Artificial Supply - Wetlands fed by man-made water sources, e.g., irrigation. |
| SY | Stockyarding - Wetland filled with straw used for livestock bedding (wintering of cattle). |
| DV | Cover density differs from adjoining wetland polygon. |
| SV | Dominant cover species differs from adjoining wetland polygon. This is commonly used to differentiate between wet meadow and shallow marsh vegetation, both of which are coded V3 in this project. |
| SS | Wetland is a sloping seepage or spring area. There is no basin to retain surface water to any depth. |

Upland Secondary Cover and Feature Codes

| Code | Category or Description |
|---|---|
| EX | Man-made excavations present. |
| SY | Stockyarding - Area is covered with straw or hay used for livestock bedding or feeding. |

2. **Preparation of "clean data records"** - By the time actual data analysis was begun (Report #2 - Millar 1988) our procedures had been modified so that corrected descriptive data were entered

directly into the in-house computer at the Prairie and Northern Wildlife Centre in Saskatoon and transferred onto diskettes for transmission to the Environmental Information System (EIS) of State of the Environment Reporting, Environment Canada (formerly the Canada Land Data System of 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 with 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.

Wetland margin data have not been analysed and consideration of wetland impacts is limited to identifying the number of wetlands per quarter section which are affected by one or more permanent impacts. Both of the above data files contain quantities of valuable habitat information and should be analysed in depth at some future date.

Grouping of transects according to slope values, in addition to soil parent material and surface form, will be deleted from this and future reports as that characteristic is not consistently available or interpreted in the earlier soils reports which cover

many of the transect locations, particularly in Alberta and Manitoba.

The EIS in Ottawa switched to generating all polygon area values in hectares so the conversion of data from acres to hectares as described in Report #2 (Millar 1988) is no longer required.

In all reports on this phase of the project wetlands are categorized in terms of cover classes established in accordance with the former Canada Land Data System's 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 Class Used in this Report (1) | Wetland Types of Millar (1984) | |
|---|---|---|
| | Basin Wetlands | Wetlands Identified as Stream Segments |
| Cultivated (V1, X0) | 0.3 | |
| Shrubs and Trees (W3, W1) | 0.2, 1.2 | |
| Grasses, Sedges and Forbs (V3) | 1.1, 1.8, 2.1, 2.8 | 1.9, 2.9 |
| Bulrush and 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 all reports the term "unit" is used as an abbreviation for "physiographic unit".

F. Rating of Sampled Morainal Physiographic Units as Waterfowl Production Habitat

In the North American Waterfowl Management Plan, areas in each province identified as having the greatest capability for waterfowl production have been designated as key or priority program areas. Habitat management activities under NAWMP will be focused in these areas. The Prairie Habitat Monitoring Program not only samples these areas but non-priority areas as well as it is important that we have some mechanism for comparing or rating the relative potential for waterfowl production of physiographic units right across the prairies.

From the location of NAWMP priority areas (NAWMP Saskatchewan Technical Committee 1988) and the baseline data generated from Saskatchewan Parkland (Millar 1988, 1989b) it is apparent that physiographic units located on morainal landforms are most likely to possess the combinations of habitat values needed to ensure successful waterfowl production. Therefore, efforts to rate units as to their capability for waterfowl production will be confined at this point to units located on those landforms.

My initial effort to identify the best units for waterfowl production simply involved identifying the estimated total amounts of various habitats in each unit. Unfortunately this approach has not proven to be adequate because it has been shown that large quantities of habitat may simply be a reflection of the size of the physiographic unit rather than the frequency of good habitat characteristics per unit area. Using this method small but highly

productive units are not given a high rating.

In this section I want to make a further effort at rating morainal physiographic units by using seven habitat factors, each of which plays a particular role in some aspect of waterfowl production. I want to emphasize that this is a subjective, "quick and dirty" approach which may not stand up in its present form under critical scrutiny. For the moment, however, the resultant rating of individual units does seem to correlate fairly well with my general knowledge of those areas.

The structure of the rating system is as follows:

Habitat factors and their role in waterfowl production

1. Percent of total land area occupied by wetlands - This provides a measure of the relative availability of waterholding depressions in a unit. The premise here is simple - no depressions, no water; no water, no ducks!

2. Percent of total wetland area occupied by grassy cover - This is a measure of the amount of good quality temporary or seasonal wetlands available for breeding pair dispersal.

3. Percent of total wetland area occupied by bulrush/cattail cover - This is a measure of the availability of semipermanent brood waters, i.e., those likely to be present in years of normal water levels.

4. Percent of total wetland area occupied by natural fresh open water - This is a measure of the availability of permanent brood waters which will be present under all but the severest drought conditions.

5. Percent of total wetland area that is unused - This is taken as a measure of the availability of undisturbed escape cover.

6. Percent of total upland area occupied by shrubs and native and seeded grasses - This is a measure of the availability of upland nesting cover.

7. Percent of total upland area that is unused - This is taken as a crude indication of the availability of dense nesting cover.

Assignment of points to individual habitat factors

For each of the seven habitat factors one point is given if the value for the unit exceeds a designated minimum. No attempt has been made to assign greater importance to one factor over another, except that a unit will be downgraded by one level if it loses points for both semipermanent (bulrush/cattail) and permanent (natural, fresh open water) wetlands, considered critical for brood production. Minimums have arbitrarily been established at approximately half the maximum observed level for each factor. For Alberta Parkland they are as follows:

1. Total wetland area - 7.5 percent of total land area
2. Grassy wetland cover - 40 percent of total wetland area
3. Bulrush/cattail cover - 7.5 percent of total wetland area.
4. Open water wetlands - 20 percent of total wetland area
5. Unused wetlands - 40 percent of total wetland area
6. Shrubby and grassy upland cover - 25 percent of total upland area
7. Unused uplands - 7.5 percent of total upland area

Rating Scale

The possible point range of zero to seven has arbitrarily been divided into four categories on the following basis:

| Number of Points Given the Unit | Rating |
|---|---|
| 6 - 7 | 1 |
| 4 - 5 | 2 |
| 2 - 3 | 3 |
| 0 - 1 | 4 |

## VI. Results and Discussion

### A. General Information on the Alberta Parkland

#### 1. Ecoregion Area and Distribution of Sampled Units

The total area occupied by the Alberta Parkland is calculated to be approximately 5,056,400 hectares (Table 1), based on the boundaries of physiographic units lying wholly or predominantly within the ecoregion. The area calculated in this fashion will differ somewhat from the area of the ecoregion when calculated on surveyed and redefined vegetation boundaries. A comparison of these values still needs to be made.

Sixteen physiographic units which have been sampled with habitat monitoring transects in Alberta, plus one which has been sampled in the Saskatchewan portion of the unit, account for just under three quarters (73.2 percent) of the total area of the ecoregion (Table 1) while unsampled units cover 21.8 percent of the area. Major river and stream valleys as well as lakes and urban areas larger than 500 hectares have been excluded from the area of

physiographic units and collectively comprise 5.0 percent of the total area of the ecoregion.

2. Distribution of Landforms in Ecoregion

The distribution of Landforms in Alberta Parkland is summarized in Table 2. Morainal terrain occupies the vast majority (92.3 percent) of the total area of physiographic units in the ecoregion and 81.6 percent of that area is in units currently being sampled in this study. Half of the morainal area is made up of one sub-category, knob and kettle surface form, and undulating ground moraine accounts for almost another 40 percent. Four fifths of the knob and kettle terrain is in physiographic units which have been sampled and all of the undulating units have been sampled. The remaining 11 percent of morainal terrain is composed of units in which the glacial till is associated with bedrock. The sampling rate is much lower in these areas. There has been no sampling at all in the small knob and kettle area and less than one fifth of the blanket/rolling category has been sampled.

The remaining 7.7 percent of land in physiographic units is found on a variety of fluvial and eolian landforms. Just over one fifth (21.7 percent) of this area is in one unit which has been sampled.

Lacustrine and lacustrine-complex terrain is not present in the ecoregion in areas large enough to be mapped as separate physiographic units.

The distribution of habitat sampling between the various landform categories is also shown in Table 2. For the major

morainal categories the relationship between distribution of sampling effort and actual occurrence of the category in the ecoregion is quite close. The morainal/bedrock categories have, however, been sampled at only about half the level of their occurrence in the ecoregion. Sampling for all morainal categories collectively amounts to 95.9 percent of our total effort while those same categories account for 92.3 percent of the total land area in physiographic units in the ecoregion. The variety of fluvial and eolian categories have been sampled at just over half the level of their presence in the ecoregion – 4.1 and 7.7 percent, respectively.

### 3. Location and Landform Character of Individual Physiographic Units

Figure 1 shows the location of all physiographic units in Alberta Parkland, including both those covered in this report and units which have not been sampled at all. Two units, 4.02 and 4.94, occur as outliers in the Mixedgrass Prairie. Unit 4.02 is predominantly, if not entirely, an artificial parkland situation created as the result of irrigation.

This report presents baseline habitat data for 19 sample sites in 16 physiographic units. In addition, data are also presented for one unit (Neutral Upland) which has been sampled in the Saskatchewan portion of the unit. Individual units and transects located in them are listed in Table 3. Collectively these 17 units comprise an area of approximately 3,700,500 hectares (Table 5) or about 73 percent of the total Alberta Parkland Ecoregion.

Origin of soil parent material and surface form for the 17 units are summarized in Table 3. All but one of the units are entirely or predominantly of morainal origin. The single exception is on fluvial material. Nine of the 16 morainal units have predominantly knob and kettle landform, six are on undulating ground moraine and one is on a morainal blanket over bedrock. The fluvial unit has an undulating landform.

The nine physiographic units in Alberta Parkland which have not been sampled to date are summarized in Table 4 as to their soil parent material, surface form and area. Seven of them are entirely or predominantly morainal in nature and three of those are morainal over bedrock. Of the remaining two, one each is fluvial/morainal and eolian/fluvial.

**4. Size of Monitoring Samples in Relation to Physiographic Units**

The relative sizes of monitoring samples covered in this report and the physiographic units in which they occur are presented in Table 5. Samples range from a low of 0.4 percent of the Castor Plain to a high of 1.9 percent of the Dogpound Benchland. Overall sample size for the 16 units, excluding the Neutral Upland (4.88) which was sampled in Saskatchewan, is 0.8 percent. If the Alberta portion of 4.88 is included the overall sample size is 0.9 percent and if all of 4.88 is included it drops back to 0.8 percent.

Eleven of the 17 units contain sufficiently well-defined variations in surface form, including density and size distribution

of wetlands, and soil parent material that they can be divided into two or more sub-units. In the Alberta Parkland this situation is most extreme in the Delburne Uplands, Battle River Uplands and Innisfree Plain which have each been divided into five sub-units. Ideally transects should be related to the sub-units in which they occur rather than to the unit as a whole. However, if this were to be done there should be additional sampling in other significant sub-units. Also, a number of transects do straddle sub-unit boundaries.

B. Sample Results

1. Wetlands

a) **Percent of Total Land Area Occupied by Wetlands**

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 19 individual transects in Alberta Parkland there is a six-fold variation (3.2 to 19.2) in the percent of total land area occupied by wetlands (Table 6).

i. **Landform character and wetland area** - Seventeen of the 19 transects in Alberta Parkland are located on knob and kettle or undulating morainal terrain. Therefore most observations regarding the relationship between landform character and wetland area will be confined to those two categories. The knob and kettle sub-category of morainal landform has a somewhat higher range of wetland area (6.7 to 17.5 percent) than undulating morainal terrain (4.5 to 14.5 percent).

Interestingly, both extremes in wetland area occur in the two transects which are not in the two above-mentioned morainal categories. The lowest percentage of wetland area is found in the Cremona transect which is located on a morainal blanket over bedrock at the edge of the foothills of the Rocky Mountains. The highest level of wetland area (19.2 percent) occurs on the single fluvial transect and is the product of a man-made situation in a man-made parkland environment. The unit (#4.02) is composed primarily of irrigated lands and many of the wetlands have been created as a result of either seepage from irrigation ditches or from spillwaters flowing out of irrigated areas.

For the ecoregion sample as a whole the percent of land area occupied by wetlands averages 9.9 which is quite comparable to the 9.5 percent recorded for Saskatchewan Parkland. The range in wetland area on morainal terrain is also remarkably close, 4.5 to 17.5 percent in Alberta (excluding morainal blanket on bedrock) compared to 4.7 to 18.1 percent in Saskatchewan (Millar 1989b).

ii. **Variability in wetland area between samples within the same physiographic unit** - Two of the 16 physiographic units sampled in the Alberta Parkland contain more than one transect. One has two transects and one has three. The expectation in such situations is that transects within the same relatively homogeneous unit should have reasonably comparable habitat values. This does not hold true in either of the above situations. In the two-transect unit, the Innisfree Plain, one transect has wetlands covering 10.3 percent of the sample while the other has 17.5

percent coverage, some 70 percent greater. The Innisfree Plain has been divided into five-sub-units primarily on the basis of differences in wetland density and size distribution. The two transects do occur in different sub-units so the difference in wetland area is not surprising. The greatest wetland area (14.5 percent) in the three-transect unit, the Killam Plain, is almost double the lowest value (7.6 percent). This unit is divided into two sub-units and the transect with the lowest percentage of wetland area is located half in each sub-unit. It is also located in an area which has been subjected to heavy wetland loss through agricultural drainage and undoubtedly many wetlands which were present in the past have now been totally eliminated through drainage. The other two transects with wetland area values of 9.4 and 14.5 percent are located in the same sub-unit so there is a high degree of variability even in areas considered to be particularly homogeneous.

iii. **Cultivated wetlands** - The amount of land occupied by cultivated wetlands is of particular interest because this is a part of the landscape which, depending on surface water conditions at the time of surveys, cannot always be interpreted from air photos as being wetland. Classification 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 in the transects covered in this report ranges from zero percent at Cremona to 2.9 percent at Galahad (Table 6) where 31 percent of the

total wetland area is cultivated. The figure of 2.6 percent for the Daysland transect amounts to 34 percent of the total wetland area and is misleading in that it does not take into consideration the loss of wetlands in that area through agricultural drainage. If those former wetland areas could be measured the wetland area affected by cultivation would of course be considerably larger.

Differences between transects in the same physiographic unit, in percent of total land area occupied by cultivated wetlands, are generally quite small because of the size of the percentages involved. The differences in the Killam Plain would be greater if, as indicated above, the area of wetlands lost through drainage at Daysland were taken into account.

For the ecoregion as a whole, total land area occupied by cultivated wetlands averages 0.9 percent. This is half that observed in Saskatchewan Parkland (Millar 1989b) and reflects the virtual absence of non-morainal transects in the Alberta sample. In Saskatchewan Parkland those categories contained the largest percentage of land area occupied by cultivated wetlands. For morainal categories the range of cultivated wetland area is virtually identical for the two ecoregions - zero to 2.9 percent in Alberta and 0.1 to 2.9 percent in Saskatchewan.

b) **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 7. Cultivated, grassy and wooded cover are considered collectively as the cover types most indicative of temporary or seasonal water

conditions and this group dominates (51.9 to 97.3 percent of total wetland area) in all transects but one. In that transect (Vegreville East) 54 percent of the wetland area is natural open water. The level of dominance by the cultivated/grassy/wooded cover group is not quite as high in Alberta Parkland as it was in Saskatchewan. In eight of the 18 transects this group accounted for less than 74 percent of the total wetland area. In six of those cases natural open water was the most significant other cover category and in the remaining two saline open water was involved.

The percent of wetland area that is cultivated in the 19 transects varies from 0.5 percent at Gayford East and Cremona on, respectively, fluvial terrain and morainal material over bedrock to 33.9 percent at Daysland on undulating morainal terrain. All but one of the eight transects on undulating morainal terrain had higher percentages of wetland area cultivated than transects on any of the other landforms. This is not surprising since wetlands in areas of low relief tend to be shallower and hence more susceptible to cultivation.

Grass (including sedges and forbs) is the dominant cover class in 17 of the 19 transects. While both wet meadow and shallow marsh vegetation are included in the class, groundtruthing surveys have confirmed that by far the great majority of the area involved is shallow marsh.

The percentage of total wetland area covered by willows and trees range from 0.8 to 22.2. This cover class does not dominate anywhere and is the second most common cover class in only two

transects. The values given in Table 7 for willows and trees include only cover which can be mapped as polygons and not all the narrow wooded margins which are characteristic of parkland wetlands.

Bulrush and cattail (deep marsh vegetation) account for only a minor (zero to 8.9 percent) part of total wetland cover in Alberta Parkland.

Transitional open water, which can only be identified from ground surveys, is irregular in its occurrence. It is recorded on only four transects and in only one case (Kirkpatrick Lake East) did it constitute more than one percent of wetland area. This class is useful as an indicator of areas which have recently experienced above normal water levels.

Natural fresh open water is highly variable in its occurrence. It is absent from one transect (Galahad) and ranges up to 54.0 percent at Vegreville East where it forms the dominant cover category. In this report open running water has been grouped with natural open water in ponds.

The area of artificial open water is consistently low in 16 of the 19 transects, ranging from 0.2 to 2.0 percent. This is to be expected since most of this cover class occurs as small dugouts. The maximum value of 5.7 percent at Trochu is made up of a combination of beaver dams, reservoirs and unusually large dugouts. At Gayford East (4.2 percent) artificial water is predominantly irrigation reservoirs and canals. At Hindville (3.0 percent) beaver dams and reservoirs constitute most of this cover category.

Saline open water is present on only four transects and in significant amounts on only two of those, Oyen (32.8 percent) and Hindville (22.8 percent). However, based on personal observations, this cover class is more widely distributed outside the sample sites.

Other cover classes are recorded in only four transects and never account for more than 0.4 percent of the wetland area. In each case the cover classes are indicative of disturbance situations.

The percent of wetland area in various cover classes varies widely between transects within the same physiographic unit. Of the 10 data pairs and triads (i.e., those cover classes which were recorded in both or all three transects), three or 30 percent have differences of less than five percent of the total wetland area while in the remaining seven or 70 percent the differences are greater and run up to 48 percent. Six (86 percent) of the large differences are associated with the four most common cover types but only one (33 percent) of the small differences are associated with this group. This is to be expected since the potential for large differences is greater where larger percentages of wetland area are involved. On the other hand, two thirds of small differences are associated with the more poorly represented cover classes.

For the ecoregion sample as a whole 95.2 percent of the total wetland area falls into five cover classes: grass - 56.8 percent, natural fresh open water - 18.5 percent, cultivated - 8.8 percent,

willows and trees - 7.7 percent, and bulrush and cattail - 3.4 percent. The distribution of these five cover classes, collectively, is almost identical to that recorded for Saskatchewan Parkland (94.5 percent, Millar 1989b). The greatest differences between the two provinces are in natural fresh open water which in Alberta Parkland is the second most common cover type (18.5 percent compared to 8.2 percent in Saskatchewan) and cultivated wetlands which drop to third place (8.8 percent compared to 19.2 percent in Saskatchewan). Temporary or seasonal wetlands, as indicated by grass, cultivated and willow/tree cover, account for 73.3 percent of total wetland area. This is almost eight percent lower than the figure recorded for Saskatchewan Parkland.

c) **Wetland Density**

Wetland density figures can be used to a limited extent to draw certain inferences about the character of the wetlands under study but must be interpreted with caution. A high wetland density, for example, can be taken as a reliable indicator that most of the wetlands present are small and hence not likely to be very permanent in nature. A low density, on the other hand, may be indicative of a variety of conditions and hence is not a reliable indicator by itself of either wetland size or permanence. It may, for example, result from the presence of small numbers of either small temporary wetlands, a mixture of a variety of sizes of wetlands of variable permanence or very large permanent wetlands.

The mean wetland densities per quarter section for all transects covered in this report and for the ecoregion sample as a

whole are listed in Table 8. Densities range from 2.0 per quarter section at Cremona to 23.5 at Vegreville West. The lowest density occurs on morainal blanket over bedrock while the range on other morainal landforms is 6.3 to 23.5 per quarter section. The range of wetland density is almost identical on both knob and kettle (6.6 to 23.4) and undulating (6.3 to 23.5) morainal terrain. The density on the single fluvial transect (12.5) falls within the range recorded for morainal terrain.

The variability in wetland density between transects within the same physiographic unit is very pronounced on the knob and kettle morainal landform of the Innisfree Plain (9.8 at Clandonald and 21.5 at Vegreville East). However, it is much more subdued on the undulating morainal landform of the Killam Plain, ranging from 14.0 at Daysland to 17.9 at Holden. The low figure at Daysland is an artifact produced as a result of agricultural drainage.

For the entire ecoregion sample the average density is 13.6 wetlands per quarter section, somewhat lower than that recorded (16.1, Millar 1989b) for Saskatchewan Parkland. Maximum wetland density in Alberta Parkland is only two thirds that recorded in Saskatchewan (23.5 and 34.5, respectively).

d) **Numbers of Wetlands in Various Cover Classes**

In this report each wetland has been categorized according to the one cover class which dominates the central and deepest portion of the basin.

The three cover classes characteristic of temporary or seasonal wetlands, i.e., cultivation, grasses and willows and

trees, collectively dominate 70.3 to 97.4 percent of the wetlands in the 19 transects (Table 8). In only two cases, Cremona and Gayford East, does the level drop below 81.8 percent. These are also the only two transects in Alberta Parkland which are not situated on either knob and kettle or undulating morainal landform. Obviously an overwhelming proportion of the wetland numbers in all areas are temporary or seasonal in nature. Within these classes grasses dominate in 16 transects and cultivation in three.

With few exceptions, representation of all other cover classes is at a very low level. Natural fresh open water does achieve double digit values in three transects with a maximum of 16.3 percent at Vegreville East. This is double the maximum level recorded for Saskatchewan Parkland (Millar 1988). The rest of its values range from zero to 7.9 percent. Bulrush/cattail achieve a maximum of 8.0 percent at Gayford East in an artificial irrigation situation. The rest of its values range from zero to 2.6 percent. Transitional open water never dominates more than 0.8 percent of the wetlands and saline open water 2.0 percent.

Artificial open water has an interesting pattern of distribution, just as it did in Saskatchewan Parkland (Millar 1988). It never dominates more than 4.6 percent of the wetlands in 14 of the 19 transects but in the remaining five transects, Cremona, Trochu, Marwayne, Greenglade and Kirkpatrick Lake East, it accounts for 5.5 to 12.3 percent of the wetlands. Those five areas also have the five lowest wetland densities so it is to be expected that under those circumstances dugouts and reservoirs will appear

as a larger segment of total wetland numbers.

The variability in percent of total wetland numbers in various cover classes between different transects within the same physiographic unit is as great (up to 49 percent of total wetland numbers) as that discussed earlier for wetland area. However, the proportions of small and large differences are almost reversed with six or 55 percent of the 11 data pairs and triads having small differences. This agrees well with the results obtained for Saskatchewan Parkland (Millar 1988, 1989b). All of the large differences in percent of wetland numbers are associated with the four most common cover types but only 33 percent of the small difference are similarly associated. When the small and large differences in percent of wetland numbers are matched against the corresponding values for wetland area those values coincide (i.e., small/small, large/large) in six cases and do not coincide in four cases. There is no matching area data for one pair of number data. This is due to the fact that some very small cover values are identifiable for wetland numbers but are so small they're recorded as zero for wetland area.

For the ecoregion sample as a whole 89.8 percent of the wetlands are dominated by grass (56.4 percent), cultivation (27.3 percent) and willows and trees (6.1 percent). Of the remaining wetlands, 5.4 percent are dominated by natural fresh open water, 2.6 percent by artificial open water, 1.5 percent by bulrush/cattail and less than one percent by all other categories together. Percentages of wetland numbers in most cover categories

are quite comparable for parkland in both Alberta and Saskatchewan. However, the percentage of open water wetlands in Alberta Parkland is two and one half times that recorded in Saskatchewan (Millar 1989b), 5.4 and 2.2 percent, respectively.

e) **Area of Wetlands in Various Land Use Activity Classes**

Utilization of wetlands in the 19 transects falls into five major land use categories - no use, abandoned cultivation, annual crops, haying and grazing. Collectively these five activity classes occur on 95.9 to 100 percent of the total wetland area (Table 9).

The percent of total wetland area that is not being subjected to any obvious or regular human activity ranges from 7.3 percent at Kirkpatrick Lake East to 81.1 percent at Marwayne. The minimal no use value at Kirkpatrick Lake East is associated with a very high (85.7 percent) level of utilization for grazing.

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. Since development of the abandoned cultivation class is related to local precipitation conditions, its presence can be expected to be erratic within and between transects. Percent of the total wetland area in this category ranges from 0.2 to 5.3 for the 19 transects covered in this report.

The amount of wetland area being used for crop production ranges from 0.5 percent at Cremona and Gayford East to 33.9 percent at Daysland. The influence of drainage on the figure for Daysland has already been discussed. Data on wetlands used for crop production are the same as those presented earlier for the cultivated cover class.

Haying of wetlands occurs in 17 of the 19 transects and on 0.2 to 10.1 percent of the total wetland area in those transects. Maximum extent of wetland haying in Alberta Parkland is just under half that recorded for Saskatchewan Parkland (21.4 percent, Millar 1989b). There is no apparent association between haying and landform.

Grazing of wetlands occurs in all of the 19 transects and on 0.4 to 85.7 percent of the wetland area. The level of grazing is considerably higher and more widespread in Alberta Parkland than in Saskatchewan (Millar 1989b). In 11 of the 19 transects grazing occurs on more than 30 percent of the wetland area and in six of those it occurs on more than 50 percent of the wetland area. As in Saskatchewan, high haying and grazing values do not seem to go hand in hand though one would expect to see a high degree of association between them.

Other land use activities on wetlands are recorded in 14 of 19 transects and in only three cases do those uses exceed one percent of the wetland area. Maximum other usage is 4.1 percent at Gayford East where a number of wetlands are used as storage reservoirs for irrigation. At Daysland (3.2 percent) a number of wetlands are

drainage ditches and at Trochu (1.7 percent) other uses are primarily recreation and water storage.

The frequency of substantial differences in land use activities on wetlands in different transects within the same physiographic unit is less than that observed for cover and wetland area data. Large differences (over five and up to 41.4 percent of total wetland area) occur in 27 percent of the 11 data pairs or triads but only in the Killam Plain (3 of 6 data triads).

For the ecoregion sample as a whole, 97.7 percent of the total wetland area falls into four land use categories. This compares with 95 percent for those categories in Saskatchewan Parkland (Millar 1989b). Slightly less than half (47.3 percent) of the wetland area is unused in Alberta compared to 59.5 percent in Saskatchewan. The most pronounced difference in wetland land use between the two provinces is in grazing. In Alberta the level is over three times higher (38.2 percent) than it is in Saskatchewan (11.1 percent). The trend to higher grazing levels as one moves westward is indicated in the Saskatchewan data where the six highest levels of grazing all occur on physiographic units on the west side of the province (Millar 1989b). Cropping occurs on less than half (8.7 percent) of the wetland area in Alberta Parkland that it does in Saskatchewan (19.3 percent). Haying occurs on 3.5 and 5.1 percent, respectively, of the wetland area in the two provinces.

f) **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 would make it possible to calculate accurate size distribution figures.

g) **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 individual 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 17.7 at Vegreville East to a high of 45.6 at Gayford East (Table 10). The relatively low (23.6 percent) level of impaction at Daysland is misleading in that wetlands totally destroyed by drainage are often difficult to interpret and are therefore not included in the data as wetlands. Hence the level of impaction is underestimated. The very high level of impaction at Gayford East is due to the fact that many wetlands are affected by

irrigation activities. In 12 of the 19 transects the level of impaction ranges between 20 and 30 percent. As in Saskatchewan Parkland, there is no apparent relationship between rate of impaction and landform character.

Differences in the rate of impaction between transects in the same physiographic unit are generally quite low, ranging from 5.3 to 13.9 percent of total wetlands, but higher than in Saskatchewan Parkland.

For the entire ecoregion sample the average impaction level is 26.5 percent, almost identical to that recorded for Saskatchewan Parkland (26.9 percent, Millar 1989b).

h) **Distribution of Streams**

The presence of stream segments in the data samples has been summarized (Table 11) to provide an indication of the relative importance of this type of water body in different physiographic units of the Alberta Parkland.

No streams are recorded in five of the 19 transects and in the remaining 14 the percent of quarter sections containing streams ranges from 8.3 at Marwayne to 33.3 at Vegreville West.

In neither of the two physiographic units containing two or more transects is the presence or absence of streams consistent for all transects within the same unit. In the Killam Plain the absence of streams at Daysland may be due to the conversion of former stream channels into drainage ditches.

In the total ecoregion sample 14.5 percent of all quarter sections contain stream segments. This is considerably higher than

the average recorded for Saskatchewan Parkland (8.9 percent, Millar 1989b).

**2. 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. In the 19 Alberta Parkland transects 98.1 to 99.8 percent of the upland cover falls into these seven classes (Table 12).

Annual crops and summerfallow are the single most common upland cover class in 18 of the 19 transects and occupy over half (51.6 to 93.6 percent) of the upland area in 14 transects. In the remaining five transects this class accounts for 35.3 to 49.8 percent of the upland area. Daysland is the most intensively cultivated transect in Alberta Parkland with 93.6 percent of its uplands in crop as well as 33.9 percent of its wetland area.

Native grass is the second most common upland cover class, occurring on 2.0 to 48.5 percent of the area. In 15 of the transects it occupies more than 10 percent of the uplands and at Gayford East it is the dominant cover class.

Shrubs are a minor element in the landscape. Low shrubs (buckbrush) occupy from a trace to 3.3 percent of the upland area and tall shrubs from 0.3 to 3.4 percent.

Native trees cover 0.1 to 19.8 percent of the uplands with the highest value occurring at Hughenden. They exceed grass in percent of upland cover only in that transect. Maximum tree cover on

Alberta Parkland transects is just over half that recorded for Saskatchewan Parkland (Millar 1989b).

Total native cover occupies from 3.7 to 52.9 percent of total upland area in the 19 transects. It exceeds all planted cover in only one transect, Gayford East. In 18 transects it occupies more than 10 percent of upland area and in 13 it exceeds 20 percent.

Planted grasses and forbs are found on 0.7 to 20.0 percent of the uplands. Four transects have values in excess of 10 percent of the upland area. One of these is in each of knob and kettle morainal, undulating morainal, morainal blanket over bedrock and fluvial units.

Planted trees and shrubs are a minor part of the landscape, accounting for 0.3 percent or less of the upland area in any transect.

Variability in upland cover values between transects within the same physiographic unit is greater for transects in Alberta Parkland than in Saskatchewan Parkland (Millar 1989b). Six of the 16 data pairs or triads for individual cover classes have large differences (in excess of five percent of total upland area). Four of those are associated with annual crops and native trees. In addition, there are large differences in total native cover for both physiographic units with two or more transects.

For the ecoregion sample as a whole, 63.8 percent of the total upland cover is annual crops and summerfallow. This is 15.2 percent lower than that recorded for Saskatchewan Parkland (Millar 1989b). Total native cover accounts for 28.0 percent of the upland

area compared to 16.4 percent in Saskatchewan Parkland. Of that amount 20.5 percent is native grass and 5.5 percent is native trees. The major difference in native cover between Alberta and Saskatchewan Parklands is in native grasses which occupy twice the area in Alberta that they do in Saskatchewan. Planted grasses and forbs cover 6.7 percent of the uplands, double that recorded in Saskatchewan Parkland. While Daysland is the most intensively cultivated transect in Alberta Parkland (93.6 percent of upland area and 33.9 percent of wetland area), Loreburn, Saskatchewan continues to hold the record as the most intensively cultivated transect in this study (96.8 percent of uplands and 76 percent of wetland area, Millar 1988).

b) **Distribution of Upland Land Use Activity Classes**

Upland land use data have been separated into seven classes plus an eighth catch-all category for all other minor land uses (Table 13).

Annual crop production is the predominant land use activity in most of the transects covered in this report. The same values and comments given in the preceding section on upland cover for the cultivated cover class also apply here.

Idle (unused plus abandoned) land accounts for 1.0 to 14.9 percent of upland area. Four transects have values in excess of 10 percent of total upland area. Land which has been abandoned from other uses never amounts to more than 1.2 percent of the total upland area in any transect.

Forage production occurs on 0.3 to 17.5 percent of the upland

area in the 19 transects. Grazing occurs in all transects on 0.1 to 58.9 percent of the uplands. It is the dominant land use activity in one transect, Gayford East. Land use activities which are associated with native vegetation and/or planted grasses and forbs collectively occupy more than half the total upland area in only one physiographic unit, the fluvial and irrigated terrain of Strathmore Plain (Gayford East).

A minor but consistent part of the uplands in all transects is devoted to farmsteads (0.4 to 2.3 percent) and roads and railways (1.2 to 3.6 percent). Other land uses collectively occupy zero to 2.3 percent of the uplands.

Variability in land use activity values between transects within the same physiographic unit is comparable to that observed for upland cover, i.e., large differences occur in 6 of the 16 data pairs or triads. Four of the large differences are associated with production of annual crops and grazing.

For the ecoregion sample as a whole, land use activities occur in descending order of importance as follows: annual crop production (63.8 percent), grazing (21.5 percent), idle (no use and abandoned - 6.6 percent), forage production (3.9 percent), roads and railways (2.8 percent), farmsteads (1.0 percent), and other uses (0.5 percent). Major differences between Alberta and Saskatchewan Parklands are in annual crop production (63.8 and 79.0 percent, respectively) and grazing (21.5 and 8.2 percent, respectively).

## 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 14 to 16, respectively.

Some indication of the degree of variability in the data can be obtained by comparing the different sets of data. For the three wetland cover classes, cultivated, grass and willows, the number of transects in which the standard error equals or exceeds the mean is very low (zero, four and zero, respectively - Table 14). In the three upland cover classes, cropland, native grass and native trees, these numbers rise to 16, 14 and eight transects, respectively (Table 15), suggesting a greater amount of variability in the extent of upland cover.

The greatest extremes in data variability are to be found in upland land use categories (Table 16). In 12 of the transects the standard error exceeds the mean for unused land. For grazing this situation occurs in all 18 transects in which this land use is

present as more than a trace. This confirms general observations that the occurrence of unused land and grazing is very irregular in most areas. At the other extreme, the standard error for roads and railways is consistently less than the mean in all transects. This is to be expected since this land use occurs with great uniformity across the country.

A very common situation which contributes significantly to the variability in habitat data is the presence within a sample of one or more quarter sections operated by a landowner whose land use practises, 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.

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

When data for the entire ecoregion sample are analysed collectively the degree of variability is reduced and grazing, as in Saskatchewan Parkland (Millar 1989b), remains as the only category out of nine in Tables 14 to 16 in which the standard error exceeds the mean.

Although the shortcomings of using limited 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 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 use activity class in each physiographic unit are presented in Tables 17 to 19, respectively.

Within the group of physiographic units sampled in Alberta Parkland, the two top units in terms of total quantity of wetland habitat are the Innisfree Plain (4.16) and Delburne Upland (4.06). They are the second and fourth largest units in size and maintain or better that rank in the wetland qualities which contribute to good waterfowl habitat. These include: (a) large areas and numbers of natural fresh open water wetlands for secure brood rearing habitat, (b) large areas and numbers of grassy (seasonal) wetlands for additional breeding pair habitat, and (c) a good proportion of undisturbed wetlands to ensure adequate escape cover.

Two additional units, Killam Plain (4.18) and Castor Plain

(4.07), the first and third largest of the sampled units, possess most of the desirable wetland qualities but lack good quantities of permanent brood ponds.

Also of interest are the Strathmore Plain (4.02) and Rumsey Upland (4.90). They are the two smallest sampled units but possess proportionately more good wetland habitat than many of the larger units. For example, while they rank 17th and 16th, respectively, in size, they rank 9th and 11th, respectively, in total wetland area, 4th and 8th, respectively in area of natural fresh open water, 10th and 11th, respectively, in area of grassy wetlands and 13th and 11th in area of unused wetlands. Strathmore Plain is an artificial situation created by irrigation and Rumsey Upland is a tongue of rough morainal terrain projecting into the Mixedgrass Prairie.

Extrapolated wetland data for the entire sampled portion of Alberta Parkland have been summarized in two ways. First, extrapolated wetland values for individual physiographic units have been added together to provide total values (physiographic unit analysis or summation). Second, the entire ecoregion sample has been analysed as a single unit and the resultant wetland values have been extrapolated to generate totals for the sampled portion of the ecoregion (ecoregion analysis). The physiographic unit analysis is considered to provide the most accurate estimate of wetland conditions in the ecoregion because it takes into account variations in the contribution of individual units to ecoregion totals in relation to both their size and wetland qualities. The

relative closeness of values generated through the ecoregion analysis to those from the physiographic unit analysis is examined to determine the extent to which these two approaches produce acceptably comparable habitat estimates for the sampled portion of the ecoregion. In this report a third calculation has been made, a physiographic unit analysis including Neutral Upland (4.88) which is sampled in the Saskatchewan portion of the unit.

The total wetland area estimate generated in the ecoregion analysis is higher than that produced in the physiographic unit analysis by just over one percent. Seven of the nine cover class values are also higher, three by less than five percent and two by under 13 percent. Two extreme deviations (75 and 100 percent) involve categories which each comprise less than one percent of total wetland area. Two cover classes are lower by 0.8 and 2.8 percent.

The pattern for wetland numbers is somewhat different. The ecoregion analysis of total wetland numbers is lower than the physiographic unit analysis by 5.7 percent. Four of nine cover class values are lower, three by less than seven percent and one by 13 percent. One cover class is exactly the same and four are higher, three by less than five percent and one by 10 percent.

The ecoregion analysis of wetland area devoted to various land use activities produces lower values in four of the six categories by 0.4 to 11.5 percent and higher values in two categories by 5.4 and 31.8 percent. The latter value is for the "other" uses

category and involves less than three percent of total wetland area.

3. Uplands

Estimated areas of upland cover and land use activity classes are presented in Tables 20 and 21. Amongst the 17 physiographic units covered in this report, Innisfree Plain (4.16) and Delburne Upland (4.06) rank second and fourth, respectively, in total upland area and first and second, respectively, for estimated amounts of upland nesting cover in the form of total native vegetation plus planted grassy cover. They also rank second and first, respectively, in terms of the amount of upland in land uses which are conducive to the perpetuation of nesting cover, i.e., idle land, forage production and grazing.

Extrapolated upland data for the entire sampled portion of the Alberta Parkland have been summarized in the same ways as previously described for wetland data. The two analyses generate virtually identical values for total upland area. Five individual cover class estimates generated in the ecoregion analysis are higher by 1.6 to 10.6 percent and three are lower by 1.9 to 7.9 percent than those produced in the physiographic unit analysis.

A similar situation exists with upland land use data with five ecoregion estimates higher and three lower than the physiographic unit summation. Most differences are very minor. Four of the five higher values differ by only 0.7 to 2.6 percent and two of the lower values differ by 1.0 to 1.7 percent. The two extreme differences of +13.0 and -13.8 percent involve very minor land use categories, "abandoned" and "other", each of which occupies less than one percent of the total upland area.

These results, together with the corresponding data for wetlands, suggest that comparable estimates of the quantities of the major cover and land use classes present in the sampled portion of the Alberta Parkland can be obtained by extrapolating the data of physiographic units either individually or collectively. Results for minor habitat categories are quite variable.

**4. Rating of Sampled Morainal Physiographic Units as Waterfowl Production Habitat**

On the basis of the habitat rating analysis described in the Methods section two sampled morainal units, Rumsey Upland (4.90) and Hazeldine Plain (4.15), receive top rating as waterfowl production areas (Table 22). In contrast to the situation in Saskatchewan Parkland (Millar 1989b), these top-rated units are two of the smaller sampled units, ranking 16th and 13th, respectively, in size. This reinforces the importance of not evaluating a unit solely on the basis of the gross amount of wetland habitat available without regard to unit size. Five units are given a number two rating, including the two, Innisfree Plain (4.16) and Delburne Upland (4.06), listed earlier as the top two units in terms of quantity of wetland habitat. Other units rated as two's are Neutral Upland (4.88), Coronation Plain (4.93) and Beaverhill Lake Plain (4.20). Vermilion Upland (4.14) and Mundare Plain (4.19) have been downgraded from two to three even though they were given four to five points because they lost points for both semipermanent (bulrush/cattail) and permanent (natural, fresh open water) wetlands which are essential for brood production.

Five other morainal units are rated number three because they have low values in at least four of the habitat factors. These

include Killam Plain (4.18) and Castor Plain (4.07), which rated second and third in terms of the total amount of wetland habitat they are estimated to contain.

One unit, Kneehills Upland (4.05), is bottom-rated (4). It scored points for only one of the seven habitat factors.

Some of the unsampled morainal units in the Alberta Parkland are unquestionably high quality waterfowl production habitat and should be given high priority in any expansion of the Prairie Habitat Monitoring Project.

D. Cover/Land Use Changes Since May 1985

Cover/land use change is an ongoing process and formal efforts to measure this were originally 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 some change in the interval between the taking of baseline aerial photography and completion of groundtruthing surveys. The date of baseline aerial photography for all transects covered in this report was May 1985. The interval between that date and the completion of the groundtruthing surveys for these transects has varied from 36 to 51 months (Table 23). Recorded changes are as small as the cultivation of a single wetland and as extreme as the clearing and breaking of most of an entire quarter section. Frequently the changes are associated with road construction. Temporary interruptions of cultivation in wetlands or uplands are not counted as changes.

Cover/land use changes have occurred on all of the 19 transects and the percent of quarter sections affected ranges from 25 at Oyen and Gayford East in Oyen Upland North (4.94) and Strathmore Plain (4.02), respectively, to a high of 75 at Lousana in the Delburne Upland (4.06). The lowest level of change occurred in transects where grazing is a significant land use component. Differences in percent of affected quarters recorded for transects within the same physiographic unit are somewhat variable but not nearly so much as in Saskatchewan Parkland (Millar 1989b).

The extent to which quarter sections in the Alberta Parkland sample have been affected by land use/cover change is higher than that reported for transects in Saskatchewan Parkland (Millar 1989b). This is interpreted as being primarily indicative of the progression of change with the passage of time since the time interval between the taking of aerial photos and completion of groundtruthing surveys was 12 to 15 months longer for Alberta parkland.

## V. Current Project Status

As of March 31, 1992, the status of work on the Prairie Habitat Monitoring Project is as follows:

1. Photo interpretation, groundtruthing, data processing and analysis and physiographic unit mapping has been completed for all ecoregions.

2. Project reports have been completed for:

   - Saskatchewan Parkland
   - Alberta Parkland

- Alberta Grasslands

3. Reports still have to be prepared for:

- Saskatchewan Grasslands
- Manitoba Grasslands
- Manitoba Parkland
- Manitoba Transition Forest
- Saskatchewan Transition Forest
- Alberta Transition Forest

## 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. 1986. 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.

Millar, J.B. 1988. Baseline (1985) habitat estimates for the settled portions of the Prairie Provinces. Report #2: Saskatchewan Parkland - Part I. Can. Wildl. Serv. Unpubl. Rep. 44 pp.

Millar, J.B. 1989a. Perspectives on the Status of Canadian prairie wetlands. Freshwater Wetlands and Wildlife, Proceedings of Symposium, Charleston, South Carolina. March 24-27, 1986. R.R. Sharitz and J.W. Gibbons (Eds.). DOE Symposium Series No. 61, U.S. Dept. of Energy, Oak Ridge, Tennessee, pp. 829-852.

Millar, J.B. 1989b. Baseline (1985) habitat estimates for the settled portions of the Prairie Provinces. Report #3: Saskatchewan Parkland - Part II. Can. Wildl. Serv. Unpubl. Rep. 65 pp.

North American Waterfowl Management Plan Saskatchewan Technical Committee. 1988. North American Waterfowl Management Plan Saskatchewan Implementation. Prairie Habitat Joint Venture. Draft Report. 52 pp.

Figure 1. Distribution of Habitat Sampling in Alberta Parkland.

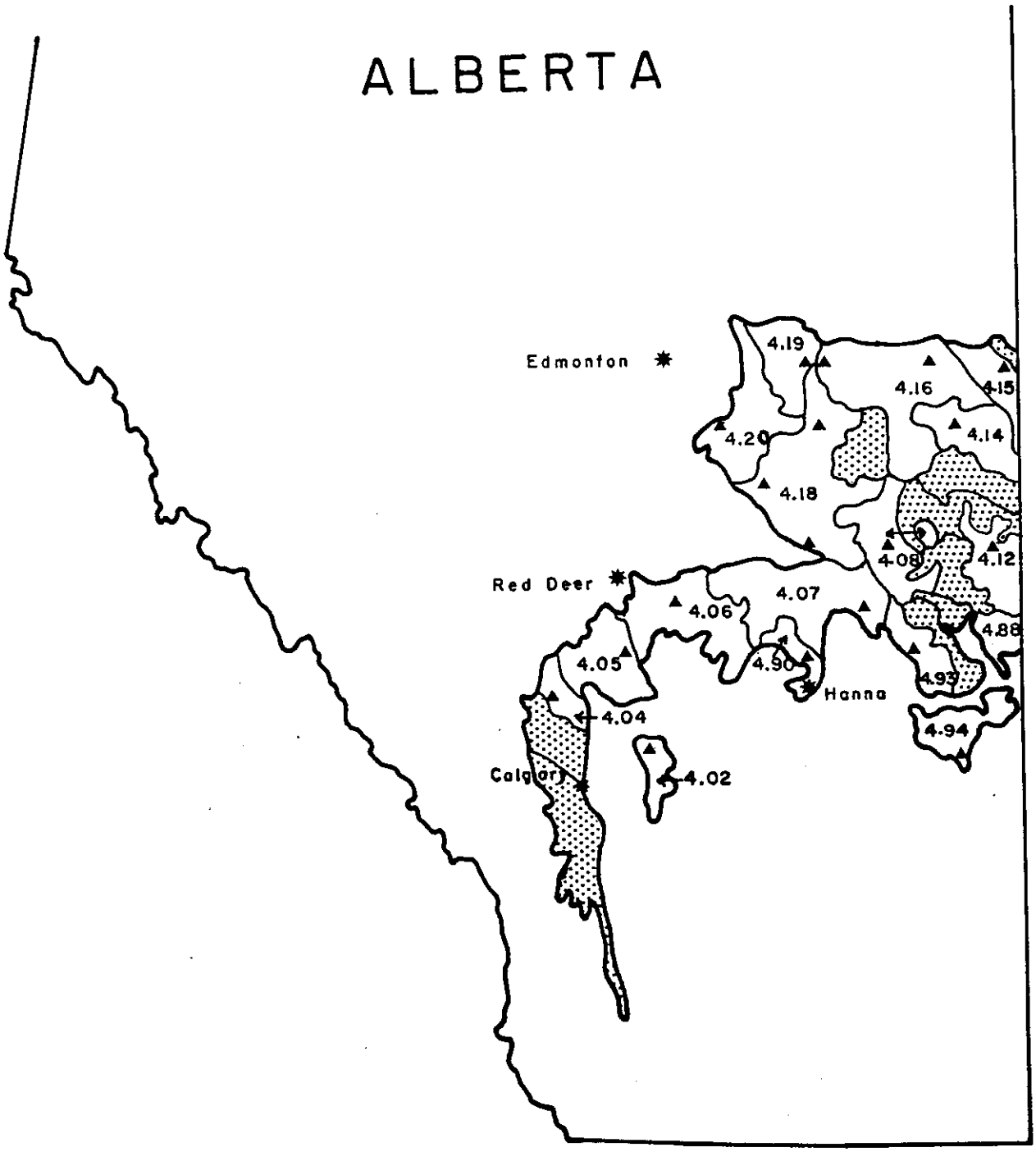

Table 1. Distribution of Habitat Sampling Relative to the Entire Alberta Parkland.

| | No. of Units | Area | |
|---|---|---|---|
| | | In Hectares[1] | As Percentage of Entire Ecoregion |
| Sampled Physiographic Units | 17[2] | 3,700,500 | 73.2 |
| Unsampled Physiographic Units | 9 | 1,104,200 | 21.8 |
| Areas Not Included in Physiographic Units | | | |
| - River and Stream Valleys | - | 145,700 | 2.9 |
| - Lakes[3] | - | 59,700 | 1.2 |
| - Urban Areas[3] | - | 46,300 | 0.9 |
| Total Alberta Parkland Ecoregion | 26 | 5,056,400 | 100 |

1. to the nearest 100 hectares.

2. Including one unit totalling 82,700 hectares or 1.6 percent of Alberta Parkland which is sampled in the Saskatchewan portion of that unit.

3. Larger than 500 hectares.

Table 2. Distribution of Landforms in Alberta Parkland.

| Origin of Parent Material | Surface Form | Area in Hectares[1] Sampled Units[2] | Unsampled Units[2] | Total[3] | % of Sampling Effort in Landform Category |
|---|---|---|---|---|---|
| Morainal | Knob & Kettle | 1,821,700[4] ( 82.1 ) | 397,300 ( 17.9 ) | 2,219,000 ( 46.2 ) | 51.6 |
| | Undulating | 1,714,400 ( 100 ) | - | 1,,714,400 ( 35.7) | 39.3 |
| Morainal/Bedrock | Knob & Kettle | - | 36,500 ( 100 ) | 36,500 ( 0.7 ) | 0.0 |
| | Blanket/Rolling | 84,300 ( 18.1 ) | 381,400 ( 81.9 ) | 465,700 ( 9.7 ) | 5.0 |
| Total Morainal | | 3,620,400 ( 81.6 ) | 815,200 ( 18.4 ) | 4,435,600 ( 92.3 ) | 95.9 |
| Fluvial | Undulating | 80,100 ( 100 ) | - | 80,100 ( 1.7 ) | 4.1 |
| Fluvial | Undulating/ Hummocky | - | 119,500 ( 100 ) | 119,500 ( 2.5 ) | 0.0 |
| Eolian | Hummocky | - | 169,500 ( 100 ) | 169,500 ( 3.5 ) | 0.0 |
| Total Fluvial, Eolian | | 80,100 ( 21.7 ) | 289,000 ( 78.3 ) | 369,100 ( 7.7 ) | 4.1 |
| TOTAL FOR ECOREGION | | 3,700,500 ( 77.0 ) | 1,104,200 ( 23.0 ) | 4,804,700 | 100.0 |

1. To nearest 100 hectares.

2. Figure in parentheses is the percent the indicated area is of the total area of that landform category.

3. Figure in parentheses is the percent each landform category is of the total ecoregion.

4. Including one unit sampled in the Saskatchewan portion of the unit.

Table 3. Physiographic Units Covered in This Report.

| Unit Number | Name | Landform Character[1] Origin of Parent Material | Surface Form | Transect[2] |
|---|---|---|---|---|
| 4.02 | Strathmore Plain | Fluvial | Undulating | Gayford East (20 ) |
| 4.04 | Dogpound Benchland | Morainal | Blanket/ over Bedrock | Cremona |
| 4.05 | Kneehills Upland | Morainal | Undulating | Trochu |
| 4.06 | Delburne Upland | Morainal | Knob and Kettle | Lousana |
| 4.07 | Castor Plain | Morainal | Undulating | Coronation |
| 4.08 | Battle River Upland | Morainal | Knob and Kettle | Hughenden |
| 4.12 | Provost Upland | Morainal | Knob and Kettle | Greenglade |
| 4.14 | Vermilion Upland | Morainal | Knob and Kettle | Hindville |
| 4.15 | Hazeldine Plain | Morainal | Knob and Kettle | Marwayne |
| 4.16 | Innisfree Plain | Morainal | Knob and Kettle | Clandonald<br>Vegreville East |
| 4.18 | Killam Plain | Morainal | Undulating | Daysland<br>Holden<br>Galahad |
| 4.19 | Mundare Plain | Morainal | Undulating | Vegreville West |
| 4.20 | Beaverhill Lake Plain | Morainal | Undulating | Hay Lakes East |
| 4.90 | Rumsey Upland | Morainal | Knob and Kettle | Scapa West (16 ) |
| 4.93 | Coronation Plain | Morainal | Undulating | Kirkpatrick Lake East(22) |
| 4.94 | Oyen Upland North | Morainal | Knob and Kettle | Oyen |
| 4.88 | Neutral Upland | Morainal | Knob and Kettle | Sampled in Saskatchewan |

1. Categories separated by / are roughly equal in occurrence.

2. The sample size in most transects is 24 quarter sections. Where the sample size varies from 24 it is shown in parentheses.

1.

2.

Table 4. Physiographic Units in Alberta Parkland which have **not** been Sampled.

| Unit Number | Physiographic Name | Landform Character[1,2] Origin of Parent Material | Surface Form | Area in Hectares[3] |
|---|---|---|---|---|
| 4.01 | Okotoks Upland | Morainal/Rock | Blanket/Veneer/ Rolling | 255,700 |
| 4.03 | Nosehill Benchland | Morainal/Rock | Blanket/Veneer/ Rolling | 125,600 |
| 4.09 | Neutral Hills | Morainal/Rock | Knob & Kettle/ Rolling | 36,500 |
| 4.10 | Ribstone Plain | Fluvial (Morainal ) | Undulating/Hummocky (Knob & Kettle) | 119,500 |
| 4.11 | Dilberry Plain | Eolian ( Fluvial ) | Hummocky | 169,500 |
| 4.13 | Edgerton Plain | Morainal ( Lacustrine ) ( Fluvial ) | Knob & Kettle (Undulating)(Fluvial) | 124,600 |
| 4.17 | Birch Lake Plain | Morainal | Knob & Kettle | 137,800 |
| 4.21 | Hillmond Upland | Morainal ( Fluvial ) | Knob & Kettle | 17,300 |
| 4.92 | Monitor Hills | Morainal | Knob & Kettle | 117,700 |
| | | | TOTAL | 1,104,200 |

1. Based on data from " A Regional Map Base for a Migratory Bird Habitat Inventory Prairie Provinces", G.D. Adams, revised Oct. 25, 1985.

2. Categories separted by / are roughly egual in occurrence while those in parentheses are of minor or secondary importance.

3. To the nearest 100 hectares.

Table 5. Size of Monitoring Samples in Relation to Physiographic Units.

| Unit Number | Physiographic Unit Name[1] | | Area in Hectares Unit[2,3] | Sample | Percentage that Sample is of Unit Area |
|---|---|---|---|---|---|
| 4.02 | Strathmore Plain | ( 20 ) | 80,100 | 1,346 | 1.7 |
| 4.04 | Dogpound Benchland | ( 24 ) | 84,300 | 1,575 | 1.9 |
| 4.05 | Kneehills Upland | ( 24 ) | 240,500 | 1,585 | 0.7 |
| 4.06 | Delburne Upland | ( 24 ) | 289,700 | 1,581 | 0.5 |
| 4.07 | Castor Plain | ( 24 ) | 383,800 | 1,586 | 0.4 |
| 4.08 | Battle River Upland | ( 24 ) | 251,100 | 1,593 | 0.6 |
| 4.12 | Provost Upland | ( 24) | 169,300 | 1,573 | 0.9 |
| 4.14 | Vermilion Upland | ( 24 ) | 197,000 | 1,590 | 0.8 |
| 4.15 | Hazeldine Plain | ( 24 ) | 111,600 | 1,576 | 1.4 |
| 4.16 | Innisfree Plain | ( 48 ) | 480,600 | 3,180 | 0.7 |
| 4.18 | Killam Plain | ( 72 ) | 528,700 | 4,733 | 0.9 |
| 4.19 | Mundare Plain | ( 24 ) | 188,200 | 1,623 | 0.9 |
| 4.20 | Beaverhill Lake Plain | ( 24 ) | 253,500 | 1,586 | 0.6 |
| 4.90 | Rumsey Upland | ( 16 ) | 80,900 | 1,055 | 1.3 |
| 4.93 | Coronation Plain | ( 22 ) | 119,700 | 1,441 | 1.2 |
| 4.94 | Oyen Upland North | ( 24 ) | 158,800 | 1,605 | 1.0 |
| 4.88 | Neutral Upland | ( 42 ) | 82,700[3] | 2,778[4] | 1.4[5] |
| TOTAL FOR ECOREGION | | Excluding 4.88 | 3,617,800 | 29,228 | 0.8 |
| | | Including 4.88[6] | 3,700,500 | 32,006 | 0.9 |
| | | Including 4.88[7] | 3,811,800 | 32,006 | 0.8 |

1. Figures in parentheses are the numbers of quarter sections in the sample.
2. To nearest 100 hectares.
3. Alberta portion of unit only. Total area, including Saskatchewan portion, is 194,000 hectares.
4. Unit sample is in Saskatchewan.
5. Percentage of entire unit sampled, including Saskatchewan portion.
6. Using only Alberta portion of unit.
7. Including Saskatchewan portion of unit.

Table 6. Land Area Occupied by Wetlands and Uplands

| Unit | Transect[1] | Sample Size ( in ha )[2] | Percent of Total Sample[2] Wetlands | | | Uplands |
|---|---|---|---|---|---|---|
| | | | Total | Uncultivated | Cultivated | |
| | ( Morainal - K & K ) | | | | | |
| 4.06 | Lousana | 1581 | 10.8 | 10.3 | 0.5 | 89.2 |
| 4.08 | Hughenden | 1593 | 7.1 | 6.7 | 0.4 | 92.9 |
| 4.12 | Greenglade | 1573 | 7.4 | 7.0 | 0.4 | 92.6 |
| 4.14 | Hindville | 1590 | 12.3 | 12.0 | 0.3 | 87.7 |
| 4.15 | Marwayne | 1576 | 9.1 | 8.7 | 0.4 | 90.9 |
| 4.16 | Clandonald | 1599 | 10.3 | 9.9 | 0.4 | 89.7 |
| | Vegreville East | 1581 | 17.5 | 16.6 | 0.9 | 82.5 |
| | | (3180) | (13.9) | (13.2) | (0.7) | (86.1) |
| 4.90 | Scapa West | 1055 | 14.1 | 13.5 | 0.6 | 85.9 |
| 4.94 | Oyen | 1605 | 6.7 | 6.5 | 0.2 | 93.3 |
| | ( Morainal - U ) | | | | | |
| 4.05 | Trochu | 1585 | 4.5 | 3.9 | 0.6 | 95.5 |
| 4.07 | Coronation | 1586 | 8.4 | 7.4 | 1.0 | 91.6 |
| 4.18 | Daysland | 1582 | 7.6 | 5.0 | 2.6 | 92.4 |
| | Holden | 1575 | 14.5 | 13.4 | 1.1 | 85.5 |
| | Galahad | 1576 | 9.4 | 6.5 | 2.9 | 90.6 |
| | | (4733) | (10.5) | (8.3) | (2.2) | (89.5) |
| 4.19 | Vegreville West | 1623 | 11.0 | 8.6 | 2.4 | 89.0 |
| 4.20 | Hay Lakes East | 1586 | 8.4 | 7.4 | 1.0 | 91.6 |
| 4.93 | Kirkpatrick Lake E. | 1441 | 9.2 | 8.8 | 0.4 | 90.8 |
| | ( Morainal/Bedrock - B/M ) | | | | | |
| 4.04 | Cremona | 1575 | 3.2 | 3.2 | 0.0 | 96.8 |
| | (Fluvial - U ) | | | | | |
| 4.02 | Gayford East | 1346 | 19.2 | 19.1 | 0.1 | 80.8 |
| Entire Ecoregion Sample | | 29228 | 9.9 | 9.0 | 0.9 | 90.1 |

1. Transects are grouped by landform ( parent material and surface form ). Letters identifying surface forms in this and subsequent tables are as follows: K & K - Knob & Kettle, U - Undulating, B - Blanket, M - Rolling.
2. Figures in parentheses are composite values for those transects occurring in one physiographic unit.

Table 7. Distribution of Wetland Area in Various Cover Classes.

| Physio-graphic Unit | Transect[1] | Total[2] Wetland Area in Sample ( in ha ) | Percent of Total Wetland Area in Cover Class[2] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Cult-ivated | Willows and Trees | Grasses | Bulrush Cattail | Transi-tional Open Water | Natural Open Water | Arti-ficial Water | Saline Open Water | Other |
| | ( Morainal - K & K ) | | | | | | | | | | |
| 4.06 | Lousana | 170 | 5.1 | 1.1 | 64.8 | 3.0 | 0.1 | 25.3 | 0.1 | 0.0 | 0.4 |
| 4.08 | Hughenden | 113 | 5.3 | 10.6 | 58.3 | 8.9 | 0.2 | 12.1 | 0.4 | 4.2 | 0.0 |
| 4.12 | Greenglade | 117 | 5.1 | 11.9 | 35.0 | 2.7 | 0.0 | 44.6 | 0.8 | 0.0 | 0.0 |
| 4.14 | Hindville | 195 | 2.1 | 8.0 | 60.0 | 1.5 | 0.0 | 2.7 | 3.0 | 22.8 | 0.0 |
| 4.15 | Marwayne | 144 | 4.8 | 8.5 | 45.5 | 7.7 | 0.0 | 32.3 | 1.2 | 0.0 | 0.0 |
| 4.16 | Clandonald | 164 | 4.3 | 9.8 | 75.3 | 3.7 | 0.0 | 6.1 | 0.4 | 0.0 | 0.4 |
| | Vegreville East | 277 | 5.0 | 2.2 | 32.4 | 6.3 | 0.0 | 54.0 | 0.0 | 0.0 | 0.0 |
| | | (441) | (4.7) | (4.9) | (48.4) | (5.3) | (0.0) | (36.4) | (0.1) | (0.0) | (0.1) |
| 4.90 | Scapa West | 149 | 4.6 | 9.7 | 60.3 | 0.2 | 0.0 | 24.8 | 0.4 | 0.0 | 0.0 |
| 4.94 | Oyen | 108 | 3.6 | 3.3 | 54.7 | 0.0 | 0.0 | 5.4 | 0.2 | 32.8 | 0.0 |
| | ( Morainal - U ) | | | | | | | | | | |
| 4.05 | Trochu | 72 | 12.6 | 1.3 | 79.4 | 0.0 | 0.0 | 1.0 | 5.7 | 0.0 | 0.0 |
| 4.07 | Coronation | 134 | 11.3 | 8.3 | 77.7 | 1.1 | 0.0 | 0.4 | 1.3 | 0.0 | 0.0 |
| 4.18 | Daysland | 121 | 33.9 | 10.5 | 47.0 | 6.8 | 0.0 | 0.2 | 1.6 | 0.0 | 0.0 |
| | Holden | 229 | 7.3 | 22.2 | 65.5 | 0.7 | 0.0 | 2.5 | 1.9 | 0.0 | 0.0 |
| | Galahad | 149 | 31.0 | 20.4 | 45.5 | 2.3 | 0.0 | 0.0 | 0.7 | 0.0 | 0.0 |
| | | (499) | (20.8) | (18.8) | (55.0) | (2.6) | (0.0) | (1.2) | (1.6) | (0.0) | (0.0) |
| 4.19 | Vegreville West | 178 | 21.5 | 6.2 | 64.0 | 3.2 | 0.0 | 4.5 | 0.5 | 0.0 | 0.0 |
| 4.20 | Hay Lakes East | 134 | 12.4 | 2.0 | 60.0 | 3.8 | 0.0 | 21.2 | 0.7 | 0.0 | 0.0 |
| 4.93 | Kirkpatrick Lake E. | 132 | 4.1 | 4.0 | 56.9 | 0.3 | 3.7 | 28.9 | 2.0 | 0.0 | 0.2 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | | | | |
| 4.04 | Cremona | 50 | 0.5 | 1.4 | 60.3 | 0.0 | 0.0 | 35.9 | 1.9 | 0.0 | 0.0 |
| | (Fluvial - U ) | | | | | | | | | | |
| 4.02 | Gayford East | 259 | 0.5 | 0.8 | 50.6 | 6.7 | 0.1 | 35.6 | 4.2 | 1.5 | 0.1 |
| Entire Ecoregion Sample | | 2895 | 8.8 | 7.7 | 56.8 | 3.4 | 0.2 | 18.5 | 1.4 | 3.1 | 0.1 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit

Table 8. Wetland Density/Distribution of Wetland Numbers in Various Cover Classes

| Physio-graphic Unit | Transect[1] | Total Number of Wetlands in Sample | Mean Density Per Quarter Section | Percent of Total Wetland Numbers in Cover Class[2] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cult-ivated | Willows and Trees | Grasses | Bulrush Cattail | Transi-tional Open Water | Natural Open Water | Arti-ficial Water | Saline Open Water | Other |
| | ( Morainal - K & K ) | | | | | | | | | | | |
| 4.06 | Lousana | 561 | 23.4 | 15.5 | 2.3 | 67.4 | 1.6 | 0.2 | 11.2 | 0.7 | 0.0 | 1.1 |
| 4.08 | Hughenden | 433 | 18.0 | 16.0 | 8.3 | 64.6 | 2.5 | 0.4 | 5.5 | 1.2 | 1.4 | 0.0 |
| 4.12 | Greenglade | 159 | 6.6 | 23.9 | 11.9 | 50.3 | 2.6 | 0.0 | 5.0 | 6.3 | 0.0 | 0.0 |
| 4.14 | Hindville | 273 | 11.4 | 8.4 | 10.3 | 72.9 | 0.7 | 0.0 | 4.0 | 2.5 | 1.1 | 0.0 |
| 4.15 | Marwayne | 230 | 9.6 | 32.2 | 9.6 | 43.5 | 0.8 | 0.0 | 6.5 | 7.4 | 0.0 | 0.0 |
| 4.16 | Clandonald | 232 | 9.8 | 25.0 | 6.9 | 59.0 | 2.2 | 0.0 | 4.8 | 1.8 | 0.0 | 0.4 |
| | Vegreville East | 516 | 21.5 | 19.0 | 3.3 | 59.5 | 1.8 | 0.0 | 16.3 | 0.0 | 0.0 | 0.2 |
| | | (748) | (15.6) | (20.9) | (4.4) | (59.4) | (1.9) | (0.0) | (12.7) | (0.5) | (0.0) | (0.1) |
| 4.90 | Scapa West | 286 | 17.9 | 11.5 | 8.1 | 77.6 | 0.7 | 0.0 | 1.1 | 1.1 | 0.0 | 0.0 |
| 4.94 | Oyen | 235 | 9.8 | 15.3 | 2.2 | 79.2 | 0.0 | 0.0 | 0.8 | 1.2 | 1.2 | 0.0 |
| | ( Morainal - U ) | | | | | | | | | | | |
| 4.05 | Trochu | 152 | 6.3 | 26.4 | 1.9 | 60.6 | 0.0 | 0.0 | 1.9 | 9.2 | 0.0 | 0.0 |
| 4.07 | Coronation | 361 | 15.0 | 27.7 | 18.0 | 49.9 | 0.3 | 0.0 | 0.3 | 3.6 | 0.0 | 0.3 |
| 4.18 | Daysland | 336 | 14.0 | 68.5 | 1.5 | 27.4 | 1.2 | 0.0 | 0.3 | 0.9 | 0.0 | 0.3 |
| | Holden | 430 | 17.9 | 19.8 | 10.4 | 62.4 | 1.2 | 0.0 | 1.6 | 4.6 | 0.0 | 0.0 |
| | Galahad | 356 | 14.8 | 56.2 | 3.6 | 35.7 | 1.4 | 0.0 | 0.0 | 2.8 | 0.0 | 0.3 |
| | | (1122) | (15.6) | (45.9) | (5.6) | (43.4) | (1.2) | (0.0) | (0.7) | (3.0) | (0.0) | (0.2) |
| 4.19 | Vegreville West | 564 | 23.5 | 47.6 | 5.3 | 40.4 | 1.1 | 0.0 | 3.7 | 1.6 | 0.0 | 0.1 |
| 4.20 | Hay Lakes East | 419 | 17.5 | 35.6 | 3.3 | 51.8 | 0.7 | 0.0 | 6.2 | 2.2 | 0.0 | 0.2 |
| 4.93 | Kirkpatrick Lake E. | 179 | 8.1 | 24.0 | 5.0 | 62.0 | 0.0 | 0.6 | 2.2 | 5.5 | 0.0 | 0.6 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | | | | | |
| 4.04 | Cremona | 49 | 2.0 | 2.0 | 3.9 | 73.9 | 0.0 | 0.0 | 7.9 | 12.3 | 0.0 | 0.0 |
| | (Fluvial - U ) | | | | | | | | | | | |
| 4.02 | Gayford East | 249 | 12.5 | 2.8 | 1.2 | 66.3 | 8.0 | 0.8 | 14.5 | 3.6 | 2.0 | 0.8 |
| Entire Ecoregion Sample | | 6020 | 13.6 | 27.3 | 6.1 | 56.4 | 1.5 | 0.1 | 5.4 | 2.6 | 0.3 | 0.3 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 9. Distribution of Wetland Area in Various Land Use Activity Classes.

| Physio-graphic Unit | Transect[1] | Total[2] Wetland Area ( in ha ) | Percent of Total Wetland Area in Land Use Activity Class[2] | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | No Use | Abandoned Cultivation | Annual Crop | Haying | Grazing | Other |
| | ( Morainal - K & K ) | | | | | | | |
| 4.06 | Lousana | 170 | 42.9 | 1.4 | 5.1 | 4.5 | 46.0 | 0.1 |
| 4.08 | Hughenden | 113 | 34.8 | 3.0 | 5.3 | 0.2 | 55.8 | 0.9 |
| 4.12 | Greenglade | 117 | 63.7 | 0.2 | 5.1 | 0.0 | 30.9 | 0.0 |
| 4.14 | Hindville | 195 | 51.6 | 0.9 | 2.1 | 3.8 | 41.4 | 0.2 |
| 4.15 | Marwayne | 144 | 81.1 | 0.7 | 4.8 | 1.3 | 11.9 | 0.2 |
| 4.16 | Clandonald | 164 | 64.1 | 0.6 | 4.3 | 6.3 | 24.8 | 0.0 |
| | Vegreville East | 277 | 63.8 | 0.5 | 5.0 | 2.4 | 28.2 | 0.1 |
| | | (441) | (63.9) | (0.5) | (4.7) | (3.9) | (26.9) | ( T )[3] |
| 4.90 | Scapa West. | 149 | 57.2 | 0.4 | 4.6 | 0.2 | 37.5 | 0.0 |
| 4.94 | Oyen | 108 | 65.7 | 0.4 | 3.6 | 0.7 | 29.6 | 0.0 |
| | ( Morainal - U ) | | | | | | | |
| 4.05 | Trochu | 72 | 14.3 | 5.3 | 12.7 | 3.0 | 63.0 | 1.7 |
| 4.07 | Coronation | 134 | 21.7 | 4.8 | 11.3 | 7.9 | 53.3 | 0.9 |
| 4.18 | Daysland | 121 | 49.8 | 4.3 | 33.9 | 8.5 | 0.4 | 3.2 |
| | Holden | 229 | 31.6 | 2.1 | 7.3 | 10.1 | 49.5 | 0.4 |
| | Galahad | 149 | 53.3 | 1.3 | 31.0 | 5.5 | 8.0 | 1.0 |
| | | (499) | (42.7) | (1.9) | (20.8) | ( 8.2) | (25.3) | (1.0) |
| 4.19 | Vegreville West | 178 | 58.1 | 4.1 | 21.5 | 1.8 | 14.5 | 0.1 |
| 4.20 | Hay Lakes East | 134 | 72.7 | 1.3 | 12.4 | 3.1 | 10.2 | 0.4 |
| 4.93 | Kirkpatrick Lake E. | 132 | 7.3 | 1.0 | 4.2 | 1.3 | 85.7 | 0.5 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | |
| 4.04 | Cremona | 50 | 13.9 | 1.0 | 0.5 | 0.0 | 84.6 | 0.0 |
| | (Fluvial - U ) | | | | | | | |
| 4.02 | Gayford East | 259 | 29.8 | 0.2 | 0.5 | 0.7 | 64.7 | 4.1 |
| Entire Ecoregion Sample | | 2895 | 47.3 | 1.5 | 8.7 | 3.5 | 38.2 | 0.8 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.
3. T ( trace ) - less than 0.05 percent.

Table 10. Wetlands Affected by One or More Permanent Impacts.

| Physiographic Unit | Transect[1] | Mean Number of Wetlands/Quarter[2] Total | Affected by One or More Impacts | Percent of Wetlands Impacted |
|---|---|---|---|---|
| | ( Morainal - K & K ) | | | |
| 4.06 | Lousana | 23.4 | 6.3 | 26.9 |
| 4.08 | Hughenden | 18.0 | 5.1 | 28.3 |
| 4.12 | Greenglade | 6.6 | 2.2 | 33.3 |
| 4.14 | Hindville | 11.4 | 2.7 | 23.7 |
| 4.15 | Marwayne | 9.6 | 2.2 | 22.9 |
| 4.16 | Clandonald | 9.8 | 3.1 | 31.6 |
| | Vegreville East | 21.5 | 3.8 | 17.7 |
| | | (15.7) | (3.5) | (22.3) |
| 4.90 | Scapa West | 17.9 | 3.6 | 20.1 |
| 4.94 | Oyen | 9.8 | 2.6 | 26.5 |
| | ( Morainal - U ) | | | |
| 4.05 | Trochu | 6.3 | 2.5 | 39.7 |
| 4.07 | Coronation | 15.0 | 4.4 | 29.3 |
| 4.18 | Daysland | 14.0 | 3.3 | 23.6 |
| | Holden | 18.0 | 5.2 | 28.9 |
| | Galahad | 14.8 | 3.7 | 25.0 |
| | | (15.6) | (4.1) | (26.3) |
| 4.19 | Vegreville West | 23.9 | 4.8 | 20.1 |
| 4.20 | Hay Lakes East | 17.5 | 3.6 | 20.6 |
| 4.93 | Kirkpatrick Lake E. | 8.1 | 2.8 | 34.6 |
| | ( Morainal/Bedrock - B/M ) | | | |
| 4.04 | Cremona | 2.0 | 0.9 | 45.0 |
| | (Fluvial - U ) | | | |
| 4.02 | Gayford East | 12.5 | 5.7 | 45.6 |
| Entire Ecoregion Sample | | 13.6 | 3.6 | 26.5 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 11. Occurrence of Streams in Data Samples.

| Physiographic Unit | Transect [1] | Number of Quarters In Sample[2] | Number of Quarters Containing Streams[2] | Percent of Quarters Containing Streams[2] |
|---|---|---|---|---|
| | ( Morainal - K & K ) | | | |
| 4.06 | Lousana | 24 | 3 | 12.5 |
| 4.08 | Hughenden | 24 | 0 | 0.0 |
| 4.12 | Greenglade | 24 | 5 | 20.8 |
| 4.14 | Hindville | 24 | 4 | 16.7 |
| 4.15 | Marwayne | 24 | 2 | 8.3 |
| 4.16 | Clandonald | 24 | 4 | 16.7 |
| | Vegreville East | 24 | 0 | 0.0 |
| | | (48) | (4) | (8.3) |
| 4.90 | Scapa West | 16 | 0 | 0.0 |
| 4.94 | Oyen | 24 | 0.0 | 0.0 |
| | ( Morainal - U ) | | | |
| 4.05 | Trochu | 24 | 6 | 25.0 |
| 4.07 | Coronation | 24 | 6 | 25.0 |
| 4.18 | Daysland | 24 | 0 | 0.0 |
| | Holden | 24 | 6 | 25.0 |
| | Galahad | 24 | 4 | 16.7 |
| | | (72) | (10) | (13.9) |
| 4.19 | Vegreville West | 24 | 8 | 33.3 |
| 4.20 | Hay Lakes East | 24 | 4 | 16.7 |
| 4.93 | Kirkpatrick Lake E. | 22 | 4 | 18.2 |
| | ( Morainal/Bedrock - B/M ) | | | |
| 4.04 | Cremona | 24 | 6 | 25.0 |
| | (Fluvial - U ) | | | |
| 4.02 | Gayford East | 20 | 2 | 10.0 |
| Entire Ecoregion Sample | | 442 | 64 | 14.5 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 12. Distribution of Upland Cover Classes

| Physio-graphic Unit | Transect[1] | Upland Area[2] ( in ha ) | Percent of Total Upland in Cover[2] | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Native | | | | | Planted | | | |
| | | | Grass | Low Shrub | Tall Shrub | Trees | Total | Annual Crops[3] | Perennial Grass & Forbs | Trees & Shrubs | Other |
| | ( Morainal - K & K ) | | | | | | | | | | |
| 4.06 | Lousana | 1411 | 19.0 | 1.0 | 0.8 | 10.5 | 31.3 | 49.8 | 17.3 | T[4] | 1.5 |
| 4.08 | Hughenden | 1480 | 18.2 | 3.3 | 3.4 | 19.8 | 44.7 | 46.7 | 6.9 | 0.2 | 1.5 |
| 4.12 | Greenglade | 1456 | 18.9 | 1.9 | 0.4 | 3.2 | 24.4 | 71.3 | 2.2 | 0.2 | 1.9 |
| 4.14 | Hindville | 1395 | 21.4 | 2.4 | 1.6 | 11.4 | 36.8 | 53.8 | 7.8 | 0.3 | 1.3 |
| 4.15 | Marwayne | 1433 | 10.8 | 0.4 | 0.9 | 4.5 | 16.6 | 81.8 | 0.7 | 0.2 | 0.7 |
| 4.16 | Clandonald | 1435 | 11.2 | 0.7 | 1.1 | 5.7 | 18.7 | 76.6 | 4.0 | 0.1 | 0.6 |
| | Vegreville East | 1303 | 14.5 | 1.1 | 1.8 | 12.6 | 30.0 | 58.7 | 9.1 | 0.3 | 1.9 |
| | | (2738) | (12.8) | (0.8) | (1.4) | (9.0) | (24.0) | (68.0) | (6.5) | (0.2) | (1.3) |
| 4.90 | Scapa West | 906 | 36.7 | 1.5 | 0.3 | 2.8 | 41.3 | 53.4 | 4.2 | 0.3 | 0.8 |
| 4.94 | Oyen | 1498 | 43.2 | 2.8 | 0.3 | 0.1 | 46.4 | 47.3 | 5.3 | 0.2 | 0.8 |
| | ( Morainal - U ) | | | | | | | | | | |
| 4.05 | Trochu | 1513 | 17.4 | 0.3 | 0.4 | 2.7 | 20.8 | 73.2 | 4.7 | 0.3 | 1.0 |
| 4.07 | Coronation | 1453 | 18.7 | 0.8 | 0.4 | 2.1 | 22.0 | 65.0 | 12.3 | 0.1 | 0.6 |
| 4.18 | Daysland | 1461 | 2.0 | T | 0.3 | 1.4 | 3.7 | 93.6 | 1.4 | 0.3 | 1.0 |
| | Holden | 1345 | 26.7 | 1.1 | 1.8 | 7.8 | 37.4 | 60.1 | 2.2 | 0.1 | 0.2 |
| | Galahad | 1427 | 5.3 | 0.9 | 0.4 | 5.3 | 11.9 | 84.1 | 2.9 | 0.1 | 1.0 |
| | | (4233) | (11.0) | (0.7) | (0.6) | (4.7) | (17.0) | (79.7) | (2.2) | (0.2) | (0.9) |
| 4.19 | Vegreville West | 1445 | 7.6 | 0.2 | 1.0 | 6.5 | 15.3 | 81.3 | 2.1 | 0.2 | 1.1 |
| 4.20 | Hay Lakes East | 1452 | 8.8 | T | 0.3 | 2.1 | 11.2 | 80.3 | 7.6 | 0.2 | 0.7 |
| 4.93 | Kirkpatrick Lake E. | 1309 | 43.4 | 0.7 | 0.3 | 0.2 | 44.6 | 47.5 | 7.3 | 0.2 | 0.6 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | | | | |
| 4.04 | Cremona | 1525 | 17.6 | 1.4 | 2.7 | 4.8 | 26.5 | 51.6 | 20.0 | 0.3 | 1.6 |
| | (Fluvial - U ) | | | | | | | | | | |
| 4.02 | Gayford East | 1088 | 48.5 | 2.1 | 1.5 | 0.8 | 52.9 | 35.3 | 10.6 | 0.2 | 1.1 |
| Entire Ecoregion Sample | | 26335 | 20.5 | 1.2 | 1.0 | 5.5 | 28.0 | 63.8 | 6.7 | 0.2 | 1.1 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.
3. Includes summerfallow.
4. T = trace - less than 0.05 percent.

Table 13. Distribution of Upland Land Use Activity Class.

| Physio-graphic Unit | Transect[1] | Total Upland Area ( in ha )[2] | Percent of Total Upland Area in Land Use in Activity[2] | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Unused | Abandoned | Annual Crops[3] | Forage | Grazing | Farm-steads | Road & Railway | Other |
| | ( Morainal - K & K ) | | | | | | | | | |
| 4.06 | Lousana | 1411 | 3.6 | 0.1 | 49.8 | 11.5 | 30.1 | 1.2 | 2.8 | 0.8 |
| 4.08 | Hughenden | 1480 | 14.8 | 0.1 | 46.7 | 1.9 | 30.6 | 0.6 | 3.0 | 2.3 |
| 4.12 | Greenglade | 1456 | 6.7 | 0.4 | 71.3 | 1.5 | 15.1 | 0.4 | 3.1 | 1.6 |
| 4.14 | Hindville | 1395 | 9.8 | 0.5 | 53.8 | 3.2 | 28.7 | 1.2 | 2.6 | 0.2 |
| 4.15 | Marwayne | 1433 | 7.9 | 0.3 | 81.8 | 0.3 | 5.5 | 1.1 | 2.7 | 0.4 |
| 4.16 | Clandonald | 1435 | 9.1 | 0.4 | 76.6 | 0.7 | 9.4 | 0.8 | 2.7 | 0.3 |
| | Vegreville East | 1303 | 12.0 | 0.6 | 58.7 | 8.3 | 15.0 | 1.6 | 3.5 | 0.4 |
| | | (2738) | (10.5) | (0.5) | (68.0) | (4.3) | (12.1) | (1.2) | (3.0) | (0.4) |
| 4.90 | Scapa West | 906 | 10.3 | 1.2 | 53.4 | 3.9 | 27.8 | 0.7 | 2.7 | T[4] |
| 4.94 | Oyen | 1498 | 6.2 | 0.5 | 47.3 | 2.8 | 40.6 | 0.5 | 2.1 | T |
| | ( Morainal - U ) | | | | | | | | | |
| 4.05 | Trochu | 1513 | 1.4 | 0.4 | 73.2 | 3.9 | 16.3 | 1.0 | 3.5 | 0.3 |
| 4.07 | Coronation | 1453 | 2.4 | 0.5 | 65.0 | 4.6 | 23.4 | 0.5 | 3.6 | 0.1 |
| 4.18 | Daysland | 1461 | 2.1 | 0.4 | 93.6 | 1.1 | 0.1 | 1.4 | 1.2 | 0.2 |
| | Holden | 1345 | 8.1 | 0.1 | 60.1 | 0.8 | 25.0 | 0.8 | 3.4 | 1.6 |
| | Galahad | 1427 | 6.4 | 0.1 | 84.1 | 0.5 | 4.0 | 1.1 | 2.8 | 1.1 |
| | | (4233) | (5.4) | (0.2) | (79.7) | (0.8) | ( 9.3) | (1.1) | (2.4) | (0.9) |
| 4.19 | Vegreville West | 1445 | 8.0 | 0.4 | 81.3 | 1.4 | 4.5 | 1.0 | 3.3 | T |
| 4.20 | Hay Lakes East | 1452 | 4.3 | 0.3 | 80.3 | 5.3 | 5.4 | 1.4 | 2.9 | 0.2 |
| 4.93 | Kirkpatrick Lake E. | 1309 | 0.8 | 0.2 | 47.5 | 2.9 | 45.8 | 0.7 | 2.2 | 0.0 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | | | |
| 4.04 | Cremona | 1525 | 2.3 | 0.0 | 51.6 | 17.5 | 22.9 | 2.3 | 3.1 | 0.3 |
| | (Fluvial - U ) | | | | | | | | | |
| 4.02 | Gayford West | 1088 | 1.3 | 0.6 | 35.3 | 1.7 | 58.9 | 0.7 | 1.5 | 0.1 |
| Entire Ecoregion Sample | | 26335 | 6.2 | 0.4 | 63.8 | 3.9 | 21.5 | 1.0 | 2.8 | 0.5 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.
3. Includes summerfallow.
4. T = trace - less than 0.05 percent

Table 14. Examples of Variability in Wetland Cover Data.

| Physio-graphic Unit | Transect[1] | Area in Hectares Per Quarter Section: Cultivated[2] Mean | Cultivated S.E.[3] | Cultivated C.V.[4] | Grass[2] Mean | Grass S.E. | Grass C.V. | Willows[2] Mean | Willows S.E. | Willows C.V. |
|---|---|---|---|---|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | | | | | | |
| 4.06 | Lousana | 0.4 | T | 0.4 | 4.6 | 1.1 | 1.2 | 0.1 | 0.0 | 0.2 |
| 4.08 | Hughenden | 0.3 | T | 0.5 | 2.7 | 0.6 | 1.1 | 0.5 | 0.1 | 0.8 |
| 4.12 | Greenglade | 0.3 | 0.1 | 1.1 | 1.7 | 0.6 | 1.8 | 0.6 | 0.3 | 2.2 |
| 4.14 | Hindville | 0.2 | T | 1.1 | 4.9 | 3.0 | 3.0 | 0.7 | 0.1 | 1.0 |
| 4.15 | Marwayne | 0.3 | T | 0.4 | 2.7 | 1.9 | 3.4 | 0.5 | 0.3 | 3.1 |
| 4.16 | Clandonald | 0.3 | T | 0.5 | 5.1 | 7.1 | 6.9 | 0.7 | 0.2 | 1.5 |
| | Vegreville East | 0.6 | 0.3 | 2.2 | 3.8 | 1.4 | 1.8 | 0.2 | T | 0.8 |
| | | (0.4) | (0.1) | (1.6) | (4.4) | (3.0) | (4.7) | (0.5) | (0.1) | (1.4) |
| 4.90 | Scapa West | 0.4 | 0.2 | 2.2 | 5.6 | 10.9 | 7.8 | 0.9 | 0.4 | 1.6 |
| 4.94 | Oyen | 0.2 | T | 0.5 | 2.4 | 0.6 | 1.1 | 0.2 | T | 0.4 |
| | ( Morainal - U ) | | | | | | | | | |
| 4.05 | Trochu | 0.4 | 0.2 | 2.5 | 2.4 | 4.7 | 9.8 | T | 0.0 | 0.5 |
| 4.07 | Coronation | 0.6 | 0.3 | 2.1 | 4.3 | 2.4 | 2.8 | 0.5 | 0.1 | 1.1 |
| 4.18 | Daysland | 1.7 | 0.5 | 1.4 | 2.4 | 0.7 | 1.5 | 0.5 | 0.1 | 1.0 |
| | Holden | 0.7 | 0.2 | 1.0 | 6.3 | 2.3 | 1.8 | 2.1 | 1.2 | 2.9 |
| | Galahad | 1.9 | 0.9 | 2.2 | 2.8 | 1.1 | 1.9 | 1.3 | 0.5 | 1.8 |
| | | (1.4) | (0.3) | (1.8) | (3.8) | (1.1) | (2.5) | (1.3) | (0.4) | (2.5) |
| 4.19 | Vegreville West | 1.6 | 0.2 | 0.7 | 4.7 | 2.0 | 2.1 | 0.5 | 0.1 | 0.7 |
| 4.20 | Hay Lakes East | 0.7 | 0.1 | 0.6 | 3.3 | 1.4 | 2.0 | 0.1 | T | 0.3 |
| 4.93 | Kirkpatrick Lake E. | 0.3 | T | 0.5 | 3.4 | 3.4 | 4.7 | 0.2 | 0.1 | 1.0 |
| ( Morainal/Bedrock - B/M ) | | | | | | | | | | |
| 4.04 | Cremona | T | 0.0 | 0.1 | 1.3 | 1.4 | 5.3 | T | 0.0 | 0.4 |
| | (Fluvial - U ) | | | | | | | | | |
| 4.02 | Gayford East | 0.1 | T | 0.5 | 6.5 | 5.1 | 3.5 | 0.1 | 0.0 | 0.2 |
| Entire Ecoregion Sample | | 0.6 | 0.1 | 1.8 | 3.7 | 0.7 | 3.7 | 0.5 | 0.1 | 2.1 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.
3. S.E. - Standard Error
4. C.V. - Coefficient of Variation.
5. T = trace - less than 0.05.

Table 15. Examples of Variability in Upland Cover Data.

| Physio-graphic Unit | Transect[1] | Area in Hectares Per Quarter Section: Cropland Mean | Cropland S.E.[3] | Cropland C.V.[4] | Native Grass[2] Mean | Native Grass[2] S.E. | Native Grass[2] C.V. | Native Trees[2] Mean | Native Trees[2] S.E. | Native Trees[2] C.V. |
|---|---|---|---|---|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | | | | | | |
| 4.06 | Lousana | 29.3 | 79.3 | 13.3 | 11.2 | 21.2 | 9.3 | 6.2 | 10.2 | 8.1 |
| 4.08 | Hughenden | 28.8 | 84.9 | 14.4 | 11.2 | 18.7 | 8.2 | 12.2 | 16.2 | 6.5 |
| 4.12 | Greenglade | 43.3 | 66.4 | 7.5 | 11.5 | 28.0 | 11.9 | 1.9 | 1.3 | 3.3 |
| 4.14 | Hindville | 31.3 | 65.8 | 10.3 | 12.4 | 16.8 | 6.6 | 6.6 | 10.7 | 7.9 |
| 4.15 | Marwayne | 48.9 | 49.9 | 5.0 | 6.5 | 21.2 | 16.1 | 2.7 | 3.8 | 6.9 |
| 4.16 | Clandonald | 45.8 | 114.3 | 12.2 | 6.7 | 6.6 | 4.8 | 3.4 | 3.3 | 4.8 |
| | Vegreville East | 31.9 | 68.4 | 10.5 | 7.9 | 16.2 | 10.1 | 6.9 | 12.8 | 9.2 |
| | | (38.8) | ( 70.3) | (12.6) | (7.3) | (7.9) | (7.5) | (5.1) | (6.0) | (8.2) |
| 4.90 | Scapa West | 30.2 | 98.8 | 13.1 | 20.8 | 75.9 | 14.6 | 1.6 | 0.8 | 1.9 |
| 4.94 | Oyen | 29.5 | 116.9 | 19.4 | 27.0 | 118.6 | 21.5 | 0.1 | 0.0 | 0.2 |
| | ( Morainal - U ) | | | | | | | | | |
| 4.05 | Trochu | 46.2 | 64.6 | 6.9 | 11.0 | 33.7 | 15.0 | 1.7 | 3.0 | 8.5 |
| 4.07 | Coronation | 39.3 | 109.2 | 13.6 | 11.3 | 41.8 | 18.1 | 1.3 | 0.5 | 1.7 |
| 4.18 | Daysland | 56.9 | 3.9 | 0.3 | 1.2 | 0.3 | 1.1 | 0.9 | 0.1 | 0.7 |
| | Holden | 33.7 | 84.2 | 12.3 | 15.0 | 25.5 | 8.3 | 4.4 | 3.7 | 4.2 |
| | Galahad | 50.0 | 24.0 | 2.4 | 3.2 | 2.8 | 4.3 | 3.2 | 7.6 | 11.8 |
| | | (46.9) | (32.4) | ( 5.9) | ( 6.5) | ( 9.8) | (12.8) | (2.8) | (2.4) | ( 7.3) |
| 4.19 | Vegreville West | 49.0 | 56.6 | 5.7 | 4.6 | 2.2 | 2.3 | 3.9 | 3.5 | 4.4 |
| 4.20 | Hay Lakes East | 48.6 | 27.8 | 2.8 | 5.3 | 4.0 | 3.7 | 1.3 | 0.4 | 1.6 |
| 4.93 | Kirkpatrick Lake E. | 28.2 | 147.9 | 24.6 | 25.8 | 105.9 | 19.2 | 0.1 | T | 0.5 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | | | |
| 4.04 | Cremona | 32.8 | 87.0 | 13.0 | 11.2 | 19.4 | 8.5 | 3.0 | 3.4 | 5.5 |
| | (Fluvial - U ) | | | | | | | | | |
| 4.02 | Gayford East | 19.2 | 107.0 | 25.0 | 26.4 | 80.0 | 13.6 | 0.4 | 0.1 | 1.4 |
| Entire Ecoregion Sample | | 38.0 | 21.0 | 12.0 | 12.0 | 9.5 | 17.0 | 3.3 | 1.4 | 8.9 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.
3. S.E. - Standard Error.
4. C.V. - Coefficient of Variation.
5. T = trace - less than 0.05.

Table 16. Examples of Variability in Upland Land Use Data.

| Physio-graphic Unit | Transect[1] | Area in Hectares Per Quarter: Unused[2] Mean | Unused S.E.[3] | Unused C.V.[4] | Grazing[2] Mean | Grazing S.E. | Grazing C.V. | Roads & Railways[2] Mean | Roads & Railways S.E. | Roads & Railways C.V. |
|---|---|---|---|---|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | | | | | | |
| 4.06 | Lousana | 2.1 | 2.5 | 5.7 | 17.7 | 53.6 | 14.9 | 1.7 | T[5] | 0.1 |
| 4.08 | Hughenden | 9.1 | 52.0 | 27.9 | 18.9 | 84.5 | 22.0 | 1.9 | 0.1 | 0.3 |
| 4.12 | Greenglade | 4.1 | 14.5 | 17.5 | 9.1 | 41.3 | 22.1 | 1.9 | 0.1 | 0.3 |
| 4.14 | Hindville | 5.7 | 17.7 | 15.3 | 16.7 | 84.2 | 24.7 | 1.5 | 0.2 | 0.7 |
| 4.15 | Marwayne | 4.7 | 5.7 | 5.9 | 3.3 | 29.6 | 44.3 | 1.6 | 0.1 | 0.3 |
| 4.16 | Clandonald | 5.4 | 11.7 | 10.5 | 5.7 | 37.4 | 32.4 | 1.6 | 0.1 | 0.3 |
| | Vegreville East | 6.5 | 6.8 | 5.1 | 8.2 | 43.1 | 25.9 | 1.9 | 0.1 | 0.4 |
| | | (6.0) | (6.4) | ( 7.5) | (6.9) | (28.1) | (28.2) | (1.7) | (0.1) | (0.3) |
| 4.90 | Scapa West | 5.8 | 26.4 | 18.1 | 15.8 | 107.2 | 27.2 | 1.5 | 0.2 | 0.6 |
| 4.94 | Oyen | 3.9 | 3.7 | 4.7 | 25.4 | 157.3 | 30.4 | 1.3 | 0.2 | 0.7 |
| | ( Morainal - U ) | | | | | | | | | |
| 4.05 | Trochu | 0.9 | 0.7 | 3.5 | 10.3 | 46.4 | 22.2 | 2.2 | 0.3 | 0.6 |
| 4.07 | Coronation | 1.5 | 2.3 | 7.6 | 14.1 | 85.2 | 29.5 | 2.2 | 0.6 | 1.4 |
| 4.18 | Daysland | 1.3 | 0.5 | 1.7 | T | T | 0.8 | 0.8 | 0.1 | 0.9 |
| | Holden | 4.6 | 16.5 | 17.7 | 14.0 | 65.8 | 23.0 | 1.9 | 0.1 | 0.2 |
| | Galahad | 3.8 | 11.3 | 14.7 | 2.4 | 9.1 | 18.7 | 1.7 | 0.3 | 0.7 |
| | | (3.2) | ( 5.5) | (14.6) | ( 5.5) | (18.5) | (28.6) | (1.4) | (0.1) | (0.7) |
| 4.19 | Vegreville West | 6.5 | 6.8 | 5.1 | 8.2 | 43.1 | 25.9 | 1.9 | 0.1 | 0.4 |
| 4.20 | Hay Lakes East | 2.6 | 2.3 | 4.2 | 3.3 | 8.5 | 12.6 | 1.7 | 0.1 | 0.3 |
| 4.93 | Kirkpatrick Lake E. | 0.5 | 0.2 | 2.1 | 27.3 | 138.5 | 23.8 | 1.3 | 0.1 | 0.3 |
| | ( Morainal/Bedrock - B/M ) | | | | | | | | | |
| 4.04 | Cremona | 1.5 | 0.8 | 2.7 | 14.6 | 43.9 | 14.8 | 2.0 | 0.1 | 0.3 |
| | (Fluvial - U ) | | | | | | | | | |
| 4.02 | Gayford East | 0.7 | 0.3 | 1.8 | 32.0 | 91.1 | 12.7 | 0.8 | 0.1 | 0.8 |
| Entire Ecoregion Sample | | 3.7 | 2.3 | 13.0 | 12.0 | 16.0 | 28.0 | 1.7 | 0.1 | 0.6 |

1. Grouped by landform ( parent soil material and surface form ).
2. Figures in parentheses are composite values for those transects occurring within one physiographic unit.
3. S.E. - Standard Error.
4. C.V. - Coefficient of Variation.
5. T = trace - less than 0.05.

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

| Unit | Physiographic Unit[1] Name | Estimated Area in Thousands of Hectares: Total Wetland Area | Cultivated | Willows and Trees | Grasses | Bulrush Cattail | Transitional Open Water | Natural Open Water | Artificial Open Water | Saline Open Water | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (Morainal - K & K) | | | | | | | | | | |
| 4.06 | Delburne Upland | 31.3 | 1.6 | 0.3 | 20.3 | 0.9 | T[2] | 7.9 | T | 0.0 | 0.1 |
| 4.08 | Battle River Upland | 17.8 | 0.9 | 1.9 | 10.4 | 1.6 | T | 2.2 | 0.1 | 0.8 | 0.0 |
| 4.12 | Provost Upland | 12.5 | 0.6 | 1.5 | 4.4 | 0.3 | 0.0 | 5.6 | 0.1 | 0.0 | 0.0 |
| 4.14 | Vermilion Upland | 24.2 | 0.5 | 1.9 | 14.5 | 0.4 | 0.0 | 0.7 | 0.7 | 5.5 | 0.0 |
| 4.15 | Hazeldine Plain | 10.2 | 0.5 | 0.9 | 4.6 | 0.8 | 0.0 | 3.3 | 0.1 | 0.0 | 0.0 |
| 4.16 | Innisfree Plain | 66.8 | 3.1 | 3.3 | 32.3 | 3.5 | 0.0 | 24.3 | 0.1 | 0.0 | 0.1 |
| 4.90 | Rumsey Upland | 11.4 | 0.5 | 1.1 | 6.9 | T | 0.0 | 2.8 | 0.1 | 0.0 | 0.0 |
| 4.94 | Oyen Upland North | 10.6 | 0.4 | 0.3 | 5.8 | 0.0 | 0.0 | 0.6 | T | 3.5 | 0.0 |
| 4.88 | Neutral Upland | 9.8 | 0.3 | 0.2 | 5.0 | 1.5 | 0.2 | T | T | 2.6 | T |
| | (Morainal - U) | | | | | | | | | | |
| 4.05 | Kneehills Upland | 10.8 | 1.4 | 0.1 | 8.6 | 0.0 | 0.0 | 0.1 | 0.6 | 0.0 | 0.0 |
| 4.07 | Castor Plain | 32.2 | 3.6 | 2.7 | 25.0 | 0.4 | 0.0 | 0.1 | 0.4 | 0.0 | 0.0 |
| 4.18 | Killam Plain | 55.5 | 11.6 | 10.4 | 30.5 | 1.4 | 0.0 | 0.7 | 0.9 | 0.0 | 0.0 |
| 4.19 | Mundare Plain | 20.7 | 4.5 | 1.3 | 13.2 | 0.7 | 0.0 | 0.9 | 0.1 | 0.0 | 0.0 |
| 4.20 | Beaverhill Lake Plain | 21.3 | 2.6 | 0.4 | 12.8 | 0.8 | 0.0 | 4.5 | 0.2 | 0.0 | 0.0 |
| 4.93 | Coronation Plain | 11.0 | 0.5 | 0.4 | 6.3 | T | 0.4 | 3.2 | 0.2 | 0.0 | T |
| | TOTAL MORAINAL[3] | 346.1 | 32.6 | 26.7 | 200.6 | 12.3 | 0.6 | 56.9 | 3.6 | 12.4 | 0.2 |
| | TOTAL MORAINAL[4] | 336.3 | 32.3 | 26.5 | 195.6 | 10.8 | 0.4 | 56.9 | 3.6 | 9.8 | 0.2 |
| | (Morainal/Rock - B/M) | | | | | | | | | | |
| 4.04 | Dogpound Benchland | 2.7 | T | T | 1.6 | 0.0 | 0.0 | 1.0 | 0.1 | 0.0 | 0.0 |
| | TOTAL MORAINAL / BEDROCK | 2.7 | T | T | 1.6 | 0.0 | 0.0 | 1.0 | 0.1 | 0.0 | 0.0 |

**Table 17 continued on next page.**

Table 17 continued. Estimated Area of Wetland Cover Classes in Physiographic Units.

| Unit | Physiographic Unit[1] Name | | Estimated Area in Thousands of Hectares: Total Wetland Area | Cultivated | Willows and Trees | Grasses | Bulrush Cattail | Transitional Open Water | Natural Open Water | Artificial Open Water | Saline Open Water | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ( Fluvial - U ) | | | | | | | | | | | |
| 4.02 | Strathmore Plain | | 15.4 | 0.1 | 0.1 | 7.8 | 1.0 | T | 5.5 | 0.7 | 0.2 | T |
| | TOTAL FLUVIAL | | 15.4 | 0.1 | 0.1 | 7.8 | 1.0 | T | 5.5 | 0.7 | 0.2 | T |
| Total for Entire Sampled Portion of Ecoregion | | A[5] | 364.2 | 32.7 | 26.8 | 210.0 | 13.3 | 0.6 | 63.4 | 4.4 | 12.6 | 0.2 |
| | | A[6] | 354.4 | 32.4 | 26.6 | 205.0 | 11.8 | 0.4 | 63.4 | 4.4 | 10.0 | 0.2 |
| | | B[7] | 358.2 | 31.5 | 27.6 | 203.4 | 12.2 | 0.7 | 66.3 | 5.0 | 11.1 | 0.4 |

1. Grouped by landform ( parent soil material and surface form ).

2. T = trace - less than 50 hectares.

3. Summation of values from individual units including 4.88.

4. Summation of values from individual units excluding 4.88.

5. Based on summation of values from individual physiographic units including 4.88.

6. Based on summation of values from individual physiographic units excluding 4.88.

7. Based on the analysis of the ecoregion sample as a single unit excluding 4.88.

Table 18. Estimated Numbers of Wetland Cover Class in Physiographic Unit.

| Unit | Physiographic Unit[1] Name | Estimated Number of Wetlands ( in thousands ) Total Number of Wetlands | Cultivated | Willows and Trees | Grasses | Bulrush Cattail | Transitional Open Water | Natural Open Water | Artificial Open Water | Saline Open Water | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | | | | | | | |
| 4.06 | Delburne Upland | 102.8 | 15.9 | 2.4 | 69.3 | 1.7 | 0.2 | 11.5 | 0.7 | 0.0 | 1.1 |
| 4.08 | Battle River Upland | 68.3 | 10.9 | 5.7 | 44.1 | 1.7 | 0.3 | 3.8 | 0.8 | 1.0 | 0.0 |
| 4.12 | Provost Upland | 17.1 | 4.1 | 2.0 | 8.6 | 0.5 | 0.0 | 0.9 | 1.1 | 0.0 | 0.0 |
| 4.14 | Vermilion Upland | 33.8 | 2.8 | 3.5 | 24.6 | 0.2 | 0.0 | 1.4 | 0.8 | 0.4 | 0.0 |
| 4.15 | Hazeldine Plain | 16.3 | 5.3 | 1.6 | 7.1 | 0.1 | 0.0 | 1.1 | 1.2 | 0.0 | 0.0 |
| 4.16 | Innisfree Plain | 113.1 | 23.6 | 5.0 | 67.2 | 2.2 | 0.0 | 14.4 | 0.6 | 0.0 | 0.1 |
| 4.90 | Rumsey Upland | 21.9 | 2.5 | 1.8 | 17.0 | 0.2 | 0.0 | 0.2 | 0.2 | 0.0 | 0.0 |
| 4.94 | Oyen Upland North | 23.2 | 3.6 | 0.5 | 18.4 | 0.0 | 0.0 | 0.2 | 0.3 | 0.3 | 0.0 |
| 4.88 | Neutral Upland | 17.6 | 1.9 | 0.2 | 13.9 | 0.2 | 0.1 | 0.1 | 0.3 | 0.7 | 0.3 |
| | ( Morainal - U ) | | | | | | | | | | |
| 4.05 | Kneehills Upland | 23.1 | 6.1 | 0.4 | 14.0 | 0.0 | 0.0 | 0.4 | 2.1 | 0.0 | 0.0 |
| 4.07 | Castor Plain | 87.4 | 24.2 | 15.7 | 43.6 | 0.3 | 0.0 | 0.3 | 3.1 | 0.0 | 0.3 |
| 4.18 | Killam Plain | 125.3 | 57.5 | 7.0 | 54.4 | 1.5 | 0.0 | 0.9 | 3.8 | 0.0 | 0.3 |
| 4.19 | Mundare Plain | 65.4 | 31.1 | 3.5 | 26.4 | 0.7 | 0.0 | 2.4 | 1.1 | 0.0 | 0.1 |
| 4.20 | Beaverhill Lake Plain | 67.0 | 23.9 | 2.2 | 34.7 | 0.5 | 0.0 | 4.2 | 1.5 | 0.0 | 0.1 |
| 4.93 | Coronation Plain | 14.9 | 3.6 | 0.7 | 9.2 | 0.0 | 0.1 | 0.3 | 0.8 | 0.0 | 0.1 |
| | TOTAL MORAINAL[2] | 797.2 | 217.0 | 52.2 | 452.5 | 9.8 | 0.7 | 42.1 | 18.4 | 2.4 | 2.3 |
| | TOTAL MORAINAL[3] | 779.6 | 215.1 | 52.0 | 438.6 | 9.6 | 0.6 | 42.0 | 18.1 | 1.7 | 2.0 |
| | ( Morainal/Rock - B/M ) | | | | | | | | | | |
| 4.04 | Dogpound Benchland | 2.6 | 0.1 | 0.1 | 1.9 | 0.0 | 0.0 | 0.2 | 0.3 | 0.0 | 0.0 |
| | TOTAL MORAINAL / BEDROCK | 2.6 | 0.1 | 0.1 | 1.9 | 0.0 | 0.0 | 0.2 | 0.3 | 0.0 | 0.0 |

**Table 18 continued on next page.**

Table 18 continued. Estimated Numbers of Wetland Cover Class in Physiographic Unit.

| Unit | Physiographic Unit Name | | Estimated Number of Wetlands ( in thousands ) Total Number of Wetlands | Cultivated | Willows and Trees | Grasses | Bulrush Cattail | Transitional Open Water | Natural Open Water | Artificial Open Water | Saline Open Water | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ( Fluvial - U ) | | | | | | | | | | | |
| 4.02 | Strathmore Plain | | 14.8 | 0.4 | 0.2 | 9.8 | 1.2 | 0.1 | 2.2 | 0.5 | 0.3 | 0.1 |
| | TOTAL FLUVIAL | | 14.8 | 0.4 | 0.2 | 9.8 | 1.2 | 0.1 | 2.2 | 0.5 | 0.3 | 0.1 |
| Total for Entire Sampled Portion of Ecoregion | | A[4] | 814.6 | 217.5 | 52.5 | 464.2 | 11.0 | 0.8 | 44.5 | 19.2 | 2.7 | 2.4 |
| | | A[5] | 790.9 | 215.6 | 52.3 | 450.3 | 10.8 | 0.7 | 44.4 | 18.9 | 2.0 | 2.1 |
| | | B[6] | 745.2 | 203.4 | 45.5 | 420.3 | 11.2 | 0.7 | 40.2 | 19.4 | 2.2 | 2.2 |

1. Grouped by landform ( parent soil material and surface form ).

2. Summation of values from individual units including 4.88.

3. Summation of values from individual units excluding 4.88.

4. Based on summation of values from individual physiographic units including 4.88.

5. Based on summation of values from individual physiographic units excluding 4.88.

6. Based on the analysis of the ecoregion sample as a single unit excluding 4.88.

Table 19. Estimated Area of Wetland Use Activity Classes in Physiographic Units.

| Unit Number | Physiographic Unit[1] Name | Estimated Area in Thousand of Hectares: Total Wetland Area | Abandoned No Use | Annual Cultivation Crop | Haying | Grazing | Other |
|---|---|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | | | |
| 4.06 | Delburne Upland | 31.3 | 13.4 | 0.4 | 1.6 | 1.4 | 14.4 | T[2] |
| 4.08 | Battle River Upland | 17.8 | 6.2 | 0.5 | 0.9 | T | 9.9 | 0.2 |
| 4.12 | Provost Upland | 12.5 | 8.0 | T | 0.6 | 0.0 | 3.9 | 0.0 |
| 4.14 | Vermilion Upland | 24.2 | 12.5 | 0.2 | 0.5 | 0.9 | 10.0 | 0.1 |
| 4.15 | Hazeldine Plain | 10.2 | 8.3 | 0.1 | 0.5 | 0.1 | 1.2 | T |
| 4.16 | Innisfree Plain | 66.8 | 42.7 | 0.3 | 3.1 | 2.6 | 18.0 | T |
| 4.90 | Rumsey Upland | 11.4 | 6.5 | 0.1 | 0.5 | T | 4.3 | 0.0 |
| 4.94 | Oyen Upland North | 10.6 | 7.0 | T | 0.4 | 0.1 | 3.2 | 0.0 |
| 4.88 | Neutral Upland | 9.8 | 5.2 | 0.1 | 0.3 | 0.1 | 4.1 | T |
| | ( Morainal - U ) | | | | | | |
| 4.05 | Kneehills Upland | 10.8 | 1.5 | 0.6 | 1.4 | 0.3 | 6.8 | 0.2 |
| 4.07 | Castor Plain | 32.2 | 7.0 | 1.5 | 3.6 | 2.5 | 17.2 | 0.3 |
| 4.18 | Killam Plain | 55.5 | 23.7 | 1.1 | 11.5 | 4.6 | 14.0 | 0.6 |
| 4.19 | Mundare Plain | 20.7 | 12.0 | 0.9 | 4.4 | 0.4 | 3.0 | T |
| 4.20 | Beaverhill Lake Plain | 21.3 | 15.5 | 0.3 | 2.6 | 0.7 | 2.2 | 0.1 |
| 4.93 | Coronation Plain | 11.0 | 0.8 | 0.1 | 0.5 | 0.1 | 9.4 | 0.1 |
| | TOTAL MORAINAL[3] | 346.1 | 170.3 | 6.2 | 32.4 | 13.8 | 121.6 | 1.6 |
| | TOTAL MORAINAL[4] | 336.3 | 165.1 | 6.1 | 32.1 | 13.7 | 117.5 | 1.6 |
| | ( Morainal/Rock - B/M ) | | | | | | |
| 4.04 | Dogpound Benchland | 2.7 | 0.4 | T | T | 0.0 | 2.3 | 0.0 |
| | TOTAL MORAINAL/ BEDROCK | 2.7 | 0.4 | T | T | 0.0 | 2.3 | 0.0 |
| | (Fluvial - U ) | | | | | | |
| 4.02 | Strathmore Plain | 15.4 | 4.6 | T | 0.1 | 0.1 | 10.0 | 0.6 |
| | TOTAL FLUVIAL | 15.4 | 4.6 | T | 0.1 | 0.1 | 10.0 | 0.6 |
| Total for Entire Sampled | A[5] | 364.2 | 175.3 | 6.2 | 32.5 | 13.9 | 133.9 | 2.2 |
| Portion of Ecoregion | A[6] | 354.4 | 170.1 | 6.1 | 32.2 | 13.8 | 129.8 | 2.2 |
| | B[7] | 358.2 | 169.4 | 5.4 | 31.2 | 12.5 | 136.8 | 2.9 |

1. Grouped by landform ( parent soil material and surface form)
2. T = trace - less than 50 hectares.
3. Summation of values from individual units including 4.88.
4. Summation of values from individual units excluding 4.88.
5. Based on summation of values from individual physiographic units including 4.88.
6. Based on summation of values from individual physiographic units excluding 4.88.
7. Based on the analysis of the ecoregion sample as a single unit.

Table 20 . Estimated Area of Upland Cover Classes in Physiographic Units

| Unit # | Physiographic Unit[1] Name | Total Upland Area | Native Grass | Native Low Shrub | Native Tall Shrub | Native Trees | Native Total | Planted Annual Crops | Planted Perennial Grasses and Forbs | Planted Trees and Shrubs | Planted Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimated Area in Thousands of Hectares | | | | | | | | | |
| | ( Morainal - K & K ) | | | | | | | | | | |
| 4.06 | Delburne Upland | 258.4 | 49.1 | 2.6 | 2.1 | 27.1 | 80.9 | 128.7 | 44.7 | 0.1 | 3.9 |
| 4.08 | Battle River Upland | 233.3 | 42.5 | 7.7 | 7.9 | 46.2 | 104.3 | 108.9 | 16.1 | 0.5 | 3.5 |
| 4.12 | Provost Upland | 156.8 | 29.6 | 3.0 | 0.6 | 5.0 | 38.2 | 111.8 | 3.5 | 0.3 | 3.0 |
| 4.14 | Vermilion Upland | 172.8 | 37.0 | 4.1 | 2.8 | 19.7 | 63.6 | 93.0 | 13.5 | 0.5 | 2.2 |
| 4.15 | Hazeldine Plain | 101.4 | 11.0 | 0.4 | 0.9 | 4.6 | 16.9 | 82.9 | 0.7 | 0.2 | 0.7 |
| 4.16 | Innisfree Plain | 413.8 | 53.0 | 3.3 | 5.8 | 37.2 | 99.3 | 281.4 | 26.9 | 0.8 | 5.4 |
| 4.90 | Rumsey Upland | 69.5 | 25.5 | 1.0 | 0.2 | 1.9 | 28.6 | 37.1 | 2.9 | 0.2 | 0.6 |
| 4.94 | Oyen Upland North | 148.2 | 64.0 | 4.1 | 0.4 | 0.2 | 68.7 | 70.1 | 7.9 | 0.3 | 1.2 |
| 4.88 | Neutral Upland | 72.9 | 37.7 | 1.2 | 0.1 | 0.4 | 39.4 | 31.5 | 1.1 | 0.1 | 0.9 |
| | ( Morainal - U ) | | | | | | | | | | |
| 4.05 | Kneehills Upland | 229.7 | 40.0 | 0.7 | 0.9 | 6.2 | 47.8 | 168.1 | 10.8 | 0.7 | 2.3 |
| 4.07 | Castor Plain | 351.6 | 65.8 | 2.8 | 1.4 | 7.4 | 77.4 | 228.5 | 43.3 | 0.4 | 2.1 |
| 4.18 | Killam Plain | 473.2 | 52.1 | 3.3 | 2.8 | 22.2 | 80.4 | 377.1 | 10.4 | 1.0 | 4.3 |
| 4.19 | Mundare Plain | 167.5 | 12.7 | 0.3 | 1.7 | 10.9 | 25.6 | 136.3 | 3.5 | 0.3 | 1.8 |
| 4.20 | Beaverhill Lake Plain | 232.2 | 20.4 | T[2] | 0.7 | 4.9 | 26.0 | 186.5 | 17.6 | 0.5 | 1.6 |
| 4.93 | Coronation Plain | 108.7 | 47.0 | 0.8 | 0.3 | 0.2 | 48.5 | 51.6 | 7.9 | 0.2 | 0.6 |
| | TOTAL MORAINAL[3] | 3190.0 | 587.4 | 35.3 | 28.6 | 194.1 | 845.6 | 2093.5 | 210.8 | 6.1 | 34.1 |
| | TOTAL MORAINAL[4] | 3117.1 | 549.7 | 34.1 | 28.5 | 193.7 | 806.2 | 2062.0 | 209.7 | 6.0 | 33.2 |
| | ( Morainal/Rock - B/M ) | | | | | | | | | | |
| 4.04 | Dogpound Benchland | 81.6 | 14.4 | 1.1 | 2.2 | 3.9 | 21.6 | 42.1 | 16.3 | 0.3 | 1.3 |
| | TOTAL MORAINAL/ BEDROCK | 81.6 | 14.4 | 1.1 | 2.2 | 3.9 | 21.6 | 42.1 | 16.3 | 0.3 | 1.3 |
| | (Fluvial - U ) | | | | | | | | | | |
| 4.02 | Strathmore Plain | 64.7 | 31.4 | 1.4 | 1.0 | 0.5 | 34.3 | 22.8 | 6.9 | 0.1 | 0.7 |
| | TOTAL FLUVIAL | 64.7 | 31.4 | 1.4 | 1.0 | 0.5 | 34.3 | 22.8 | 6.9 | 0.1 | 0.7 |
| Total for Entire Sampled | A[5] | 3336.3 | 633.2 | 37.8 | 31.8 | 198.5 | 901.5 | 2158.4 | 234.0 | 6.5 | 36.1 |
| Portion of Ecoregion | A[6] | 3263.4 | 595.5 | 36.6 | 31.7 | 198.1 | 862.1 | 2126.9 | 232.9 | 6.4 | 35.2 |
| | BZ[7] | 3259.6 | 658.5 | 39.1 | 32.6 | 182.5 | 912.7 | 2086.1 | 218.4 | 6.5 | 35.9 |

1. Grouped by landform ( parent soil material and surface form)
2. T = trace - less than 50 hectares.
3. Summation of values from individual units including 4.88.
4. Summation of values from individual units excluding 4.88.
5. Based on summation of values from individual physiographic units including 4.88.
6. Based on summation of values from individual physiographic units excluding 4.88.
7. Based on the analysis of the ecoregion sample as a single unit.

Table 21. Estimated Area of Upland Land Use Activity Classes in Physiographic Units.

| Unit # | Physiographic Unit[1] Name | Estimated Area in Thousands of Hectares: Total Upland Area | Unused | Abandoned | Crops | Annual Forage | Grazing | Farmsteads | Roads and Railways | Other |
|---|---|---|---|---|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | | | | | | |
| 4.06 | Delburne Upland | 258.4 | 9.3 | 0.3 | 128.8 | 29.7 | 77.8 | 3.1 | 7.2 | 2.1 |
| 4.08 | Battle River Upland | 233.3 | 34.5 | 0.2 | 109.0 | 4.4 | 71.4 | 1.4 | 7.0 | 5.4 |
| 4.12 | Provost Upland | 156.8 | 10.5 | 0.6 | 111.7 | 2.4 | 23.7 | 0.6 | 4.9 | 2.5 |
| 4.14 | Vermilion Upland | 172.8 | 16.9 | 0.9 | 93.0 | 5.5 | 49.6 | 2.1 | 4.5 | 0.4 |
| 4.15 | Hazeldine Plain | 101.4 | 8.0 | 0.3 | 83.1 | 0.3 | 5.6 | 1.1 | 2.7 | 0.4 |
| 4.16 | Innisfree Plain | 413.8 | 43.4 | 2.1 | 281.4 | 17.8 | 50.1 | 5.0 | 12.4 | 1.7 |
| 4.90 | Rumsey Upland | 69.5 | 7.2 | 0.8 | 37.1 | 2.7 | 19.3 | 0.5 | 1.9 | T[2] |
| 4.94 | Oyen Upland North | 148.2 | 9.2 | 0.7 | 70.1 | 4.2 | 60.2 | 0.7 | 3.1 | 0.1 |
| 4.88 | Neutral Upland | 72.9 | 2.6 | 0.5 | 31.5 | 0.2 | 34.8 | 0.5 | 2.7 | 0.2 |
| | ( Morainal - U ) | | | | | | | | | |
| 4.05 | Kneehills Upland | 229.7 | 3.2 | 0.9 | 168.1 | 9.0 | 37.4 | 2.3 | 8.0 | 0.7 |
| 4.07 | Castor Plain | 351.6 | 8.4 | 1.7 | 228.5 | 16.2 | 82.3 | 1.7 | 12.6 | 0.3 |
| 4.18 | Killam Plain | 473.2 | 25.6 | 1.0 | 377.6 | 3.8 | 44.0 | 5.2 | 11.4 | 4.3 |
| 4.19 | Mundare Plain | 167.5 | 13.4 | 0.7 | 136.3 | 2.4 | 7.5 | 1.7 | 5.5 | 0.1 |
| 4.20 | Beaverhill Lake Plain | 232.2 | 10.0 | 0.7 | 186.4 | 12.3 | 12.5 | 3.3 | 6.7 | 0.5 |
| 4.93 | Coronation Plain | 108.7 | 0.9 | 0.2 | 51.5 | 3.2 | 49.8 | 0.8 | 2.4 | 0.0 |
| | TOTAL MORAINAL[3] | 3190.0 | 203.1 | 11.6 | 2094.1 | 114.1 | 626.0 | 30.0 | 93.0 | 18.7 |
| | TOTAL MORAINAL[4] | 3117.1 | 200.5 | 11.1 | 2062.6 | 113.9 | 591.2 | 29.5 | 90.3 | 18.5 |
| | ( Morainal/Rock - B/M ) | | | | | | | | | |
| 4.04 | Dogpound Benchland | 81.6 | 1.9 | 0.0 | 42.1 | 14.3 | 18.7 | 1.9 | 2.5 | 0.3 |
| | TOTAL MORAINAL/ BEDROCK | 81.6 | 1.9 | 0.0 | 42.1 | 14.3 | 18.7 | 1.9 | 2.5 | 0.3 |
| | (Fluvial - U ) | | | | | | | | | |
| 4.02 | Strathmore Plain | 64.7 | 0.8 | 0.4 | 22.8 | 1.1 | 38.1 | 0.5 | 1.0 | 0.1 |
| | TOTAL FLUVIAL | 64.7 | 0.8 | 0.4 | 22.8 | 1.1 | 38.1 | 0.5 | 1.0 | 0.1 |
| Total for Entire Sampled Portion of Ecoregion | A[5] | 3336.3 | 205.8 | 12.0 | 2159.0 | 129.5 | 682.8 | 32.5 | 96.5 | 19.1 |
| | A[6] | 3263.4 | 203.2 | 11.5 | 2127.5 | 129.3 | 648.0 | 31.9 | 93.8 | 18.9 |
| | B[7] | 3259.6 | 205.4 | 13.0 | 2105.7 | 127.1 | 665.0 | 32.6 | 94.5 | 16.3 |

1. Grouped by landform ( parent soil material and surface form)
2. T = trace - less than 50 hectares.
3. Summation of values from individual units including 4.88.
4. Summation of values from individual units excluding 4.88.
5. Based on summation of values from individual physiographic units including 4.88.
6. Based on summation of values from individual physiographic units excluding 4.88.
7. Based on the analysis of the ecoregion sample as a single unit.

Table 22. Rating of Sampled MORAINAL Physiographic Units in Alberta Parkland as Waterfowl Production Habitat

| Unit Number | Physiographic Unit[1] Name | Percent of Total Unit Area in Wetlands | Percent of Wetland Area In Cover Class | | | Percent of Upland Area | | | Area of Unit in 1000's of Hectares | Rating as Waterfowl Production Habitat |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Grass | Bulrush/ Cattail | Natural, Fresh, Open Water | That is Unused | In Native and Seeded Grass and Shrub Cover | That is Unused | | |
| 4.90 | Rumsey Upland | 14.1 | 60.3 | 0.2 | 24.8 | 57.2 | 42.7 | 10.3 | 80.9 | 1 |
| 4.16 | Innisfree Plain | 13.9 | 48.4 | 5.3 | 36.4 | 63.9 | 21.5 | 10.5 | 480.6 | 2 |
| 4.14 | Vermilion Upland | 12.3 | 60.0 | 1.5 | 2.7 | 51.6 | 33.2 | 9.8 | 197.0 | 2 (3)[5] |
| 4.88 | Neutral Upland[2] | 11.8 | 51.3 | 15.0 | 0.3 | 52.8 | 54.9 | 3.6 | 82.7[3] | 2 |
| 4.19 | Mundare Plain | 11.0 | 64.0 | 3.2 | 4.5 | 58.1 | 10.9 | 8.0 | 188.2 | 2 (3)[5] |
| 4.06 | Delburne Upland | 10.8 | 64.8 | 3.0 | 25.3 | 42.9 | 38.1 | 3.6 | 289.7 | 2 |
| 4.18 | Killam Plain | 10.5 | 55.0 | 2.6 | 1.2 | 42.7 | 14.5 | 5.4 | 528.7 | 3 |
| 4.93 | Coronation Plain | 9.2 | 56.9 | 0.3 | 28.9 | 7.3 | 51.7 | 0.8 | 119.7 | 2 |
| 4.15 | Hazeldine Plain | 9.1 | 45.5 | 7.7 | 32.3 | 81.1 | 12.8 | 7.9 | 111.6 | 1 |
| 4.07 | Castor Plain | 8.4 | 77.7 | 0.0 | 5.4 | 21.7 | 32.2 | 2.4 | 383.8 | 3 |
| 4.20 | Beaverhill Lake Plain | 8.4 | 60.0 | 3.8 | 21.2 | 72.7 | 16.7 | 4.3 | 253.5 | 2 |
| 4.12 | Provost Upland | 7.4 | 35.0 | 2.7 | 44.6 | 63.7 | 23.4 | 6.7 | 169.3 | 3 |
| 4.08 | Battle River Upland | 7.1 | 58.3 | 8.9 | 12.1 | 34.8 | 31.8 | 14.8 | 251.1 | 2 |
| 4.94 | Oyen Upland North | 6.7 | 54.7 | 0.0 | 5.4 | 65.7 | 51.6 | 6.2 | 158.8 | 3 |
| 4.05 | Kneehills Upland | 4.5 | 79.4 | 0.0 | 1.0 | 14.3 | 22.8 | 1.4 | 240.5 | 4 |
| 4.04 | Dogpound Benchland[4] | 3.2 | 60.3 | 0.0 | 35.9 | 13.9 | 41.7 | 2.3 | 84.3 | 3 |

1. Physiographic units are arranged in order of diminishing proportion of wetland area in the landscape.
2. Sampled in Saskatchewan portion of the unit.
3. Area in Alberta.
4. Morainal blanket over bedrock.
5. Downgraded to 3 because of low values for both bulrush/cattail + natural fresh open water

Table 23. Frequency of Land Use, Cover Changes Between May 1985 and Time of Ground Truth Survey.

| Physio-graphic Unit | Transect[1] | Numbers of Quarters[2] in Sample | Affected by Land Use/Cover Changes | Percent of Quarters Affected[2] | Time Interval from May 1985 to Ground Truth Survey (in months)[3] |
|---|---|---|---|---|---|
| | ( Morainal - K & K ) | | | | |
| 4.06 | Lousana | 24 | 18 | 75.0 | 38 |
| 4.08 | Hughenden | 24 | 10 | 41.7 | 38 |
| 4.12 | Greenglade | 24 | 7 | 29.2 | 37 |
| 4.14 | Hindville | 24 | 11 | 45.8 | 42 |
| 4.15 | Marwayne | 24 | 13 | 54.2 | 42 |
| 4.16 | Clandonald | 24 | 12 | 50.0 | 42 |
| | Vegreville East | 24 | 16 | 66.7 | 41 |
| | | (48) | (28) | (58.3) | |
| 4.90 | Scapa West | 16 | 6 | 37.5 | 36 |
| 4.94 | Oyen | 24 | 6 | 25.0 | 51 |
| | ( Morainal - U ) | | | | |
| 4.05 | Trochu | 24 | 8 | 33.3 | 36 |
| 4.07 | Coronation | 24 | 9 | 37.5 | 38 |
| 4.18 | Daysland | 24 | 9 | 37.5 | 39 |
| | Holden | 24 | 12 | 50.0 | 39 |
| | Galahad | 24 | 9 | 37.5 | 38 |
| | | (72) | (30) | (41.7) | |
| 4.19 | Vegreville West | 24 | 17 | 70.8 | 42 |
| 4.20 | Hay Lakes East | 24 | 15 | 62.5 | 39 |
| 4.93 | Kirkpatrick Lake East | 22 | 12 | 54.5 | 51 |
| | ( Morainal/Bedrock - B/M ) | | | | |
| 4.04 | Cremona | 24 | 13 | 54.2 | 36 |
| 4.02 | Gayford East | 20 | 5 | 25.0 | 36 |

1. Grouped by landform ( parent soil material and surface form )
2. Figures in parentheses are composite values for values for those transects occurring within one physiographic unit.
3. All transects were surveyed in 1988 except Oyen and Kirkpatrick Lake East which were surveyed in