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

Report #12: Manitoba Mid-Boreal Transition

Prairie Habitat Monitoring Project

March 10, 1993

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ABSTRACT

This report presents data for five transects in five physiographic units in the Manitoba Mid-Boreal Transition Ecoregion. Partial data are also presented for one unit which is sampled only in the Saskatchewan portion of the unit. Collectively these six units account for just over one third of the total area of the ecoregion.

Data are also presented for one transect located just outside the northern limit of the transition ecoregion in the Manitoba Mid-Boreal Lowlands.

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. The accuracy of extrapolated habitat values in the Mid-Boreal Transition is even more variable than it is for data from more southerly ecoregions since this ecoregion is at the northern edge of settlement and several units contain large blocks of totally undeveloped land which have not been sampled.

Distribution of sampling amongst soil parent material categories is very close to the level of occurrence of those categories within the Manitoba Mid-Boreal Transition but the relationship becomes highly variable when further subdivisions on the basis of surface form are introduced.

For the ecoregion sample as a whole:

(a) Wetland area averages 6.0 percent of the total land area of sampled physiographic units. This is approximately two thirds of the levels observed in the parkland samples for the three Prairie Provinces.

(b) Three of the sampled units are on predominantly morainal landforms. Two are on predominantly lacustrine material and one on fluvial terrain.

(c) A large proportion of wetland area (70.9 percent) and an overwhelming proportion of wetland numbers (90.6 percent) are temporary or seasonal in nature.

(d) Almost a fifth (17.4 percent) of the wetland area and 4.2 percent of wetland numbers are classed as permanent water (natural, fresh open water). Most of this is found in the transect in the Riding Mountain Upland.

(e) Over half (58.3 percent) of the wetland area is not subjected to any human use. Grazing occurs on 21.4 percent of the wetland area.

(f) Two thirds (66.7 percent) of the total upland area is in annual crops. Native cover occurs on 23.7 percent of the uplands.

(g) Grazing occurs on 9.5 percent of the uplands.

(h) One sampled morainal physiographic unit, the Riding Mountain Upland, is rated as being class one habitat for waterfowl production. It retains this level even when rated by benchmark Alberta Parkland criteria.

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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 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 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 summarized in Report #4 (Millar 1992a). In this report only methodology relating specifically to the Manitoba Mid-Boreal Transition will be discussed.

A. Delineation of Physiographic Units

Changes in unit boundaries from those delineated by Adams (1985) - All physiographic units in the Manitoba Mid-Boreal Transition have been remapped and most now have some significant boundaries from those delineated by Adams.

Creation and deletion of physiographic units - In Manitoba Mid-Boreal Transition no physiographic units have been created or deleted.

The Interlake Plain (7.32) has been enlarged by inclusion of the Lily Bay Terrace parkland unit (4.80) because the latter lies within the Transition Forest Ecoregion. The Red Deer River Plain, which lies primarily in Saskatchewan, has had its name changed to Lower Red Deer River Plain (7.21) because of a unit split in Saskatchewan.

B. Sampling Network

Two of the five transects located in the Manitoba Mid-Boreal Transition are the product of transect splitting. This has involved a split into two separate transition units.

Two sampled physiographic units straddle the Manitoba-Saskatchewan boundary. One of these, the Lac La Course Plain (7.23), is sampled in the Manitoba portion of the unit. The other, the Lower Red Deer River Plain (7.21), is sampled in the Saskatchewan portion of the unit. Data from this latter transect are included in parts of this report to permit extrapolation of the sample data to the area of the unit located in Manitoba.

Also included in this report are data from a single transect, Fisher Branch, located just outside the northern edge of the Mid-Boreal Transition Ecoregion in the Fisher River Plain of the Manitoba Mid-Boreal Lowlands.

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

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 Manitoba Mid-Boreal Transition are as follows:

1. Total wetland area - 8.4 percent of total land area.
2. Grassy wetland cover - 28 percent of total wetland area.
3. Bulrush/cattail cover - 4.7 percent of total wetland area.
4. Natural fresh open water wetlands - 15 percent of total wetland area.
5. Unused wetlands - 32 percent of total wetland area.
6. Shrubby and grassy upland cover - 13 percent of total upland area.
7. Unused uplands - 11 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 Manitoba Mid-Boreal Transition

1. Ecoregion Area and Distribution of Sampled Units

The total area occupied by the Manitoba Mid-Boreal Transition is calculated to be approximately 3,079,300 hectares (Table 1), based on the boundaries of physiographic units lying wholly or predominantly within the ecoregion. The area calculated in this manner will differ somewhat from the area of the ecoregion when calculated on the basis of surveyed and redefined vegetation boundaries. A comparison of these values still needs to be made.

Six physiographic units which have been sampled with habitat monitoring transects, including one which has been sampled only in the Saskatchewan portion of the unit, account for just over one third (36.4 percent) of the total area of the ecoregion. This is the lowest percentage of any ecoregion to be sampled so far in this study. Unsampled units cover 52.7 percent of the ecoregion. 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 10.9 percent of the total area of the ecoregion.

One sampled unit, the Upper Assiniboine Delta (7.29), occurs as an outlier within the Manitoba Parkland.

2. Distribution of Landforms in the Ecoregion

The distribution of various landforms in Manitoba Mid-Boreal Transition is summarized in Table 2. Morainal terrain occupies half (52.7 percent) of the total area of physiographic units in the ecoregion but only a quarter (23.5 percent) of that area is in

units currently being sampled in this study. One fifth (20.0 percent) of the morainal area is made up of knob and kettle surface form. Undulating ground moraine accounts for 7.7 percent, ridged landform 56.1 percent and dissected terrain 16.2 percent. Most (79.1 percent) of the knob and kettle terrain is in units which have been sampled while all of the units with undulating surface form have been sampled. None of the ridged or dissected morainal terrain have been sampled.

Just under one third (31.0 percent) of the land in physiographic units is on predominantly lacustrine parent material. Just over half (56.2 percent) of this area is in units which have been sampled. Most (74.5 percent) of the lacustrine terrain has level topography and two fifths (41.1 percent) of that is in units which have been sampled. The remainder of the lacustrine terrain has a dissected surface form and all of that has been sampled.

The remaining 16.3 percent of land in physiographic units is on predominantly fluvial material. Over two thirds (68.2 percent) of this area is in units which have been sampled.

The distribution of habitat sampling between various soil parent material and landform categories is also shown in Table 2. The relationship between distribution of sampling effort and distribution of all soil parent materials in the ecoregion is quite close but when surface form is added the relationship becomes highly variable. For example, sampling of all morainal categories collectively amounts to 50.0 percent of our total effort while those same categories occupy 52.7 percent of the total land area in

physiographic units in the ecoregion. However, all of that sampling is confined to two surface forms, knob and kettle and undulating, which collectively comprise only 27.7 percent of total morainal terrain.

3. Location and Landform Character of Individual Physiographic Units

Figure 1 shows the location of all physiographic units in Manitoba Mid-Boreal Transition 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 located in five physiographic units in Manitoba Mid-Boreal Transition. In addition, partial data are also presented for one transect located in the Saskatchewan portion of a sixth unit which straddles the Manitoba-Saskatchewan boundary.

Data are also presented for one sample site located just outside the northern limit of the ecoregion in the Manitoba Mid-Boreal Lowlands.

Individual units and the transects located in them are listed in Table 3. Collectively the six units in the Transition Ecoregion comprise an area of approximately 1,122,400 hectares (Table 1) or about 36.4 percent of the total Manitoba Mid-Boreal Transition Ecoregion.

Origin of soil parent material and surface form for the six transition units and one lowland unit are also summarized in Table 3. Three of the six units are entirely or predominantly of morainal origin. Two are on predominantly lacustrine and one on

fluvial material. One of the morainal units has predominantly knob and kettle landform and two are on undulating ground moraine. One of the lacustrine units is on level terrain and the other has a predominantly dissected surface form. The single fluvial unit has primarily a level surface form. The single Mid-Boreal Lowlands sub-unit is primarily on ridged lacustrine landform.

The 10 physiographic units in Manitoba Mid-Boreal Transition which have not been sampled to date are summarized in Table 4 as to their soil parent material, surface form and area. Five of them are entirely or predominantly morainal in nature, three are on lacustrine material and two are fluvial in 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. The percentage which the area of each sample is of the area of the entire unit is given for both the total area of the unit and the portion of the unit located in Manitoba. Samples range from a low of 0.4 percent of the Lower Red Deer River Plain to a high of 0.7 percent of the total Riding Mountain Upland and Valley River Plain. Overall sample size for the six units is 0.6 percent of the total area of the units. This is at the lower end of the range of 0.5 to 1.1 percent recorded for all the other ecoregions reported on to date (Millar 1989b, 1992 a to f, 1993 a,b).

Only one of the six units contains sufficiently well-defined

variations in surface form, including density and size distribution of wetlands, and soil parent material that it can be divided into two or more sub-units. The Upper Assiniboine Delta has been divided into four 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 substantial additional sampling in other significant sub-units.

The sample in the Fisher River Plain of the Manitoba Mid-Boreal Lowlands is calculated as 1.5 percent of the sub-unit in which it occurs rather than a percentage of the entire unit. This has been done because the sub-unit in which it occurs is predominantly mineral soils similar to the transition unit to the south and the northern sub-unit is predominantly organic soils.

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 Manitoba Mid-Boreal Transition there is a seven-fold variation (2.4 to 16.8) in the percent of total land area occupied by wetlands (Table 6).

For the sampled portion of the ecoregion as a whole the percent of land area occupied by wetlands averages 6.0. This is

about the middle of the range (1.9 to 9.9 percent) recorded for ecoregions reported on to date.

i. Landform character and wetland area - Two of the five transects in the Manitoba Mid-Boreal Transition are located on morainal terrain and in these the total wetland area ranges from 2.4 to 16.8 percent. The wetland area on the transect in knob and kettle moraine (16.8 percent) is the highest recorded for the ecoregion and that on the undulating ground moraine (2.4 percent) is the lowest. The percent of total land area occupied by wetlands in the two lacustrine transects is marginally higher (2.5 and 3.1 percent) than the low end of the morainal values. The single fluvial transect has a somewhat higher wetland area (5.0 percent) than the lacustrine transects.

In the Fisher Branch transect on a ridged lacustrine landform in the Manitoba Mid-Boreal Lowlands wetlands occupy 6.7 percent of the land area, slightly higher than the average for the Manitoba Transition and higher than four out of five of the individual transects in that ecoregion.

ii. Variability in wetland area between samples within the same physiographic unit - None of the units sampled in the Manitoba Mid-Boreal Transition contains more than one transect so this particular analysis is not applicable to this ecoregion.

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 transition transects covered in this report ranges from a trace at Carberry to 1.1 percent at Durban (Table 6) where 47.8 percent of the total wetland area is cultivated (Table 7). In four of the five transects cultivated wetlands occupy less than one percent of the total landscape.

For the ecoregion as a whole, total land area occupied by cultivated wetlands averages 0.5 percent. This ties with Saskatchewan Shortgrass Prairie for the lowest percent of total land area occupied by cultivated wetlands which has been recorded to date (Millar 1992f).

In the Fisher Branch transect 0.7 percent of the total land area is occupied by cultivated wetlands.

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 (61.4 to 93.0 percent of total wetland area) in all transition transects as well as the one Mid-Boreal Lowlands transect (92.2 percent). In only one of the five transition transects and the lowlands transect do those cover categories account for more than 90 percent of the

total wetland area. The level of dominance by the cultivated/grassy/woody cover group in Manitoba Mid-Boreal Transition Ecoregion as a whole is the lowest (70.9 percent) recorded so far in this study.

The percent of wetland area that is cultivated in the five transition transects varies from 0.3 on complex fluvial terrain at Carberry to 47.8 on undulating morainal terrain at Durban. It is the dominant cover class only at Durban.

Grass (including sedge and forbs) is the dominant cover class in three of five transition transects. While both shallow marsh and wet meadow vegetation are included in this case, ground truthing surveys have confirmed that the great majority of the area involved is shallow marsh.

The percentage of total wetland area covered by willows and trees ranges from 1.8 to 63.7 in the transition transects. This cover category is dominant at Carberry. The values given in Table 7 for willows and trees include only cover which can be mapped as polygons and do not include the narrow wooded margins which are characteristic of wetlands in parkland or woodland.

Bulrush and cattail (deep marsh vegetation) occupy from 2.3 to 15.6 percent of total wetland area in the transition transects. A double digit value is attained only in the Carberry transect.

Transitional open water, which can only be identified from ground surveys, was recorded only at Grandview West and there only as a trace.

Natural fresh open water is highly variable in its occurrence.

It is completely absent from two transects and occupies 1.3, 6.6 and 29.1 percent, respectively, of the wetland area in the three transition transects where it is present.

In this report open running water in streams and rivers has not been grouped with natural fresh open water in ponds as in some earlier reports but is recorded as "other".

The range in area of artificial open water in the transition transects is particularly narrow (a trace to 3.9 percent). In four of five transects this cover class occupies 1.9 percent or less of the total wetland area and this is almost entirely in the form of small dugouts. The largest value of 3.9 percent is due to the presence of sewage lagoons and a beaver dam.

Saline open water is absent from all transects covered in this report.

The "other" cover category is recorded in all but one of the transition transects and, where present, accounts for 0.3 to 12.4 percent of the wetland area. In two transects it accounts for less than one percent of the wetland area and in these cases disturbance situations are involved. The two values in excess of one percent (7.0 and 12.4 percent) are both generated by the presence of streams.

For the ecoregion sample as a whole 96.9 percent of the total wetland area falls into five cover classes: grass - 48.4 percent, natural fresh open water - 17.4 percent, willows and trees - 13.7 percent, cultivated - 8.8 and bulrush/cattail - 8.6 percent. These values rank as follows amongst the ecoregions reported on to date.

The grass value is the third lowest, natural fresh open water is the second highest, willows and trees is the highest, cultivated is tied for the lowest and bulrush/cattail is the second highest.

In the Mid-Boreal Lowlands sample 96.0 percent of the wetland area falls into four cover classes: grass - 77.1 percent, cultivated - 11.1 percent, willows and trees - 4.0 percent and bulrush/cattail - 3.8 percent. If the "other" class (3.8 percent) is included, 99.8 percent of the total wetland area is accounted for. The "other" value is due almost entirely to the presence of drainage ditches. Natural fresh open water is almost completely absent (0.2 percent) from this sample due, to an undetermined extent, by the occurrence of extensive drainage.

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 a few very large permanent wetlands.

The mean wetland densities per quarter section for all

transects covered in this report and for the ecoregion samples as a whole are listed in Table 8. Densities range from 1.8 per quarter section at Carberry to 22.9 at Grandview West. Wetland densities on morainal landforms range from 7.5 to 22.9 with the highest figure being associated with knob and kettle terrain. Densities on lacustrine parent material range from 3.3 to 10.6 and on the one fluvial transect the density is 1.8. The maximum density of 22.9 at Grandview West is the fourth highest recorded to date.

The mean wetland density per quarter section on lacustrine material in the lowlands sample is 5.8, within the range for lacustrine samples in the Manitoba Mid-Boreal Transition.

For the entire ecoregion sample the average density is 9.2 wetlands per quarter section. This is the fourth highest density recorded to date and is exceeded only by the values recorded for the three parkland ecoregions.

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., cultivated, grasses (including sedges) and woody vegetation collectively dominate (66.1 to 94.2 percent) the numbers of wetlands in all five transition transects (Table 8). Within these three cover classes grasses dominate in three transects and cultivation in two. From 3.3 to 25.1 percent of

wetlands are dominated by woody vegetation in the five transition transects.

With few exceptions representation of all other cover classes is at a very low level. Natural fresh open water is present in three of five transects and never exceeds 9.3 percent. Bulrush/cattail are present in all five transects and achieve a maximum of 5.1 percent at Dauphin. Transitional open water is present in a very minor amount (0.2 percent) in one transect.

Artificial open water wetlands are present in all five transects and account for 0.2 to 18.0 percent of total wetland numbers. Saline open water wetlands are absent from all transects. From 0.5 to 3.6 percent of total wetlands fall into the "other" category in four of five transects.

For the ecoregion as a whole 90.6 percent of all wetlands are dominated by grass (52.1 percent), cultivation (33.3 percent) and shrubs and trees (5.2 percent). Of the remaining wetlands 4.2 percent are dominated by natural fresh open water, 3.1 percent by artificial open water, 1.3 percent by bulrush/cattail and 0.8 percent by all other categories together.

In the Mid-Boreal Lowlands sample 93.6 percent of wetland numbers fall into four cover categories: grass - 58.4 percent, cultivation - 28.8 percent, bulrush/cattail - 4.3 percent and willows and trees - 2.1 percent. If the "other" (3.6 percent) and artificial open water (2.1 percent) are added in 99.3 percent of all wetlands are accounted for.

e) Area of Wetlands in Various Land Use Activity Classes

Utilization of wetlands in the five transition transects falls into five major land use categories - no use, abandoned cultivation, annual crops, haying and grazing. Collectively these activity classes occur on 83.4 to 99.5 percent of the total wetland area (Table 9). In the lowlands transect this figure is 83.2 percent.

The percent of total wetland area that is not being subjected to any obvious or regular human activity ranges from 34.3 percent at Dauphin to 64.8 percent at Grandview West. The minimal no use value at Dauphin is associated with a high (61.4 percent) level of utilization for grazing and drainage.

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 7.6 for the five transition transects covered in this report.

The amount of wetland area being used for crop production ranges from 0.3 percent at Carberry to 47.8 percent at Durban.

Haying of wetlands occurs on 0.9 to 10.1 percent of the total

wetland area in four of the five transects.

Grazing of wetlands occurs in all of the transects and on a trace to 44.8 percent of the wetland area in those transects. In two of the five transects grazing occurs on more than 30 percent of the wetland area. In the Manitoba Mid-Boreal Transition there are extreme differences between grazing and haying values though one would expect there to be a high degree of association between these two land use activities.

"Other" land use activities on wetlands are recorded in all of the transects but in only one case does those activities exceed 3.8 percent of the wetland area. This one unusually large value of 16.6 percent involves drainage activities.

For the ecoregion sample as a whole, virtually all of the total wetland area (96.8 percent) falls into the five named land use categories, i.e., no use, abandoned cultivation, annual crops, haying and grazing. Over half (58.3 percent) of the wetland area is unused, grazing occurs on 21.4 percent of the wetland area, annual crops on 8.8 percent, haying on 6.0 percent and abandoned cultivation on 2.3 percent. In relation to the ecoregions previously reported on in this study the above values rank as follows: no use - second highest, grazing - fourth lowest, annual crops - second lowest, haying - third highest and abandoned cultivation - fifth highest.

In the Mid-Boreal Lowlands sample 83.2 percent of the wetland area falls into the five named land use categories: no use - 29.8 percent, abandoned cultivation - 1.8 percent, annual crops - 11.1, haying - 34.5 percent, and grazing - 6.0 percent. The value for

haying is the highest recorded so far for any transect in this study. The high level (16.8 percent) of the "other" category is due primarily to drainage activities.

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 in the Manitoba Mid-Boreal Transition ranges from a low of 16.5 at Grandview East to a high of 47.4 at Dauphin (Table 10).

The two highest rates of impaction occur on lacustrine and fluvial terrain.

For the entire ecoregion sample the average impaction level is 22.5 percent. This is almost equal to the previous minimum rate recorded in Alberta Fescue Prairie (22.4 percent, Millar 1992c).

In the Mid-Boreal Lowlands sample 44.6 percent of all wetlands have been impacted in some way.

h) Distribution of Streams

The presence of stream segments in the data samples have been summarized (Table 11) to provide an indication of the relative importance of this type of water body in different physiographic units of the Manitoba Mid-Boreal Transition.

No streams were recorded in one of the five transects and in the remaining four the percent of quarter sections containing streams ranges from 12.5 at Carberry to 25.0 at Durban and Grandview East.

In the total ecoregion sample 15.8 percent of all quarter sections contain stream segments. This is the fourth highest level recorded amongst the ecoregions reported on to date.

In the Mid-Boreal Lowlands sample half of the quarter sections contain stream segments but this is almost entirely an artificial situation created by the widespread presence of drainage ditches.

3. Uplands

a) Distribution of Upland Cover Classes

Upland cover data have been analysed on the basis of seven named classes, four native and three planted, plus a catch-all

named classes, four native and three planted, plus a catch-all category for all other cover. In the five Manitoba Mid-Boreal Transition transects 94.1 to 99.4 percent of the upland cover falls into the seven named classes (Table 12). In the lowland transect this figure is 98.8 percent.

Annual crops and summerfallow are the single most common upland cover class in all five transects and occupy 40.1 to 85.9 percent of the total upland area.

Native grass occupies from 5.4 percent of total upland area at Durban to 13.9 percent at Grandview West.

Shrubs are a minor element in the landscape in all transects. Low shrubs (buckbrush) occupy from a trace to 1.6 percent of the upland area and tall shrubs from 0.2 to 5.5 percent. Native trees cover 1.4 to 22.3 percent of the uplands with the highest value occurring at Carberry.

Total native cover occupies from 7.0 to 38.9 percent of total upland area in the five transects. In four transects it occupies more than 10 percent of the upland area and in three it exceeds 20 percent.

Planted grasses and forbs are found on 1.4 to 14.6 percent of the uplands. Planted trees and shrubs are a minor but consistent part of the landscape, accounting for a trace to 0.7 percent of the upland area in the five transects.

For the ecoregion sample as a whole two thirds (66.7 percent) of the total upland cover is annual crops and summerfallow. Total native cover accounts for 23.7 percent of the upland area. Half of

grass. Planted grasses and forbs cover 6.9 percent of the uplands and planted trees and shrubs 0.3 percent. "Other" cover, primarily man-made surfaces and bare soil other than cropland, occupies 2.4 percent of the uplands. In relation to the other ecoregions which have been reported on so far these values rank as follows: Total native cover is the fourth highest and within that group native trees have the highest value yet recorded while native grass ranks fifth lowest. Annual crops rank fourth lowest, seeded grass ties for third highest and planted trees are in the middle of a very narrow range.

Durban is the most intensively cultivated transect in Manitoba Mid-Boreal Transition - 85.0 percent of upland area and 47.8 percent of wetland area.

In the lowlands sample half of the uplands are cultivated, native cover values are almost identical to the values for the same categories in the transition ecoregion samples. Perennial grass and forbs are almost equal (23.8 percent) to total native cover.

b) Distribution of Upland Land Use Activity Classes

Upland land use data have been separated into seven named 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 all of the transects (five transition plus one lowland) 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 4.1 to 21.2 percent of the upland area. Land which has been abandoned from other uses never amounts to more than 1.4 percent of the total upland area in any transect.

Forage production occurs on 1.1 to 10.0 percent of the upland area in the five transects. Grazing occurs on all transects on 0.5 to 26.7 percent of the uplands.

Land use activities which are associated with native vegetation and/or planted grasses and forbs collectively account for 7.6 to 48.9 percent of the total upland area in any transect.

A minor but consistent part of the uplands is devoted to farmsteads (0.4 to 1.7 percent) and to roads and railways (1.9 to 4.9 percent) in all transects. Other land uses collectively occupy 0.1 to 5.3 percent of the uplands. Residential use is a significant contributor to the higher "other" values.

For the ecoregion sample as a whole, upland land use activities in descending order of occurrence are as follows: annual crop production (66.7 percent), idle (no use plus abandoned - 11.1 percent), grazing (9.5 percent), forage production (6.5 percent), roads and railways (3.3 percent), "other" uses (2.1 percent) and farmsteads (0.8 percent). In relation to average values obtained in the other ecoregions reported on to date the above values rank as follows: annual crops - fourth lowest, idle - the highest level on record, grazing - fifth highest, forage

production - the highest level on record, roads and railways - the highest value in a very narrow range and farmsteads - tied for third lowest in a narrow range.

In the Mid-Boreal Lowlands sample the land use activities are as follows in descending order of occurrence: annual crops - 49.9 percent, forage production - 24.9 percent, idle - 10.6 percent, grazing - 9.4 percent, roads and railways - 3.4 percent, farmsteads - 1.1 percent and "other" - 0.7 percent.

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 transition transects in which the standard error equals or exceeds the mean in relation to the number of transects in which the cover

type was present is very low as follow: zero of five, one of five and one of five, respectively (Table 14). In the lowlands transect the standard error marginally exceeds the mean only for grass.

In the three upland cover classes, i.e., cropland, native grass and native trees, the frequency of the standard error exceeding the mean is consistently higher: three of five, two of five and four of five transects, respectively (Table 15). In the lowland transect the standard error exceeds the mean for cropland and native trees.

The greatest extremes in data variability are to be found in upland land use categories (Table 16). An equally high level of variability (the standard error equals or exceeds the mean in four of five transects) occurs with both unused land and grazing. This differs from the pattern observed in other ecoregions in that the variability for unused land is usually at an intermediate level. For roads and railways the standard error is consistently less than the mean in all transects and strongly so in four of five transects. This latter situation is to be expected since roads and railways are distributed with great uniformity across the country. In the lowland transect the standard error exceeds the mean for both unused land and grazing.

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 or forage production, are markedly different than those of his neighbors. When this happens the data

are strongly skewed and cannot be analysed by standard methods.

When data for the entire Mid-Boreal Transition Ecoregion sample are analysed collectively the standard error is below the mean for six of the nine categories in Tables 14 to 16. Native trees, unused land and grazing all show a high degree of variability in their distribution. This increase in the number of categories showing such variability over the results obtained in most other ecoregions is not surprising when one considers the irregularity of agricultural development at the northern fringes of settlement.

The shortcomings of using limited habitat data from this project to generate estimated habitat values for entire physiographic units have been acknowledged in previous reports but they have become even more obvious as our studies have moved into the fringes of settlement where the distribution of many cover types and land uses are distributed irregularly and where large blocks of undeveloped land exist. However, these habitat estimates are often the only data available for many localities and, if interpreted with care, can provide useful information.

2. Wetlands

Estimations of the area of wetland cover classes, the number of wetlands in each cover class and the area of each wetland land use activity class present in each physiographic unit in 1985 are presented in Tables 17 to 19, respectively.

Within the group of physiographic units sampled in the Manitoba Mid-Boreal Transition the top unit in terms of total quantity of wetland habitat is the Riding Mountain Upland (7.26). It is the third largest unit accounting for just over one fifth of

the total area of sampled units in the ecoregion. However, it is estimated to contain (a) 79.6 percent of the total area and 71.3 percent of the total numbers of semi-permanent and permanent wetlands available for secure brood rearing habitat, (b) 64 percent of total area and 66.8 percent of total numbers of grassy (seasonal) wetlands available for additional breeding pair habitat, as well as (c) 60.1 percent of the total undisturbed wetland area available as good escape cover.

Extrapolated wetland data for the entire sampled portion of the Manitoba Mid-Boreal Transition 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) for the sampled portion of the ecoregion. 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 the ecoregion total 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 just 4.4 percent. Five of the eight cover classes present also have lower values, two by 4.9 percent or less and three by 11.0, 19.3 and 22.2 percent, respectively. One cover class involving less than one tenth of the total wetland area is higher by 28.2 percent and two very minor cover classes have equal values.

The pattern for wetland numbers is somewhat different. The ecoregion analysis of total wetland numbers is higher than the physiographic unit analysis by 6.2 percent. Four of eight cover class values are higher by 1.4, 6.7, 18.5 and 100 percent and three are lower by 1.5, 2.4 and 8.3 percent. The extreme positive value involves a cover class (transitional open water) which is present in only a minute amount. One minor cover class has equal ecoregion and unit values.

The ecoregion analysis of wetland area devoted to various land use activities produces lower values in four of the six categories by 2.4 to 12.3 percent and higher values in two categories by 15.4 and 28.3 percent. The two high positive values involve small land areas.

3. Uplands

Estimated areas of upland cover and land use activity classes are presented in Tables 20 and 21. Amongst the six transition physiographic units covered in this report the Riding Mountain Upland (7.26) ranks fourth in total upland area, third, after the

Upper Assiniboine Delta (7.29) and Dauphin Lake (7.30), in estimated amounts of upland nesting cover in the form of native vegetation plus planted grassy cover and second, after the Upper Assiniboine Delta, in 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 Manitoba Mid-Boreal Transition have been summarized in the same way as previously described for wetland data. The two analyses generate virtually identical values (+0.3 percent for the ecoregion analysis) for total upland area. Six individual cover class estimates generated in the ecoregion analysis are lower by 4.3 to 14.3 percent and two are higher by 3.2 and 6.8 percent than those produced in the physiographic unit analysis.

For upland land use data three ecoregion estimates are higher and five are lower than the physiographic unit summation. The range in size of the differences (+5.0 to +20.5 and -1.1 to -17.8 percent) is higher than that observed for upland cover classes. The one positive double digit difference involves a minor land area while the two negative double digit differences involved significant land areas.

The above results, together with the corresponding data for wetlands, suggest that comparable estimates of the quantities of most major cover and land use classes present in the sampled portion of the Manitoba Mid-Boreal Transition can be obtained by extrapolating the data from physiographic units either individually

or collectively. Results for minor habitat categories are more variable.

The accuracy of extrapolated habitat values will vary more widely from unit to unit in the Manitoba Mid-Boreal Transition than it does in more southerly ecoregions because this ecoregion extends across the northern limit of agricultural settlement and several units contain large blocks of totally undeveloped land which have not been included in our sampling network. These undeveloped lands include Riding Mountain National Park (Riding Mountain Upland), Spruce Woods Provincial Park (Upper Assiniboine Delta) and undesignated wilderness areas in the above units plus the Lower Red Deer River Plain. In future analyses designated areas such as parks and forest reserves can be deducted from unit area calculations with little difficulty but the delineation and removal of scattered areas of undesignated wilderness is a more difficult task.

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 Riding Mountain Upland (7.26) receives top rating as a waterfowl production area relative to other sampled morainal units in the Manitoba Mid-Boreal Transition (Table 22). The remaining two units, Lower Red Deer River Plain (7.21) and Lac La Course Plain (7.23) are bottom-rated as fours, the latter being downgraded by one level for losing points for both semi-permanent and permanent wetlands.

When Manitoba Mid-Boreal Transition units are rated using Manitoba Parkland minimum rating values all units retain their previous level. When Alberta Parkland benchmark minimum rating values are applied Riding Mountain Upland still retains its number one rating and the other two units remain as fours. The only change is a reversal between the latter two units as to which one is downgraded one level for losing points for both semi-permanent and permanent wetlands.

The single Manitoba Mid-Boreal Lowlands sub-unit sampled in this study is on predominantly lacustrine material and therefore not considered in this waterfowl production assessment.

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 the ground truthing 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 ground truthing surveys for the five transition transects varies from 52 to 65 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 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 located in Manitoba Mid-Boreal Transition and the percent of quarter sections affected in individual transects ranges from 33.3 at Carberry to 66.7 at Grandview West.

The average percent of quarter sections affected by cover/land use changes and the mean length of time in months between the taking of aerial photos and completion of ground truthing surveys for the ecoregions reported on to date are as follows:

Ecoregion	Average Percent of Quarter Sections Affected by Change	Mean Length of Time Between Photography and Ground Truthing (in months)
Saskatchewan Parkland	27.0	23.7
Alberta Parkland	47.1	40.1
Alberta Mixedgrass Prairie	34.6	55.3
Alberta Fescue Prairie	30.0	54.2
Alberta Shortgrass Prairie	8.3	63.0
Saskatchewan Mixedgrass Prairie	30.6	62.2
Saskatchewan Shortgrass Prairie	24.0	61.8
Manitoba Parkland	39.5	37.5
Manitoba Mixedgrass Prairie	34.8	40.1
Manitoba Tallgrass Prairie	20.8	49.0
Manitoba Mid-Boreal Transition	55.8	57.2

According to the above data Manitoba Mid-Boreal Transition has the highest percentage of quarter sections affected by change in the fourth longest mean time interval between date of baseline photography and ground truthing surveys. This makes this ecoregion

the most severely affected by change of any of the prairie ecoregions reported on to date.

The single transect (Fisher Branch) in the Manitoba Mid-Boreal Lowlands experienced changes in 75 percent of its quarter sections in a 41-month period. This transect has been severely affected by wetland drainage.

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Figure 1. Distribution of Habitat Sampling in Manitoba Mid-Boreal Transition and Mid-Boreal Lowlands

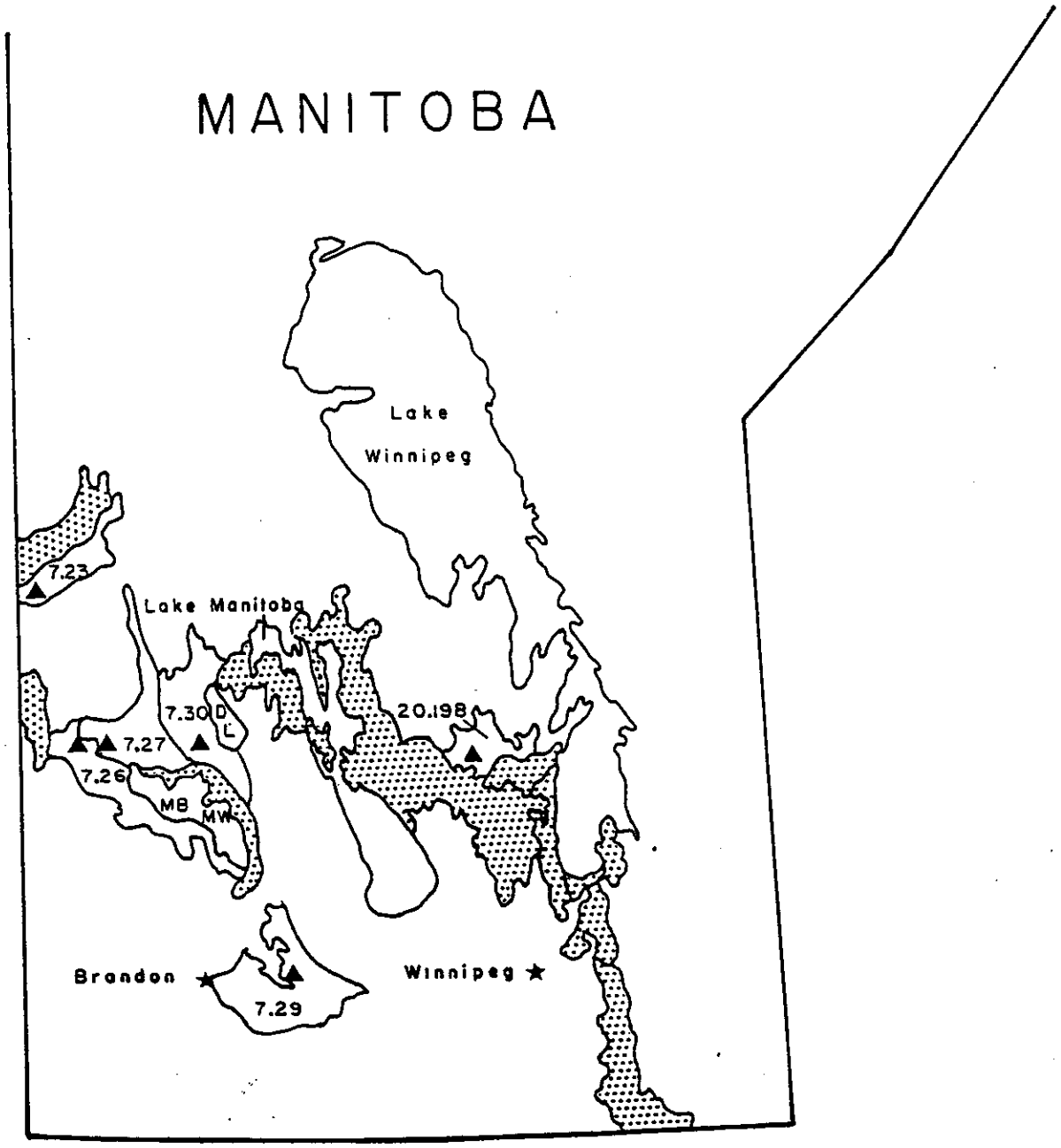

Table 1. Distribution of Habitat Sampling Relative to the Entire Manitoba Mid-Boreal Transition

	No. of Units	Area	
		In Hectares[1]	As percentage of Entire Ecoregion
Sampled Physiographic Units	6[2]	1,122,400	36.4
Unsampled Physiographic Units	10	1,621,500	52.7
Areas Not Included in Physiographic Units			
- River and Stream Valleys	-	57,800	1.9
- Lakes[3]		276,200	9.0
- Urban Areas[3]		1,400	T[4]
Total Manitoba Transition Ecoregion	16	3,079,300	100

1. To the nearest 100 hectares.
2. Including one unit, totalling 3,800 hectares or 0.1 percent of the Manitoba Mid-Boreal Transition, which is sampled only in the Saskatchewan portion of that unit.
3. Larger than 500 hectares.
4. T = trace = less than 0.05 percent.

Table 2. Distribution of Landforms in Manitoba Mid-Boreal Transition

Origin of Parent Material[1]	Surface Form[1]	Area in Hectares[2] Sampled Units[3]	Unsampled Units[3]	Total[4]	Percent of Sampling Effort in Landform Category
Morainal	Knob and Kettle	228,900 (79.1)	60,000 (20.9)	289,500 (10.5)	16.7
	Undulating	111,700[5] (100)	-	111,700 (4.1)	33.3
	Ridged	-	811,600 (100)	811,600 (29.6)	0.0
	Dissected	-	234,600 (100)	234,600 (8.5)	0.0
Total Morainal		340,600 (23.5)	1,106,800 (76.5)	1,447,400 (52.7)	50.0
Lacustrine	Level	260,600 (41.1)	372,700 (58.9)	633,300 (23.1)	16.7
	Dissected	216,700 (100)	-	216,700 (7.9)	16.7
Total Lacustrine		477,300 (56.2)	372,700 (43.8)	850,000 (31.0)	33.3

Table 2. Distribution of Landforms in Manitoba Mid-Boreal Transition - Continued

Origin of Parent Material[1]	Surface Form[1]	Area in Hectares[2] Sampled Units[3]	Unsampled Units[3]	Total[4]	Percent of Sampling Effort in Landform Category
Fluvial	Level	304,500 (94.0)	19,300 (6.0)	323,800 (11.8)	16.7
	Hummocky	-	122,700 (100)	122,700 (4.5)	0.0
Total Fluvial		304,500 (68.2)	142,000 (31.8)	446,500 (16.3)	16.7
Total for Ecoregion		1,122,400 (40.9)	1,621,500 (59.1)	2,743,900 (100)	100

1. Listed by primary category only.
2. To the nearest 100 hectares.
3. Figure in parentheses is the percent the indicated area is of the total area of that landform category.
4. Figure in parentheses is the percent each landform category is of the total area in physiographic units in the ecoregion.
5. Including one unit sampled in the Saskatchewan portion of that unit.

Table 3. Physiographic Units Covered in This Report

Unit Number	Name	Landform Character[1]		Transect[2]
		Origin of Parent Material	Surface Form	
7.21	Lower Red Deer River Plain	Morainal * Lacustrine	Undulating	Porcupine Plain[3]
7.23	Lac La Course Plain	Morainal * Fluvial * Lacustrine	Undulating (Hummocky)	Durban
7.26	Riding Mountain Upland	Morainal	Knob and Kettle * Rolling * Hummocky	Grandview West
7.27	Valley River Plain	Lacustrine * Morainal * Fluvial	Dissected * Undulating * Ridged	Grandview East
7.29	Upper Assiniboine Delta	Fluvial * Lacustrine * Eolian	Level * Undulating * Dissected * Hummocky	Carberry
7.30	Dauphin Lake Plain	Lacustrine * Morainal	Level * Undulating * Dissected	Dauphin
**********	**********	**********	**********	**********
20.19A	Fisher River Plain[4]	Lacustrine * Morainal * Organic	Ridged * Blanket (Level)	Fisher Branch

1. Based primarily on data from "A Regional Map Base for a Migratory Bird Habitat Inventory Prairie Provinces" G.D. Adams, revised Oct. 25, 1985.
   Secondary categories following * are a significant component while those in parentheses are of minor importance.
2. The sample size in all transects is 24 quarter sections.
3. The unit is sampled in the Saskatchewan portion of the unit.
4. The Fisher River Plain is in the Mid-Boreal Lowlands Ecoregion.

Table 4. Physiographic Units in Manitoba Mid-Boreal Transition Which Have Not Been Sampled

Unit Number	Name	Landform Character[1,2]		Area in Hectares[3]
		Origin of Parent Material	Surface Form	
7.24	Swan River Plain	Morainal * Lacustrine	Dissected * Undulating	135,100[4]
7.25	Big Boggy Creek Upland	Morainal	Knob & Kettle	60,600[4]
7.28	Riding Mountain Escarpment	Morainal * Morainal over Rock	Inclined Dissected * Veneer	99,500
7.31	Crane River Plain	Morainal (Lacustrine)	Ridged * Level	131,500
7.32	Interlake Plain	Morainal * Morainal over Rock (Organic)	Ridged * Undulating * Veneer	680,100
7.33	Icelandic River Plain	Lacustrine * Morainal (Organic)	Level * Undulating	81,800
7.34	Lake Winnipeg Terrace	Lacustrine	Level * Veneer	71,200
7.35	Red River Delta	Fluvial * Alluvium * Lacustrine	Level (Ridged)	19,300
7.36	Pine Ridge Plain	Fluvial * Lacustrine	Hummocky * Level * Veneer	122,700
7.37	Caliento Plain	Lacustrine * Organic	Level * Veneer * Hummocky	219,700
			Total Area	1,621,500

1. Based primarily on data from "A Regional Map Base for a Migratory Bird Habitat Inventory Prairie Provinces", G.D. Adams, revised Oct. 25, 1985.
2. Secondary categories following * are a significant component while those in parentheses are of minor importance.
3. To the nearest 100 hectares.
4. Manitoba portion of the unit only. The unit straddles the Manitoba-Saskatchewan boundary.

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

Unit Number	Name[1]	No. of Quarter Sections In Sample[2]	Area in Hectares		Percentage that Sample is of Unit Area[6]
			Unit[3,4]	Sample[5]	
7.21	Lower Red Deer River Plain*	-(24)	3,800 (406,500)	- (1,587)	- (0.4)
7.23	Lac La Course Plain*	24	107,900 (288,200)	1,559 (-)	1.4 (0.5)
7.26	Riding Mountain Upland	24	228,900	1,592	0.7
7.27	Valley River Plain	24	216,700	1,612	0.7
7.29	Upper Assiniboine Delta	24	304,500	1,599	0.5
7.30	Dauphin Lake Plain	24	260,600	1,605	0.6
Total for Ecoregion		120(144)	1,122,400(1,705,400)	7,967 (1,587)	0.7 (0.6)
20.19A	Fisher River Plain	24	109,300	1,606	1.5

1. Units marked with an asterisk straddle the Manitoba-Saskatchewan boundary.
2. Figures in parentheses are the number of quarter sections sampled in the Saskatchewan portion of the unit.
3. To the nearest 100 hectares.
4. Each figure in parentheses is the total size of the unit, including the portion of the unit in Saskatchewan.
5. Each figure in parentheses is the size of the sample, in hectares, located in the Saskatchewan portion of the unit.
6. Based on the size of the unit and sample in Manitoba only. Figures in parentheses are based on total unit and sample size, including portions located in Saskatchewan.
7. The Fisher River Plain is the only sampled physiographic unit in the Mid-Boreal Lowlands in Manitoba. Data are presented for only the sampled sub-unit within that unit.

Table 6. Land Area Occupied by Wetlands and Uplands

Physio-graphic Unit	Transect[1]	Sample Size (in ha)	Percent of Total Sample[2]			
			Wetlands			Uplands
			Total	Uncultivated	Cultivated	
	(Morainal - K&K)					
7.26	Grandview West	1,592	16.8	16.1	0.7	83.2
	(Morainal - U)					
7.23	Durban	1,559	2.4	1.3	1.1	97.6
	(Lacustrine - L)					
7.30	Dauphin	1,605	3.1	3.0	0.1	96.9
	(Lacustrine - D)					
7.27	Grandview East	1,612	2.5	1.8	0.7	97.5
	(Fluvial - C)					
7.29	Carberry	1,599	5.0	5.0	T[2]	95.0
Ecoregion Sample		7,967	6.0	5.5	0.5	94.0
	(Lacustrine - R)					
20.19A	Fisher Branch	1,606	6.7	6.0	0.7	93.3

1. Transects are grouped by landform (soil parent material and surface form). Letters identifying surface forms in this and subsequent tables are as follows: K&K - Knob and Kettle, U - Undulating, L - Level, D - Dissected, R - Ridged and C - Complex.

2. T = trace = less than 0.05 percent.

Table 7. Distribution of Wetland Area in Various Cover Classes

Physio-graphic Unit	Transect[1]	Total Wetland Area in Sample (in ha)	Percent of Total Wetland Area in Cover Class								
			Cultiv-ated	Willows and Trees	Grasses and Sedges	Bulrush/ Cattail	Trans-itional Open Water	Natural Open Water	Artif-icial Open Water	Saline Open Water	Other
	(Morainal - K&K)										
7.26	Grandview West	267	3.9	2.3	55.2	9.5	T[2]	29.1	T	0.0	0.0
	(Morainal - U)										
7.23	Durban	38	47.8	11.4	33.8	3.2	0.0	1.3	1.9	0.0	0.6
	(Lacustrine - L)										
7.30	Dauphin	50	2.9	5.3	76.1	2.4	0.0	0.0	0.9	0.0	12.4
	(Lacustrine - D)										
7.27	Grandview East	41	28.6	1.8	58.5	2.3	0.0	0.0	1.8	0.0	7.0
	(Fluvial - C)										
7.29	Carberry	80	0.3	63.7	9.6	15.6	0.0	6.6	3.9	0.0	0.3
Ecoregion Sample		476	8.8	13.7	48.4	8.6	T	17.4	1.0	0.0	2.1
	(Lacustrine - R)										
20.19A	Fisher Branch	108	11.1	4.0	77.1	3.8	0.0	T	0.2	0.0	3.8

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

2. T = trace = less than 0.05 percent.

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								
				Culti-vated	Willows and Trees	Grasses and Sedges	Bulrush Cattail	Trans-itional Open Water	Natural Open Water	Artif-icial Open Water	Saline Open Water	Other
	(Morainal - K&K)											
7.26	Grandview West	549	22.9	20.0	3.8	68.0	0.7	0.2	7.1	0.2	0.0	0.0
	(Morainal - U)											
7.23	Durban	181	7.5	61.9	3.3	24.3	1.1	0.0	2.3	6.6	0.0	0.5
	(Lacustrine - L)											
7.30	Dauphin	80	3.3	27.6	11.1	47.5	5.1	0.0	0.0	5.1	0.0	3.6
	(Lacustrine - D)											
7.27	Grandview East	254	10.6	48.0	4.0	42.2	0.7	0.0	0.0	4.0	0.0	1.1
	(Fluvial - C)											
7.29	Carberry	44	1.8	4.4	25.1	36.6	4.4	0.0	9.3	18.0	0.0	2.2
Ecoregion Sample		1,108	9.2	33.3	5.2	52.1	1.3	0.1	4.2	3.1	0.0	0.7
	(Lacustrine - R)											
20.19A	Fisher Branch	139	5.8	28.8	2.1	58.4	4.3	0.0	0.7	2.1	0.0	3.6

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

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

Physio-graphic Unit	Transect[1]	Total Wetland Area in Sample (in ha)	Percent of Total Wetland Area in Land Use Activity Class					
			No Use	Abandoned Cultivation	Annual Crop	Haying	Grazing	Other
	(Morainal - K&K)							
7.26	Grandview West	267	64.8	2.2	3.9	10.1	18.5	0.5
	(Morainal - U)							
7.23	Durban	38	43.3	3.8	47.8	1.3	T[2]	3.8
	(Lacustrine - L)							
7.30	Dauphin	50	34.3	0.5	2.9	0.9	44.8	16.6
	(Lacustrine - D)							
7.27	Grandview East	41	54.4	7.6	28.6	1.2	5.8	2.4
	(Fluvial - C)							
7.29	Carberry	80	62.5	0.0	0.3	0.0	34.2	3.0
Ecoregion Sample		476	58.3	2.3	8.8	6.0	21.4	3.2
	(Lacustrine - R)							
20.19A	Fisher Branch	108	29.8	1.8	11.1	34.5	6.0	16.8

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

2. T = trace = less than 0.05 percent.

Table 10. Wetlands Affected by One or More Permanent Impacts

Physio-graphic Unit	Transect[1]	Mean Number of Wetlands/Quarter: Total	Mean Number of Wetlands/Quarter: Affected by One or More Impacts	Percent of Wetlands Impacted
	(Morainal - K&K)			
7.26	Grandview West	22.9	4.8	20.9
	(Morainal - U)			
7.23	Durban	7.5	1.5	19.4
	(Lacustrine - L)			
7.30	Dauphin	3.3	1.6	47.4
	(Lacustrine - D)			
7.27	Grandview East	10.6	1.8	16.5
	(Fluvial - C)			
7.29	Carberry	1.8	0.8	43.1
Ecoregion Sample		9.2	2.1	22.5
	(Lacustrine - R)			
20.19A	Fisher Branch	5.8	2.6	44.6

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

Table 11. Occurrence of Streams in Data Samples

Physio-graphic Unit	Transect[1]	Number of Quarters In Sample	Number of Quarters Containing Streams	Percent of Quarters Containing Streams
	(Morainal - K&K)			
7.26	Grandview West	24	0	0.0
	(Morainal - U)			
7.23	Durban	24	6	25.0
	(Lacustrine - L)			
7.30	Dauphin	24	4	16.7
	(Lacustrine - D)			
7.27	Grandview East	24	6	25.0
	(Fluvial - C)			
7.29	Carberry	24	3	12.5
Ecoregion Sample		120	19	15.8
	(Lacustrine - R)			
20.19A	Fisher Branch	24	12[2]	50

1. Grouped by landform (soil parent material and surface form).
2. In most (10 of 12) quarters the streams are artificial drainage channels.

Table 12. Distribution of Upland Cover Classes

Physio-graphic Unit	Transect[1]	Total Upland Area (in ha)	Percent of Total Upland in Cover								
			Native					Planted			
			Grass	Low Shrub	Tall Shrub	Trees	Total	Annual Crops[2]	Perennial Grass & Forbs	Trees & Shrubs	Other
	(Morainal - K&K)										
7.26	Grandview West	1,324	13.9	0.5	5.5	17.6	37.5	55.7	5.8	T[3]	1.0
	(Morainal - U)										
7.23	Durban	1,521	5.4	T	0.2	1.4	7.0	85.0	4.2	0.7	3.1
	(Lacustrine - L)										
7.30	Dauphin	1,555	10.5	0.6	1.4	12.2	24.7	64.8	8.7	0.3	1.5
	(Lacustrine - D)										
7.27	Grandview East	1,571	6.4	0.1	1.5	4.0	12.0	85.9	1.4	0.1	0.6
	(Fluvial - C)										
7.29	Carberry	1,519	13.8	1.6	1.2	22.3	38.9	40.1	14.6	0.5	5.9
Ecoregion Sample		7,490	9.9	0.6	1.9	11.3	23.7	66.7	6.9	0.3	2.4
	(Lacustrine - R)										
20.19A	Fisher Branch	1,498	9.9	1.4	2.0	11.7	25.0	49.9	23.8	0.1	1.2

1. Grouped by landform (soil parent material and surface form).
2. Includes summerfallow.
3. T = trace = less than 0.05 percent.

Table 13. Distribution of Upland Land Use Activity Classes

Physio-graphic Unit	Transect[1]	Total Upland Area (in ha)	Percent of Total Upland Area in Land Use Activity							
			Unused	Abandoned	Annual Crops[2]	Forage	Grazing	Farm-steads	Roads & Railways	Other
	(Morainal - K&K)									
7.26	Grandview West	1,324	20.4	0.8	55.7	8.7	11.1	0.4	1.9	1.0
	(Morainal - U)									
7.23	Durban	1,521	2.7	1.4	85.0	3.0	0.5	1.7	3.7	2.0
	(Lacustrine - L)									
7.30	Dauphin	1,555	13.0	0.2	64.8	9.9	6.1	0.7	3.3	2.0
	(Lacustrine - D)									
7.27	Grandview East	1,571	6.2	0.3	85.9	1.1	3.4	0.6	2.4	0.1
	(Fluvial - C)									
7.29	Carberry	1,519	12.1	0.1	40.1	10.0	26.7	0.8	4.9	5.3
Ecoregion Sample		7,490	10.6	0.5	66.7	6.5	9.5	0.8	3.3	2.1
	(Lacustrine - R)									
20.19A	Fisher Branch	1,498	9.8	0.8	49.9	24.9	9.4	1.1	3.4	0.7

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

2. Includes summerfallow.

Table 14. Examples of Variability in Wetland Cover Data

Physio-graphic Unit	Transect[1]	Area in Hectares Per Quarter Section								
		Cultivated			Grass			Willows		
		Mean	S.E.[2]	C.V.[3]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
	(Morainal - K&K)									
7.26	Grandview West	0.4	0.1	0.7	6.1	2.4	1.9	0.2	T[4]	0.4
	(Morainal - U)									
7.23	Durban	0.8	0.5	3.3	0.5	0.1	1.1	0.2	0.1	2.0
	(Lacustrine - L)									
7.30	Dauphin	0.1	0.0	0.2	1.6	3.7	11.6	0.1	T	0.6
	(Lacustrine - D)									
7.27	Grandview East	0.5	0.1	0.8	1.0	0.5	2.2	T	0.0	0.1
	(Fluvial - C)									
7.29	Carberry	T	0.0	0.1	0.3	0.1	1.6	2.1	4.0	9.4
Ecoregion Sample		0.4	0.1	2.0	1.9	1.0	5.8	0.5	0.4	8.6
	(Lacustrine - R)									
20.19A	Fisher Branch	0.5	0.2	1.9	3.1	3.2	5.0	0.2	T	1.0

1. Grouped by landform (soil parent material and surface form).
2. S.E. = Standard Error.
3. C.V. = Coefficient of Variation
4. 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			Native Grass			Native Trees		
		Mean	S.E.[2]	C.V.[3]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
	(Morainal - K&K)									
7.26	Grandview West	30.7	63.0	10.1	7.6	17.7	11.4	9.7	19.7	9.9
	(Morainal - U)									
7.23	Durban	53.8	15.9	1.5	3.4	0.6	0.9	0.9	0.7	3.7
	(Lacustrine - L)									
7.30	Dauphin	42.0	122.9	14.3	6.8	18.3	13.2	7.9	25.6	15.9
	(Lacustrine - D)									
7.27	Grandview East	56.2	20.7	1.8	4.2	2.4	2.8	2.6	3.2	5.9
	(Fluvial - C)									
7.29	Carberry	25.4	65.8	12.7	8.8	8.7	4.8	14.1	29.8	10.4
Ecoregion Sample		41.6	38.6	10.2	6.2	4.5	8.0	7.1	9.0	13.9
	(Lacustrine - R)									
20.19A	Fisher Branch	31.1	81.2	12.8	6.2	5.2	4.1	7.3	20.4	13.7

1. Grouped by landform (soil parent material and surface form).
2. S.E. = Standard Error.
3. C.V. = Coefficient of Variation.

Table 16. Examples of Variability in Upland Land Use Data

Physio-graphic Unit	Transect[1]	Area in Hectares Per Quarter Section								
		Unused			Grazing			Roads & Railways		
		Mean	S.E.[2]	C.V.[3]	Mean	S.E.	C.V.	Mean	S.E.	C.V.
	(Morainal - K&K)									
7.26	Grandview West	11.3	26.8	11.6	6.2	38.6	30.7	1.0	0.1	0.5
	(Morainal - U)									
7.23	Durban	1.7	1.2	3.6	0.3	0.2	2.8	2.4	0.4	0.8
	(Lacustrine - L)									
7.30	Dauphin	8.4	37.3	21.7	3.9	24.4	30.9	2.1	0.2	0.5
	(Lacustrine - D)									
7.27	Grandview East	4.0	5.5	6.6	2.2	10.4	23.0	1.6	0.2	0.5
	(Fluvial - C)									
7.29	Carberry	7.7	31.1	19.9	16.9	99.4	28.8	3.1	2.1	3.3
Ecoregion Sample		6.6	9.9	16.3	5.9	18.1	33.5	2.0	0.3	1.6
	(Lacustrine - R)									
20.19A	Fisher Branch	6.1	12.9	10.3	5.9	41.0	34.2	2.1	0.1	0.3

1. Grouped by landform (soil parent material and surface form).
2. S.E. = Standard Error.
3. C.V. = Coefficient of Variation.

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares: Total Wetland Area	Cultivated	Willows and Trees	Grasses and Sedges	Bulrush/ Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
	(Morainal - K&K)										
7.26	Riding Mountain Upland	38.4	1.5	0.9	21.2	3.6	T[2]	11.2	T	0.0	0.0
	(Morainal - U)										
7.23	Lac La Course Plain	2.6	1.2	0.3	0.9	0.1	0.0	T	0.1	0.0	T
7.21	Lower Red Deer River Plain	0.3	0.2	T	0.1	T	0.0	T	T	0.0	0.0
Total Morainal[3]		41.3	2.9	1.2	22.2	3.7	T	11.2	0.1	0.0	T
Total Morainal[4]		41.0	2.7	1.2	22.1	3.7	T	11.2	0.1	0.0	T
	(Lacustrine - L)										
7.30	Dauphin Lake Plain	8.2	0.3	0.4	6.2	0.2	0.0	0.0	0.1	0.0	1.0
	(Lacustrine - D)										
7.27	Valley River Plain	5.5	1.6	0.1	3.2	0.1	0.0	0.0	0.1	0.0	0.4
Total Lacustrine		13.7	1.9	0.5	9.4	0.3	0.0	0.0	0.2	0.0	1.4
	(Fluvial - C)										
7.29	Upper Assiniboine Delta	15.2	T	9.7	1.5	2.4	0.0	1.0	0.6	0.0	T
Total Fluvial		15.2	T	9.7	1.5	2.4	0.0	1.0	0.6	0.0	T
Total for Entire Sampled Portion of Ecoregion	A[5]	70.2	4.8	11.4	33.1	6.4	T	12.2	0.9	0.0	1.4
	A[6]	69.9	4.6	11.4	33.0	6.4	T	12.2	0.9	0.0	1.4
	B[7]	66.8	5.9	9.2	32.3	5.7	T	11.6	0.7	0.0	1.4

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

Physiographic Unit[1]		Estimated Area in Thousands of Hectares									
Number	Name	Total Wetland Area	Cultivated	Willows and Trees	Grasses and Sedges	Bulrush/ Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
	(Lacustrine - R)										
20.19A	Fisher River Plain	7.3	0.8	0.3	5.6	0.3	0.0	T	T	0.0	0.3

1. Grouped by landform (soil parent material and surface form).
2. T = trace = less than 50 hectares.
3. Summation of values from individual units including 7.21 in which the data sample is located in the Saskatchewan portion of the unit.
4. Summation of values from individual units excluding 7.21.
5. Based on summation of values from individual units including 7.21
6. Based on summation of values from individual units excluding 7.21.
7. Based on the analysis of the ecoregion sample as a single unit excluding 7.21.

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

Physiographic Unit[1] Number	Name	Estimated Number of Wetlands (in Thousands) Total Number of Wetlands	Cultivated	Willows and Trees	Grasses and Sedges	Bulrush/ Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
	(Morainal - K&K)										
7.26	Riding Mountain Upland	78.9	15.8	3.0	53.7	0.6	0.1	5.6	0.1	0.0	0.0
	(Morainal - U)										
7.23	Lac La Course Plain	12.5	7.8	0.4	3.0	0.1	0.0	0.3	0.8	0.0	0.1
7.21	Lower Red Deer River Plain	1.0	0.6	0.1	0.2	T[2]	0.0	T	0.1	0.0	T
Total Morainal[3]		92.4	24.2	3.5	56.9	0.7	0.1	5.9	1.0	0.0	0.1
Total Morainal[4]		91.4	23.6	3.4	56.7	0.7	0.1	5.9	0.9	0.0	0.1
	(Lacustrine - L)										
7.30	Dauphin Lake Plain	13.0	3.6	1.4	6.1	0.7	0.0	0.0	0.7	0.0	0.5
	(Lacustrine - D)										
7.27	Valley River Plain	34.1	16.3	1.4	14.4	0.2	0.0	0.0	1.4	0.0	0.4
Total Lacustrine		47.1	19.9	2.8	20.5	0.9	0.0	0.0	2.1	0.0	0.9
	(Fluvial - C)										
7.29	Upper Assiniboine Delta	8.4	0.4	2.1	3.0	0.4	0.0	0.8	1.5	0.0	0.2
Total Fluvial		8.4	0.4	2.1	3.0	0.4	0.0	0.8	1.5	0.0	0.2
Total for Entire Sampled Portion of Ecoregion	A[5]	147.9	44.5	8.4	80.4	2.0	0.1	6.7	4.6	0.0	1.2
	A[6]	146.9	43.9	8.3	80.2	2.0	0.1	6.7	4.5	0.0	1.2
	B[7]	156.1	52.0	8.1	81.3	2.0	0.2	6.6	4.8	0.0	1.1

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

Physiographic Unit[1] Number	Name	Estimated Number of Wetlands (in Thousands) Total Number of Wetlands	Cultivated	Willows and Trees	Grasses and Sedges	Bulrush/ Cattail	Transitional Open Water	Natural Open Water	Artificial Open Water	Saline Open Water	Other
	(Lacustrine - R)										
20.19A	Fisher River Plain	9.5	2.7	0.2	5.5	0.4	0.0	0.1	0.2	0.0	0.4

1. Grouped by landform (soil parent material and surface form).
2. T = trace = less than 50 hectares.
3. Summation of values from individual units including 7.21 in which the data sample is located in the Saskatchewan portion of the unit.
4. Summation of values from individual units excluding 7.21.
5. Based on summation of values from individual units including 7.21.
6. Based on summation of values from individual units excluding 7.21.
7. Based on the analysis of the ecoregion sample as a single unit excluding 7.21.

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares: Total Wetland Area	No Use	Abandoned Cultivation	Annual Crops	Haying	Grazing	Other
	(Morainal - K&K)							
7.26	Riding Mountain Upland	38.4	24.9	0.8	1.5	3.9	7.1	0.2
	(Morainal - U)							
7.23	Lac La Course Plain	2.6	1.1	0.1	1.3	T[2]	T	0.1
7.21	Lower Red Deer River Plain	0.3	0.1	T	0.2	T	T	T
Total Morainal[3]		41.3	26.1	0.9	3.0	3.9	7.1	0.3
Total Morainal[4]		41.0	26.0	0.9	2.8	3.9	7.1	0.3
	(Lacustrine - L)							
7.30	Dauphin Lake Plain	8.2	2.8	T	0.2	0.1	3.7	1.4
	(Lacustrine - D)							
7.27	Valley River Plain	5.5	3.0	0.4	1.6	0.1	0.3	0.1
Total Lacustrine		13.7	5.8	0.4	1.8	0.2	4.0	1.5
	(Fluvial - C)							
7.29	Upper Assiniboine Delta	15.2	9.5	0.0	T	0.0	5.2	0.5
Total Fluvial		15.2	9.5	0.0	T	0.0	5.2	0.5
Total for Entire Sampled Portion of Ecoregion	A[5]	70.2	41.4	1.3	4.8	4.1	16.3	2.3
	A[6]	69.9	41.3	1.3	4.6	4.1	16.3	2.3
	B[7]	66.8	39.0	1.5	5.9	4.0	14.3	2.1

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares: Total Wetland Area	No Use	Abandoned Cultivation	Annual Crops	Haying	Grazing	Other
	(Lacustrine - R)							
20.19A	Fisher River Plain	7.3	2.2	0.1	0.8	2.6	0.4	1.2

1. Grouped by landform (soil parent material and surface form).
2. T = trace = less than 50 hectares.
3. Summation of values from individual units including 7.21 in which the data sample is located in the Saskatchewan portion of the unit.
4. Summation of values from individual units excluding 7.21.
5. Based on summation of values from individual units including 7.21.
6. Based on summation of values from individual units excluding 7.21.
7. Based on the analysis of the ecoregion sample as a single unit excluding 7.21.

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares									
			Native					Planted			
		Total Upland Area	Grass	Low Shrub	Tall Shrub	Trees	Total	Annual Crops	Perennial Grasses and Forbs	Trees and Shrubs	Other
	(Morainal - K&K)										
7.26	Riding Mountain Upland	190.5	26.5	1.0	10.5	33.5	71.5	106.1	11.0	T[2]	1.9
	(Morainal - U)										
7.23	Lac La Course Plain	105.3	5.7	T	0.2	1.5	7.4	89.5	4.4	0.7	3.3
7.21	Lower Red Deer River Plain	3.5	0.2	T	T	0.7	0.9	2.3	0.2	T	0.1
Total Morainal[3]		299.3	32.4	1.0	10.7	35.7	79.8	197.9	15.6	0.7	5.3
Total Morainal[4]		295.8	32.2	1.0	10.7	35.0	78.9	195.6	15.4	0.7	5.2
	(Lacustrine - L)										
7.30	Dauphin Lake Plain	252.4	26.5	1.5	3.5	30.8	62.3	163.6	22.0	0.7	3.8
	(Lacustrine - D)										
7.27	Valley River Plain	211.2	13.5	0.2	3.2	8.4	25.3	181.4	3.0	0.2	1.3
Total Lacustrine		463.6	40.0	1.7	6.7	39.2	87.6	345.0	25.0	0.9	5.1
	(Fluvial - C)										
7.29	Upper Assiniboine Delta	289.3	39.9	4.6	3.5	64.5	112.5	116.0	42.2	1.5	17.1
Total Fluvial		289.3	39.9	4.6	3.5	64.5	112.5	116.0	42.2	1.5	17.1
Total for Entire Sampled Portion of Ecoregion	A[5]	1,052.2	112.3	7.3	20.9	139.4	279.9	658.9	82.8	3.1	27.5
	A[6]	1,048.7	112.1	7.3	20.9	138.7	279.0	656.6	82.6	3.1	27.4
	B[7]	1,051.8	104.1	6.3	20.0	118.9	249.3	701.5	72.6	3.2	25.2

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares									
			Native					Planted			
		Total Upland Area	Grass	Low Shrub	Tall Shrub	Trees	Total	Annual Crops	Perennial Grasses and Forbs	Trees and Shrubs	Other
	(Lacustrine - R)										
20.19A	Fisher River Plain	102.0	10.1	1.4	2.1	11.9	25.5	50.9	24.3	0.1	1.2

1. Grouped by landform (soil parent material and surface form).
2. T = trace = less than 50 hectares.
3. Summation of values from individual units including 7.21 in which the data sample is located in the Saskatchewan portion of the unit.
4. Summation of values from individual units excluding 7.21.
5. Based on summation of values from individual units including 7.21.
6. Based on summation of values from individual units excluding 7.21.
7. Based on the analysis of the ecoregion sample as a single unit excluding 7.21.

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares: Total Upland Area	Unused	Abandoned	Annual Crops	Forage	Grazing	Farm-steads	Roads and Railways	Other
	(Morainal - K&K)									
7.26	Riding Mountain Upland	190.5	38.9	1.5	106.1	16.6	21.1	0.8	3.6	1.9
	(Morainal - U)									
7.23	Lac La Course Plain	105.3	2.8	1.5	89.5	3.2	0.5	1.8	3.9	2.1
7.21	Lower Red Deer River Plain	3.5	0.8	T[2]	2.3	T	0.1	T	0.2	0.1
Total Morainal[3]		299.3	42.5	3.0	197.9	19.8	21.7	2.6	7.7	4.1
Total Morainal[4]		295.8	41.7	3.0	195.6	19.8	21.6	2.6	7.5	4.0
	(Lacustrine - L)									
7.30	Dauphin Lake Plain	252.4	32.8	0.5	163.6	25.0	15.4	1.8	8.3	5.0
	(Lacustrine - D)									
7.27	Valley River Plain	211.2	13.1	0.6	181.4	2.3	7.2	1.3	5.1	0.2
Total Lacustrine		463.6	45.9	1.1	345.0	27.3	22.6	3.1	13.4	5.2
	(Fluvial - C)									
7.29	Upper Assiniboine Delta	289.3	35.0	0.3	116.0	28.9	77.3	2.3	14.2	15.3
Total Fluvial		289.3	35.0	0.3	116.0	28.9	77.3	2.3	14.2	15.3
Total for Entire Sampled Portion of Ecoregion	A[5]	1,052.2	123.4	4.4	658.9	76.0	121.6	8.0	35.3	24.6
	A[6]	1,048.7	122.6	4.4	656.6	76.0	121.5	8.0	35.1	24.5
	B[7]	1,051.8	111.5	5.3	701.5	68.4	99.9	8.4	34.7	22.1

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

Physiographic Unit[1] Number	Name	Estimated Area in Thousands of Hectares: Total Upland Area	Unused	Abandoned	Annual Crops	Forage	Grazing	Farm-steads	Roads and Railways	Other
	(Lacustrine - R)									
20.19A	Fisher River Plain	102.0	10.0	0.8	50.9	25.4	9.6	1.1	3.5	0.7

1. Grouped by landform (soil parent material and surface form).
2. T = trace = less than 50 hectares.
3. Summation of values from individual units including 7.21 in which the data sample is located in the Saskatchewan portion of the unit.
4. Summation of values from individual units excluding 7.21.
5. Based on summation of values from individual units including 7.21.
6. Based on summation of values from individual units excluding 7.21.
7. Based on the analysis of the ecoregion sample as a single unit excluding 7.21.

Table 22. Rating of Sampled MORAINAL Physiographic Units in Manitoba Mid-Boreal Transition as Waterfowl Production Habitat

Physiographic Unit[1] Number	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[2]
			Grass	Bulrush/ Cattail	Natural Fresh Open Water	That is Unused	In Native and Seeded Grass and Shrub Cover	That is Unused		
7.26	Riding Mountain Upland	16.8	55.2	9.5	29.1	64.8	25.7	20.4	228.9	1 /1 /1
7.21	Lower Red Deer River Plain[3]	8.1	25.1	0.2	0.2	28.7	9.9	21.5	3.8[4]	4 /4 /4*
7.23	Lac La Course Plain	2.4	33.8	3.2	1.3	43.3	11.2	2.7	107.9[4]	4* /4* /4

1. Physiographic units are arranged in order of diminishing proportion of wetland area in the landscape.
2. Three waterfowl production ratings have been calculated for each unit using the minimum rating values for, sequentially, Manitoba Mid-Boreal Transition/ Manitoba Parkland/ Alberta Parkland. Asterisks indicate ratings which have been downgraded one level because of loss of points for both bulrush/cattail and natural fresh open water.
3. Sampled only in the Saskatchewan portion of the unit.
4. Manitoba portion of the unit only.

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	Numbers of Quarters[2] Affected by Land Use/ Cover Changes	Percent of Quarters Affected	Time Interval from May 1985 to Ground Truth Survey (in months)
	(Morainal - K&K)				
7.26	Grandview West	24	16	66.7	52
	(Morainal - U)				
7.23	Durban	24	15	62.5	65
	(Lacustrine - L)				
7.30	Dauphin	24	14	58.3	65
	(Lacustrine - D)				
7.27	Grandview East	24	14	58.3	52
	(Fluvial - C)				
7.29	Carberry	24	8	33.3	52
Ecoregion Sample		120	67	55.8	
	(Lacustrine - R)				
20.19A	Fisher Branch	24	18	75.0	41

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