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

Report #6: Alberta Fescue Prairie

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 five transects in four physiographic units in the Alberta Fescue Prairie. These units account for just under half of the total area of the ecoregion.

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 is not as close to the level of occurrence of most of those categories within the Alberta Fescue Prairie as it was for either Alberta Mixedgrass Prairie or Parkland.

For the ecoregion sample as a whole:

(a) The distribution of sampling on various soil parent materials and landforms is confined to undulating and rolling morainal categories.

(b) Wetland area averages 4.0 percent of the total land area of sampled physiographic units. This compares to 4.4 percent for Alberta Mixedgrass Prairie and 9.9 percent recorded for Alberta Parkland.

(c) An overwhelming proportion of wetland numbers (94.4 percent) and wetland area (88.5 percent) are temporary or seasonal in nature.

(d) Only 6.3 percent of the wetland area and 0.8 percent of

wetland numbers are classed as permanent water (natural, fresh open water). This compares to 2.4 and 1.5 percent, respectively, for Alberta Mixedgrass Prairie and 18.5 and 5.4 percent, respectively, for Alberta Parkland.

(e) One quarter of the wetland area is not subjected to any human use. Grazing occurs on 41.6 percent of the wetland area.

(f) Over three quarters (78.4 percent) of the total upland area is in annual crops compared to 60.9 percent in Alberta Mixedgrass Prairie and 63.8 percent in Alberta Parkland. Native cover occurs on 17.3 percent of the upland compared to 29.6 percent in Alberta Mixedgrass Prairie and 28.0 percent in Alberta Parkland.

(g) Grazing occurs on only 14.0 percent of the uplands compared to 27.8 percent in Alberta Mixedgrass Prairie and 21.5 percent in Alberta Parkland.

(h) One physiographic unit, the Rosebud Creek Plain, is rated as having the best habitat for waterfowl production in the sampled part of the morainal portion of the ecoregion. However, when it is rated in comparison to Parkland units it is downgraded to a class four. The Milk River Upland, on the other hand, is initially rated as a two but when rated in comparison to Parkland units retains a class three rating and therefore emerges as the best morainal waterfowl production unit in the Alberta grassland ecoregions.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

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

Report #6: Alberta Fescue Prairie

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 data presented in this report represents 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 summarized in Report #4 (Millar 1992a). In this report only methodology relating specifically to the Alberta Fescue Prairie will be discussed.

A. Delineation of Physiographic Units

Boundary changes from those delineated by Adams (1985) - These have affected all of the physiographic units in the mapped area to a greater or less degree.

Redefinition of physiographic units - In Alberta Fescue Prairie three physiographic units have been redefined. The Del Bonita Plain (formerly 3.02) has been substantially reduced in size and has been given a new numerical designation, 3.10. A new unit, the Milk River Upland, has been created out of portions of the old

2.05 Mixedgrass unit, formerly called the Milk River Upland, and the Del Bonita Plain. It has been given the numerical designation 3.02 which was previously assigned to the Del Bonita Plain. A second new unit, the Sweetgrass Upland, has been identified along the United States border and given the designation 3.11.

B. Sampling Network

Two of the five transects discussed in this report are the product of transect splitting which involves one split between fescue and mixedgrass and one between fescue and parkland.

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

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

1. Total wetland area - 4.0 percent of total land area
2. Grassy wetland cover - 34 percent of total wetland area
3. Bulrush/cattail cover - 2.4 percent of total wetland area
4. Open water wetlands - 10 percent of total wetland area

5. Unused wetlands - 19 percent of total wetland area
6. Shrubby and grassy upland cover - 18 percent of total upland area.
7. Unused uplands - 2.2 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

IV. Results and Discussion

A. General Information on Alberta Fescue Prairie

1. Ecoregion Area and Distribution of Sampled Units

The total area occupied by the Alberta Fescue Prairie is calculated to be approximately 1,380,000 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.

Four physiographic units which have been sampled with habitat monitoring transects account for just under half (45.8 percent) of the total area of the ecoregion (Table 1) while unsampled units cover 47.8 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 6.4 percent of the total area of the ecoregion.

2. Distribution of Landforms in the Ecoregion

The distribution of various landforms in Alberta Fescue Prairie is summarized in Table 2. Morainal terrain occupies just over three quarters (76.1 percent) of the total area of physiographic units in the ecoregion and 64.3 percent of that area is in units currently being sampled in this study. Just over half of the morainal area is made up of undulating ground moraine and rolling terrain accounts for another 36 percent. All of the undulating terrain is in units which have been sampled while 37.3

percent of the rolling terrain has been sampled. Just over 13 percent of morainal terrain has a dissected landform and none of that is in sampled units.

Over one fifth (22 percent) of the land in physiographic units is on predominantly lacustrine parent material. None of this area is in units which have been sampled. All of the lacustrine terrain has undulating topography.

The remaining 1.9 percent of land in physiographic units is on terraced fluvial landform. None of this area is in units which have been sampled.

The distribution of habitat sampling between various parent material and landform categories is also shown in Table 2. For the major morainal categories the relationship between distribution of sampling effort and distribution of the category is not nearly as close as it was in either the Alberta Parkland or Mixedgrass Prairie (Millar 1992a, 1992b). Undulating terrain accounts for 38.8 percent of the total land area in physiographic units but 79.3 percent of our sampling effort is in that landform. On the other hand, rolling morainal terrain occurs on 27.1 percent, of the total area in physiographic units and 20.7 percent of our sampling is in that landform. The dissected morainal category is not sampled at all. In the Alberta Fescue Prairie all of our sampling effort is concentrated in two morainal categories while those same categories occupy only 65.9 percent of the total land area in physiographic units in the ecoregion.

3. Location and Landform Character of Individual Physiographic Units

Figure 1 shows the location of all physiographic units in Alberta Fescue Prairie, including both those covered in this report and units which have not been sampled at all.

This report presents baseline habitat data for five sample sites in four physiographic units. Individual units and transects located in them are listed in Table 3. Collectively these units comprise an area of approximately 631,800 hectares (Table 5) or about 45.8 percent of the total Alberta Fescue Prairie Ecoregion.

Origin of soil parent material and surface form for the four units are summarized in Table 3. All of the units are entirely or predominantly of morainal origin. Three of the units have predominantly undulating morainal landform and one is on rolling morainal terrain.

The seven physiographic units in Alberta Fescue Prairie which have not been sampled to date are summarized in Table 4 as to their soil parent material, surface form and area. Four of them are entirely or predominantly morainal in nature and two are on lacustrine material. One is of fluvial origin.

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 0.9 percent of the Rosebud Creek Plain to a high of 1.8 percent of the Frank Lake

Plain. Overall sample size for the four units is 1.1 percent.

Two of the four 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 Fescue Prairie this situation is most extreme in the Milk River Upland which has been divided into seven 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 five individual transects in Alberta Fescue Prairie there is a 6-fold variation (1.3 to 7.9) in the percent of total land area occupied by wetlands (Table 6). The level of variation is comparable to that recorded for Alberta Parkland (Millar 1992a) and most of Alberta Mixedgrass Prairie (Millar 1992b).

i. Landform character and wetland area - All five of the transects in Alberta Fescue Prairie are located on morainal terrain. Transects on undulating ground moraine have both the

highest and lowest percentages of wetland area. The highest value at Strathmore (7.9 percent) is not quite double the next highest value (4.4 percent) and is most certainly to some extent an artifact resulting from the presence of irrigation on part of that transect. Gayford West, which has the second highest value, is also affected to a minor extent by irrigation. The wetland value on the single transect in rolling terrain is within the range recorded for the transects on undulating landform.

For the sampled portion of the ecoregion as a whole the percent of land area occupied by wetlands averages 4.0 which is comparable to that in Alberta Mixedgrass Prairie (4.4 percent, Millar 1992b) but less than half that recorded for Alberta Parkland (9.9 percent, Millar 1992a).

ii. Variability in wetland area between samples within the same physiographic unit - One of the four physiographic units sampled in the Alberta Fescue Prairie, the Frank Lake Plain, contains two transects. The expectation in such a situation is that transects within the same relatively homogeneous unit should have reasonably comparable habitat values. This does not hold true in this case any more than it did in previous reports. In the Frank Lake Plain the Vulcan West transect has wetlands covering 1.3 percent of the sample while the Farrow has 3.2 percent coverage, some two and one half times greater. The Frank Lake Plain contains no sub-units so the differences between the two transects confirm that there is a high degree of habitat variability even in areas considered to be relatively 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 0.1 percent at Gayford West to 3.5 percent at Strathmore (Table 6) where 44 percent of the total wetland area is cultivated. The Vulcan West transect has the lowest percent of total land area in wetlands (1.3) but almost half of that is cultivated.

Differences between transects in the same physiographic unit, in percent of total land area occupied by cultivated wetlands, are quite small because of the size of the percentages involved.

For the ecoregion as a whole, total land area occupied by cultivated wetlands averages 1.2 percent. This is slightly more than that observed in either Alberta Parkland (0.9 percent, Millar 1992a) or Alberta Mixedgrass Prairie (0.7 percent, Millar 1992b) and is due to the large value for Strathmore.

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 shrub or tree cover are considered collectively as the cover types most indicative of temporary or

seasonal water conditions and this group dominates (69.9 to 98.3 percent of total wetland area) in all transects. Interestingly, the highest value occurs at Strathmore, the partially irrigated transect. As expected, the level of dominance by the cultivated/grassy/wooded cover group is substantially higher than in Alberta Parkland. In three of the five transects dominated by this group those cover categories accounted for more than 90 percent of the total wetland area.

The percent of wetland area that is cultivated in the five transects varies from 2.4 percent at Gayford West to 44.8 percent at Vulcan West, both on undulating morainal terrain. In contrast to the situation observed in Alberta Mixedgrass Prairie (Millar 1992b), a high rather than low cultivation value is associated with the presence of some irrigation at Strathmore. The three lowest levels of cultivation are associated with the three highest levels of grazing.

Grass (including sedges and forbs) is the dominant cover class all five transects. While both wet meadow and shallow marsh vegetation are included in the class, groundtruthing surveys have confirmed that the majority of the area involved is shallow marsh. However, the proportion of wet meadow vegetation is higher than that recorded for Alberta Parkland.

Willow and tree cover is of only rare occurrence in wetlands in the grassland ecoregions. In the fescue sample covered in this report willows are not recorded at all on any of the transects.

Bulrush and cattail (deep marsh vegetation) are completely

absent from four of the five transects and occupy 4.7 percent of the wetland area in the Gayford West transect.

Transitional open water, which can only be identified from ground surveys, is totally absent from all transects, suggesting that none of the sampled portion of the Fescue Prairie Ecoregion has experienced above-normal water levels in recent years.

Natural fresh open water is quite variable in its occurrence. It is completely absent from two transects and ranges up to 20.4 percent at Ross Lake. In this report open running water has been grouped with natural open water in ponds.

The range in area of artificial open water (0.6 to 7.1 percent) is marginally greater than that recorded for Alberta Parkland but only half that recorded for Alberta Mixedgrass Prairie. The maximum value of 7.1 percent at Gayford West is composed of a combination of dugouts, dammed watercourses, irrigation ditches and gravel pit excavations. Interestingly, the second lowest value for artificial open water occurs on the partially irrigated Strathmore transect.

Saline open water is absent from all five transects. Other cover classes are recorded on only two transects and never account for more than 4.5 percent of the wetland area. In both cases those cover classes are indicative of disturbance situations.

The percent of wetland area in various cover classes varies considerably between transects within the same physiographic unit but not as widely as recorded in previous reports. Of the three data pairs (i.e., those cover classes which were recorded in both

transects), one or 33.3 percent has a difference of less than five percent of the total wetland area while in the remaining two the differences are greater and run as high as 17.7 percent. Both of the large differences are associated with the two major cover types. 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, the small difference occurs with the one minor cover class.

For the ecoregion sample as a whole 97.4 percent of the total wetland area falls into four cover classes: grass - 60.1 percent, cultivated - 28.4 percent, natural open water - 6.3 percent, and artificial open water 2.6 percent. As in previously reported ecoregions, grass is the predominant cover class. Other cover classes, however, continue to show variability in their relative ranking from ecoregion to ecoregion.

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 3.7 per quarter section at Vulcan West to 11.5 at Farrow. The maximum density of 11.5 at Farrow is higher than the maximum (9.8) recorded for Alberta Mixedgrass Prairie (Millar 1992b) but just half that (23.5) recorded for Alberta Parkland (Millar 1992a).

The variability in wetland density between transects within the same physiographic unit is at a maximum within our sample since both the minimum (3.7 at Vulcan West) and maximum (11.5 at Farrow) densities occur within the same unit.

For the entire ecoregion sample the average density is 7.6 per quarter section, 29 percent higher than that recorded for Alberta Mixedgrass Prairie but only 56 percent of that recorded for Alberta Parkland.

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 woody vegetation, collectively dominate (80.7 to 97.2 percent) the numbers of wetlands in all five of the transects (Table 8). In only one of these transects, Gayford West, does the level drop below 90 percent. In contrast to the situation observed at Lethbridge in

the Mixedgrass Prairie (Millar 1992b), irrigation at Strathmore has not reduced the dominance of cover classes characteristic of temporary or seasonal wetlands. Grasses dominate in two transects and cultivation in three while woody vegetation is totally absent from wetlands in all five transects.

With few exceptions, representation of all other cover classes is at a very low level. Natural fresh open water never exceeds 3.0 percent of the wetlands and is absent from both transects (Farrow and Vulcan West) in the Frank Lake Plain. Bulrush/cattail were recorded only in two transects, Strathmore and Gayford West, where there was some irrigation and achieved a maximum of 2.0 percent in the latter transect. Transitional open water and saline open water are totally absent from all transects. In the five transects 0.6 to 12.4 percent of the wetlands are artificial open water. Other cover classes are recorded in four of the five transects to a maximum of 2.0 percent.

The variability in percent of total wetland numbers in various cover classes between different transects within the same physiographic unit is slightly less (up to 14.9 percent of total wetland numbers) than that discussed earlier for wetland area. In contrast to the situation with wetland area where there were large (> five percent) differences between members of only two of three data pairs, the differences in percent of total wetland numbers exceeded five percent in all three data pairs.

For the ecoregion sample as a whole 94.4 percent of the wetlands are dominated by grass (46.4 percent), and cultivation

(48.0 percent). Of the remaining wetlands, 0.8 percent are dominated by natural fresh open water, 3.9 percent by artificial open water, 0.4 percent by bulrush/cattail and 0.5 percent by all other categories together. Wooded, transitional open water and saline open water wetlands are totally absent from the Fescue Prairie sample. The percentage of wetlands which are cultivated in the Fescue Prairie sample is roughly double that recorded for both Alberta Mixedgrass Prairie and Parkland while all other cover categories occurred less frequently than in either of the other ecoregions.

e) Area of Wetlands in Various Land Use Activity Classes

Utilization of wetlands in the five transects falls into five major land use categories - no use, abandoned cultivation, annual crops, haying and grazing. Collectively these five activity classes occur on 95.6 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 12.4 percent at Strathmore to 38.0 percent at Gayford West.

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. This category most frequently 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. The percent of the total wetland area in this category ranges from zero to 2.3 for the five transects covered in this report.

The amount of wetland area being used for crop production ranges from 2.4 percent at Gayford West to 44.8 percent at Vulcan West.

Haying of wetlands occurs in three of the five transects and on 0.3 to 2.9 percent of the total wetland area in those transects. Maximum extent of wetland haying in Alberta Fescue Prairie is somewhat less than that recorded for Alberta Mixedgrass Prairie (3.7, Millar 1992b) and just over one quarter of that recorded for Alberta Parkland (10.1 percent, Millar 1992a). There is no apparent association between haying and landform.

Grazing of wetlands occurs in all of the five transects and on 8.1 to 54.2 percent of the wetland area. The maximum level of grazing in Alberta Fescue Prairie is just over half that recorded for Alberta Mixedgrass Prairie (Millar 1992b). In four of the five transects grazing occurs on more than 30 percent of the wetland area and in two of those it occurs on more than 50 percent of the wetland area. As in all previously reported ecoregions, 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 four of five transects and in none of those cases do those uses exceed 4.4 percent of the wetland area.

The frequency of substantial differences in land use activities on wetlands in different transects within the same physiographic unit is somewhat more than that observed for cover and wetland area data. Large differences (over five and up to 35.6 percent of the total wetland area) occur in 75 percent of the four data pairs and triads.

For the ecoregion sample as a whole, 95.9 percent of the total wetland area falls into four land use categories, no use, annual crops, haying and grazing. This compares with 97.7 percent for those categories in Alberta Parkland (Millar 1992a) and 94.0 percent in Alberta Mixedgrass Prairie (Millar 1992b). One quarter of the wetland area is unused compared to 16.8 percent in Mixedgrass Prairie and 47.3 percent in Parkland. The level of grazing is comparable to that recorded for Alberta Parkland (41.6 and 38.2 percent, respectively) but well below the 60.5 percent observed in Mixedgrass Prairie. This could be a reflection of the fact that the entire fescue sample is on landforms suitable for crop production, i.e., undulating and rolling. This conclusion is further supported by the fact that the proportion of wetland area utilized for cropping is considerably higher in the Fescue Prairie (28.5 percent) than in either the Mixedgrass Prairie (16.4 percent) or Parkland (8.7 percent). Haying occurs on 1.5 percent of the wetland area compared to 0.3 percent in Mixedgrass Prairie and 3.5 percent in parkland.

f) Wetland Size Distribution

Variations in the size distribution of wetlands amongst

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 13.6 at Ross Lake to a high of 35.0 at Gayford West (Table 10).

The difference in the rate of impaction between transects in the same physiographic unit is quite low, 6.1 percent of total wetlands.

For the entire ecoregion sample the average impaction level is 22.4 percent compared to 35.6 percent in Alberta Mixedgrass Prairie

and 26.5 percent in Alberta Parkland.

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 Fescue Prairie.

No streams are recorded in three of the five transects and in the remaining two the percent of quarter sections containing streams is 4.2 at Strathmore and 37.5 at Gayford West.

In the total ecoregion sample 9.1 percent of all quarter sections contain stream segments. This is somewhat lower than the average recorded for either Alberta Mixedgrass Prairie (11.8 percent) or Alberta Parkland (14.5 percent).

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 five Alberta Fescue Prairie transects 98.8 to 99.9 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 all five of the transects and occupy 64.5 to 93.3 percent of the upland area. Vulcan West is the most intensively cultivated transect in the ecoregion with 93.3 percent of its uplands in crop as well as 44.8 percent of its wetland area.

Native grass occupies 5.3 to 34.2 percent of the uplands in

the five transects.

Shrubs, as is to be expected in a grassland situation, are a very minor element in the landscape. Low shrubs (buckbrush) are present in three transects and occupy from a trace to 0.2 percent of the upland area while tall shrubs also occur in three transects and on a trace to 0.2 percent of the uplands.

Native trees are recorded in three transects and on a trace to 0.1 percent of the uplands.

Total native cover occupies from 5.3 to 34.8 percent of total upland area in the five transects. In three transects it occupies more than 10 percent of the upland area and in one it exceeds 20 percent.

Planted grasses and forbs are found on 0.6 to 6.3 percent of the uplands.

Planted trees and shrubs are a very 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 very low. Four of the five data pairs for individual cover classes have small differences (five percent or less of total upland area). The single large difference (only 7.5 percent) is associated with annual crops.

For the ecoregion sample as a whole 78.4 percent of the total upland cover is annual crops and summerfallow. This is higher than that recorded for either Alberta Mixedgrass Prairie (60.8 percent, Millar 1992b) or Alberta Parkland (63.8 percent, Millar 1992a).

Total native cover accounts for 17.3 percent of the upland area compared to 29.6 percent in Alberta Mixedgrass Prairie and 28.0 percent in Alberta Parkland. Almost all of that amount (17.1 percent) is native grass. Planted grasses and forbs cover 3.5 percent of the uplands, compared to 8.3 percent for Alberta Mixedgrass Prairie and 6.7 percent for Alberta Parkland. As mentioned previously, Vulcan West is the most intensively cultivated transect in Alberta Fescue Prairie with 93.3 percent of its upland area in crop as well as 44.8 percent of its wetland area.

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 0.6 to 5.0 percent of upland area. Land which has been abandoned from other uses never amounts to more than 0.7 percent of the total upland area in any transect.

Forage production occurs on 0.1 to 0.9 percent of the upland area in four of five transects. Grazing occurs in all transects on 2.4 to 32.4 percent of the uplands. Land use activities which are associated with native vegetation and/or planted grasses and forbs

collectively never occupy more than one third of the total upland area in any of the five physiographic units.

A minor but consistent part of the uplands is devoted to farmsteads (0.8 to 1.2 percent) in four of the five transects and to roads and railways (2.1 to 3.3 percent) in all transects. Other land uses collectively occupy zero to 1.9 percent of the uplands. Variability in land use activity values between transects within the same physiographic unit is as low as that observed for upland cover with only one large difference in the seven data pairs. The single large difference of only 7.5 percent is associated with production of annual crops.

For the ecoregion sample as a whole, land use activities occur in descending order of importance as follows: annual crop production (78.4 percent), grazing (14.0 percent), roads and railways (2.9 percent), idle (no use and abandoned - 2.8 percent), farmsteads (0.8 percent), other uses (0.6 percent) and forage production (0.4 percent).

Utilization of uplands for crop production is higher in the Alberta Fescue Prairie than in either the Mixedgrass Prairie or Parkland while a lower proportion of the land is devoted to forage or grazing. The percent of upland area used for farmsteads, roads and railways and "other uses is comparable in all three ecoregions. Idle land (unused plus abandoned) occurs at about the same level (2.8 and 2.2 percent, respectively) in both Fescue and Mixedgrass Prairies but that is substantially below the 6.6 percent recorded for Alberta Parkland.

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 indications 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 (one, two and zero, respectively - Table 14). In the three upland cover classes, cropland, native grass and native trees, these numbers rise to three, five and zero transects, respectively (Table 15), suggesting a greater amount of variability in the extent of upland cover. In both cases the zero values for woody vegetation reflect the absence or infrequent distribution of that cover type in the Fescue Prairie.

Extremes in data variability are also to be found in upland land use categories (Table 16). In three of the transects the

standard error exceeds the mean for unused land. For grazing this situation occurs in all five of the transects. 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 indicate 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 situation very much.

When data for the entire ecoregion sample are analysed collectively the degree of variability is reduced but not as much as was noted for other ecoregions. In Fescue Prairie four categories (cultivated wetlands, native upland grass, unused upland, and grazing) out of nine in Tables 14 to 16 have standard errors which continue to exceed 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 land use activity class in each physiographic unit are presented in Tables 17 to 19, respectively.

Within the group of physiographic units sampled in Alberta Fescue Prairie the top unit in terms of total quantity of wetland habitat is the Rosebud Creek Plain (3.08). It is the largest unit and ranks first or second in various wetland qualities which contribute to good waterfowl habitat. These include: (a) areas and numbers of semi-permanent and permanent wetlands for secure brood rearing habitat, (b) 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.

This unit is, however, modified to some extent by irrigation. None of the units has significant quantities of permanent or semi-permanent brood waters.

Extrapolated wetland data for the entire sampled portion of Alberta Fescue Prairie 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 assumed 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.

The total wetland area estimate generated in the ecoregion analysis is lower than that produced in the physiographic unit analysis by 8.0 percent (Table 17). Five of the six cover classes recorded in the ecoregion sample also have lower values and the sixth, the "other" category, had equal values. Differences in the five cover classes range from four to 20 percent and the three

largest differences (12.5 to 20 percent) are all associated with the least abundant cover classes.

The pattern for wetland numbers is considerably different (Table 18). The ecoregion analysis of total wetland numbers is higher than the physiographic unit analysis by 3.0 percent. Two of six cover classes are higher by 10.1 and 33.3 percent, two are equal and two are lower by 2.6 and 14.3 percent. The extreme positive and negative differences are both associated with small numbers of wetlands.

The ecoregion analysis of wetland area devoted to various land use activities produces lower values in four of the six categories by four to 20 percent, an equal value in one category and a higher value in one category by 50 percent (Table 19). This latter extreme difference is associated with a very small estimated wetland area.

3. Uplands

Estimated areas of upland cover and land use activity classes are presented in Tables 20 and 21. Amongst the four physiographic units covered in this report, the Rosebud Creek Plain (3.08) ranks first in total upland area and a close second in both estimated amounts of upland nesting cover in the form of native vegetation plus planted grassy cover and the amount of upland in land uses which are conducive to the perpetuation of nesting cover, i.e., idle land, forage production and grazing. The top ranking unit for the quantity of the above-mentioned upland cover and land use classes is the Milk River Upland (3.02) and it is the smallest of

the four sampled fescue units.

Extrapolated upland data for the entire sampled portion of the Alberta Fescue Prairie have been summarized in the same ways as previously described for wetland data. The two analyses generate virtually identical values for total upland area. Three individual cover class estimates generated in the ecoregion analysis are higher by 3.3 to 50.0 percent and five are lower by 4.5 to 85.0 percent than those produced in the physiographic unit analysis. Deviations, both positive and negative, in excess of 10 percent are all associated with cover types which involve minor land areas.

In the comparison of upland land use data values the ecoregion estimate is higher (by 3.3 percent) for only one land use, equal for one and lower by 1.1 to 20.0 percent for the remaining six uses. The extreme difference of 20.0 percent is associated with a relatively minor land use category.

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 Fescue Prairie 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 one sampled morainal unit, the Rosebud Creek Plain (3.08) receives top rating as a waterfowl production area relative

to other sampled units in the Alberta Fescue Prairie (Table 22). The Milk River Upland (3.02) rates as a two, the Serviceberry Creek Plain (3.07) as a three and the Frank Lake Plain (3.06) as a four. The last two units have both been downgraded for losing points for both semi-permanent and permanent wetlands.

In a previous report (Millar 1992b) the differences in minimal habitat rating values between ecoregions was noted. Accordingly, the Alberta Fescue Prairie units have also been rated using both Alberta Mixedgrass Prairie and Alberta Parkland rating values. When Mixedgrass Prairie values are applied the ratings for the Rosebud Creek Plain, Milk River Upland and Frank Lake Plain remain unchanged at one, two and four, respectively. The Serviceberry Creek Plain, however, drops from a three to a four. When Parkland values are applied the Rosebud Creek Plain drops from a one to a four due in part to downgrading because of a low semi-permanent and permanent wetland values. The Milk River Upland drops one level to a three and at that level rates as the best waterfowl production habitat in the Alberta grasslands when rated in comparison to parkland units. It is characterized by the presence of large permanent wetlands in an environment with a significant rangeland component.

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 the 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 63 months (Table 23). Recorded changes are as small as the cultivation of a single wetland and as extreme as the breaking of most of an entire quarter section. Frequently the changes have been 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 five transects and the percent of quarter sections affected ranges from 16.7 at Gayford West to a high of 54.2 at Farrow. Attempts to associate levels of change with land use practises is difficult because of the variability in time between aerial survey and groundtruthing. The lowest levels of change are, however, all associated with the highest levels of grazing and the highest levels of change both occur on transects which are the most intensively cultivated. The difference in percent of affected quarters recorded for transects within the same physiographic unit is quite large.

The extent to which quarter sections in the Alberta Fescue Prairie sample have been affected by land use/cover change is lower (16.7 to 54.3 percent) than that reported for transects in Alberta

Mixedgrass Prairie as a whole (12.5 to 70.8 percent) but the level of change in Mixedgrass Prairie is lower (12.5 to 43.8 percent) if the high rates of change in intensively irrigated transects are omitted (Millar 1992b). The level of change in Fescue Prairie is substantially lower than that reported for Alberta Parkland (Millar 1992a) even though the time interval between the taking of aerial photos and completion of groundtruthing surveys is greater for most of the transects in the Fescue Prairie. This suggests that in the last few years agricultural change has been proceeding at a slower pace in the Alberta Fescue Prairie than it has in the Alberta Parkland.

V. 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.

Millar, J.B. 1992a. Baseline (1985) habitat estimates for the settled portions of the Prairie Provinces. Report #4: Alberta Parkland. Can. Wildl. Serv. Unpubl. Rep. 72 pp.

Millar, J.B. 1992b. Baseline (1985) habitat estimates for the settled portions of the Prairie Provinces. Report #5: Alberta Mixedgrass Prairie. Can. Wildl. Serv. Unpubl. Rep. 66 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 Fescue Prairie.

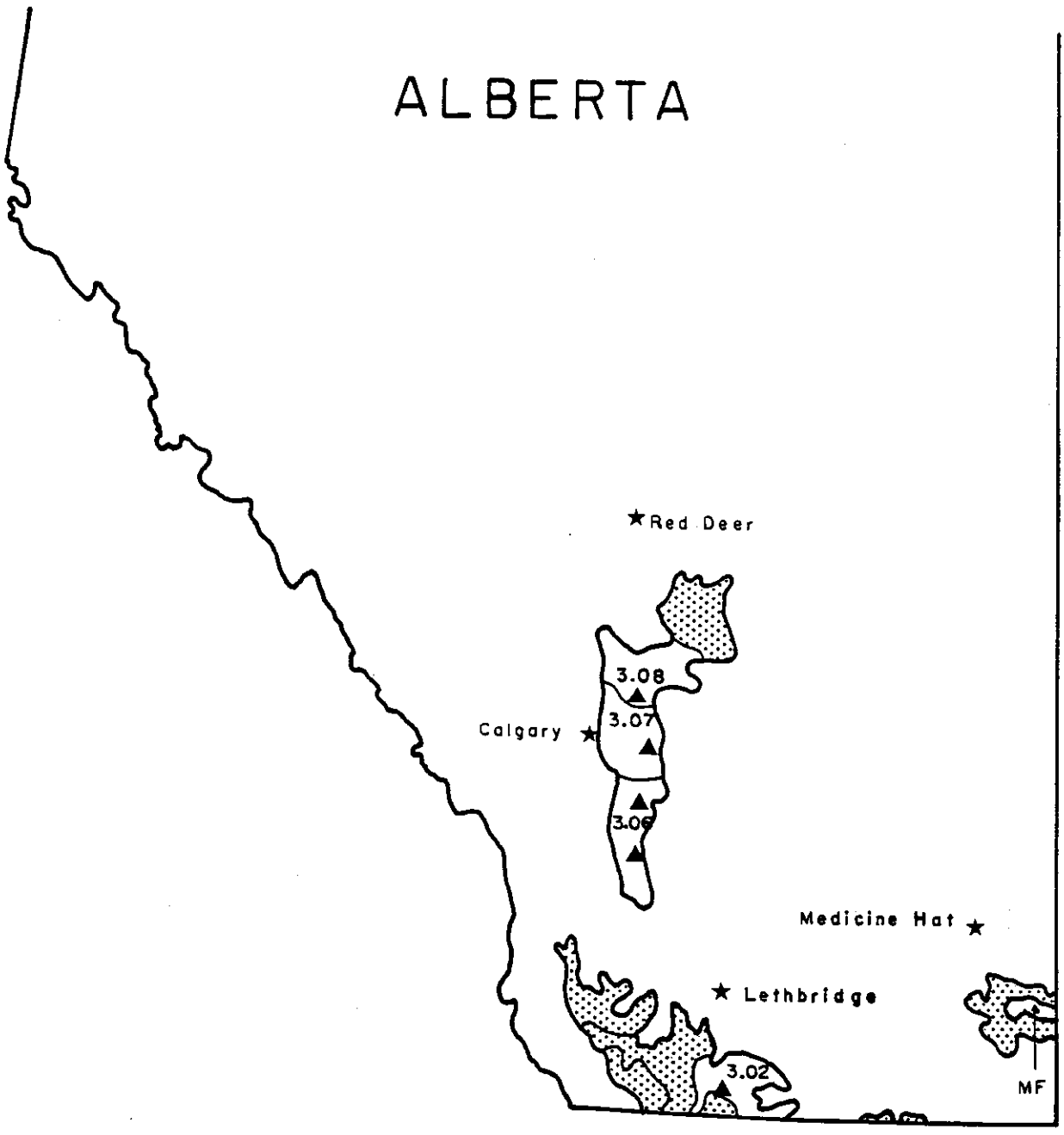

Table 1. Distribution of Habitat Sampling Relative to the Entire Alberta Fescue Prairie.

	Area		
	No. of Units	In Hectares[1]	As Percentage of Entire Ecoregion
Sampled Physiographic Units	4	631,800	45.8
Unsampled Physiographic Units	7	659,700	47.8
Areas Not Included in Physiographic Units			
- River and Stream Valleys	-	67,300	4.9
- Lakes[2]	-	5,200	0.3
- Urban Areas[2]	-	16,000	1.2
Total Alberta Fescue Prairie Ecoregion	11	1,380,000	100

[1] To the nearest 100 hectares.

[2] Larger than 500 hectares.

Table 2. Distribution of Landforms in Alberta Fescue Prairie.

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	Undulating	501,000 (100.0)	-	501,000 (38.8)	79.3
	Rolling	130,800 (37.3)	219,700 (62.7)	350,500 (27.1)	20.7
	Dissected	-	131,500 (100.0)	131,500 (10.2)	0.0
Total Morainal		631,800 (64.3)	351,200 (35.7)	983,000 (76.1)	100.0
Lacustrine	Undulating	-	284,000 (100.0)	284,000 (22.0)	0.0
Total Lacustrine		-	284,000 (100.0)	284,000 (22.0)	0.0
Fluvial	Terraced	-	24,500 (100.0)	24,500 (1.9)	0.0
Total Fluvial		-	24,500 (100.0)	24,500 (1.9)	0.0
TOTAL FOR ECOREGION		631,800 (45.8)	659,200 (47.8)	1,291,500	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.

Table 3. Physiographic Units Covered in this Report.

Unit Number	Name	Landform Character[2]		Transect[1]
		Origin of Parent Material	Surface Form	
3.02	Milk River Upland	Morainal	Rolling (Hummocky)	Ross Lake (20)
3.06	Frank Lake Plain	Morainal	Undulating (Rolling)	Farrow Vulcan West (18)
3.07	Serviceberry Creek Plain	Morainal (Lacustrine)	Undulating	Strathmore
3.08	Rosebud Creek Plain	Morainal (Lacustrine)	Undulating	Gayford West

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

[2] Categories in parentheses are of secondary importance.

Table 4. Physiographic Units in Alberta Fescue Prairie which have not been Sampled.

Unit Number	Physiographic Name	Landform Character[1,3]		Area in Hectares[2]
		Origin of Parent Material	Surface Form	
3.01	Elkwater Lake Upland	Morainal	Dissected	119,000
3.03	St. Mary Plain	Morainal	Rolling (Undulating)	140,300
3.04	Waterton Upland	Morainal	Rolling (Veneer)	79,400
3.05	Pincher Plain	Lacustrine (Morainal)	Undulating (Veneer)	130,200
3.09	Ghostpine Plain	Lacustrine	Undulating (Rolling)	153,800
3.10	Del Bonita Plain	Fluvial	Terraced	24,500
3.11	Sweet Grass Upland	Morainal	Dissected	12,500
TOTAL				659,700

[1] Based on data from "A Regional Map Base for a Migratory Bird Habitat Inventory Prairie Provinces", G.D. Adams, revised October 24, 1985.

[2] To the nearest 100 hectares.

[3] Categories in parentheses are of secondary importance.

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

Unit Number	Physiographic Unit Name[1]	Area in Hectares		Percentage that Sample is of Unit Area
		Unit[2]	Sample	
3.02	Milk River Upland (20)	130,800	1,312	1.0
3.06	Frank Lake Plain (42)	158,600	2,768	1.8
3.07	Serviceberry Creek Plain (24)	159,900	1,586	1.0
3.08	Rosebud Creek Plain (24)	182,500	1,594	0.9
TOTAL FOR ECOREGION		631,800	7,260	1.1

[1] Figures in parentheses are the numbers of quarter sections in the sample.

[2] To nearest 100 hectares.

Table 6. Land Area Occupied by Wetlands and Uplands.

Unit	Transect[1]	Sample Size (in ha)	Percent of Total Sample[2]			
			Wetlands			
			Total	Uncultivated	Cultivated	Uplands
	(Morainal - M)					
3.02	Ross Lake	1,312	2.4	2.1	0.3	97.6
	(Morainal - U)					
3.06	Farrow	1,585	3.2	2.3	0.9	96.8
	Vulcan West	1,183	1.3	0.7	0.6	98.7
		(2,768)	(2.4)	(1.6)	(0.8)	(97.6)
3.07	Strathmore	1,586	7.9	4.4	3.5	92.1
3.08	Gayford West	1,594	4.4	4.3	0.1	95.6
Entire Sample	Ecoregion	7,260	4.0	2.8	1.2	96.0

[1] Transects are grouped by landform (parent material and surface form). Letters identifying surface forms in this and following tables are as follows: M - Rolling, U - Undulating.

[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.

Physiographic Unit	Transect[1]	Total Wetland Area in Sample (in ha)[1]	Percent of Total Wetland Area in Cover Class[4]								
			Cultivated	Willows and Trees	Grasses	Bulrush Cattail	Transitional Open Water	Natural Open Water	Artificial Water	Saline Open Water	Other
	(Morainal-M)										
3.02	Ross Lake	32	13.4	0.0	61.1	0.0	0.0	20.4	0.6	0.0	4.5
	(Morainal-U)										
3.06	Farrow	50	29.8	0.0	68.3	0.0	0.0	0.0	1.9	0.0	0.0
	Vulcan West	16	44.8	0.0	50.6	0.0	0.0	0.0	4.6	0.0	0.0
		(66)	(33.8)	(0.0)	(63.7)	(0.0)	(0.0)	(0.0)	(2.5)	(0.0)	(0.0)
3.07	Strathmore	126	44.5	0.0	53.8	0.4	0.0	0.2	1.1	0.0	0.0
3.08	Gayford West	71	2.4	0.0	67.5	4.7	0.0	16.3	7.1	0.0	2.0
Entire Ecoregion Sample		294	28.4	0.0	60.1	1.5	0.0	6.3	2.6	0.0	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.

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-M)											
3.02	Ross Lake	176	8.8	35.8	0.0	61.4	0.0	0.0	1.7	0.6	0.0	0.6
	(Morainal-U)											
3.06	Farrow	276	11.5	57.6	0.0	39.2	0.0	0.0	0.0	2.9	0.0	0.3
	Vulcan West	66	3.7	66.7	0.0	24.3	0.0	0.0	0.0	9.0	0.0	0.0
		(342)	(8.1)	(59.4)	(0.0)	(36.3)	(0.0)	(0.0)	(0.0)	(4.1)	(0.0)	(0.2)
3.07	Strathmore	222	9.3	55.0	0.0	41.9	0.4	0.0	0.4	2.2	0.0	0.0
3.08	Gayford West	97	4.0	14.4	0.0	66.3	2.0	0.0	3.0	12.4	0.0	2.0
Entire Ecoregion Sample		837	7.6	48.0	0.0	46.4	0.4	0.0	0.8	3.9	0.0	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.

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

Physio-graphic Unit	Transect[1]	Total Wetland Area (in ha)[2]	% of Total Wetland Area in Land Use Activity Class[2]					
			No Use	Abandoned Cultivation	Annual Crop	Haying	Grazing	Other
	(Morainal-M)							
3.02	Ross Lake	32	36.1	0.0	13.3	0.0	50.0	0.6
	(Morainal-U)							
3.06	Farrow	50	21.8	1.5	30.1	1.0	43.7	1.9
	Vulcan West	16	44.8	2.3	44.8	0.0	8.1	0.0
		(66)	(34.0)	(1.9)	(35.3)	(0.6)	(26.9)	(1.3)
3.07	Strathmore	126	12.4	0.8	44.4	2.9	36.0	3.6
3.08	Gayford West	71	38.0	0.7	2.4	0.3	54.2	4.4
Entire Ecoregion Sample		294	24.3	1.1	28.5	1.5	41.6	3.0

[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 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-M)			
3.02	Ross Lake	8.8	1.2	13.6
	(Morainal-U)			
3.06	Farrow	11.5	2.4	20.9
	Vulcan West	3.7	1.0	27.0
		(8.1)	(1.8)	(22.2)
3.07	Strathmore	9.3	2.3	24.7
3.08	Gayford West	4.0	1.4	35.0
Entire Ecoregion Sample		7.6	1.7	22.4

[1] Grouped by landform (parent soil material, surface form and percent slope).

[2] Figures in parentheses are composite values for those transects occurring within one physiographic unit.

Table 11. Occurrence of Streams in Data Samples.

Physiogrpahic Unit	Transect[1]	Number of Quarters In Sample[2]	Number of Quarters Containing Streams[2]	Percent of Quarters Containing Streams
	(Morainal-M)			
3.02	Ross Lake	20	0	0.0
	(Morainal-U)			
3.06	Farrow	24	0	0.0
	Vulcan West	18	0	0.0
		(42)	(0)	(0.0)
3.07	Strathmore	24	1	4.2
3.08	Gayford West	24	9	37.5
Entire Ecoregion Sample		110	10	9.1

[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 12. Distribution of Upland Cover Classes.

Physiographic Unit	Transect[1]	Upland Area (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-M)										
3.02	Ross Lake	1281	34.6	0.2	0.0	0.0	34.8	64.5	0.6	0.0	0.1
	(Morainal-U)										
3.06	Farrow	1534	9.6	0.1	0.1	T[4]	9.8	85.8	3.5	0.1	0.8
	Vulcan West	1168	5.3	0.0	0.0	0.0	5.3	93.3	0.8	0.1	0.5
		(2702)	(7.7)	(0.1)	(0.1)	(T)	(7.9)	(89.0)	(2.4)	(0.1)	(0.6)
3.07	Strathmore	1460	16.9	T	T	T	16.9	76.7	5.1	0.3	0.9
3.08	Gayford West	1523	19.0	0.0	0.2	0.1	19.3	73.0	6.3	0.2	1.2
Entire Ecoregion Sample		6966	17.1	0.1	0.1	T	17.3	78.4	3.5	0.1	0.7

[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.

Table 13. Distribution of Upland Land Use Activity Classes.

Physiographic Unit	Transect[1]	Total Upland Area (in ha)[2]	Percent of Total Upland Area in Land Use in Activity							
			Unused	Abandoned	Annual Crops[3]	Forage	Grazing	Farmsteads	Road & Railway	Other
	(Morainal-M)									
3.02	Ross Lake	1281	0.9	0.0	64.5	0.1	32.4	0.0	2.1	0.0
	(Morainal-U)									
3.06	Farrow	1534	2.1	0.5	85.8	0.9	6.7	1.1	2.9	T[4]
	Vulcan West	1168	0.4	0.2	93.3	0.0	2.4	0.8	2.8	0.1
		(2702)	(1.3)	(0.4)	(89.0)	(0.5)	(4.9)	(1.0)	(2.9)	(0.1)
3.07	Strathmore	1460	4.4	0.6	76.7	0.6	11.7	0.8	3.3	1.9
3.08	Gayford West	1523	3.5	0.7	73.0	0.5	17.1	1.2	3.2	0.9
Entire Ecoregion Sample		6966	2.4	0.4	78.4	0.4	14.0	0.8	2.9	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] Includes summerfallow.

[4] T = trace - less than 0.05.

Table 14. Examples of Variability in Wetland Cover Data.

Physio-graphic Unit	Transect[1]	Area in Hectares Per Quarter Section								
		Cultivated[2]			Grass[2]			Willows[2]		
		Mean	S.E.[3]	C.V.[4]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
	(Morainal-M)									
3.02	Ross Lake	0.2	T[5]	0.4	1.0	0.4	2.0	0.0	0.0	0.0
	(Morainal-U)									
3.06	Farrow	0.6	0.1	1.0	1.4	1.0	3.5	0.0	0.0	0.0
	Vulcan West	0.4	0.1	0.6	0.4	0.2	2.0	0.0	0.0	0.0
		(0.5)	(0.1)	(0.9)	(1.0)	(0.5)	(3.4)	(0.0)	(0.0)	(0.0)
3.07	Strathmore	2.3	10.4	21.8	2.8	7.0	12.3	0.0	0.0	0.0
3.08	Gayford West	0.1	0.0	0.3	2.0	2.0	4.9	0.0	0.0	0.0
Entire Ecoregion Sample		0.8	1.1	15.3	1.6	1.1	7.2	0.0	0.0	0.0

[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 percent.

Table 15. Examples of Variability in Upland Cover Data.

Physio-graphic Unit	Transect[1]	Area in Hectares Per Quarter Section								
		Cropland[3]			Native Grass[2]			Native Trees[2]		
		Mean	S.E.[3]	C.V.[4]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
	(Morainal-M)									
3.02	Ross Lake	41.3	160.9	17.4	22.1	147.8	29.8	0.0	0.0	0.0
	(Morainal-U)									
3.06	Farrow	54.8	25.7	2.3	6.1	10.3	8.2	T[5]	0.0	0.2
	Vulcan West	60.5	6.4	0.4	3.4	4.7	5.9	0.0	0.0	0.1
		(57.3)	(13.9)	(1.6)	(5.0)	(5.9)	(7.7)	(T)	(T)	(0.2)
3.07	Strathmore	46.7	101.0	10.6	10.3	42.4	20.2	T	0.0	0.2
3.08	Gayford West	46.3	49.4	5.2	12.0	16.2	6.6	0.1	T	0.6
Entire Ecoregion Sample		49.7	33.8	7.1	10.8	21.7	21.1	T	T	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] S.E. = Standard Error.

[4] C.V. = Coefficient of Variation.

[5] T = trace - less than 0.05 percent.

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

Physio-graphic Unit	Transect[1]	Area in Hectares Per Quarter Section								
		Unused[2]			Grazing[2]			Road & Railways[2]		
		Mean	S.E.[3]	C.V.[4]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
	(Morainal-M)									
3.02	Ross Lake	0.6	1.3	9.1	20.7	160.7	34.7	1.3	0.3	1.0
	(Morainal-U)									
3.06	Farrow	1.3	0.8	2.9	4.3	15.6	17.7	1.9	0.1	0.2
	Vulcan West	0.3	0.1	0.7	1.6	5.0	13.4	1.8	0.1	0.3
		(0.9)	(0.4)	(2.8)	(3.1)	(8.2)	(17.0)	(1.8)	(0.1)	(0.2)
3.07	Strathmore	2.7	11.3	20.2	7.1	43.5	29.8	2.0	0.1	0.2
3.08	Gayford West	2.2	2.6	5.7	10.8	47.1	21.3	2.0	0.6	1.4
Entire Ecoregion Sample		1.5	1.6	11.1	8.9	26.6	31.4	1.8	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.

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

Unit No.	Physiographic Unit[1] Name		Estimated Area in Thousands of Hectares									
			Total Wetland Area	Cultivated	Willows & Trees	Grasses	Bulrush Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
	(Morainal-M)											
3.02	Milk River Upland		3.1	0.4	0.0	1.9	0.0	0.0	0.6	T[2]	0.0	0.1
	(Morainal-U)											
3.06	Frank Lake Plain		3.8	1.3	0.0	2.4	0.0	0.0	0.0	0.1	0.0	0.0
3.07	Serviceberry Creek Plain		12.6	5.6	0.0	6.8	0.1	0.0	T	0.1	0.0	0.0
3.08	Rosebud Creek Plain		8.0	0.2	0.0	5.4	0.4	0.0	1.3	0.6	0.0	0.2
	TOTAL MORAINAL		27.5	7.5	0.0	16.5	0.5	0.0	1.9	0.8	0.0	0.3
Total for Entire Sampled Portion of Ecoregion		A[3]	27.5	7.5	0.0	16.5	0.5	0.0	1.9	0.8	0.0	0.3
		B[4]	25.3	7.2	0.0	15.2	0.4	0.0	1.6	0.7	0.0	0.3

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

[2] T = trace - less than 50 hectares.

[3] Based on summation of values from individual units.

[4] Based on the analysis of the ecoregion sample as a single unit.

Table 18. Estimated Numbers of Wetland Cover Classes in Physiographic Units.

Unit No.	Physiographic Unit[1] Name	Estimated Number of Wetlands (in thousands)									
		Total No. of Area	Cultivated	Willows & Trees	Grasses	Bulrush Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
	(Morainal-M)										
3.02	Milk River Upland	17.6	6.3	0.0	10.8	0.0	0.0	0.3	0.1	0.0	0.1
	(Morainal-U)										
3.06	Frank Lake Plain	19.6	11.6	0.0	7.1	0.0	0.0	0.0	0.8	0.0	T[2]
3.07	Serviceberry Creek Plain	22.4	12.3	0.0	9.4	0.1	0.0	0.1	0.5	0.0	0.0
3.08	Rosebud Creek Plain	11.1	1.6	0.0	7.4	0.2	0.0	0.3	1.4	0.0	0.2
	TOTAL MORAINAL	70.7	31.8	0.0	34.7	0.3	0.0	0.7	2.8	0.0	0.3
Total for Entire Sampled	A[3]	70.7	31.8	0.0	34.7	0.3	0.0	0.7	2.8	0.0	0.4
Portion of Ecoregion	B[4]	72.8	35.0	0.0	33.8	0.3	0.0	0.6	2.8	0.0	0.4

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

[2] T = trace - less than 50 hectares.

[3] Based on summation of values from individual units.

[4] Based on the analysis of the ecoregion sample as a single unit.

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

Unit No.	Physiographic Unit Name	Estimated Area in Thousand of Hectares						
		Total Wetland Area	No Use	Abandoned Cultivation	Annual Crop	Haying	Grazing	Other
	(Morainal-M)							
3.02	Milk River Upland	3.1	1.1	0.0	0.4	0.0	1.6	T[2]
	(Morainal-U)							
3.06	Frank Lake Plain	3.8	1.3	0.1	1.3	T	1.0	0.1
3.07	Serviceberry Creek Plain	12.6	1.6	0.1	5.6	0.4	4.5	0.5
3.08	Rosebud Creek Plain	8.0	3.0	T	0.2	T	4.4	0.4
	TOTAL MORAINAL	27.5	7.0	0.2	7.5	0.4	11.5	1.0
Total for Entire Sampled A[3]		27.5	7.0	0.2	7.5	0.4	11.5	1.0
Portion of Ecoregion B[4]		25.3	6.2	0.3	7.2	0.4	10.5	0.8

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

[2] T = trace - less than 50 hectares.

[3] Based on summation of values from individual units.

[4] Based on the analysis of the ecoregion sample as a single unit.

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

Unit No.	Physiographic Unit[1] Name	Total Upland Area	Estimated Area in Thousands of Hectares								
			Native					Planted			
			Grass	Low Shrub	Tall Shrub	Trees	Total	Annual Crops	Perennial Grass & Forbs	Trees & Shrubs	Other
	(Morainal-M)										
3.02	Milk River Upland	127.7	44.2	0.2	0.0	0.0	4.4	82.4	0.8	0.0	0.1
	(Morainal-U)										
3.06	Frank Lake Plain	154.8	11.9	0.2	0.2	T[2]	12.2	137.7	3.7	0.2	0.9
3.07	Serviceberry Creek Plain	147.3	24.9	T	T	T	24.9	113.0	7.5	0.4	1.3
3.08	Rosebud Creek Plain	174.5	33.2	0.0	0.3	0.2	33.7	127.4	11.0	0.3	2.1
	TOTAL MORAINAL	604.3	114.2	0.4	0.5	0.2	115.2	460.5	23.0	0.9	4.4
Entire Ecoregion Sampled A[3]		604.3	114.2	0.4	0.5	0.2	115.2	460.5	23.0	0.9	4.4
Portion of Ecoregion B[4]		606.5	103.7	0.6	0.6	T	105.0	475.7	21.2	0.6	4.2

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

[2] T = trace - less than 50 hectares.

[3] Based on summation of values from individual units.

[4] 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 No.	Physiographic Unit[1] Name	Estimated Area in Thousands of Hectares								
		Total Upland Area	Unused	Abandoned	Annual Crops	Forage	Grazing	Farmsteads	Roads and Railways	Other
	(Morainal-M)									
3.02	Milk River Upland	127.7	1.1	0.0	82.4	0.1	41.4	0.0	2.7	0.0
	(Morainal-U)									
3.06	Frank Lake Plain	154.8	2.0	0.6	137.7	0.8	7.6	1.5	4.5	0.1
3.07	Serviceberry Creek Plain	147.3	6.5	0.9	113.0	0.9	17.2	1.2	4.9	2.8
3.08	Rosebud Creek Plain	174.5	6.1	1.2	127.3	0.9	29.8	2.1	5.6	1.6
	TOTAL MORAINAL	604.3	15.7	2.7	460.4	2.7	96.0	4.8	17.7	4.5
Total for Entire Sampled A[2]		604.3	15.7	2.7	460.4	2.7	96.0	4.8	17.7	4.5
Portion of Ecoregion B[3]		606.5	14.6	2.6	475.7	2.7	85.2	4.7	17.5	3.6

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

[2] Based on summation of values from individual units.

[3] Based on the analysis of the ecoregion sample as a single unit.

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

Unit No.	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[2] Waterfowl Production Habitat
			Grass	Bulrush/ Cattail	Natural Fresh,Open Water	That is Unused	In Native and Seeded Grass & Shrub Cover	That is Unused		
3.07	Serviceberry Creek Plain	7.9	53.8	0.4	0.2	12.4	22.3	4.4	159.9	3 / 4 / 4
3.08	Rosebud Creek Plain	4.4	67.5	4.7	16.3	38.0	25.8	3.5	182.5	1 / 1 / 4
3.06	Frank Lake Plain	2.4	63.7	0.0	0.0	34.0	10.4	1.3	158.6	4 / 4 / 4
3.02	Milk River Upland	2.4	61.1	0.0	20.4	36.1	35.4	0.9	130.8	2 / 2 / 3

[1] Physiographic units are arranged in order of diminishing proportion of wetland area in the landscape.

[2] Three waterfowl production habitat ratings have been calculated for each unit using the minimum rating values for, sequentially, Alberta Fescue Prairie / Alberta Mixedgrass Prairie / Alberta Parkland.

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

Physiographic	Transect[1]	Numbers of Quarters[2] In Sample	Numbers of Quarters[2] Affected by Land Use/Cover Changes	Percent of Quarters Affected[2]	Time Interval from May 1985 to Ground Truth Survey (in months)
	(Morainal-M/H)				
3.02	Ross Lake	20	4	20.0	60
	(Morainal-U)				
3.06	Farrow	24	13	54.2	63
	Vulcan - West	18	6	33.3	63
		(42)	(19)	(45.2)	
3.07	Strathmore	24	6	25.0	49
3.08	Gayford - West	24	4	16.7	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.