Evaluation of Wetland Ecosystems and Migratory Bird Use in the Roseau River Basin, Manitoba

Preliminary Assessment and Inventory

Report Prepared by the Canadian
Wildlife Service for the International
Roseau River Engineering Board

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Evaluation of Wetlands and Migratory Bird Use of the Roseau River Basin, Manitoba.

Introduction

The International Roseau River Engineering Board was authorized in 1971 to undertake studies on the Roseau River within the province of Manitoba and the state of Minnesota to determine the following:

(1) To assess the effects of past drainage and other control works on the Roseau River and tributaries.

(2) To coordinate plans to provide effective use and control of waters arising in or draining into the Basin.

(3) To determine the environmental impact of implementing such plans.

(4) To determine what protective measures are necessary to provide for changes in flood flows on the Roseau River; and to estimate costs and apportioning of funds between the two countries.

The "Plan of Study" issued by the Board in February, 1972, sets out the overall guidelines for a comprehensive interdisciplinary study "to assess the impacts of suggested coordinated plans on the total natural, physical and social environment of the Roseau River Basin". The proposed water-related resource studies consist of two phases: (1) an inventory and analysis stage conducted on a disciplinary basis, and (2) a subsequent ecosystem approach to evaluate the potential impact of water control schemes (Ransom, pers. comm.). The purpose of the proposed wildlife studies is to appraise current and projected wildlife use, and to assess the probable effects on wildlife habitat as a result of changed water regimes due to impoundments, diversions, channeling and other manipulations of water flows in the Roseau River and tributaries. Within the framework of the proposed engineering works, the study objective is to identify

opportunities for development and management of wildlife habitat through the application of water controls. Finally, recommendations for a coordinated resource plan would emphasize utilization and recreational benefits of wildlife in the Roseau Basin.

Objectives

This study represents the initial phase or inventory assessment concerned with wetlands and associated migratory bird use in the Manitoba portion of Roseau Basin. Much of the information in this report and the attached maps rely heavily upon the Canada Land Inventory classification for waterfowl conducted in 1969 and 1970, by the Canadian Wildlife Service.

The objectives of this present study are:

(1) To inventory and classify wetlands in the Roseau River Basin of Manitoba.

(2) To describe seasonal use patterns for waterfowl and other migratory birds utilizing wetlands in the Roseau River Basin.

(3) To rate wetland habitat in terms of capability for waterfowl production.

(4) To describe the structure and ecological processes controlling the development and succession of wetland ecosystems in the Roseau Basin.

(5) To identify and evaluate potential wetland areas which may be developed to provide additional waterfowl habitat in the Roseau Basin.

Method

The existing waterfowl capability maps for the Winnipeg and Kenora map sheets were considered adequate to depict most of the large and significant wetland ecosystems within the Roseau River Basin (Figure 1).

However, further information was required to characterize wetland classes and to study the ecological factors influencing successional changes. There is also a need to quantify information relating to waterfowl and other migratory bird use of the Roseau River and associated wetlands.

This inventory commenced in May, 1972. Three aerial surveys of the watershed were conducted in May, July and early September to document bird use and to describe habitat conditions. Several ground reconnaissance trips were also taken to obtain samples from wetlands of water quality and vegetation parameters, and to record bird observations. In addition, the Canadian Wildlife Service also carried out a census of migratory bird use along a 21 mile course of the Roseau River in June. The results of these surveys are presented in Appendix D.

General description of the watershed

A physical description of the Roseau Basin in Manitoba has been presented in the Plan of Study of the Roseau River Engineering Board, 1972.

In Manitoba, the Roseau River traverses three broad landscape regions: the Southeastern Lake Terrace, the Red River Plain and the Pembina Delta (Ehrlich et al.,1953).

Over 80 percent of the Manitoba portion of the Roseau Basin occupies the Southeastern Lake Terrace. The Terrace, which is a lake-washed undulating plain situated above the 850 foot ASL contour, is comprised of moraines, outwash, beach ridges, and intervening areas of organic deposits. Dark grey chernozems, luvisols, gleysols and mesisols have developed upon the silts, sandy loams, and organic materials in the area.

The Red River Plain and Pembina Delta are level featureless plains modified by low ridges trending northwest to southeast. The Roseau River bisects a portion of the Red River Plain stretching from Green Ridge to Dominion City. Below this point, the loop of the Roseau River traverses the Pembina Delta before flowing into the Red River. Black chernozemic soils and poorly drained gleysols have developed upon the lacustrine and alluvial silts and clays on the Plain, whereas the Delta materials are chiefly sandy loams often covered by a surface mantle of clay. Once persistent surface waters, have largely disappeared due to the network of drainage ditches and the grain farming economy. However, spring run off waters and occasional flooding from the Roseau River may last for several weeks.

Climate and vegetation

The climate, and in particular the available moisture is a controlling factor affecting the development of wetlands in the Roseau Basin. Annual average precipitation varies from 20 inches in the west to 22 inches in the eastern portion of the watershed (Chapman and Brown, 1966). Similarly, the May to September precipitation increases from 13 to 14 inches from west to east. However, the variable nature of the precipitation is shown by the 18 year range from 10.4 to 33.9 inches for Sprague (Smith et al.,1964). The average annual moisture deficiency also shows an eastward trend varying from 4 to about 2 inches in the eastern portion of the Basin (Chapman and Brown, 1966),

These climatic gradients reflect the increasing boreal or more humid affinities of the vegetation that are apparent in the Sprague area. Here elements of the Great Lakes Forest are intermixed with components of the

Boreal forest and grassland (Rowe, 1959). Characteristic species include jackpine (Pinus banksiana), trembling aspen (Populus tremuloides), red and white pines (Pinus resinosa and P. strobus), white cedar (Thuja occidentalis), balsam fir (Abies balsamifera), black spruce (Picea mariana), tamarack (Larix laricina), white birch (Betula papyrifera), white elm (Ulmus americana) and green and black ash (Fraxinus pennsylvania and F. niger).

Mixed woods with scattered meadow openings occupies the tension zone on the western portion of the Southeastern Lake Terrace (Rowe, 1959). The more common species include jackpine, bur oak (Quercus macrocarpa), trembling aspen, balsam poplar (Populus balsamifera), white spruce (Picea glauca), and hardwoods such as white elm, white birch and boxelder (Acer negundo) along the river terraces.

On the Red River Plain, the native vegetation was wooded grassland of the aspen-oak association (Rowe, 1959). The floodplains and levees of the Red and Roseau rivers are forested by white elm, eastern cottonwood (Populus deltoides), boxelder, green ash, and bur oak. Grassland species that were once prevalent are big and little blue stem (Andropogon gerardi and A. scoparius), switch grass (Panicum virgatum), and prairie cord grass (Spartina pectinata).

Wetland classification

The classification of wetlands on an ecological basis is important in order to interpret developmental processes and biological productivities in relation to wildlife management. Although wetlands are easily recognizable in wet periods, the classification presents problems due to alternating wet and dry cycles, fluctuating ground water, vegetative succession, and the modifying effects of land use. Also, the delineation

of wetland boundaries on the basis of soil moisture gradients is difficult due to the low relief in the area. In most large wetlands there are transitions between zones of saturation and peat accumulation, and this is expressed in terms of vegetation cover and gradations between wetland classes.

In the Roseau Basin, wetlands vary from herbaceous to forested cover types developed on substrate materials ranging from mineral soils to peat. The majority of wetlands have developed upon peat of variable depth, texture and composition; and these peatlands are almost exclusively confined to the Southeastern Lake Terrace with its degraded and leached upland soils. In the western portion of the watershed, the peatlands are predominantly open or shrub-covered, and the peats are usually shallow, ranging in depth from about 1 foot to less than 4 feet. Forested peatlands and bogs developed upon deep peats are more prevalent in the eastern part of the area bounded by the headwaters of Pine and Sprague creeks, and in the Sundown vicinity (Smith et al.,1964).

The criteria used to characterize wetland classes were those adapted from Adams and Zoltai (1969), Tarnocai (1970), Mueller-Dombois (1964), and Heinselmann (1970). The most important features relate to the landform aspect, with its associated microrelief and hydrotopography, and the substrate composition, whether mineral or chiefly organic material. However, ground water movement, water quality, surface water periodicity and plant composition and physiognomy are all interrelated factors.

In southeastern Manitoba, Mueller-Dombois (1964) recognizes six types of forested wetlands. Two types are confined to moist and wet mineral soil habitats and four occur on peatlands:

Forested wetlands (Mueller-Dombois, 1964)

A. Mineral soil habitat

1. Eutrophic alluvial swamp - characterized by broadleaf hardwoods such as white elm, ash, and boxelder.

2. Eutrophic depressional or seepage swamps - characterized by conifers such as tamarack, black spruce, white cedar, and broadleafs such as aspen, dogwood (Cornus stolonifera), alder (Alnus rugosa) and willow (Salix spp.).

B. Peatland habitat

1. Moist oligotrophic black spruce-feather moss Sphagnum forest.

2. Eutrophic wet flat bog - characterized by sedges, mosses, dwarf birch (Betula glandulosa), willows and tamarack.

3. Mesotrophic wet sinkhole bog - characterized by feather moss, Sphagnum, black spruce and tamarack.

4. Oligotrophic raised bog - characterized by Sphagnum - feather moss and black spruce.

The main emphasis of this report is concerned with non-forested minerotrophic wetlands that usually hold surface waters for varying periods of time. These wetland classes include mineral soil and peatland habitats varying from consolidated meadows to open pools. In some areas the variety of wetland classes and the interspersion of water and vegetation cover provide attractive habitat for terrestrial and aquatic wildlife.

Non-forested Minerotrophic wetlands

A. Mineral soil habitat

Wetlands developed upon gleyed and glesolic soils that usually exhibit a humic Ah horizon or a surface layer of well decomposed peat or muck usually less than 16 inches deep (Can. Dep't. Agr., 1970).

1. Wet meadow (Figure 2). Grassy areas with consolidated sod, subject to seasonal flooding. Soils are waterlogged for part of the growing season, but lose surface water rapidly due to evaporation or a declining water table. The characteristic vegetation consists of tall and medium grasses, sedges, rushes, and broad leaved shrubs.

2. Marsh (Figures 3,4). Wet grassy areas subject to fluctuating water levels, and occasionally drying. The water table usually is situated above or near the surface for most of the growing season. The sod is unconsolidated or interrupted with patches interspersed with standing water, and frequently with large deep pools. The vegetation is comprised of tall emergent grasses, broad leaved sedges and reeds which are dispersed in standing water and often forming a broad and dense marginal band. Submerged and floating aquatic plants are usually present (Appendix B).

B. Peatland habitat

Wetlands developed upon fen or mixed peats with fibric, mesic or humic surface layers usually greater than 16 inches deep. These wetlands are usually saturated for long periods, and they are subject to poor surface drainage and low oxygen saturation.

1. Fen (Figure 6). Areas of saturated and consolidated peat, usually with a dark brown mesic or fibric surface layer overlying layers of mesic or humic peat. Seasonal flooding occurs and the water table usually persists at or near the surface except during droughts. The

characteristic vegetation consists of broad and narrow leaved sedges, reed grasses, rushes and scattered willows, dwarf birch, and tamarack.

1b. Altered Fen (Figure 2). Fens which have been affected by a lowered water table resulting in drying and humification of the surface layer of peat. The resultant vegetation reverts to a wet meadow type with invading shrubs and trees. This wetland class may represent a successional stage proceeding towards a dry terrestial site. However, in most situations these fens have been drained and altered by burning and mowing.

2. Fen Marsh (Figure 5). A wetland successional stage transitional between a fen and a marsh, but usually holding surface water in the central part of the basin. The substrate usually consists of saturated semi-floating mesic peat, surrounded on the periphery by a margin of more consolidated mesic peat. Superficially this class resembles a marsh with areas of interspersed sod and open water, with typical emergent reeds and reed grass, and aquatic plants; but it is differentiated from a marsh on the basis of peat development, higher water retention capacity, and lower nutrient status (Appendix B).

3. Fen Pools (Figures 6, 7,8,9). Usually large oval to irregularly shaped pools of permanent water located within a fen matrix, often situated on water tracks. These pools occupy broken expanses in peatlands, and represent either residual lakes or ground water discharge areas. The pool substrate consists of mineral soil with a variable thickness of overlying sedimentary or aquatic (humic) peat. An anchored or floating mat of fibric or mesic peat with often a narrow fringe of reeds and reed grasses borders the open water. Fen pools with bordering floating mats are more common in the deeper peat complexes in the eastern portion of the watershed (Appendix B).

Factors controlling wetland succession

An assessment of the impact of water developments upon wetland ecosystems is difficult unless one understands the genesis, controlling factors and ecological succession of wetlands in the area. This study does not permit a thorough appraisal of wetland ecosystems, but perhaps some relationships can be inferred. A knowledge of the systems will allow prediction of changes and enable proper management inputs if waterfowl management is a goal.

The large fen lands of the southeast such as the Caliento Bog have developed on the water worked sediments of Glacial Lake Agassiz. These materials are largely silt or silty-sand textured till or lacustrine deposits. Further east the materials of the former glacial lake bed predominantly consist of sands or sandy loams which are relatively low in fertility (Smith et al., 1964). Water quality measurements (Appendix C) taken of a limited sample of wetlands indicate that these wetlands are only of moderate fertility as interpreted by the low range of specific conductivity of 230 to 425 micromilliohms and a low sulfate ion concentration of 1 to 5 ppm. In comparison, the more fertile marshes of the Newdale Till Plain in western Manitoba show a range in specific conductivity from 190 to more than 10,000 micromilliohms, with a mean of about 1,600 (Adams, 1970). The high pH values (8.4-8.9) and the range in total alkalinity of 80 to 205 ppm. (Appendix C) indicate that the waters in the Roseau Basin are alkaline, reflecting the influence of the limestone dominated parent materials.

The alkalinity of the waters and the substrate have influenced the development of the eutrophic fens; and it is only where surface drainage has been restricted, or where peat accumulation has masked the

mineralizing influences, that the more acidic oligotrophic bogs have developed. According to Heinselmann (1970) the key factors determining the type of vegetation and peat development are water chemistry and circulation of ground waters.

The Roseau Basin peatlands have probably developed as a result of swamping of the terrain, with the peat forming processes initiated under swamp forests, fens, and marshes. Heinselmann (1970) has shown that about 94% of the Lake Agassiz peatland area in Minnesota has originated in this way. However, in some localized areas, it is apparent that peat has developed from aquatic sources. The occurrence of fen pools suggests that hydrarch succession or peat accumulation by autogenic processes is continuing. Several apparent stages in this sequence are shown by examples of stagnant marshes, fen marshes, and floating mat development. However, the classical basin - filling succession as described by Conway (1949) does not necessarily take place as there are many interruptions and reversions of this sequence.

The climatic variability of the region with alternating wet and dry cycles imposes other environmental limitations that influence or counteract autogenic succession. These allogenic (drought) and reversion (flooding) processes are discussed by Fuller and LaRoi (1971) for the Peace-Athabasca Delta. Assuming that the precipitation-evaporation ratios for the region favor the retention of surface waters or a saturated substrate, then organic materials will accumulate. Therefore, stagnating marshes in closed basins would progress through successional stages with the basin being gradually filled by peat, eventually succeeding to a sedge fen. However, the imposition of drought periods tends to interrupt this process in the shallow mineral basins, through drying of the substrate and oxidizing of the organic deposits. As a result, many

marshes have probably persisted for long periods of time. In general, however, closed basins and poorly drained areas in the watershed are influenced more by autogenic processes and peat accumulation tends to exceed decomposition rates despite droughts. Probably there is ample water retained in the peat substrate for a sufficient period of time to prevent oxidation, except where artificial drainage occurs.

In the shallow peats the residual ponds tend to close in due more to lateral growth of peat rather than to accumulation of bottom sediments. Less severe droughts or incomplete drainage causing lowered water levels in the pools, with resulting stagnation, facilitates peat growth by allogenic and autogenic processes. As a result, anchored sedge sod develops on exposed peat at the periphery of the pool and tends to advance inward. Recurrent flooding may tend to hold these processes at equilibrium and in extreme cases may cause a reversion of this sequence through the breakup of sod and the drowning of vegetation. Conversely, artificial drainage may accelerate peat forming processes and result in rapid revegetation of these fen pools.

In the deep peats, fen pools are affected by lateral and vertical accumulation of peat. A lateral developing floating mat comprised of mosses and sedges is usually characteristic of the deeper ponds. The mat usually oscillates according to rising and falling water levels, and growth may be held in check by wind action or by changes in ground water levels. Occasionally floating islands of peat may occur, but these are usually formed due to break up of peaty shorelines by wave action or flooding. The impoundment of Horseshoe Lake located 3 miles northeast of Sundown, shows similar results due to the inundation of deep peats (Figure 10).

Fen pools tend to vary in productivity depending upon sources of ground water, but in general those pools developed in shallow peats such as the Caliento Bog are moderately productive of aquatic flora (Appendix B). Isolated ponds in the deep peat complexes usually show less diversity in aquatic plant species, the most prevalent species being spatterdock (Nuphar variegatum), floating leaved pondweed (Potamogeton natans) and aquatic mosses. These apparent differences in nutrient supply should also be reflected in water quality parameters but sampling is insufficient.

The frequent occurrence in stagnant pools of great quantities of anchored and floating semi-fluid mats of aquatic mosses such as Drepanocladus, suggests that these mosses are important peat formers in wetlands on the Southeastern Lake Terrace. The mosses are found in almost all classes of wetlands, especially in fen marshes and fen pools. The presence of moss mats in transition wetlands such as the Vita Marsh (Appendix B) may suggest that the wetland has originated from an aquatic source and that the basin filling sequence is almost completed. However, the peat profile does not reveal any substantial layer of aquatic peat and therefore, other processes must have been involved.

The Vita Marsh appears to be in a closed depression with no outflow, receiving inflow only from runoff and possibly ground water. The basin is somewhat saucer shaped in profile with the greatest depth in the wet center. Peat formation was probably initiated in a marsh and as the peat developed there was a gradual rise in the water table. The consequent accumulation of mesic peat accompanied by corresponding rises in the water table resulted in lateral proliferation of peat towards the peripheries of the wetland causing an increase in the areal coverage of the wetland. Peat growth probably did not proceed as rapidly in the center of the basin due to fluctuations in surface water and ground water discharge.

Periodic flooding and drawdowns may have accounted for the invasion of marsh emergents, but a more recent decrease in the water table has probably favored lateral peat growth and the proliferation of moss mats in the basin center. In 1972, the surface waters were declining appreciably but pools were still present in August. The bordering fen was dry enough to produce hay crops.

Practices such as draining, burning, mowing, and cultivation of the peatlands in the central portion of the watershed have caused some irreversible changes. Vast acreages of shallow peatlands have been drained and burned to furnish forage or grain crops. These practices cause destruction of the peat layer or physical alteration due to subsidence of the peat, changes in the water holding capacity, and changes in plant succession. Drying and subsequent burning reduces rank residual cover and woody growth causing a decline in sedges and reeds and a succession to grassy wet meadow species. Fires will also denude peat mats and burn out patches of sod, thereby creating shallow depressions. If drainage is not complete the reflooding of these burn-outs creates small ponds. The denuded mats are then colonized by plants such as burreed (Sparganium sp.), cattail (Typha latifolia), reed grasses (Calamagrostis spp.) and annual species.

There are many examples in the Roseau Basin where drainage ditches have been less successful in removing surface or subsurface waters from peatlands. The large deep peat deposits are difficult to drain completely. In some cases such as Wetland No. 33, only the periphery has been drained leaving the interior wet enough to prevent access of farm machinery. Partial drainage considerably reduces waterfowl habitat in the area but seldom achieves any alternate land use benefits. The effects of surface drainage of hay meadows and fens were enhanced by the

drought of 1972. In areas where there was no spring irrigation the hay crops were of low yield. It is possible that continued drainage of peatlands will affect an important source of water storage and possibly reduce the supply of ground water. Therefore, the validity of continued drainage is questionable in an area where ground water supplies are minimal (Roseau River Basin Board).

Waterfowl capability

The natural capability or potential of the habitat for waterfowl production is shown on the attached Canada Land Inventory Maps (Figure 1). A description of the background, guidelines, and assumptions of the inventory is discussed by Perret (1970). There is also a general description of the habitat in the narratives accompanying the unpublished Winnipeg and Kenora capability maps (Adams and Hutchison, 1972).

Most of the existing waterfowl habitat in the Roseau Basin is confined to the Southeastern Lake Terrace, where the highest capability habitat (Class 3 and 4) refers to marshes, shallow streams, fen marshes, and fen pools. The most productive wetlands are wet meadow marsh habitats along the Rat River, marshes and intermittent stream courses in the Tolstoi area, marshes and fens in the Zhoda, Vita and Arbakka areas, and fen pools east and south of Caliento (Appendix A).

The chief limitation affecting waterfowl production in wetlands within the Roseau Basin is available nutrient levels as inferred from water quality parameters (Appendix C) and the abundance of aquatic plants. The majority of wetlands are deficient in aquatics except for mosses, bladderwort (Utricularia vulgaris) and water milfoil (Myriophyllum sp.). The fine leaved Potamogeton species which are

preferred waterfowl foods are scarce to absent except in local areas such as the Caliento Bog (Appendix B). The low nutrient levels are probably related to the infertile parent materials, the poor circulation of mineral charged waters,and the low oxygen saturation within the peatlands.

Other limiting factors restricting waterfowl production are shallow basin depths, a lack of permanent surface water, and poor shoreline edge development. Shallow wetlands situated on coarse textured soils are usually subject to rapid water loss by evaporation, or due to bottom seepage, or via ditches and drains. Most marsh basins are currently so heavily overgrown with emergents such as cattail and hardstem bulrush (Scirpus acutus) that they provide poor habitat for waterfowl breeding pairs. This habitat could be considerably improved by the addition of water.

Current migratory bird use

Inventories of current waterfowl use of wetlands and migratory bird use of riparian cover along a portion of the Roseau River were attempted in 1972 (Appendix D). Aerial counts of waterfowl were conducted on September 5 and previous reconnaissance flights were also carried out in 1969 and 1970. Two canoe float trips were undertaken on the Roseau River channel between Gardenton and the Senkiw Ford on June 16, and June 29, 1972. The inventories were hampered by the heavy vegetation cover which reduced visibility, the dispersion of habitat, and the relative inaccessibility of many wetlands for ground observations.

Observations of breeding pairs, lone drakes, and broods indicate that the most abundant species of breeding waterfowl in the Roseau Basin

are the mallard (Anas platyrhynchos), blue-winged teal (Anas discors), green-winged teal (Anas crecca), lesser scaup (Aythya affinis), ring-necked duck (Aythya collaris), and scattered numbers of canvasback (Aythya valisineria). In addition, other species frequenting the fens and meadows in the region are the common snipe (Capella galinago), and the sandhill crane (Grus canadensis). Also, occasional wood ducks (Aix sponsa) probably nest along the Roseau River. A list of observed numbers and species of waterfowl and other migratory birds is provided in Appendix D.

Our current knowledge of waterfowl breeding populations in the Roseau River Basin is incomplete with only a few surveys providing any quantitative data. It is difficult to establish population density indexes for breeding pairs, or to relate waterfowl numbers to changes in habitat without a yearly inventory. Visibility factors also introduce a large and variable source of error often resulting in underestimates of population size. Survey flights conducted during May, 1969, 1970, and 1972, indicated relatively low duck breeding pair use on ponds and some small ponds or fen pools showed no visible use whatsoever. Similarly, surveys along a 21 mile course of the Roseau River in June failed to reveal more than three ducks and one brood (Appendix D, Table 3). Additional and periodic aerial and ground inventories will be necessary if a more complete knowledge of waterfowl populations in the Roseau Basin is required.

Breeding pairs and small flocks of waterfowl frequent the following wetlands in the spring and summer: wetland numbers 6, 8, 9, 10, 11, 17, 18, and 19, and including the Rat River west of Zhoda (Figure 1). The Caliento Marshes and the Rat River area together with the Roseau River Refuge in Minnesota, probably constitute the best waterfowl

breeding habitat in the Roseau Basin.

Some index of waterfowl use of wetlands in early fall can be deduced from counts conducted on September 5, 1972 (Appendix D, Table 1). The most frequently used wetlands were the more permanent fen pools and these included wetland numbers 7A, 8, 10 (Caliento Marshes), 17, 18, and 19 (Figure 1). There is increased waterfowl usage of these wetlands in the fall with the most prevalent migrating species being mallard, lesser scaup, and blue-winged teal. Other important species that migrate through this area include the Giant Canada Goose (Branta canadensis maxima), and the sandhill crane. Probably most of the migrating waterfowl that fly this corridor pass over the Roseau Basin stopping at Whitemouth Lake, Horseshoe Lake, or the managed marshes of the Roseau Wildlife Refuge in Minnesota.

The status of the sandhill crane is interesting. Apparently a small population of the birds breed in southeastern Manitoba (Stephen, 1967) and several observations of cranes in 1972 support this view (Appendix D, Table 2). The cranes were observed near Sundown, on large fens near the Roseau River Diversion, on hay meadows southeast of Sirko and at the Zhoda Marsh. Four cranes were observed at the Diversion ditch 5 miles west of Arbakka on July 28, 1972 and again on September 5 two cranes were seen in the area. Cranes have also been seen repeatedly in the Sundown area. In most cases, the cranes frequent rather open meadows in inaccessible areas.

These sandhill cranes probably represent members of the rather small crane population that migrates to wintering grounds in southeastern U. S. A. (Stephen, 1967). Breeding birds of this species are relatively rare in southern Manitoba and there is concern over their status. Currently the Canadian Wildlife Service (Cooch, pers. comm.) is interested in documenting the southern breeding range of this species.

Habitat development and restoration potential

Opportunities for the development of wildlife habitat are dependent upon the supply of available water and the type of engineering works that are implemented. For example, flood storage projects may improve waterfowl habitat, whereas drainage projects are likely to decrease habitat. In assessing opportunities for development it was assumed that potential areas had to be located near a source of water such as seasonal drainage channels, rivers or large peatlands. The presence of residual marsh vegetation, seepage areas, and small ponds also furnished clues to the development possibilities of drained areas. No attempt has been made to determine the engineering feasibility of constructing water controls or to evaluate the cost benefits of developing given areas.

The following wetland areas listed below probably have considerable potential for improvement as waterfowl habitat providing that sufficient water can be held on the areas through spring, summer and fall, and providing that water levels can be manipulated to achieve an optimum interspersion of vegetation and surface water. A partial fall drawdown is probably beneficial as long as the new impoundment is not allowed to dry. With the prospect of increased discharges down the lower Roseau River due to drainage projects in Minnesota, it may be just as feasible to trap excess water in subimpoundments, thereby benefiting wildlife habitat, than to channelize portions of the river to handle increased flows. The following areas with the addition of dyking, may serve as water reservoirs for excess runoff on the Roseau and Rat rivers and they also should provide good waterfowl habitat (see Appendix A).

1. Wetland No. 21 - 16, 17, 20-1-7 East. Located adjacent to the Souris diversion. Small dyked impoundments may be feasible.

2. The arm of the Roseau River below the Arbakka dam and ~~up~~ down stream to the entrance of the diversion ditches. The reduced flows have allowed the development of marsh conditions, but the channel could be managed by releasing additional water in midsummer to prevent stagnation and water loss (Figure 13).

3. The shallow peatland located south of Vita and adjoining the cut-off portion of the Roseau. Spring overflow could be discharged via a pumping system but dyking would be necessary.

4. Wetland No. 24 - 11-2-6 East. The drainage ditch would have to be closed or water rechanneled into the area.

5. Wetland No. 33 - 15W, 16E-2-4 East. This wetland could be improved in wet years by trapping runoff from drainage channels. A control on the outlet ditch would be necessary.

6. Stream channel 34 and other intermittent drainages in Township 2, Ranges 4 and 5. The depth and sideslopes of the channels would permit flooding up to 3 feet in places by the construction of small check dams with gates.

7. Wetlands No. 2, 3, and the grassy wet meadows along the Rat River in Township 3, Ranges 7 and 8 East. The suitability of this area is dependent upon periodic flooding from the Rat River. Perhaps an impoundment could be constructed here but dyking would be necessary to prevent loss of water through the large drain leading to the Roseau River.

8. The Caliento Bog (Wetlands No. 9, 10). Township 2, Ranges 8 and 9 East. Flooding of the Caliento Bog may occur normally as waters from the Rat River are periodically flushed into the area, probably draining slowly southward through the fen west and south of Sundown. In the

proposed Caliento project, waters from the Sand and Rat rivers would be diverted into the peatland and stored for use later in the season. Flooding of this peatland to a depth of about 2 feet accompanied by a fall drawdown would probably result in the reversion of successional stages and the creation of a large minerotrophic marsh with interspersed pools and islands. This impoundment would likely create similar conditions as exist in the Roseau Refuge marsh, situated a few miles south across the international boundary (Int. Roseau Basin Board). Therefore, migrating waterfowl use should increase considerably and Canada goose production could be increased by a restocking program. A proposed impoundment in this area probably has the greatest potential for wildlife management of any other site located in the Manitoba portion of the Roseau River Basin.

Another use of water in southeastern Manitoba is the establishment of wild rice paddies in the Piney and Sprague vicinities (Figure 11). Water is pumped from Pine and Sprague creeks to flood the compartments. However, in the Piney rice paddies there has been an invasion of cattail and aquatics such as sago pondweed have proliferated. Small flocks of waterfowl, especially mallards and pintail (Anas acuta) were observed on the paddies on June 13 and July 28, 1972. This management of water for wild rice production may inadvertently create new waterfowl feeding habitat and cause concentrations of waterfowl and ensuing land use conflicts.

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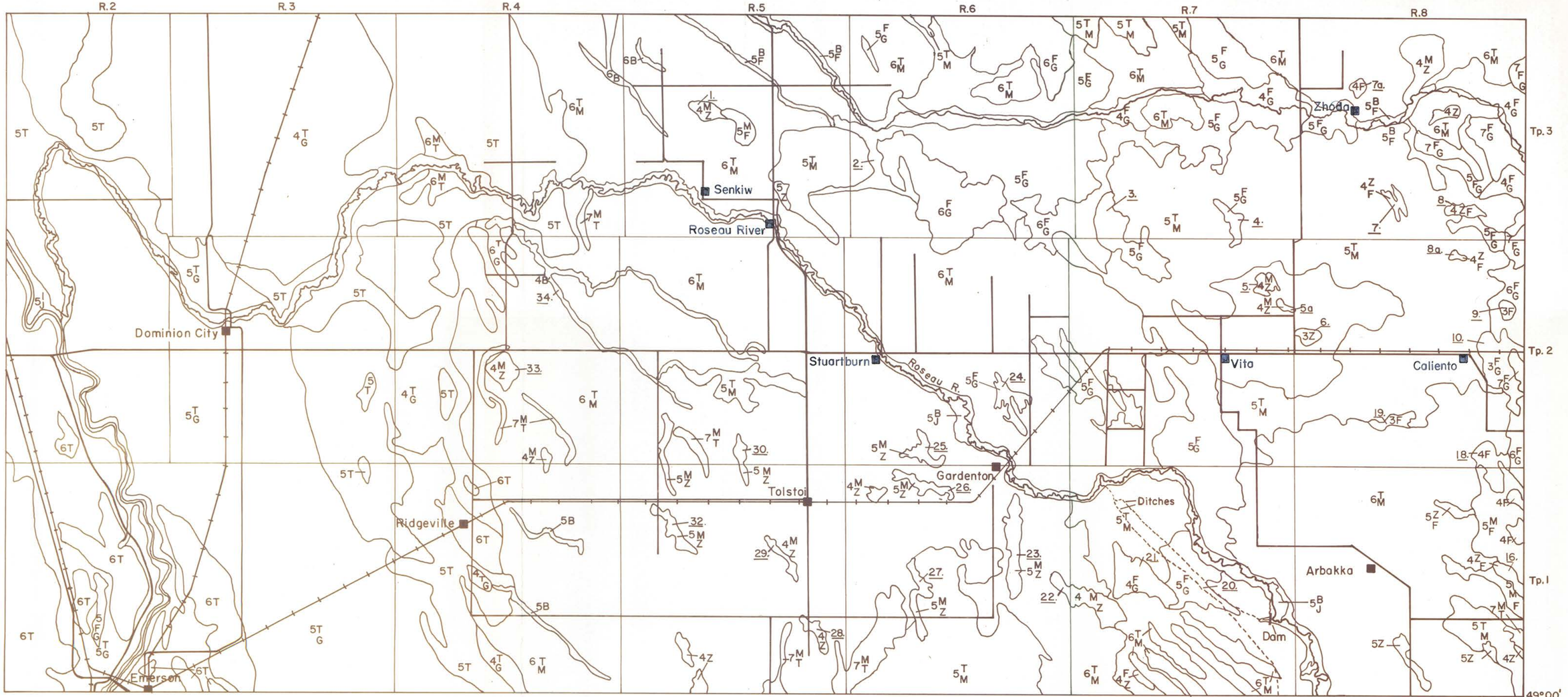

Figure IA.

Land Capability For Waterfowl, Roseau Basin.

Scale: 1:126,720

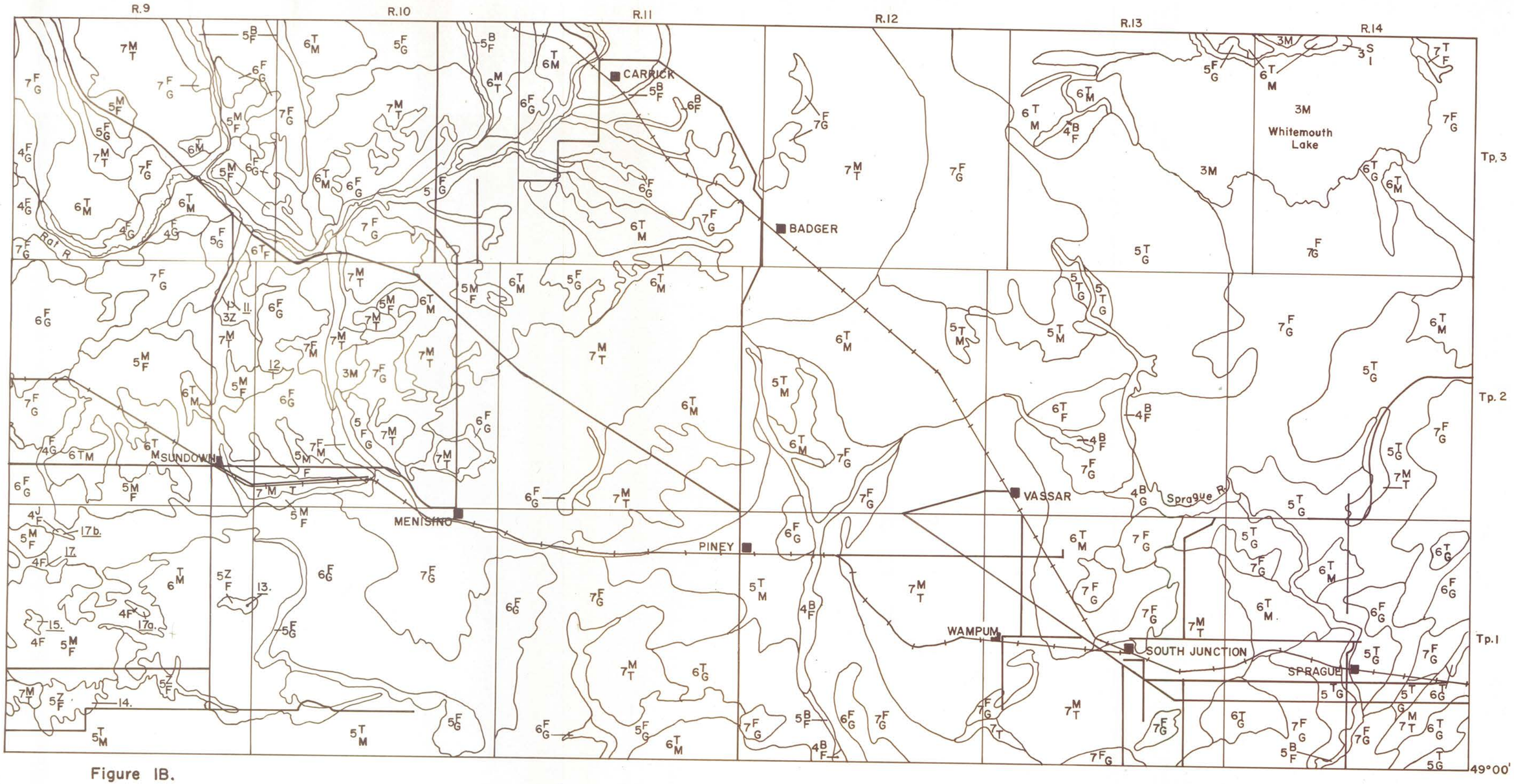

Figure 1B.

Scale: 1:126,720

Figure 2. Wetland No. 2. 7, 8-3-6E. Drained fen in foreground. Hayed wet meadows in background. Located south of Rat River. Waterfowl capability classes 6^{F}_{G} and 5^{F}_{G}.

Figure 3. Wetland No. 7A. Zhoda Marsh. A semipermanent marsh with bordering wet meadow and a cattail fringe. Interspersed stands of bulrush in water. Capability class 3_{P}.

Figure 4. Wetland No. 18. 36-1-8E. A pool or open water marsh with a broad cattail fringe and adjoining sedge meadow. Scattered boulders showing. Capability class 4_F.

Figure 5. Wetland No. 6. A fen marsh located on 19W-2-8E. Semi-permanent. Interspersed pools and stands of bulrush, cattail, and Phragmites. Adjoining fen. Capability class 3_Z.

Figure 6. Wetland No. 10. 13-2-8E. A fen pool with an irregular shoreline of fen peat fringed by cattail. Denuded peat mats showing in water. Bordering shrub covered fen. Caliento Bog. Capability class 3^{F}_{G}.

Figure 7. Wetland No. 8A. 35W-2-8E. A fen pool with a small island. Broad band of cattail and Phragmites. Exposed areas of peat shown. Capability class 4^{Z}_{F}.

Figure 8. Wetland No. 10. 7W-2-9E and 12E-2-8E. South end of Caliento Bog. Fen pools in a sedge fen with scattered patches of cattail and Phragmites. Capability class 3^{F}_{G}.

Figure 9. Wetland No. 10. 7SW-2-9E. A ground photo of fen pool with a marginal fringe of cattail. See Appendix B. Capability class 3^{F}_{G}.

Figure 10. Horseshoe Lake. 21-2-10E. A Ducks Unlimited impoundment, flooding a fen developed upon deep peat. Low production capability - but a migratory staging area for waterfowl (3M).

Figure 11. Flooded wild rice paddies. Located 3 mi. S of Piney. Primarily mineral soil.

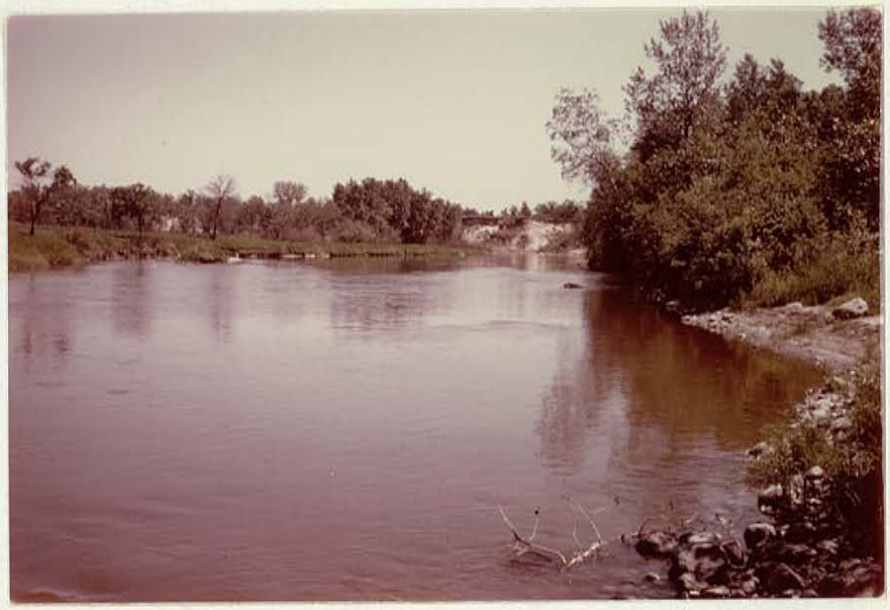

Figure 12. The Roseau River at Senkiw Ford, showing agraded and degraded banks.

Figure 13. The cutoff channel of the Roseau River below the Arbakka Dam and east of Gardenton. Some marsh development, June, 1972.

Appendix A - Wetland Inventory - Roseau River Basin.

Aerial Reconnaissance: September 5, 1972.

Wetland No. 1 - 62H/20,21-3-5E: Waterfowl Capability - 4^{M}_{Z}

A dry "wet meadow", drained by a ditch, predominantly grasses, sedges, and scattered willows.

Wetland No. 2 - 7-12,-3-6E: Waterfowl Capability 5^{F}_{G} and 6^{F}_{G}

"Half bog" soils located south of Rat River, meadows with sedges and grasses and interspersed moist spots with cattail and Phragmites. Mostly dry, scattered, open, denuded patches due to previous burns or evaporating water. Interspersion of islands and clumps of aspen and willows, primarily mineral soil with alternating wooded areas and meadows.

Wetland No. 3 - 62H/2E-32,33-2-7E: Waterfowl Capability - 5^{F}_{G}

A drained, hayed, grassy meadow with interspersed shrub and brush, some shallow peat areas.

Wetland No. 4 - 2-3-7E: Waterfowl Capability - 5^{F}_{G}

A dry, "wet meadow".

Wetland No. 5 - 25W-2-7E: Waterfowl Capability - 4^{M}_{Z}

Grassy "wet meadow", willows scattered, patches of Phragmites, largely hayed.

Wetland No. 6 - 19W-2-8E: Waterfowl Capability - 3_{Z}

Semipermanent fen marsh, bulrush, cattail, and Phragmites, scattered small patches of spatterdock. Small areas of open water. Largely closed. Muskrat use.

Wetland No. 7 - 4W-3-8E: Waterfowl Capability - 4^{Z}_{F}

Dry "wet meadow" interspersed by aspen.

Wetland No. 7A - 20W-3-8E: Waterfowl Capability - 3_{F}

Located at Zhoda. Wet semipermanent, bulrush marsh.

Wetland No. 8 - 2W-3-8E: Waterfowl Capability - 4^{Z}_{F}

Peaty area, fen pools with open water somewhat reduced in area. Several interspersed pools, Phragmites fringe adjoining sedge meadows. Fairly sterile bottom.

Wetland No. 8A - 35W-2-8E: Waterfowl Capability - 4^{Z}_{F}

Fen pool, peaty periphery, open water with one small island in the center. Cattail fringes.

Wetland No. 9 - 25E-2-8E: Waterfowl Capability - 3_{F}

Caliento area, large fen marsh, sedge meadow and Phragmites, largely overgrown, wet, with bulrush, spatterdock, scattered pools. Similar to No. 6.

Wetland No.10- 12E,13W-2-8E: Waterfowl Capability - 3^{F}_{G}

Scattered fen pools in peat mass. Phragmites interspersed in sedge meadow. North end of Caliento marshes, very interspersed open areas in peat, appear to be growing in. Bare denuded peat mats shown. Inner zone of cattail, backed by sedge, calamagrostis, Phragmites - meadow and willows. Additional pools, aquatic moss in water, narrow leaf cattail, burreed (floating), scattered spatterdock. Some submergents seen.

Wetland No. 11 - 36W-2-9E: Waterfowl Capability - 3_{Z}

Marsh with large drawdown area, whitish patches, largely mineral soil. Shallow, dense with pondweeds. Main open area in south is bulrush, with mud flats, some burreed and Phragmites, good potential with more water.

Wetland No. 12 - 13,24-2-9E: Waterfowl Capability - 5^{M}_{F}

Dry, hayed meadow except for sedge meadow in central portion, with willows.

Wetland No. 13 - 24E-1-9E: Waterfowl Capability - 5^{Z}_{F}

Dry "wet meadow" grazed.

Wetland No. 14 -5,8-1-9E: Waterfowl Capability - 5^{Z}_{F}

Primarily, "wet meadow", probably very shallow peat. Sedge, grass, patches of dead cattail.

Wetland No. 15 - 19E-1-9E: Waterfowl Capability - 4_{F}

Largely dry, permanent pool in center. Peaty, fen type, sedge meadow, muskrat house, cattail fringe, denuded mats. Burning around periphery.

Wetland No. 16 -13,24-1-8E: Waterfowl Capability - 4^{Z}_{F}

One small remnant pool or two, bordered by wet cattail - sedge meadow. Water is open with aquatic mosses. Scattered cattail.

Wetland No. 17 - 30-1-9E: Waterfowl Capability - 4_F

Fen pools with sedge meadow border and cattail margins. Patches of cattail and Phragmites. Open pools are largely choked with mosses with cattail margins. Stagnant. North pool merges into a large open fen.

Wetland No. 17A - 2 W-1-9E: Waterfowl Capability 4_F

Fen pools with sedge meadow border, Phragmites periphery. Similar to Caliento Bog.

Wetland No. 17B - 32W-1-9E: Waterfowl Capability - 5^J_F

Third pool in fen. A catchment area, on a drainage track. Floating fen edge, spatterdock, small pools have burreed and spatterdock and bulrush. Patches of cattail.

Wetland No. 18 - 36W-1-8E: Waterfowl Capability - 4_F

South of Caliento, largely fen or sedge meadows. Open pools bordered by cattail, and interspersed interruptions in peat sod. Phragmites and some willow. Aquatic moss, rocks showing.

Wetland No. 19 - 9S-2-8E: Waterfowl Capability - 3_F

Dry fen bordering pools, sedge and cattail, scattered pools, drawdowns, denuded peat areas, stones showing. Few aquatics seen.

Wetland No. 20 - 15,22,21-1-7E: Waterfowl Capability - 5^F_G

At Roseau diversion. Choked emergents growing in Roseau channel downstream from dam. Bordering dry sedge meadow.

Wetland No. 21 - 16, 17,20-1-7E: Waterfowl Capability - 4^F_G

Uninterrupted shallow peaty area with boulders present. Hayed in areas. Scattered bands of Phragmites scattered tiny pools with phragmites and cattail growing. Some potential, sedge-grass meadow.

Wetland No. 22 - 18-1-7E: Waterfowl Capability - 4^M_Z

Largely hayed sedge-grass meadow.

Wetland No. 23 -14,23,26-1-6E: Waterfowl Capability - 5^M_Z

Sedge-grass meadow drained by large ditch.

Wetland No. 24 - 11-2-6E: Waterfowl Capability - 5^F_G

Largely dry meadow, drained.

Wetland No. 25 - 4W-2-6E: Waterfowl Capability - 5^{M}_{Z}

Dry "wet meadow", grazed.

Wetland No. 26 - 33-1-6E: Waterfowl Capability - 5^{M}_{Z}

Wet meadow - dwarf birch, willow, dry.

Wetland No. 27 - 9,16-17-1-6E: Waterfowl Capability - 5^{M}_{Z}

Dry, "wet meadow", sedge-grass, scattered willows, hayed in patches. Soutern end is wetter, with dry bulrush and sedges.

Wetland No. 28 - 12W, 11E-1-5E: Waterfowl Capability - 4_{Z}

Largely wet meadow. Some cattail, bulrush, dry cattail sedge. Closed canopy. Grazed on periphery.

Wetland No. 29 - 23W-1-5E: Waterfowl Capability - 4^{M}_{Z}

Dry, sedge-grass, cattail meadow, grazed and hayed.

Wetland No. 30 - 34W-1-5E: Waterfowl Capability - 5^{M}_{Z}

Dry sedge-grass meadow.

Wetland No. 32 - 29-1-5E: Waterfowl Capability - 5^{M}_{Z}

Largely dry meadow, hayed.

Wetland No. 33 - 15W, 16E-2-4E: Waterfowl Capability - 4^{M}_{Z}

Old dyke, bisecting area has adjoining ditches trapping water, fen marsh with patches of cattail. Needle and broadleaf sedges, scattered bulrush, no open water, grazed on periphery. Drained.

Wetland No. 34 - Waterfowl Capability - 4_{B}

Intermittent, mostly dry stream channel. Slight topographic depression, bordered by heavy tree and shrub growth, but changing to open fields and a winding ditch. Wet meadow vegetation. Channelled to river, some potential.

Appendix B - Description of Wetland Types.

1. Marsh - Located 23^{N}_{W} -5-6 East. Located just north of the Roseau Basin, this semipermanent marsh which is largely overgrown with emergents is rather typical of many such wetlands on the Southeastern Lake Terrace. The marsh is situated adjacent to a beach ridge, and it receives runoff and some inflow from an intermittent stream. Water levels seldom exceed 24 inches and the marsh was virtually dry in the late summer of 1972. An outer wet meadow zone of northern reedgrass (Calamagrostis inexpansa), broad leaved and needle leaved sedges (Carex spp.) borders an inner marsh zone of interspersed stands of cattail, hardstem bulrush, sweetflag (Acorus calamus), and water horsetail (Equisetum fluviatile). The open water areas are blanketed by bladderwort, water milfoil, and aquatic mosses. The substrate of the basin is predominantly mineral soil with a thin layer of humic peat.

2. Fen Marsh - Wetland No. 6. Located 19-2-8 East. A large isolated basin with an outer zone of hummocky mesic fen peat, about 3 to 4 feet deep. The inner zone consists of saturated areas and small stagnant pools developed on floating fibric peat overlying a layer of mesic peat. A closed stand of hardstem bulrush and patches of Phragmites and cattail occur within the wet center; whereas, sedges and meadow grasses such as Agrostis, Muhlenbergia and Poa grow on the bordering fen. Aquatic plants such as spatterdock, floating leaved pondweed, narrow leaved burreed, bladderwort, water milfoil, and aquatic mosses are found in the standing water.

3. Fen Pools - Wetland No. 10. SW 7-2-9 East. A small pool with a bordering anchored fen mat, situated in a large fen (peat depth - 3-4 feet) known as the Caliento Bog. The bordering fen consists of mesic peat, supporting surface vegetation of sedges, northernreedgrass, willows, dwarf birch, and a fringe of cattail adjoining the pools. The peripheries of this fen have been drained, burned and mowed. The pool which is about 2-3 feet deep (Aug., 1972), contains relatively clear water and exhibits a substrate of 4 to 6 inches of flocculent, dark brown sedimentary peat overlying a silty-sand textured till with occasional boulders. The common aquatic plants include water milfoil, bladderwort, muskgrass (Chara sp.), common coontail (Ceratophyllum demersum), and pondweeds such as sago (Potamogeton pectinatus), and ribbon leaved pondweed (P. pusillus). Other plants of scattered occurrence were clumps of spatterdock, northern water lily (Nymphaea tetragona), and narrow leaved burreed.

Appendix C - Water Quality Parameters of Sample Wetlands and Streams in Southern Manitoba.

Site	Location	Date	Specific conductivity mmmhos	Total alkalinity ppm	SO_4 ppm	PH
Roseau River	S of Vita	22-6'72		185		8.0
Roseau River	Stuartburn	29-6'72		185		8.5
Sprague Creek	N of Vassar	22-6'72		160		8.5
Rat River	1.5 E of Rosa	6-8'70		120	3	8.4
Rat River	SW 4-4-5E	6-8'70	425			
Wetland No. 11	36W-2-9E	28-10'70		80	3	8.6
Horseshoe Lake	21-2-10E	28-10'70		120	2	8.4
Wetlands	23^{N}_{W}-5-6E	21- 8'69	240	80	2	8.9
Wetlands	6^{N}_{E}-5-6E	20- 8'69		110	5	
Wetlands	32^{N}_{W}-3-9E	15- 8'69	230	120	1	
Wetlands	6^{S}_{E}-4-9E	16- 8'69	380	205	< 2	

Appendix D - Inventories of Migratory Bird Use of the Roseau River Basin.

Table 1. Aerial waterfowl counts - September 5, 1972.

Wetland	Location	Species	Estimated No.
No. 6	19W-2-8E	Mallard	2
No. 7A	20W-3-8E	Mallard	Total of 50±
		Blue-winged Teal	
No. 8	2W-3-8E	Unident. Ducks	11
No. 8A	35W-2-8E	Mallard	6
No. 10	12E,13W-2-8E	Mallard	8
		Unident. Ducks	16
No. 17	30 -1-9E	Mallard	5
		Blue-winged Teal	2
		Unident. Ducks	29
No. 17B	32W-1-9E	Unident. Divers	4
No. 18	36W-1-8E	Unident. Ducks	6
No. 19	9S-2-8E	Mallard	25

Appendix D - Inventories of Migratory Bird Use of the Roseau River Basin.

Table 2. Sandhill Crane observations in southeastern Manitoba.

Date	Locale	Number
13-5'70	2 mi. S Marchand	1
21-5'70	1 mi. N Sundown	1
17-5'72	1 mi. E Sundown	4
28-7'72	5 mi. W Arbakka	4
28-7'72	2 mi. SE Sirko	2
5-9'72	Zhoda	3
5-9'72	4 mi. W Arbakka	2

Appendix D - Inventories of Migratory Bird Use of the Roseau River Basin.

Table 3. Numbers and species of migratory birds identified along the Roseau River between Gardenton and Stuartburn on June 16, 1972.

Species	No.	Species	No.
Green-winged Teal (Anas crecca)	1	House Wren (Troglodytes aedon)	4
Wood Duck (Aix sponsa)	1	Catbird (Dumetella carolinensis)	10
Red-tailed Hawk (Buteo jamaicensis)	1	Robin (Turdus migratorius)	15
Sparrow Hawk (Falco sparverius)	1	Veery (Hylocichla fuscescens)	2
Killdeer (Charadrius vociferus)	3	Cedar Waxwing (Bombycilla cedrorum)	8
Spotted Sandpiper (Arctitis macularia)	4	Loggerhead Shrike (Lanius ludovicianus)	2
Mourning Dove (Zenaidura macroura)	5	Yellow Warbler (Dendroica petechia)	11
Great Horned Owl (Bubo virginianus)	2	Wilson's Warbler (Wilsonia pusilla)	4
Yellow-shafted Flicker (Colaptes auratus)	2	Unidentified Warblers	50
Downy Woodpecker (Dendrocopos pubescens)	1	Western Meadowlark (Sturnella neglecta)	2
Eastern Kingbird (Tyrannus tyrannus)	9	Red-winged Blackbird (Agelaius phoeniceus)	1
Western Kingbird (Tyrannus verticalis)	2	Brewer's Blackbird (Euphagus cyanocephalus)	43
Eastern Phoebe (Sayornis phoebe)	2	Common Grackle (Quiscalus quiscula)	7
Least Flycatcher (Empidonax minimus)	2	Baltimore Oriole (Icterus galbula)	17
Cliff Swallow (Petrochelidon pyrrhonota)	109	Scarlet Tanager (Piranga olivacea)	1
Bank Swallow (Riparia riparia)	3	American Goldfinch (Spinus tristis)	10
Rough-winged Swallow (Stelgidopteryx ruficollis)	3	Song Sparrow (Melospiza melodia)	6
		TOTAL SPECIES	33
		TOTAL BIRDS	344

Appendix D - Inventories of Migratory Bird Use of the Roseau River Basin.

Table 4. List of species of migratory birds identified along the Roseau River between Stuartburn and Senkiw on June 29, 1972.

Species	Latin Name
Mallard	(Anas platyrhynchos)
Red-tailed Hawk	(Buteo jamaicensis)
Broad-winged Hawk	(Buteo platypterus)
Great Blue Heron	(Ardea herodias)
Killdeer	(Charadrius vociferus)
Spotted Sandpiper	(Arctitis macularia)
Mourning Dove	(Zenaidura macroura)
Black-billed Cuckoo	(Coccyzus erythropthalmus)
Great Horned Owl	(Bubo virginianus)
Belted Kingfisher	(Megaceryle alcyon)
Eastern Kingbird	(Tyrannus tyrannus)
Eastern Phoebe	(Sayornis phoebe)
Least Flycatcher	(Empidonax minimus)
Bank Swallow	(Riparia riparia)
House Wren	(Troglodytes aedon)
Catbird	(Dumetella carolinensis)
Robin	(Turdus migratorius)
Veery	(Hylocichla fuscescens)
Bluebird	(Sialia sp.)
Cedar Waxwing	(Bombycilla cedrorum)
Red-eyed Vireo	(Vireo olivaceous)
Yellow Warbler	(Dendroica petechia)
Yellowthroat	(Geothlypis trichas)
Redstart	(Setophaga ruticilla)
House Sparrow	(Passer domesticus)
Brewer's Blackbird	(Euphagus cyanocephalus)
Common Grackle	(Quiscalus quiscula)
Brown-headed Cowbird	(Molothrus ater)
Baltimore Oriole	(Icterus galbula)
American Goldfinch	(Spinus tristis)
Clay-colored Sparrow	(Spizella pallida)
Song Sparrow	(Melospiza melodia)