WILDLIFE ENHANCEMENT OPTIONS FOR BUFFALO CREEK: MANITOBA

By

Pierre Johnstone

A Practicum
Submitted to the Faculty of Graduate Studies
In Partial Fulfillment of the
Requirements for the Degree

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Gerontology 0351
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- Medieval 0581
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- Black 0328
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- Asia, Australia and Oceania 0332
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WILDLIFE ENHANCEMENT OPTIONS FOR BUFFALO CREEK: MANITOBA

A practicum submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements of the degree of Master of Natural Resources Management.

By

Mr. Pierre Johnstone

ABSTRACT

This practicum addresses the problem of declining wildlife numbers and decreasing wildlife diversity observed at Buffalo Creek, Manitoba. Historical and existing wildlife conditions of the site are established using existing literature, on-site investigations, public input, and interviews with experts in the field. High wildlife-value sites are identified, as well as the most likely and potential wildlife species that can be enhanced at these sites.

With this information, wildlife enhancement options are examined in detail, and assigned rank in terms of priority using a simple decision matrix. A wildlife enhancement plan for Buffalo Creek is presented; it includes the following recommendations in the order of declining priority:

1- identify and protect tallgrass prairie;
2- survey for critical habitat and species of concern;
3- discontinue livestock grazing along the creek;
4- provide wildlife cover outside the buffer strip;
5- improve travel corridors for wildlife;
6- install flushers on farm machinery.
7- provide nesting structures in water for wildlife;
8- provide nesting structures on land for wildlife;
9- modify or design physical structures for wildlife;
10- improve water/cover ratios;
11- control beaver and muskrat activity; and
12- control nuisance wildlife.

ACKNOWLEDGEMENTS

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Invaluable assistance, time and advice was also received from many individuals: Judy Zieske, of the Natural Resources Institute; Dr. Wayne Cowan and Brent Wark of Ducks Unlimited;Nat Olson, Prairie Farm Rehabilitation Administration; Pat Rakowsky, Canadian Wildlife Service; John Morgan of Prairie Habitats; Cathy Johnson and Ken de Smet of the Manitoba Wildlife Branch; Darrell Resche of Buffalo Plains Soil and Water Management Association; Bob Austman and Al Schritt of the Altona Community College; Elmer Heinrichs, Red River Valley Echo; and the many landowners and stakeholders who attended the meetings and responded to the survey. Finally, I would like to thank Françoise Mainwaring for her unwavering support and assistance.

CONTENTS

FIGURES

TABLES

1.0 INTRODUCTION

1.1 Loss of Prairie Wildlife and Natural Habitat

Axelrod (1985) indicates that the prairie ecosystem is a relatively recent biome in North America, a result of the last glaciation, having developed 12,000 to 15,000 years ago. Tallgrass prairie at one time blanketed Central North America, stretching west from Indiana to Nebraska, south to Texas, and north to Canada's prairie provinces, with outlying patches in Ohio, Kentucky, and Arkansas (Figure 1.1). While this grassland was not uniform throughout, "tall" grass habitat was ubiquitous, and any gradient in prairie was almost imperceptible.

Settlers soon began to realize the agricultural potential of the rich prairie soil, and with John Deere's invention of the first self cleaning steel plough in 1837, pioneers had the tool to break ground at a greater rate. Brink (1982) observed that "virtually all (99.95% in Manitoba) of the Tall Grass or True Prairie has been ploughed or in other ways destroyed...". Forty-six percent of North American wetlands (Madsen 1986) and over 90% of prairie lands were diverted to agriculture and development. The result of this conversion of natural habitat has been a great loss of wildlife species and diversity, increased soil erosion, increased sediment load in waterways, soil salinity, soil, water, and air pollution, and general damage to terrestrial and aquatic ecosystems of the prairies.

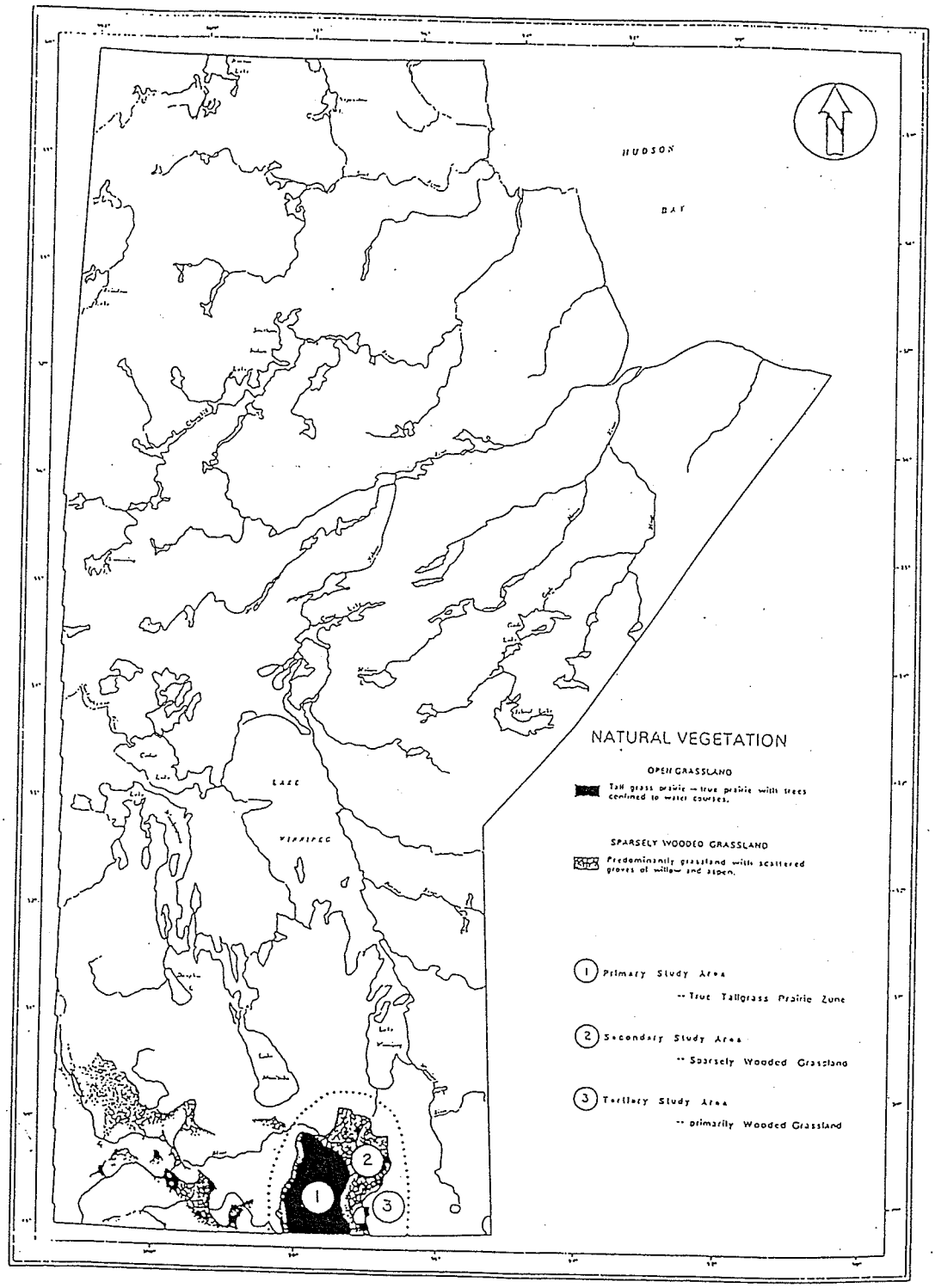


Figure 1.1. Historical Distribution of Tallgrass Prairie (Joyce 1989)

In Manitoba, tallgrass prairie once occupied a 6000 km^2 area north of the U.S. border, west of the Red River, south of the Assiniboine river, and east of the Manitoba escarpment. Today, estimates of the amount of remnant tallgrass prairie are between 10% (World Wildlife Fund 1989) and 0.05% (Joyce 1989; Joyce and Morgan 1988) remnant of its historical, pre-settlement extent. Most remnant prairie species in Manitoba are found in rights-of-way or ditches (Anderson 1986; Morgan 1992), and in undeveloped marginal lands (Joyce 1989).

Because this habitat supported a diversity of life, many attempts have and are being made to develop tallgrass prairie communities where they once flourished. Some examples of successful tallgrass prairie restoration include the Living Prairie Museum, portions of Oak Hammock Marsh, and portions of Beaudry Provincial Heritage Park; examples of successful prairie grass planting include the Fort Whyte Center for Environmental Education (Morgan 1992; Carson 1986). More recently, the Tolstoi prairie in southeastern Manitoba was set aside as a preserve.

This decline in wildlife and natural habitat conditions has not been unnoticed by the landowners. The Buffalo Plains Soil and Water Management Association (BPS&WMA), a non-profit group of farmers and landowners in Southern Manitoba, decided to try to remedy the situation, beginning with Buffalo Creek. Some environmental problems that were first addressed were declining water quality, soil erosion, agricultural pollution, declining recreational value, and decreasing wildlife numbers and biodiversity. In October, 1991, the BPS&WMA hired a Study Team from the University of

Manitoba Natural Resources Institute to prepare a detailed rehabilitation plan for the Buffalo Creek and its banks (Dangerfield et al. 1992, vol.3).

Thus, through the BPS&WMA, the impetus for this project came from the local community, and landowners concerned about the general degradation of the Buffalo Creek area, particularly with respect to declining wildlife, wildlife habitat quality, and the natural value of the landscape. The situation is different with respect to the initiating party: rather than the federal or provincial government approaching the landowners with wildlife enhancement programs, it was the local farming association that decided to take action. The Buffalo Creek project is one of the few times in Manitoba where a farming association has sought outside help for habitat restoration on their own initiative. The following practicum is drawn in part from this project.

It must be noted that this rehabilitation effort is on a small scale. Only a short stretch of stream is under study, within a much larger watershed system. However, the stream section is representative of many riparian systems in Manitoba, and the recommendations presented in this practicum may be widely applicable.

1.2 Study Area

Buffalo Creek has its headwaters in the United States, and flows northeast to join up with the Red River system. The targeted study area (Figure 1.2) is a 16 km stretch of the creek immediately west of Altona, Manitoba, specifically sections 1 and 12 (township 2, range 2 west), and sections

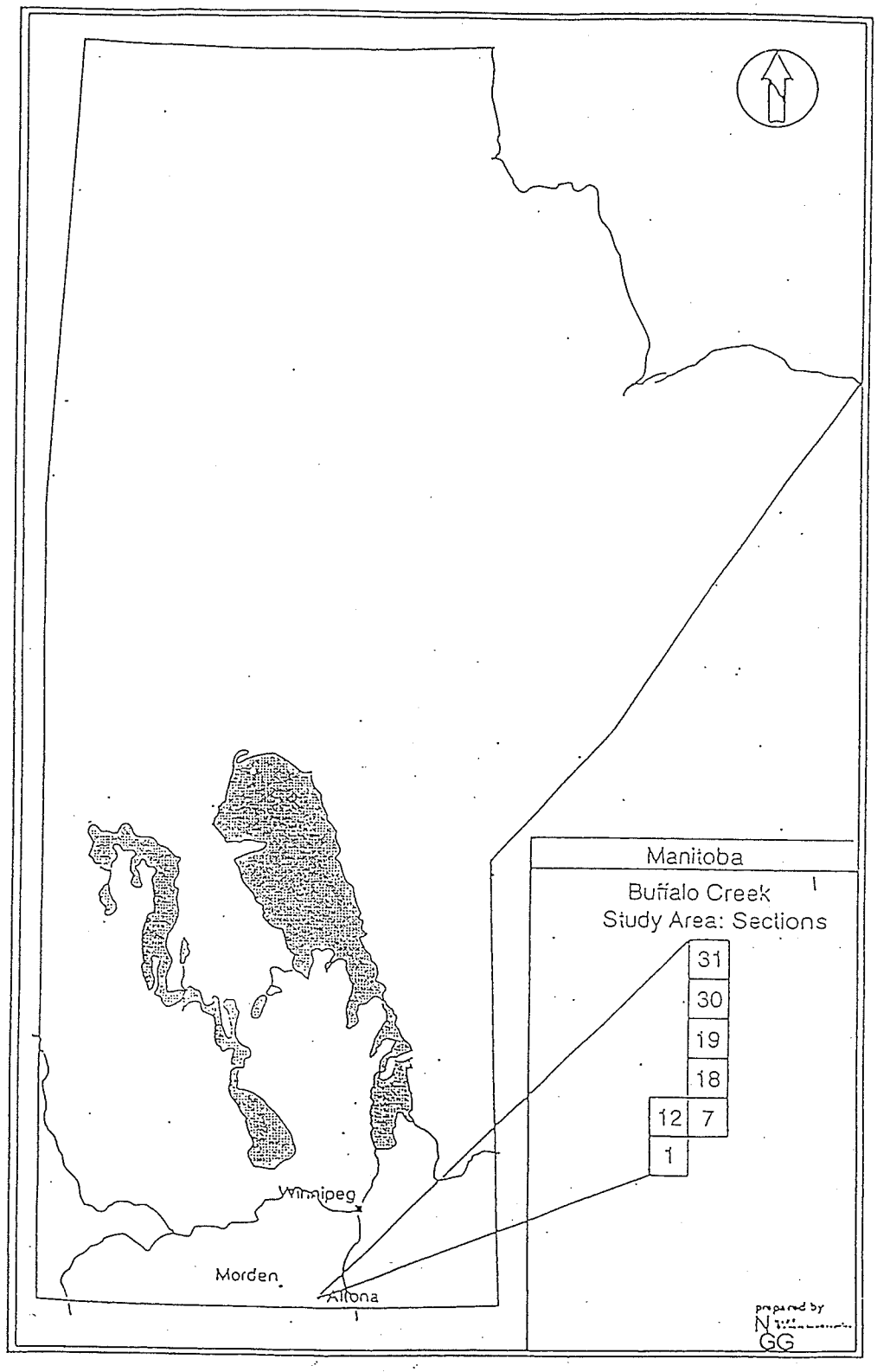


Figure 1.2. Buffalo Creek Wildlife Enhancement: Study Area

7, 18, 19, 30, 31, and 32 (township 2, range 1 west)(Figure 1.3). The region is prime agricultural land, zoned as A40, which is defined as follows (Dangerfield et al. 1991, vol.1):

> This zone provides for general agricultural uses and other uses which are related to or compatible with agriculture and are carried out on large parcels of land. Certain uses on smaller parcels are also provided for as identified in the Rhineland Development Plan.

Crops grown in the area include canola, soybean, sugar beets, sunflowers, corn, peas, and other specialty crops. Livestock raised close to the creek include cattle, horses, pigs, and poultry. In some sections cultivation is done within 4 m of the water's edge, in others, cattle graze right along the creek. Naturally occurring vegetation includes thistle (*Cirsium flodmani*), nettle (*Urtica procera*), willows (*Salix spp.*), alders (*Alnus spp.*), elms (*Ulmus americana*), grasses, and various sedges (*Carex spp.*), rushes (*Juncus spp.*), and wetland species.

1.3 Issue Statement

The original, pre-settlement habitat along Buffalo Creek has been greatly disturbed since farming began in the immediate vicinity. The result has been a decline in the abundance and diversity of wildlife. The BPS&WMA have expressed a wish to restore this wildlife abundance and diversity, and approached the Natural Resources Institute to provide a rehabilitation plan for Buffalo Creek. Such a plan will include the identification of high wildlife-value sites and the selection of detailed wildlife enhancement options. This practicum is a companion document to the Buffalo Creek

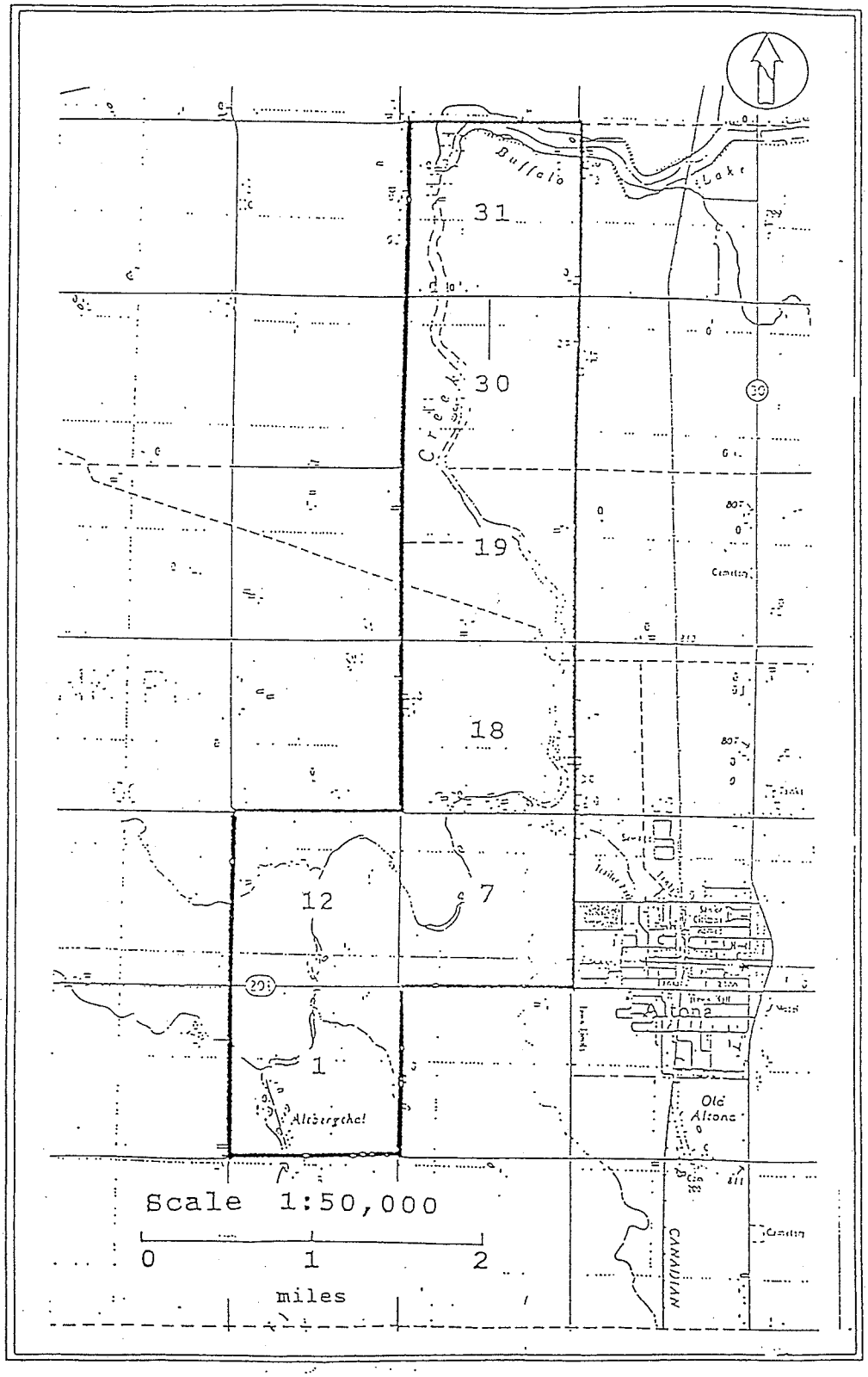


Figure 1.3. Buffalo Creek Wildlife Enhancement: Study Site

Study Site Management Plan (Dangerfield et al. 1992, vol.3), commissioned by the Buffalo Plains Soil and Water Management Association.

1.4 Objectives

The objectives of this practicum are the following:

1- to establish the historical and existing wildlife conditions of the site;

2- to identify high wildlife-value sites at Buffalo Creek;

3- to determine what wildlife species can likely and potentially be enhanced;

4- to identify wildlife enhancement options for Buffalo Creek.

1.5 Organization of the Study

2.0 METHODS describes the methods that were used to achieve the stated objectives, **3.0 LITERATURE REVIEW** explores some of the issues and information concerning wildlife enhancement in an agricultural setting such as Buffalo Creek. The existing physical and biological conditions of the study site are established in **4.0 SITE ANALYSIS AND EXISTING CONDITIONS**, where the community concerns that were raised are also reported. **5.0 LIKELY AND POTENTIAL WILDLIFE SPECIES** includes the wildlife survey results, the descriptions of high wildlife-value sites at the creek, and which wildlife species will likely or potentially be enhanced at Buffalo Creek. In **6.0 WILDLIFE ENHANCEMENT OPTIONS**, twelve wildlife enhancement options are detailed. A matrix evaluation is then used to establish the ranking of each option in terms of priority. The enhancement options

and policy recommendations are presented in **7.0 WILDLIFE ENHANCEMENT PLAN.** The final chapter, **8.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS** briefly relates the results of the practicum.

2.0 METHODS

2.1 Site Analysis and Existing Conditions

Between October 1991 and June 1992, the author collected material and information on the existing physical and biological conditions of Buffalo Creek. Sources included the following: the Existing Conditions report (Dangerfield et al. 1992, vol.1); studies of prairie communities (i.e. Duebbert et al. 1981; Environment Canada 1981; Poston and Schmidt 1981; Howell et al. 1988; Green et al. 1989; Prairie Conservation Action Plan 1989; Newbury and Gaboury 1991; Trottier 1992; etc.); personal communications with local nature enthusiasts (i.e. Austman 1991, Friesen 1992, Schritt 1992); personal communications with representatives of the Manitoba Museum of Man and Nature (Conrad 1991), the Manitoba Wildlife Branch (De Smet 1992; Johnson 1992; Joyce 1992), Ducks Unlimited Canada (Cowan 1991; Wark 1991; Poole 1992), the Manitoba Naturalists' Society (Latta 1992), Prairie Habitats (Morgan 1992), and the Canadian Wildlife Service (Rakowski 1992); as well as public meetings and survey responses from the **Buffalo Creek Wildlife Survey (Appendix A)**.

2.2 Field Work

During the period of June 2 - 6, 1992, the author conducted field investigations throughout the study site. Permission to visit and photograph the creek was obtained from the landowners by telephone. The main goal of the field work was to locate high wildlife-value sites where identified wildlife enhancement options can be implemented. Working from false color infrared aerial photographs, a total of 15

sites were selected to be visited on foot (see **2.3 Identifying High Wildlife-Value Sites**). During the field work, any wildlife observed were recorded, as well as any signs of wildlife, including dens, lodges, feeding sites, nesting sites, roosts, droppings, songs, and tracks. Not only did this information identify high wildlife-value sites, but it also was used to determine the likely and potential wildlife species (see **2.4 Determining Likely and Potential Wildlife Species**).

Another important goal of the field work was to gain additional information regarding landowners' perception of wildlife at Buffalo Creek. Landowners were asked to respond to an informal questionnaire to identify any wildlife concerns (see **2.7.2 Buffalo Creek Wildlife Survey**).

2.3 Identifying High Wildlife-Value Sites

Morgan (1992, pers. com.) guided the interpretation of false color infrared aerial photographs to locate and map possible existing sites of high wildlife-value. Areas where there appeared to be a significant amount of water (over approximately 0.5 continuous hectares in area) and diverse cover (at least 3 ground plant species and shrubs or trees) were targeted, as well as possible remnant tallgrass prairie sites. The photographs were taken July 26 1989, which was during a relatively dry period of the summer of 1989 (Dangerfield et al. 1992, vol.3). Field work involved visual inspection of each identified site and the compilation of a photographical record of each site. In order to qualify as a high wildlife-value site, at least 2 of the following criteria were necessary: some waterfowl (at

least 10 individuals); at least 3 different forb species; some shrubs or trees; at least 4 different bird species (more than just blackbirds); the presence of burrows, dens, muskrat and/or beaver lodges; the presence of mammal tracks; sightings of wildlife, such as foxes (*Vulpes vulpes*), beaver (*Castor canadensis*), or muskrat (*Ondatra zibethicus*). Additional considerations were the availability of both water and suitable cover for wildlife; sites with systems of different ecotones were deemed of high wildlife-value: for example, sites that include each of open water, marsh, seasonal wetland, shrub/tree, and field zones were considered superior for wildlife.

2.4 Determining Likely and Potential Wildlife Species

Likely and potential species were determined using the following sources: the existing and historical wildlife recorded in the literature; wildlife species and signs recorded during the field work; and existing wildlife as reported by professionals in the field, **4.5 Community Concerns** and the **Buffalo Creek Wildlife Survey (Appendix A)**. In addition, telephone interviews with landowners raised local, specific wildlife concerns, and provided information on local perception of wildlife which influenced the likely and potential species lists (see **5.1 Wildlife Survey Results**).

The field work was important in determining which species would likely or potentially be enhanced at Buffalo Creek. Wildlife actually observed at the creek were included in the likely enhanced species, because enhancement should increase their numbers. Some of the potential species listed depend

on identified enhancement options (i.e. **6.1.5 Provide Nesting Structures on Land for Wildlife** for raptors and **6.1.6 Provide Nesting Structures in Water for Wildlife** for game birds). The field work identified if the requirements for these options (i.e. snags for cavity nesters, open spaces for raptors, open water and emergent vegetation for waterfowl) were available at Buffalo Creek.

For the purposes of this practicum, it was assumed that the longterm establishment of a tallgrass prairie type buffer strip will be implemented as recommended in Buffalo Creek Study Site Management Plan (Dangerfield et al. 1992, vol.3), which also affects which species are likely and potential, as described in chapter **5.0 LIKELY AND POTENTIAL WILDLIFE SPECIES: RESULTS.**

2.4.1 Determining Likely Wildlife Species

Wildlife species that will likely be enhanced are those that are consistent with a tallgrass prairie type buffer strip and existing habitat conditions along the creek, and that are present (existing wildlife) at the creek, or within individual species' immigration distances of the creek. **Likely wildlife species will be enhanced simply by establishing the tallgrass prairie type buffer strip**, which would provide additional food and cover to sustain larger numbers of wildlife without any other significant development action (Collier et al. 1978). To determine which existing wildlife species would likely be enhanced at Buffalo Creek, the literature was reviewed (i.e. Smith 1980; Duebbert et al. 1981; Environment Canada 1981; Poston and Schmidt 1981; Welty 1982; Howell et al. 1988; Green et al.

1989; Prairie Conservation Action Plan 1989; Wiens 1989; Newbury and Gaboury 1991; Trottier 1992; etc.). Personal communications with professionals in the field (Austman 1991; De Smet 1992; Joyce 1992; Latta 1992; Morgan 1992; Poole 1992; Rakowski 1992) suggested that species listed as likely enhanced might respond favorably to the establishment of a tallgrass prairie type buffer strip.

2.4.2 Determining Potential Wildlife Species

Potential wildlife species fall into two categories. In some cases, these species are present at the creek but uncommon, and directed action is needed for enhancement; in other cases, these are species that once populated the creek area (historical), and need to be re-introduced or attracted to the area. These species will not respond significantly if the only wildlife enhancement action is the establishment of a tallgrass prairie type buffer strip. **Potential wildlife species need additional management actions in order to be enhanced.** Criteria of some outside assistance sources (**Appendix B**) describe what wildlife categories are more likely to receive enhancement assistance; existing literature (i.e. Shemnitz 1980; Duebbert et al. 1981; Environment Canada 1981; Poston and Schmidt 1981; American Fisheries Society 1982; Barickman et al. 1987; Howell et al. 1988; Baird 1989; Green et al. 1989; Prairie Conservation Action Plan 1989; Newbury and Gaboury 1991; Trottier 1992; etc.) and professionals (i.e. personal communications with De Smet 1992; Joyce 1992; Latta 1992; Morgan 1992; Poole 1992; Rakowski 1992) were consulted to determine wildlife species that can potentially be enhanced, and the methods (enhancement options) by which this could be achieved.

2.5 Identifying Wildlife Enhancement Options

Once likely and potential wildlife species were determined, there were two areas from which wildlife enhancement options for Buffalo Creek were drawn. First, appropriate techniques were chosen from the known wildlife enhancement methods, and second, stakeholders' concerns were addressed.

2.5.1 Applicable Wildlife Enhancement Techniques

Current practises for wildlife enhancement in situations of riparian and wetland habitat surrounded by intensive agriculture were explored through the existing literature (i.e. Dobson 1981; Duebbert et al. 1981; Burke 1983; Brace and Pepper 1984; Davis 1986; DeBano and Hansen 1989; Green et al. 1989; etc.), and personal communications with professionals in the field (i.e. Cowan 1991; Wark 1991; De Smet 1992; Poole 1992; Rakowski 1992). This review of the literature and consultations with professionals provided a number of wildlife enhancement options directly applicable to Buffalo Creek, which are fully described in chapter **6.0 WILDLIFE ENHANCEMENT OPTIONS.**

2.5.2 Public Input and Identifying Options

Stakeholders are not likely to support the enhancement of undesirable wildlife species; for this reason, stakeholders were targeted early, throughout the public participation process (see **2.7 Public Participation**), and were asked to share any wildlife concerns. Landowners who attended the public meetings were asked to help identify which of the likely and potential species are considered desirable or undesirable by the local residents. Landowners controlling shoreline property were contacted by telephone, and were

asked to respond to the **Buffalo Creek Wildlife Survey (Appendix A)**. The combined results of the public participation process and the telephone survey are described in **4.5 Community Concerns** and **5.1 Wildlife Survey Results.** This public input was useful both for identifying enhancement options and for assigning implementation priorities (see **2.6 Priority Evaluation of Identified Enhancement Options**).

2.6 Priority Evaluation of Identified Enhancement Options

To present a priority approach to the implementation of the possible wildlife enhancement options that were identified, a method of ranking these options was necessary. The matrix evaluation chosen for this purpose was subjective, and asked the evaluator to judge the relative importance of each option with respect to each other option. The evaluator used any criteria in establishing this priority: costs, benefits to wildlife, benefits to landowners, or a combination of these. Section **6.2 Priority Evaluation** describes the matrix and the rationale behind the assigned priorities in greater detail.

2.7 Public Participation

Webb and Hatry (1973) list sources of "citizen feedback", including mass media, public meetings, and surveys. Each of these methods figured in the public participation process that was used in developing this practicum. The process proved invaluable in establishing community concerns and perceptions of wildlife, as well as establishing historical and existing wildlife and likely and potential species. Due to the established wildlife interest in Buffalo Creek,

the public was involved in all levels of research. This input was sought in a number of ways including: public meetings, personal interviews, and contact through the media, using advertisements and radio interviews. Numerous copies of three preceding reports, Existing Conditions (Dangerfield et al. 1991, vol.1), Objectives and Options (Dangerfield et al. 1992, vol.2), and the Buffalo Creek Study Site Management Plan (Dangerfield et al. 1992, vol.3) were also made available to the public for comment. The first two public meetings were used to inform the public of the progress of the Buffalo Creek Management Plan and to obtain input on the existing conditions and management plan development. The last two meetings were used to obtain public input on specific management options that could be implemented in the area. The Red River Valley Echo newspaper, CBC Radio, CBC TV, and CFRA Radio were used to report the progress and development of the Buffalo Creek Study Site Management Plan (Dangerfield et al. 1992, vol.3), and to inform the public of meetings.

2.7.1 Public Participation Activities

Public participation activities that were used to gain wildlife information for historical, existing, likely and potential species at the creek, as well as community concerns and perceptions of wildlife include:

Monday, November 4, 1991, 10:00 a.m. Altona Airport Clubhouse.

The Study Team was formally introduced to the Buffalo Plains Soil and Water Management Association (BPS&WMA) executive, as well as the Prairie Farm Rehabilitation Administration

(PFRA) representative, Nat Olson. BPS&WMA objectives were discussed, as were approaches to meeting these objectives. One of the objectives the Study Team was asked to examine was how to enhance wildlife along Buffalo Creek.

Monday, November 18, 1991, 7:30 p.m. Rhineland Pioneer Center, Altona.

The first public meeting was held to introduce the Study Team and the proposed development of the Buffalo Creek multipurpose rehabilitation management plan. This was also the first attempt to get public feedback and baseline information. Following an introduction by the BPS&WMA President (Jake Enns), the Study Team reviewed the three-step research approach to the project, outlined what had been accomplished to date, and asked the community to get involved. Les McEwen, president of the Deerwood Soil and Water Management Association, related some of their Association's experiences with watershed management. Only limited wildlife information was obtained.

Monday, December 2, 1991, 7:30 p.m. Rhineland Pioneer Center, Altona.

At the second public meeting the preliminary findings of existing conditions were presented (Dangerfield et al. 1991, vol.1). There was also a second attempt to get feedback on these conditions. The Team also sought input on how to proceed with identifying options for the Buffalo Creek Management Plan, including wildlife enhancement. Following an introduction of the project, the Study Team described the creek's past and present physical and biological conditions, as well as its heritage and recreation aspects. A poster session was held at the coffee break to provide a relaxed

and informal atmosphere for questions, comments, and discussion. During this break, participants were asked about what wildlife was considered desirable or undesirable. Only limited wildlife information was obtained.

Monday, February 3, 1992, Rhineland Pioneer Center, Altona. At the third public meeting, participants were divided into four small groups and asked to help determine priority objectives and management actions (see Dangerfield et al. 1992, vol.2 for a sample of the list of objectives and possible actions that was used). Each person was provided with an outline of the project objectives and the possible options that were identified, including wildlife enhancement actions. Each group, led by a member of the Study Team, then tried to prioritize the objectives, options, and actions. Individuals were encouraged to comment on or add to the outline. This was the most successful meeting in terms of gaining public input on wildlife issues.

Monday, March 9, 1992. Shoney's Restaurant, Altona. At the final public meeting, following introductions and a recap of the Study Team's approach, the third public meeting was summarized and discussed. There was little verbal response after the second report Objectives and Options (Dangerfield et al. 1992, vol.2) was presented, including several wildlife enhancement options.

Agenda of the public meetings are found in **Appendix C**, and several of the articles that appeared in the Red River Valley Echo are reproduced in **Appendix D.**

The above series of steps was intended to gradually widen the circle of participants, starting with the immediate stakeholders, including the landowners along the creek, and ending with all potentially interested parties. Attendance at these meetings averaged to approximately 25 individuals. Input was received from many of the directly affected landowners and from the broader community over the four meetings. The information gathered by this process is reflected throughout the practicum.

2.7.2 Buffalo Creek Wildlife Survey

In addition to the public participation process outlined above, and because of the low amount of public input directly related to wildlife enhancement, telephone surveys (**Appendix A: Buffalo Creek Wildlife Survey**) were conducted during the period of June 2 - 6, 1992, attempting to contact all the landowners at the study site.

The survey was intended to identify what the landowners consider desirable and undesirable wildlife, and to bring out any important opinions or views previously undiscovered by the public participation process. Also, this telephone survey would reach landowners that had been unable to attend the public meetings for comment.

Using the most recent list of landowners, repeated attempts were made to contact all owners of shoreline within the study area over the three day period. Any concerns were recorded and incorporated into the selection of wildlife enhancement options (see **2.5 Identifying Wildlife Enhancement Options**).

3.0 WILDLIFE AND HABITAT RELATIONSHIPS

3.1 Loss of Wildlife and Habitat in Manitoba

In Manitoba, the southern portion of the province has been greatly changed through agriculture and settlement. What was once prairie or parkland habitat has been replaced by cities, towns, and great expanses of farmland, where the dozens of natural plant species have given way to a handful of commercial crops. The steady disappearance of prairie habitat has brought about a steady decline in the abundance and diversity of wildlife. The eskimo curlew (*Numenius borealis*), the long-billed curlew (*Numenius americanus*), the kit fox (*Vulpes macrotis*), grizzly bear (*Ursus arctos*), pronghorn (*Antilocapra americana*), bison (*Bison bison*), and the greater prairie chicken (*Tympanuchus cupido*) are extirpated; the loggerhead shrike (*Lanius ludovicianus*) is endangered; the prairie long-tailed weasel (*Mustela frenata longicauda Bonaparte*), wolverine (*Gulo gulo*), burrowing owl (*Athene cunicularia*), ferruginous hawk (*Buteo regalis*), and Baird's sparrow (*Ammodramus bairdii)* are threatened; the plains pocket gopher (*Geomys busarius*), least bittern (*Ixobrychus exilis*), trumpeter swan (*Cygnus buccinator*), and the northern prairie skink (*Eumeces septentrionalis*) are vulnerable. The white pelican (*Pelicanus erythrorhyncos*) was delisted in 1987. (Nero 1978; Johnson 1992, pers. com.; World Wildlife Fund Canada 1992).

3.1.1 Loss of Wildlife and Habitat at Buffalo Creek

Historically, wildlife was viewed by developers as an obstacle to be overcome (Brink 1982). Before early settlers began to cultivate the area, Buffalo Creek included

tallgrass in a mosaic of prairie, riparian, and wetland habitat (Joyce and Morgan 1988). Vegetation was greatly influenced by large mammals, surface water and intermittent fires. Today, the large mammals, for the most part, are extinct or extirpated, and virtually all of the tallgrass prairie has disappeared under the plough. It is estimated that only .05% of traditional habitat remains (Joyce and Morgan 1988). The habitat fragments that are left are often too small or too far apart for individuals of a population to interact (Watson 1990). This loss of habitat resulted in a simplified wildlife structure (Watson 1990), including declines in species diversity and numbers of individuals.

3.2 Wildlife and Agriculture Interactions

Today, "the major interactions... are the destruction of habitat for agricultural expansion, or the destruction of agricultural products by wildlife" (Watson 1990). At Buffalo Creek, what wildlife is left is also under stress from continued and intensive farming, livestock pasturing, and high levels of human traffic. Many agricultural practices are indirectly deleterious to wildlife. Summerfallowing, fall tillage, or unrotated grazing removes food and cover and causes soil erosion that chokes streams and ponds (Watson 1990). The effects of sustained cattle grazing on streambanks include (Platts 1981; Davis 1986; Wagstaff 1986; Adams and Erlert 1990):

1- collapsed streambanks;
2- widening and shallowing of the stream;
3- stream channel trenching or braiding;
4- silt degradation of spawning habitat and invertebrate food producing areas;
5- loss of streamside and stream cover;
6- increased water temperature and velocity;

7- decreased terrestrial food inputs;
8- altered stream chemistry and fertility;
9- changes in plant community structure.

Such effects of cattle grazing are found within the study area. Medin and Clary (1989) found that small mammal populations were over a third higher in ungrazed habitat. Pollution problems that occur at the creek can arise when farm chemicals get incorporated into the air, soil and water, and make their way through food chains, affecting entire ecosystems (Watson 1990).

While rural residents generally favor wildlife, some species are considered undesirable because they reduce economic returns or are pests. Migrating waterfowl can contribute to crop losses through consumption, trampling, or faecal damage (Timm 1983; Watson 1990). Deer (*Odocoileus spp.*) will also consume and damage grain and other crops (Timm 1983). Beaver and muskrat are often problem species, reducing or eliminating woody cover, flooding areas and restricting flows (Johnston and Naiman 1989). Nongame birds such as magpies (*Pica spp.*), blackbirds (*Agelaius spp.*), and sparrows can also cause problems, consuming crops and injuring livestock (Timm 1983; Watson 1990). Rodents and furbearers may dig burrows that can damage farm machinery, injure livestock, or damage crops (Timm 1983), and the mounds can provide good seed beds for weeds (Watson 1990). Small mammals will also consume crops (Watson 1990).

It is possible for wildlife and agriculture to coexist and interact for mutual benefit (Sutton and Tittensor 1988). "Agricultural practices which are generally good for the

land are generally good for wildlife" (O'Grady 1990). By changing some current methods and policies, farmers can contribute to wildlife enhancement for the benefit of all. For example: integrated pest management (IPM) and biological controls are emerging as ecological alternatives for dealing with plant, insect, or animal pests (Cox et al. 1979; Klingauf 1988); using pesticide exclusion strips of only a few metres (m) is beneficial to wildlife (Sotherton et al. 1988). Table 3.1 presents some ecologically sound pest control principles applicable at Buffalo Creek.

3.3 The Valuation of Wildlife

Environmental goods can be defined as those goods that together comprise our natural environment, and include public and private land, air, and water, as well as less tangible commodities, such as scenery, biodiversity, recreation appeal, and wildlife (Dysart 1988). In a review of several surveys completed in Canada, Watson (1990) found that "wildlife is important to the rural community,..., and at a slightly higher level than the importance given by urban residents". In some cases, wildlife brings direct economic returns: trappers sell pelts into a market; game hunters can place a dollar figure on the food value of deer or duck that is shot. Without considering economic aspects, conservation can be justified on scientific, aesthetic, cultural, and ethical grounds (Rolston 1985; The World Commission 1987). One can not always place a dollar value on wildlife: some would argue that doing so detracts from the right to exist which is shared by all wildlife, and that this right should be the primary consideration (Tangley 1986; Rowe 1990; Watson 1990; Morowitz 1991).

Table 3.1. Ecologically Sound Pest Control Principles Applicable at Buffalo Creek (Klingauf 1988)

1. Physical methods

Hand picking of egg masses, larvae etc.
Destroying of attacked plant parts, e.g. pruning of apple twigs when first infestations by apple mildew occur.
Electromagnetic waves against storage pests, weeds.

2. Cultural methods

Cultivation techniques, such as ploughing, crop rotation (e.g. against hibernating stages of cornborers in stubbles).
Adjustment of planting date.
Adjustment of fertilizer application, irrigation.
Intercropping.
Adjustment of crop density.

3. Chemical control

Use of selective pesticides without or with limited side effects on beneficial organisms and wildlife.
Selective use of pesticides, e.g. timing in relation to pests and natural enemies, selective application techniques, dosage rates.

4. Biological control

Introduction of parasites, predators or pathogens.
Preservation of natural enemies.
Inundative release of beneficial organisms.
Release of sterile or genetically manipulated insects.
Induced resistance of crops through application of manipulated virus strains (premunity) or through application of non-pathogenic bacteria, or plant substances etc. (summarized under biocontrol, because crops are organisms antagonistic to pests).

5. Biotechnical methods (based on natural, physical or chemical stimuli etc.)

Behaviour-modifying chemicals, e.g. pheromones.
Insect hormones, e.g. juvenile hormones.
Plant substances, e.g. antifeedants, repellents, attractants, growth regulators.
Colour traps.

6. Resistance breeding

Vertical resistance (crop resistance to only certain genetic variants of a particular parasite, which might be easily circumvented by new pathotypes).
Horizontal resistance (generally polygenic and effective against a greater number of parasites, usually remaining for a longer period, but requires selection from large outbreeding populations).

7. Quarantine

Methods to prevent introduction of new pest insects, diseases, weeds etc.

Different uses of environmental goods imply varied user interests and values for these lands:

> The wilderness lover sees a wonderful stand of virgin old-growth timber while the lumberman or forester sees the same trees as ripe for harvest or even over-mature. The hunter sees a prime wildlife habitat supporting a healthy deer population where a nice buck might be harvested, while the animal lover sees a protected refuge for the deer. Each sees and appraises the natural resource in terms of his or her personal knowledge, experiences, background, values, and interests (Dysart 1988).

3.4 The Valuation of Tallgrass, Wetland, and Riparian Habitat

Conservationists value tallgrass prairie for several reasons, among them:

1- tallgrass prairie is the most productive type of grassland in North America. Prairie systems have evolved so that every moment of the growing season is used. Plants flower and germinate at different times. Roots and rhizomes reach depths up to 4 m, and ground cover often reaches 100%. Every year, large amounts of organic matter are returned to the soil, readily available as nutrients for new crops (Carson 1986);

2- tallgrass prairie supports a great diversity of wildlife, much of which is endangered. Species such as the loggerhead shrike have become threatened or endangered, and migratory waterfowl numbers are at low levels from loss of breeding grounds;

3- plant species form an important gene pool that has evolved to adapt precisely to Manitoba conditions, and may be used in the future for agriculture, medicine,

etc. At Beaudry Provincial Heritage Park, 108 flowering plant species were found in remnant tallgrass prairie (Carson 1986). In her study of Manitoba tall grass prairie, Anderson (1986) found over 20 species of woody plants, 47 grasses, sedges, and rushes, and 132 forbs in prairie remnants.

Carson (1986) argues that "restored prairies also provide an historical perspective and can be used for interpretation of cultural and natural history."

Buffalo Creek includes various wetland habitat, including open water, wet marsh, and intermittent or seasonally wet reaches. Brace and Pepper (1984) present the following benefits of wetlands:

1- moisture retention;
2- climate moderation;
3- salinity confinement;
4- water source for livestock and farming operations;
5- fodder during dry years;
6- wildlife can be a biological pest control;
7- less flooding of lower lying fields;
8- reduced soil erosion.

Wetlands have negative aspects as well (Watson 1990), and may be viewed as:

1- impediments to farm machinery;
2- habitat for nuisance wildlife;
3- a source of weeds.

The transition zone between a water body and the upland area is referred to as riparian habitat. This habitat is important to an ecosystem in many ways. The vegetation stabilizes banks and channels, filters pollutants and sediment, reduces peak flows, controls water temperatures,

and recharges ground water (Debano and Schmidt 1989). Riparian habitat offers more habitat to more diverse wildlife populations than any other habitat type (Hoover et al. 1985). Finally, a riparian zone accommodates and attracts important recreational activities (Field et al. 1985; Hoover et al. 1985).

3.5 Economic Equity

Often, user groups may have conflicting views with respect to what constitutes an optimal basket of environmental goods. "Because economic efficiency alone is not a sufficient guide to decisions about natural resource use and development, it must be supplemented by economic equity, or who bears the costs and who gains the benefits" (Clawson 1988). In order to reach socially acceptable decisions on the contents of the environmental goods basket, the value placed on such goods must accurately reflect the value that is perceived by interest groups. In the past, development of the natural environment has been "overwhelmingly in favor of commodity production... at the expense of the more intangible, but nevertheless real values such as nature appreciation, the wilderness..., the opportunity to be in contact with that type of landscape..." (Evans 1988). The problem lies in rendering these values tangible, quantifiable, so that the decision-making economic equations incorporate more of the factors involved, and that the resulting decisions better reflect the actual equation inputs. This is the valuation problem, a major concern of contemporary natural resource economics (Randall 1986).

3.6 Restoration and Reclamation

If one defines the disturbance of an environment as an anthropogenic alteration of a natural environment, specifically physical alteration of the land surface (Smith 1974), then Buffalo Creek can certainly be described as a disturbed environment. Returning such an environment to a more 'natural' state can be attempted at many levels. The greater part of this section is directed at the restoration of plant communities, which is an inseparable element of wildlife enhancement: if the food and shelter is not available, the wildlife will not be enhanced. While restoration of the plant communities is not specifically addressed in this practicum, the following sections must be incorporated when implementing the wildlife enhancement options. For example, when providing cover for wildlife, the managers should follow a reclamation or restoration plan, as described in **3.6.1 Restoration and Reclamation Planning.**

Dabbs (1974) believes that reclamation "requires that we restore the damaged ecosystem, as much as practicable, to a primary successional state which can only be accomplished by using the same species as would naturally invade, given sufficient time." As an alternative to reclamation, revegetation is "quickly providing a plant cover for erosion control." To develop a selected habitat, Dabbs suggests that we merely re-introduce the pioneer species that will begin the appropriate plant succession. Eventually, the selected habitat will be reached (assuming that pioneer species can be determined and that sources are available).

Cairns (1988) describes full restoration as "the restoration of a site to its pre-damaged condition", and partial restoration as the "restoration of selected ecological attributes of the site", or the development of a selected habitat. Unlike Dabbs, Cairns suggests that reclamation or restoration should target the level of succession that was present when the site was damaged. Some options regarding levels of restoration will be discussed in **3.8 Wildlife Enhancement Obstacles.**

3.6.1 Restoration and Reclamation Planning

For successful restoration or reclamation of disturbed environments, proper management procedures must be applied. Unfortunately, many projects in the past have been carried out more or less hap-hazardly: Cole (1989), in a survey of over 900 such projects, found that only 5% followed formal restoration plans. Nuzzo (1990) defined a restoration plan as a "detailed guide for designing and implementing restoration." She describes a five step process:

> 1- conducting a site analysis and gathering background material, which provide the context for the restoration and describe the preproject site conditions. Both biotic (functional) and abiotic (structural) conditions of the site are identified and assessed. When time, budget, or both combine to constrain, background information may be gathered from existing and general data;
>
> 2- establishing the project policy, goals, and objectives. For Nuzzo, goals should "describe what will be accomplished", and objectives are "quantifiable measures, or statements about measurable features, that make the goals operational";
>
> 3- creating the restoration design which, in conjunction with the goals and objectives, articulates and depicts the desired outcome. The design describes the finished product, and the desired outcome;

4- establishing and scheduling the implementation procedures and a short-term management program, which indicate the methods necessary to develop the site to the state described by the objectives and design;

5- establishing a monitoring and evaluation program that allows assessment of the restoration procedures.

This final step is important for the success of any wildlife enhancement project. For wildlife enhancement, Green et al. (1987) suggest the following 4-step process for habitat reclamation:

1- "Identification of the reclamation requirements", where the "nature and level of concern for project effects on wildlife and wildlife habitat" are clearly defined;

2- "Develop a conceptual reclamation plan and schedule." Other end uses are considered. Targets are incorporated into the design;

3- "Implement reclamation plan";

4- "Monitoring and certification". Continuous assessment of the progress and effectiveness of the project helps ensure eventual success.

A 4 step approach was used to achieve the four objectives of this practicum and to identify the wildlife enhancement options. The approach that was followed can be described as follows:

1- establishment of existing conditions. Baseline information was collected from existing data, interviews with landowners, residents, and experts, and from similar projects;

2- identification of high wildlife-value sites at Buffalo Creek. Through field work and photo interpretation, 13 high wildlife-value sites were identified and mapped at Buffalo Creek;

3- determination of which wildlife species can likely and potentially be enhanced using existing data, interviews with landowners, residents, and experts, and from similar projects;

4- option identification. Wildlife enhancement options that could increase species numbers or species diversity at Buffalo Creek were identified using public input, existing information, and expert advice, and then presented in suggested sequence as an enhancement plan.

The monitoring phase of wildlife enhancement, while very important, is beyond the scope of this practicum, and is left to the BPS&WMA.

3.7 Critical Habitat Restoration and Development at Buffalo Creek

The field work and the photographical record of the 16 km strip showed that current wildlife habitat at Buffalo Creek is a mix of marginal land, intermittent wetland, small open water ponds, and grazed or cultivated land. The creek zone is typical of a small, low lying riparian strip in Manitoba, or in prairies in general. Surrounding this riparian zone is mostly cropland, residential land, pasture, and marginal land, which once was tallgrass prairie. This assembly of small, different ecotypes is an excellent base for wildlife enhancement, and already supports a variety of wildlife. Three requisites of good wildlife habitat are already present: water, food, and some habitat diversity. The greatest problem is the small area. The total amount of uncultivated, undisturbed habitat available to wildlife along the creek is presently approximately 167 hectares (ha). This available wildlife habitat is broken by livestock grazing and cultivation into discontinuous, often very narrow (3 m) patches over 16 km of stream. The establishment of a tallgrass prairie type buffer strip as described in Buffalo Creek Study Site Management Plan (Dangerfield et al. 1992, vol.3) is the most important

aspect of rehabilitation of the creek, but there are a number options available to managers to effectively increase the area of habitat, or improve its quality. These are described in detail in chapter **6.0 WILDLIFE ENHANCEMENT OPTIONS.**

3.7.1 Critical Habitat and Limiting Factors

The fact that some endangered and threatened wildlife has been seen along the creek indicates that there is some critical habitat found in the area. Salzman (1990) defines critical habitat as "a legally designated geographic area crucial to the continued viability of an endangered species". Another definition of critical habitat for a wildlife species is that habitat where an environmental component, or group of components, without which the species cannot maintain a population, is found (Purves and Orians 1987; Merilees 1989). Such a component is a limiting factor in the establishment of a species. There is a wide range of environmental elements that can be limiting factors to any one or more species. These limiting factors are often grouped into four categories: food, water, shelter, or a specific reproduction requirement.

For example: waterfowl need cover and open water (Turbak 1988); ferruginous hawks need suitable nesting trees (Struzik 1990), and a sufficient prey base, preferably ground squirrels (*Spermophilus spp.*)(Johnson 1992, pers. com.); loggerhead shrikes appear to need shelterbelts and willow lined lowland/cropland (De Smet 1992, pers. com.). Cadman (1990) claims that habitat destruction by succession, industrial and housing development, and agriculture are the

main limiting factor for eastern shrikes. He also mentions the need to study shrike winter habitat as a possible limiting factor. For prairie long-tailed weasels, "the vegetation species composition is not as important as the interspersion of (varied) habitats, low canopy cover, 50% ground cover and availability of free standing water" (Manitoba Department of Natural Resources 1991). Red squirrels (*Tamiasciurus hudsonicus*) or gray squirrels (*Sciurus carolinensis*) and great blue herons (*Ardea herodias*) need trees (Johnson 1992, pers. com.). "Burrowing owls require open areas with low ground cover, existing burrows, and abundant food", with the loss of suitable burrows perhaps most critical (Manitoba Department of Natural Resources 1992). American avocets (*Recurvirostra americana*) need mudflats, and Brown-headed cowbirds (*Molothrus ater*) favor habitat edge (Johnson 1992, pers. com.). Insects (an important food source for many birds and small mammals) can be managed for by "restoring habitat diversity, by eliminating unnatural landscape features, and by burning with restraint" (Panzer 1988). Some examples of how to provide limiting factors that would enhance wildlife at Buffalo Creek are discussed in detail in **6.0 WILDLIFE ENHANCEMENT OPTIONS.**

The size of a habitat parcel should be carefully considered when enhancing for wildlife. If the reserved or managed patch is too small, there will not be enough natural resources for wildlife enhancement. Forman and Godron (1981) wrote that "productivity, nutrient and water flux, and species dynamics are all affected by the size of landscape patches". For example, enhancement of the greater

prairie chicken (*Tympanuchus cupido*) is not currently feasible in Manitoba, because this species needs large undisturbed areas to live and reproduce (Minish 1987). A common criterion of conservation value is species richness, the number of species in a habitat patch. In relatively undisturbed sites, the area of the patch influences species richness (Luria et al. 1981; Margules and Usher 1981; Dickman 1987; Purves and Orians 1987; Tilghman 1987). Dickman (1987), speaking of an urban environment, found that richness can be maintained for mammals (excluding large mammal species such as deer) with a system of small (>0.65 ha) patches of undisturbed habitat. For reptiles and amphibians, patches >0.55 ha with permanent water are required. The United States Department of the Interior Fish and Wildlife Service (1981) found greater waterfowl densities and better hatch rates in large patches (over 40 ha). Dickman (1987) notes that:

> the value of smaller patches of habitat may depend on whether they contain rare species which do not occur elsewhere, on their proximity to source areas from which organisms can disperse, or on whether they are connected by 'travel corridors'.

By establishing a network of such travel corridors, species richness is increased, and migration, foraging, predator avoidance, and gene flow are facilitated (Forman and Godron 1981). A system of small patches effectively becomes one larger patch. Corridors must be wide and diverse to provide enough cover for wildlife (Poston and Schmidt 1981). Referring to "stream corridors", Forman and Godron (1981) recommend that there be a well-drained strip of interior environment enclosed within the corridor for those species that could not survive stream flooding.

There are negative effects on wildlife associated with travel corridors. If the habitat strip is too narrow and too linear, it may act as a prey trap, where predators take advantage of the higher concentration and increased detectability of prey species (Poole 1992, pers. com.; Baydack 1993, pers. com.). Increasing patch size is not always associated with duck nesting success or reduced predation. Clark and Nudds (1991) found it "difficult... to verify the effects of patch size on duck nesting success", and conclude that further research is needed.

3.7.2 Riparian and Wetland Habitat

Riparian and wetland areas have been identified as extremely important wildlife habitat. McMullen (1987) states that in order to restore wetland areas for wildlife habitat, you must first establish what wildlife species are to be targeted, what conditions are needed or available for these species, what plant species will be needed to meet these requirements, what type or types of wetland are needed, and what the minimum size and arrangement or configuration is to be. When the target species are identified, their life requisites must be considered: food, cover, and other specific habitat factors needed for reproduction. This would be a logical system to use in establishing any wildlife habitat, not just wetland, and a key consideration is the vegetation type. Unfortunately, describing or recommending specific vegetation of the Buffalo Creek area under study is beyond the scope of this practicum, although a few suggestions are provided in **Appendix F: Some Favorite Plants and Grasses for Wildlife at Buffalo Creek.**

Some hydric habitat that may be critical to wildlife found at the creek include: emergent vegetation and shallow marsh aquatics, banked by healthy graminaceous growth for waterfowl (Hennan and Munson 1979; Turbak 1988); wetlands with open, bare shorelines and a flourishing littoral zone for shorebirds (Hennan and Munson 1979); and riverbanks and marshes for furbearers (Shemnitz 1980; Poston and Schmidt 1981; Timm 1983; Wade and Ramsey 1986; Trottier 1992). Some wetland improvement techniques are discussed in detail in section **6.0 WILDLIFE ENHANCEMENT OPTIONS.**

3.7.3 Upland Habitat

As was noted in the introduction, the Buffalo Creek area was once covered by tallgrass prairie. It is likely that some remnant tallgrass can be found in the upland area along the creek. The uniqueness of this tallgrass prairie habitat makes it critical for some wildlife. Although some studies have gone into great detail concerning the needs and performance of prairie ecosystems, only general features and characteristics will be considered here. For a more complete account of tallgrass restoration at Buffalo Creek, see Dangerfield et al. (1991, vol.1; 1992, vol.3).

Full restoration of a natural tallgrass prairie habitat has been attempted on several occasions, with varying degrees of success. Due to the great diversity of native tallgrass prairie, full restoration involves considerable expertise and application. Hernandez (1991, pers. com.), who refers to restoration as "applied farming", pointed out that we are dealing with point restoration, where microclimatic variations will count. Any plant introductions will have to

be from native and local stock. Carson (1986) found references claiming sources should be taken from within 80 to 480 km of the restoration site. Becker (1988), Masters and Vogel (1988), and Rohn and Bragg (1988) all found that periodic fire (simulating pre-disturbance conditions) helped renovate tallgrass prairie habitat. Dubis et al. (1988) found that populations of small mammals generally increased following periodic burns. Burning has become established as a management tool for restoration when remnant species are present.

Fire management was also shown to decrease both fungal disease occurrence and severity (Shearer and Tiffany 1988). Hernandez (1991, pers. com.) advocates mowing as a weed suppressant for the first few years, once or twice per mowing season. Ehrenreich and Aikman (1963) found that mowing generally decreased prairie productivity. This was also observed by Boetcher and Bragg (1988) who noticed that a decrease in diversity and changes in species composition was related to mowing as well.

The management techniques of mowing and burning can also benefit in partial restoration of tallgrass prairie. While major influences such as fire are a necessary component to the habitat (i.e. to suppress woody vegetation), fire does not, in itself, ensure the permanent establishment of a tallgrass prairie community. In very small reclamation projects, hand seeding, hand weeding, and physical transplanting of native species is possible. When larger projects are envisioned, economies of scale must be considered. For prairie restoration in Manitoba, only a

limited number of seed varieties are available in quantities great enough to plant large tracts of land (i.e. quarter sections). Seeds are sown using conventional farm equipment for efficiency, but special grass drills are considered superior. Seedbed preparation involves removal or suppression of undesirable species through burning or chemical applications, perhaps followed by soil compaction. Following seeding, the site is periodically mowed in the first couple of years, with or without additional chemical applications. Once desired prairie species are established, periodic burning (every two or five years, or when needed) is used to control woody plant invasion. Wark (1991, pers. com.) claims that this recipe leads to "successful re-establishment of representative tallgrass prairie species".

The United States Department of the Interior Fish and Wildlife Service (1981) has produced an excellent report on the establishment of grasslands for wildlife habitat in the prairies. The wildlife species they discuss are largely birds and waterfowl, but the report provides a comprehensive manual from site preparation to dates and rates of seeding to seed sources. They say little about size requirements:

> field size is a factor to consider in establishing seeded cover for duck nesting habitat. No field is too small for grassland establishment, but greater duck nest densities and higher hatch rates have usually been found in relatively large fields (greater than 40 acres) that do not contain wetland or other habitat divisions.

For Buffalo Creek, most seeded cover would necessarily occur along the creek, in a linear strip. Representatives of Ducks Unlimited Canada (Cowan 1991, Wark 1991, and Poole 1992, pers. com.), pointed out that a narrow buffer strip

would be a biological trap for ducks because predators can run the strip more readily. They recommended 16 ha of continuous buffer, or as large a block of land as possible.

The United States Department of the Interior Fish and Wildlife Service report does state that the number of nests per unit area and success of duck nests were related to visual obstruction measurements (height and density) of residual vegetation. Dense nesting cover has been accomplished using mixtures of tall wheatgrass, intermediate wheatgrass, and alfalfa. In stands of seeded cover the diameter and strength of the plant stems are important because the vegetation will be resistant to flattening or lodging caused by winter snows. Grasses such as intermediate wheatgrass, tall wheatgrass, big bluestem, indiangrass, and switch grass are particularly resistant to flattening. The report also states that seeded grasslands are relatively easy to establish compared with other habitat types, such as forests or wetland, and prairie wildlife species begin using them rapidly.

3.8 Wildlife Enhancement Obstacles

Often, wildlife enhancement projects are implemented on private land. One of the major problems faced by such a project is that of convincing local owners to develop portions of their land for wildlife. Possible strategies include lease agreements, land trades, purchases, or expropriation (for example, heritage sites or critical habitat for endangered species may be subject to government expropriation). Peer pressure from neighbours and local interest groups may also prove to be helpful, and public

participation meetings can precipitate this effect. Furthermore, some economic benefits to the landowners may result from enhancing wildlife, such as reduced soil erosion, snow catch, greater water retention, and an increase in game animals and waterfowl.

Some believe that it is the private owner who controls the fate of the environment. Symms (1991) argues that some laws and regulations that control the development of resources actually violate private property rights, and claims that there is "mounting evidence that American progress on environmental protection may be attributable to... our private property heritage".

Another problem will be any habitat reclamation associated with wildlife enhancement. While full restoration is certainly desirable, it is not likely possible at Buffalo Creek: for one, little is known of the exact composition of the site before settlement; for two, restoration of tallgrass prairie would involve the re-establishment of over 130 plant species (Anderson 1986; White 1988), not to mention the complex interactions of animals, insects, etc. in the ecosystem. Partial restoration, or habitat development, is a compromise solution, where as many parties as possible get some measure of benefit. Methods are relatively inexpensive, and quick to implement. Restoration species are selected on a basis of availability and suitability, and are disseminated in bulk (Wark 1991, pers. com.). Habitat development establishes "tallgrass communities", not to be confused with tallgrass prairie. Periodic burns and mowings are performed, undesirable

species are controlled, but the original pre-disturbance diversity is not a priority. In this manner, limited funds and resources are spread further, and more habitat can be restored.

For each wildlife enhancement project there will be specific difficulties more or less unique to the site and management objectives. Depending on the priorities, different end uses must be well planned if they are not to interfere with each other.

3.9 Wildlife Enhancement Incentives

The wildlife enhancement obstacles mentioned above can be overcome with appropriate incentives. While rural residents certainly value wildlife (Watson 1990), their family income often depends on the amount of land that is in production, and any arable portions given up for wildlife reduces this income. Besides, good farmland may cost as much as $2400/ha (Enns 1992, pers. com.). In order to persuade landowners to return some of their land to natural habitat, some form of compensation may be necessary.

The most obvious incentive available to the BPS&WMA is the purchase of land for wildlife enhancement. While one of the most expensive of the possible strategies, the BPS&WMA would not likely bear the whole cost. There are numerous financial incentive programs that are designed for native grassland conservation and wildlife enhancement, including: Critical Wildlife Habitat; the Habitat Trust Program; and the Permanent Cover Program (see **Appendix D: Outside Assistance Sources**). These programs provide funding or

assistance in kind for the purchase of lands for wildlife enhancement. Leasing land is another option, and can be of a short-term or a long-term form, with financial assistance provided by many of the same sources (Trottier 1992).

Land trading is also practised, where the landowner gives up some areas considered marginal for crop production, but valuable for wildlife, such as marsh habitat or similar lowland. In exchange, the owner is allowed to farm more productive soil nearby (Trottier 1992). This incentive method is also costly, as it requires that the BPS&WMA have some good quality land to trade with.

Tax incentives can also be applied to secure land for wildlife enhancement (Scarth 1984). Sawatzky (1992) suggests the following:

> 1- 'untax' nature by applying a zero-value assessment to wasteland within the municipal taxation system, and offsetting foregone revenues by additional taxes on society at large;
>
> 2- for privately-owned rural land, "institute detailed, explicit, categorized tax billings", where wildlife habitat is set apart; and
>
> 3- create legislature to allow landowners to commit any portion of their land to ecological reserve while retaining complete title, and removing these reserves from the municipal tax base.

3.10 Developing Wildlife Policy

Why must wildlife be managed? In the case of Buffalo Creek, the local ecosystem has been altered to the extent that many natural wildlife populations have either disappeared from the area, or have been declining in numbers. In the Background Study to the R.M. of Rhineland Development Plan,

the Municipal Planning Branch (1982) writes that "practices of intensive agriculture for the most part entirely contravene implementation of wildlife management principles necessary to allow wildlife to become a meaningfully and abundant resource of the area". Without a concerted management effort to rehabilitate wildlife conditions at the creek, the local ecosystem will continue to deteriorate, to the detriment of all concerned. "We must manage wildlife because it is ethically responsible, an environmental necessity, and ultimately in our own self-interest" (Hoole undated). Payne (1991) defines wildlife management as "the art and science of manipulating the natural environment and controlling the activities of people to ensure that we derive from wildlife what society demands". A goal of wildlife management is to reach a point where human needs can be met without continuously overtaxing the environment. We must integrate ourselves within the earth's ecosystems (Rowe 1990). Sawatzky (1992) suggests that "we must set about imbuing our institutions with operational ethics whose perceived messages cumulatively promote ecologically sound rational collective responses".

Watson (1990) recognizes the need for integrated policy making at the wildlife/agriculture interface, and notes the integration potential of soil and water conservation with wildlife management. Integration methods may include reduced tillage, shelterbelts, rest-rotational grazing, ditch and fencerow cover maintenance, grassed waterways and legume underseeding, forage planting in saline areas, forages in crop rotations, careful timing of farming operations, and flood retention dams. Hill (1991) suggests

that "agricultural options include more complex crop rotations, intercropping, multistorey polyculture systems, and rotational grazing".

At Buffalo Creek, some measure of reconstruction is called for. Portions of the natural ecosystem must be developed and pieced back together. "If you can build an ecosystem so well that it sustains itself, resists the intrusion of alien species and bounces back from the trauma of fire and storm, you may be close to the real thing" (Wiley 1989). Maintaining the productivity of an ecosystem, or ensuring its sustainability, depends on the degree of species diversity.

> "Ecosystems naturally evolve toward optimum designs with respect to their sustainability. Thus, efforts to design and manage productive agroecosystems should at least take note of the natural designs that are present in the area in question, and aim to mimic their essential elements. What is certain, however, is that the nature of future prairie agricultural communities will be very different from those of today" (Hill 1991).

3.11 The Future of Wildlife Enhancement

Increasing efforts to restore or enhance natural wildlife populations are being made by scientists and lay persons alike (Tangley 1986; Jager 1992). Computer assisted decision-making and modelling is taking great strides in the habitat and wildlife management fields (Stauffer et al. 1990). Nabhan (1991) believes that these efforts are "the most important environmental development since the first Earth Day". In Manitoba, there are currently numerous agencies, groups and organizations which are working on their own and in joint ventures to help re-establish floral

and faunal habitat, breeding grounds, and diversity (Prairie Farm Rehabilitation Administration, Canadian Wildlife Service, Ducks Unlimited Canada, Manitoba Naturalists' Society, Prairie Habitats, etc.). While organizations may differ on certain aspects and issues (i.e. should full or partial restoration be the objective?), a new era of cooperation and purpose has emerged, as evidenced by the BPS&WMA initiative.

3.12 Wildlife Enhancement at Buffalo Creek

In this chapter, the decline in wildlife diversity and numbers was linked to the reduction of natural habitat. When wildlife habitat is sufficiently removed or altered, wildlife will begin to disappear, as is evident at Buffalo Creek today. It has been shown that people value wildlife for its own sake, and value the natural habitat that supports wildlife, both because of this supporting role, and its own many tangible and intangible values. In the past, these values were not fully addressed in development decisions. When deciding on development and the relative costs and benefits of development actions, these values must be well assigned and incorporated into the decision making, or economic equity is compromised. However, many landowners have to make a living off their land, and may require offsetting incentives to enhance wildlife on their property.

Now that these wildlife and other environmental values are beginning to be understood, organisations such as the BPS&WMA are interested in the enhancement, restoration and reclamation of wildlife and natural habitat. Enhancing wildlife and reclaiming habitat are inseparable, and

managers often do one to accomplish the other. Many of the options in **6.1 Detailed Wildlife Enhancement Options** are in fact habitat development (i.e. **6.1.7 Provide Wildlife Cover Outside the Buffer Strip**, **6.1.8 Improve Travel Corridors for Wildlife**, and **6.1.9 Improve Water/Cover Ratios**). Other identified options (i.e. **6.1.3 Discontinue Livestock Pasturing Along the Creek**, **6.1.4 Modify or Design Physical Structures for Wildlife**, **6.1.5 Provide Nesting Structures on Land for Wildlife**, and **6.1.6 Provide Nesting Structures in Water for Wildlife**) do not develop tallgrass communities, but are considered habitat development because they provide a necessary habitat element (limiting factor) to enhance wildlife. This linkage is well recognized, and wildlife managers routinely use habitat development as a method of wildlife enhancement. Ideally, those habitat elements that are limiting factors for a target species are supplied. It will be left to individual landowners, the BPS&WMA, and the local community to decide to what extent the enhanced wildlife and developed habitat will resemble pre-settlement conditions, and to implement their wildlife enhancement actions correspondingly.

4.0 SITE ANALYSIS AND EXISTING CONDITIONS: RESULTS

4.1 Buffalo Creek Resource Use

Lands along the Creek are used primarily for agriculture. Farmers have crops planted right to the edge of the creek in some circumstances. Crops grown in the area include canola, soybeans, sugar beets, sunflowers, corn, peas, and other specialty crops. Livestock raised close to the creek include cattle, pigs, and poultry. A lack of pasture areas for livestock in the region has meant that the creek bed and shores have been utilized as grazing areas.

Water is a major resource used by landowners located on or near Buffalo Creek, but water quantities taken from the creek are small. The Lake Agassiz Irrigation Association (LAIA) is a group of farmers in south central Manitoba who use Buffalo Creek and Buffalo Drain as a source of water for irrigation purposes (LAIA is currently looking at increasing the amount of water taken from the creek and drain). Landowners fill dugouts in the spring to store water for use in drier months. Water is used for livestock, gardening, and other farm purposes.

The 16 km section of Buffalo Creek under study is a valuable recreation resource to the community of Altona. In the past the area was used for swimming, fishing, hiking, ice skating, hunting, and trapping. Activities which are enjoyed at present include canoeing, hiking, fishing, cross country skiing, snowshoeing, wildlife viewing, hunting, and snowmobiling. Fur trapping has been abandoned since the decline in fur prices.

4.2 Physical Characteristics

4.2.1 Topography and Geology

Topography of the study site can be described as flat with little or no relief. The elevation is approximately 246 m above sea level, with slopes of 0 to 5%. The land falls eastward from the principal meridian at a rate of approximately 1.14 m/km. Elevation also decreases from south to north over the study site. The banks of Buffalo Creek are the most noticeable relief in the 16 km stretch of the study area. These banks consist of low, relatively continuous ridges running generally NNW to SSE parallel to the creek. Due to the flatness of the area, lands peripheral to the creek are prone to flooding during peak runoff periods (March through June).

4.2.2 Hydrology

The section of Buffalo Creek under study is part of the Buffalo Lake Watershed. The headwaters of the Creek are located in North Dakota. Water originating in the south branch of the Buffalo Lake watershed enters the Buffalo Lake Drain southwest of Altona and enters the Red River to the north near the village of St. Jean Baptiste, via the Buffalo Lake Channel and Plum River (Figure 4.1). Buffalo Creek and Drain are classified by the Manitoba Department of Natural Resources Water Resources Branch as intermittent streams. This means that during periods of the year certain portions of the streambed may contain no water, and water becomes trapped in pools with little or no flow. During the years 1939 and 1940 records indicate that Buffalo Creek had zero flow.

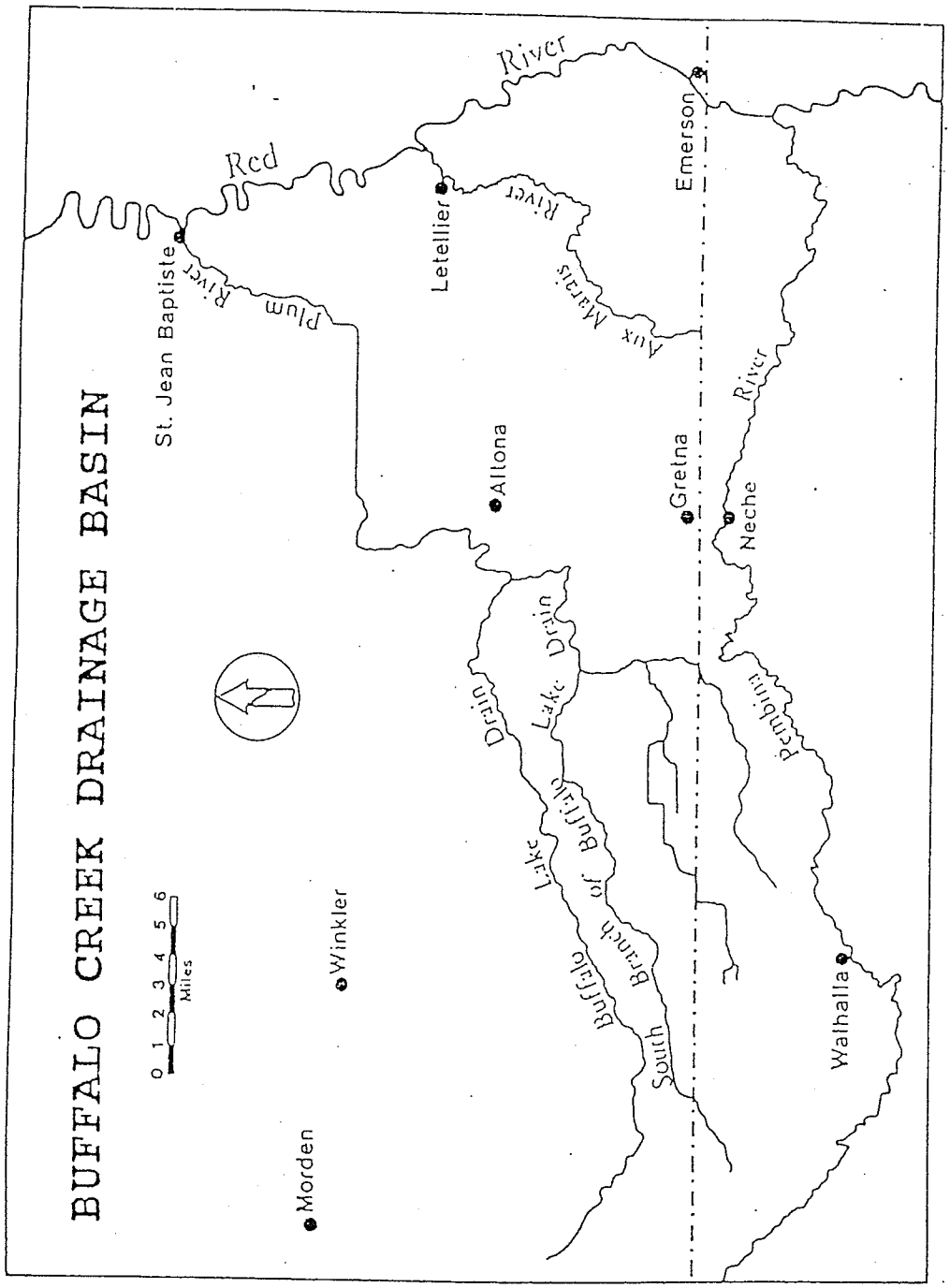


Figure 4.1. Buffalo Creek Drainage Basin
(Ogrodnik, 1984)

The availability of water at Buffalo Creek is a major factor affecting the health of the ecosystems found there. The availability and quality of water present in the creek plays a direct role in the health of the biological systems. For example, in drier years there is less water available for aquatic organisms, which reduces their habitat, and less habitat means fewer organisms are present. The fact that flow is not maintained over the course of a year creates several problems associated with water quality. Peak flows occur in the spring and large volumes of water travel through the creek in a short period of time. This causes flooding of lands beside the creek and causes erosion leading to an increase in turbidity of the water. Water quality fluctuates dramatically over the months and years. In the hot summer months lack of flow causes degradation of water quality in Buffalo Lake and other shallow standing water bodies. Algal blooms and plant growth lead to oxygen depletion in the creek, and lack of oxygen can reduce the habitat quality for aquatic organisms.

4.2.3 Soils

Erosion is the main problem that BPS&WMA feels is occurring along the creek. It is felt that soil is both being blown into the creek and washing into the creek after rainstorms. Some residents have indicated that sections of Buffalo Creek within the study area are becoming shallower due to accumulation of sediment. High soil salinity in sections along the creek bed has also been identified as a soil problem. Saline areas are located near the Fausting site and sporadically throughout the study area. The extent of the soil problems was not agreed upon by all members of the

community. Several landowners felt that erosion only occurred during the spring thaw. Flood water and ice jams were identified as causes of soil movement along the creek. It is difficult to assess soil accumulation in the creek because water levels fluctuate greatly over the months and years. The section on soils in Dangerfield et al. (1991, vol.1) provides a more detailed examination of the soil types found within the study area.

4.3 Biological Resources

4.3.1 Vegetation

The area is located within the ecological site designated as the grassland region (Dangerfield et al. 1992, vol.1). At present, the dominant vegetation of the study area is cultivated crops. Crops grown in the area include canola, soybeans, sugar beets, sunflowers, corn, peas, and other specialty crops.

Within the uncultivated area of the study site, the dominant species vary from grasses to willows to deciduous trees. A list of natural vegetation which may be present along the 16 km stretch of the study site has been compiled and is presented in Existing Conditions (Dangerfield et al. 1991, vol.1). A more detailed vegetation inventory is planned, and will be available through the BPS&WMA by mid 1993.

The Background Study to the R.M. of Rhineland Development Plan (Municipal Planning Branch 1982), within which the study site falls, states the importance of the areas of remaining natural vegetation in the following recommendation:

Wildlife is limited in Rhineland therefore the few remaining habitat areas, such as shelterbelts, creeks, and road allowances should be protected where possible.

4.3.2 Fish

The fishery resource at Buffalo Creek is dependent on the availability of water. Children in the area have caught northern pike from bridges over deeper sections of the creek. Bob Austman (1991, pers. com.) has indicated that students have caught fish in the winter months by ice fishing. Residents have identified the following species of fish in the creek: brown bullhead (*Ictalurus nebulosus*), northern pike (*Esox lucius*), fathead minnow (*Pimephales promelas*), carp (*Cyprinus carpio*), mullet (*Mugil cephalus*), sucker (*Catostomus commersoni*), and the common shiner (*Notropis cornutus*). Because of the intermittent nature of the creek and the limited scope of this practicum, fish are not considered further.

4.3.3 Wildlife

The designated 16 km stretch of Buffalo Creek and its banks can be described as a mosaic of different habitat types, including open water, riparian zone, shrub, field, marsh, and seasonal wetland. Such a variety of habitat types is capable of supporting a wide range of wildlife. The land zones support a variety of small mammals (shrews, voles, moles, gophers, squirrels and mice are common), which provide a solid base to the food chain. While not reported by residents as often as the small mammals, reptiles and amphibians such as snapping turtles (*Chelydra serpentina*), painted turtles (*Chrysemys picta*), and northern leopard frogs (*Rana pipiens*) were reported present to complement

this base. Red foxes (*Vulpes vulpes*) were seen frequently by residents, and one was seen hunting in the area during the field week (see section **5.2 High Wildlife-Value Sites**); coyotes (*Canis latrans*) and raptors were also reported by residents. The different water habitats (marsh, open water, seasonally wet) are used by many species of waterfowl. Although most use the creek as a layover during spring and fall migrations, several species were reported by landowners as nesting along the creek, including: wood ducks (*Aix sponsa*) living in trees and nest boxes; blue-winged teals (*Anas discors*); canvasbacks (*Aythya valisineria*); mallards (*Anas platyrhyncus*); and at least one pair of Canada geese (*Branta canadensis*). American coots (*Fulica atra*) were seen on nests during the field week.

Deer frequently are seen in the creek area by the residents. Some species that are less common but have been sighted within 15 km of the creek region in the recent past include black bear (*Ursus americanus*), bobcat (*Felis rufus*), moose (*Alces alces*), and wapiti (*Cervus elaphus*). There have been sightings of endangered and threatened species within 15 km of the creek, namely the loggerhead shrike, the burrowing owl, the ferruginous hawk, and Baird's sparrow (Enns 1992, pers. com.; Schritt 1992, pers. com.).

Appendix E: Existing Wildlife at Buffalo Creek, is a list of mammal, bird, reptile, and amphibian species that have been sighted within 15 km of the creek within the past ten years. The list was compiled from existing literature, professionals in the field, local experts, and local landowners (see **2.4 Determining Likely and Potential**

Wildlife Species). This list should not be considered exhaustive. The frequency of sighting (common or uncommon) was derived from personal communications with landowners along or near the creek and with local wildlife experts (Al Schritt for birds, Bob Austman for mammals, reptiles, and amphibians). Species that are not on the list but may be found in the area include Baird's sparrow, the black-tailed prairie dog, the plains harvest mouse, and the northern prairie skink. The least, masked, and northern short-tailed shrew were all included in one listing ("shrew"), due to identification difficulties. It should be noted that the relative frequencies and presence of the remaining small mammals has not been verified with field samples, and therefore is subject to some reservations, as these mammals can also be difficult to identify. Introduced species include ring-necked pheasants, which escaped from a game farm in the area a few years ago. These birds have been decimated by local wildlife (i.e. foxes) and landowners, and very few (if any) are left. Scientific names for wildlife species can be found in **Appendix E: Existing Wildlife at Buffalo Creek.**

Local residents feel that most species of wildlife (particularly birds) have been decreasing in numbers and variety. "There just aren't as many as there used to be" (Friesen 1991, pers. com.). Changes in species composition include an increase in the frequency of white-tailed deer sightings, possibly due to pressures in other regions. These findings of decreased wildlife diversity and abundance suggest a simplification trend of the Buffalo Creek ecosystem.

4.3.4 Wildlife Benefits, Drawbacks, and Controls

In this section, broad wildlife categories of Buffalo Creek are described to provide a base for future management decisions. Listing some of the benefits and drawbacks of each of the groups is intended to suggest the delicate balances that exist. For controls, poisons were excluded because the consequences of this method can be unpredictably dangerous. When control of a wildlife species is necessary, various methods should be combined and applied early, continuously, erratically, and until the problem is solved. If, after prolonged and diligent control efforts, the pest problem persists, a local wildlife officer should be contacted.

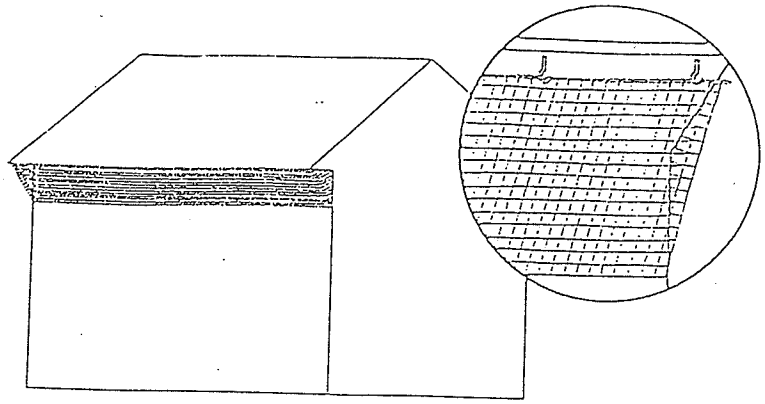
The following wildlife descriptions were compiled from Shemnitz (1980), Poston and Schmidt (1981), Timm (1983), Wade and Ramsey (1986), Trottier (1992).

Raptors: including hawks and owls.

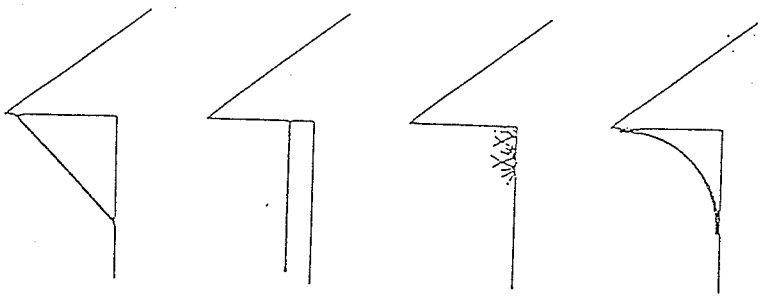
Benefits: raptors control birds and small mammals up to small beavers and waterfowl in size; some raptors clean road kills; owls, night hawks, and kestrels eat insects such as grasshoppers, crickets, wasps, locusts, etc.; raptors have a high aesthetic value.

Drawbacks: raptors may kill desirable wildlife species that are being managed for; domestic animals are vulnerable, particularly free-ranging farm fowl.

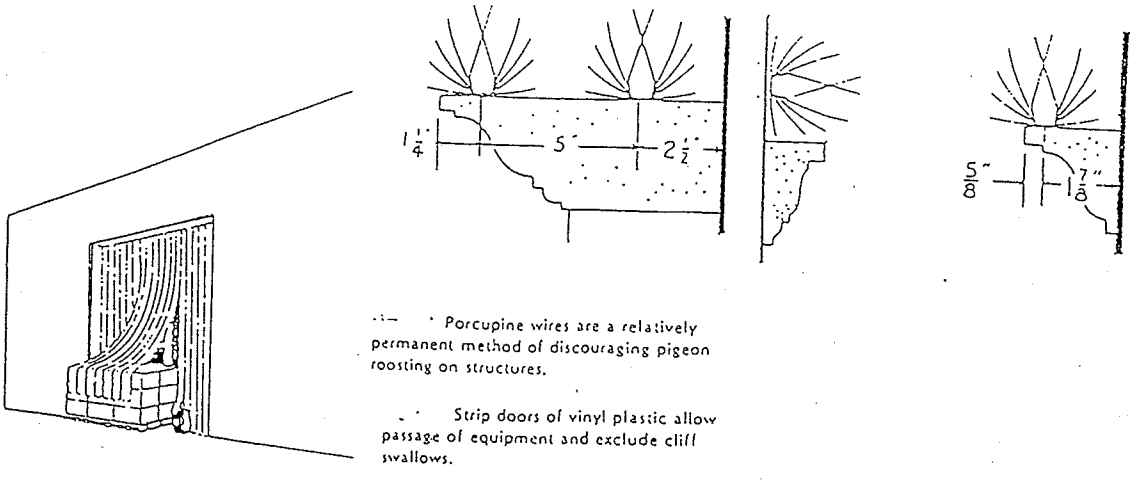
Controls: eliminating perching sites within 35 m of problem areas (Figure 4.2) or capping poles with sheet metal cones;



.. Netting mounted on building from outside edge of eave down to the side of the building. Insert shows a method of attachment using hooks and dowels.



. Four methods which may deter cliff swallow nesting. From left to right: Netting attached from the outer edge of the eave down to the side of the building; a curtain of netting; metal projections along the junction of the wall and eave; fiberglass panel mounted to form a smooth, concave surface.



· Porcupine wires are a relatively permanent method of discouraging pigeon roosting on structures.

· Strip doors of vinyl plastic allow passage of equipment and exclude cliff swallows.

Figure 4.2. Buffalo Creek Wildlife Enhancement: Preventing Bird Nesting and Perching
(after Timm 1983)

placing electric pole shockers on perches within the threatened area (Figure 4.3); improve wildlife escape cover; live-trapping, frightening, and blocking entries are effective at keeping raptors from buildings.

Non game birds: including songbirds, woodpeckers, blackbirds, pigeons, etc.

Benefits: many nongame birds such as starlings, blackbirds, and cowbirds help control insects, particularly during the nesting season, May through July; songbirds have a high aesthetic value.

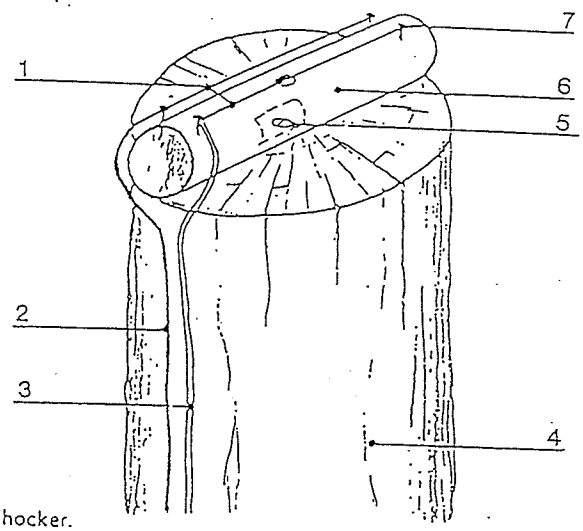
Drawbacks: nongame birds may feed on crops, particularly in late summer to fall; perching and roosting birds may damage stored crops and foul equipment.

Controls: birds can be prevented from perching or building nests (Figures 4.2 and 4.3); hawk, owl or snake models, noisemakers, and revolving lights may frighten some birds; trapping (Figures 4.4 and 4.5); lure cropping and planting non-preferred crops within 8 km of roosts; deep planting, or reduced tillage; harvesting as early as possible; keeping birds from indoors by blocking or screening all openings to the outside.

Game birds: including waterfowl and upland game birds.

Benefits: many game birds will help control insect populations; source of sport and food; high aesthetic value.

Drawbacks: game birds may feed on crops; some species may become very numerous (i.e. geese, mallards).



. The electric pole shocker.
(1) uninsulated (exposed) 12-gauge copper, ground and hot wires (no connection from ground to hot wire)
(2) insulated wire to ground
(3) insulated wire to fence charger
(4) 14- to 16-foot post
(5) mounting screw
(6) 1-inch x 6-inch self-insulating plastic pipe
(7) 3/4-inch sheet metal screws with plastic expansion sleeve or tubing between head of screw and plastic pipe

Figure 4.3. Buffalo Creek Wildlife Enhancement: An Electric Shocker to Discourage Perching (after Timm 1983)

Materials Needed for Trap

15 pieces 1 x 4s 8 feet long
25 pieces 1 x 4s 6 feet long
4 pieces 1 x 1s 6 feet long

1 piece 1/2 x 16-in exterior plywood, 6 feet long
2 hinges
2 lbs. staples
40-ft. length of 6-ft. chicken wire, 1-inch mesh

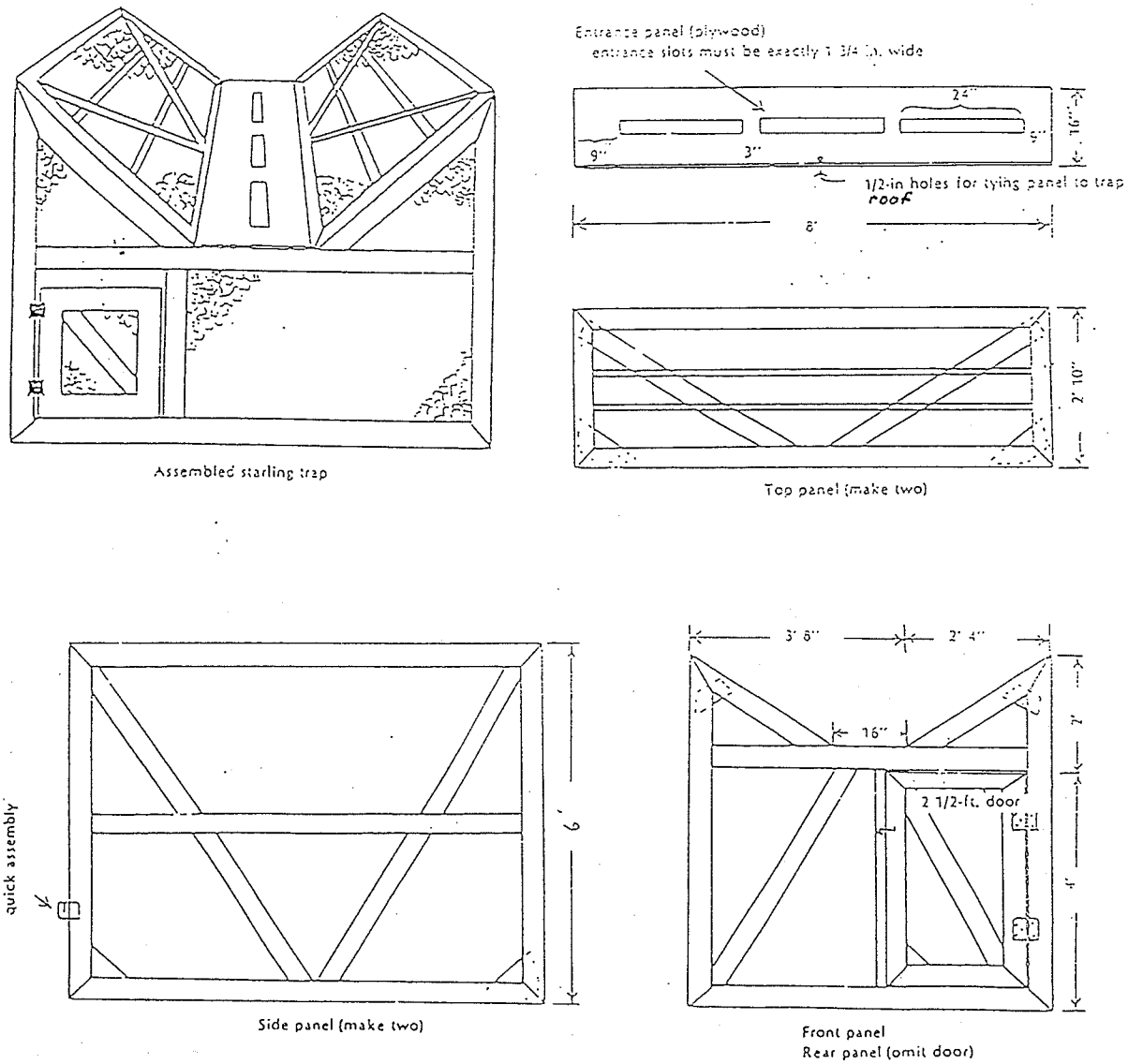


Figure 4.4. Buffalo Creek Wildlife Enhancement: A Starling Decoy Trap
(after Timm 1983)

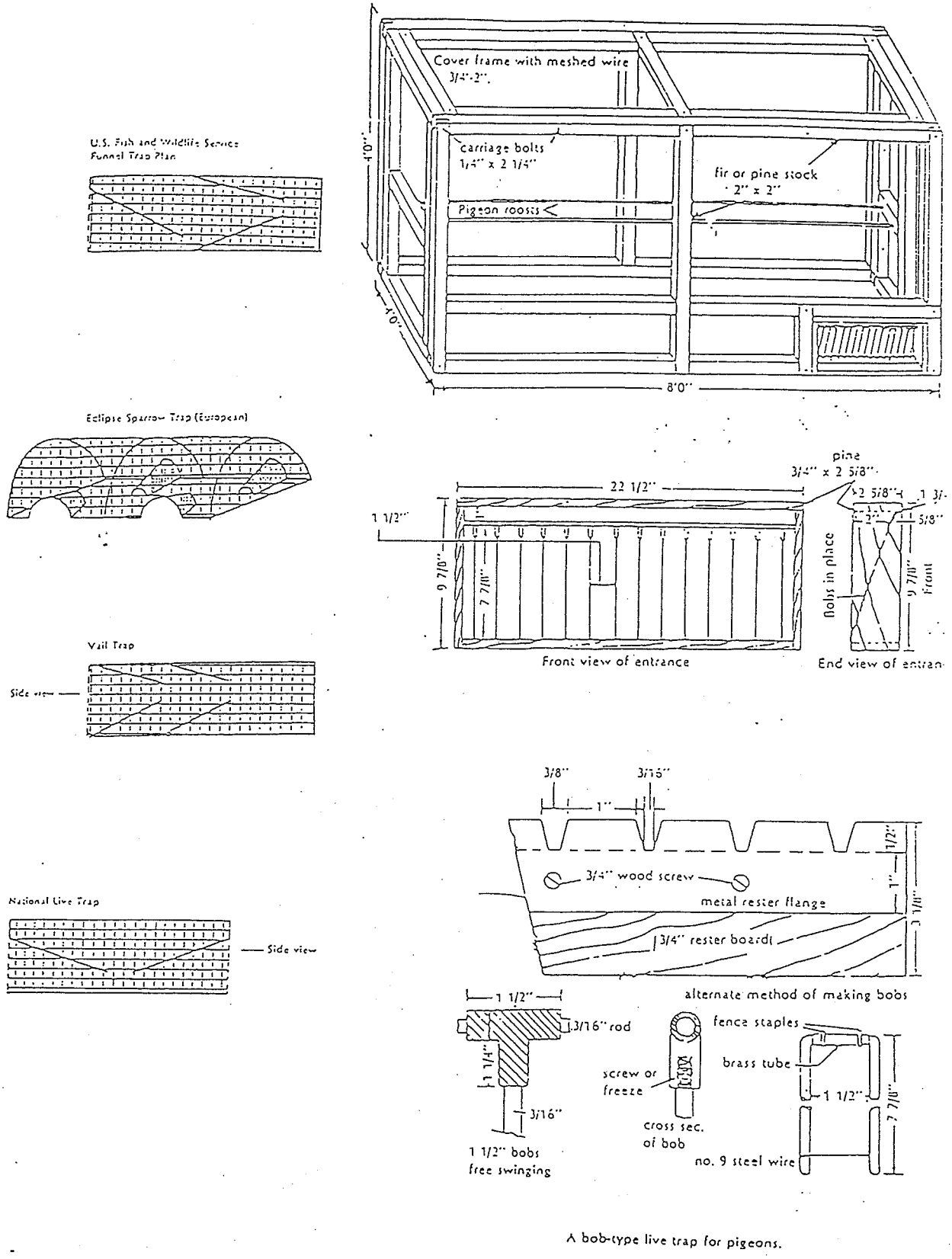


Figure 4.5. Buffalo Creek Wildlife Enhancement: Some Bird Traps
(after Timm 1983)

Controls: plant early maturing crops; use grain dryers; delay fall ploughing to allow waterfowl to feed in harvested fields; trapping; hunting; lure-cropping; scaring tactics, combining exploders, shooting, and flags (Figure 4.6).

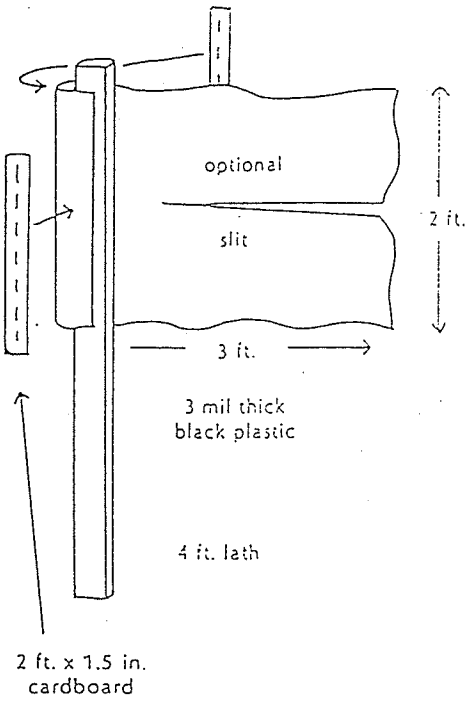
Small mammals: including mice, voles, gophers, etc.
Benefits: small mammals provide a food source for furbearers and other wildlife.

Drawbacks: burrowing species may damage crops, pipes, and cables; earth mounds may encourage weeds or damage equipment; other rodents may damage crop stores and fields; some rodents girdle seedlings, mature trees, and ornamental plants in fall and winter; some structural damage of buildings and containers may occur.

Controls: crop rotation; grain buffer strips around hay fields; weed control; allowing grassy areas to grow tall and dense; flood irrigation; rodent-proof construction; hardware cloth cylinders to prevent girdling of plants; trapping.

Furbearers: including mink, weasels, foxes, badgers, etc.
Benefits: once species are well established, controlled trapping for fur can become an income; high aesthetic value; these species help control bird and small mammal numbers.

Drawbacks: the larger carnivores will kill mammals, including livestock and pets; may kill wildlife that is being managed for; some species may carry disease that affects humans and animals.



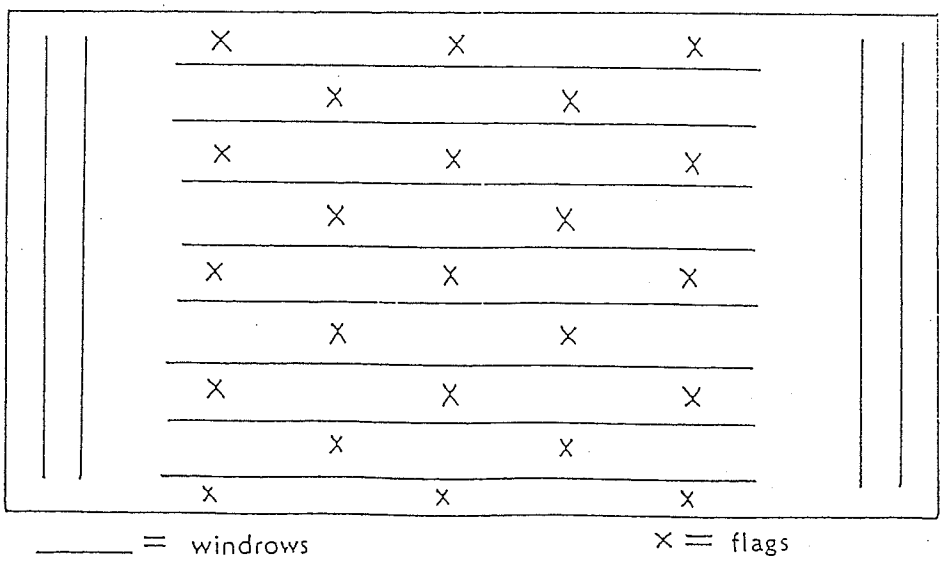


Figure 4.6. Buffalo Creek Wildlife Enhancement: Flag Construction and Placement
(after Timm 1983)

Controls: confining livestock; using guard dogs; hunting and trapping; removing prey species; using bright lights at night to exclude from an area.

Beaver/Muskrat:

Benefits: when managed, ponds control water flow and allow sediment to settle; successively raising then lowering a pond level exposes mud flats suitable for planting. Beaver pond ecosystems can be important habitats for nongame breeding birds. Medin and Clary (1990) found that bird biomass, bird species richness, and bird species diversity were higher in a willow dominated beaver pond habitat compared to a nonwillow riparian habitat.

Drawbacks: beaver and muskrat may dam drainage ditches, canals, and the creek, and plug drainpipes; both species burrow into pond banks and dams causing washouts and water loss; both may feed extensively on sorghum, corn, soybeans and other crops adjacent to the creek; beaver may carry *Giardiasis,* a protozoan disease affecting humans.

Controls: trees or shrubs can be protected by fencing with small mesh net wire; installing structures such as log stop drains in the dams allows water levels to be controlled; keeping crops no closer than 100 yards from the creek or ponds; trapping and relocation; some raptors (great horned owls (*Bubo virginianus*)) and carnivores (mink (*Mustela vison*)) prey extensively on muskrats; rock rip-rap on the inside face of a dam or cement aprons around drainage areas helps prevent burrowing; water control devices can be fitted to beaver dams (Figure 4.7); trapping and hunting.

Figure 4.7. Buffalo Creek Wildlife Enhancement: A Beaver Pipe
(after Yoakum et al. 1980)

4.4 Community Concerns

With respect to this practicum, perhaps the most significant question raised by those who completed the surveys and attended the public meetings was "how can agriculture and nature be integrated?" The landowners and stakeholders recognized the value of the creek wildlife, and expressed a desire to help support or enhance it, but were wary of making any big changes. For example, landowners questioned whether pest species would increase if lands peripheral to the creek were rehabilitated with a buffer strip. Landowners have problems with blackbirds, grasshoppers, beavers, and plant species which interfere with crop production. Some locals questioned the value of reduced till practices. They were, however, virtually unanimously agreed that wildlife should be maintained or enhanced.

Environmental concerns that were aired during public consultations included those of pollution problems with air, water, and soil. Questions were raised about the impact that farm practices, such as chemical use, have on the creek's ecosystem. For example, a fish kill which occurred in July 1991 focused public attention on the health of Buffalo Creek. The Manitoba Department of the Environment attributed the fish kill to a lack of oxygen, which is not uncommon in intermittent streams. However, the same test indicated the presence of almost every chemical associated with farm practices.

5.0 LIKELY AND POTENTIAL WILDLIFE SPECIES: RESULTS

As described in **2.4 Determining Likely and Potential Wildlife Species**, existing and historical wildlife records, field work, public input, and interviews with local residents and professionals in the field were used to determine what wildlife will likely or potentially be enhanced at Buffalo Creek. The sections in this chapter summarize the wildlife survey results and describe the high wildlife-value sites that were identified before determining the likely and potential wildlife species.

5.1 Wildlife Survey Results

A total of 14 registered owners of Buffalo Creek shoreline within the 7 study site sections responded to the survey. These respondents represent 39% of the shoreline owners, and together control 59% of the total shoreline, shown as the darkened reaches of Buffalo Creek in Figure 5.1. Repeated attempts were made to contact all owners, but some remained unavailable. Of the owners contacted, none refused to respond, and all had heard of the BPS&WMA rehabilitation plan. Permission was obtained from each respondent to visit and photograph their property.

Generally, the landowners contacted were supportive of wildlife. The views expressed were not significantly different from those described in **4.5 Community Concerns.** One individual complained of magpies; another considered local badgers as pests. The remaining respondents had no wish to see less of any species of wildlife on their property with the possible exception of blackbirds,

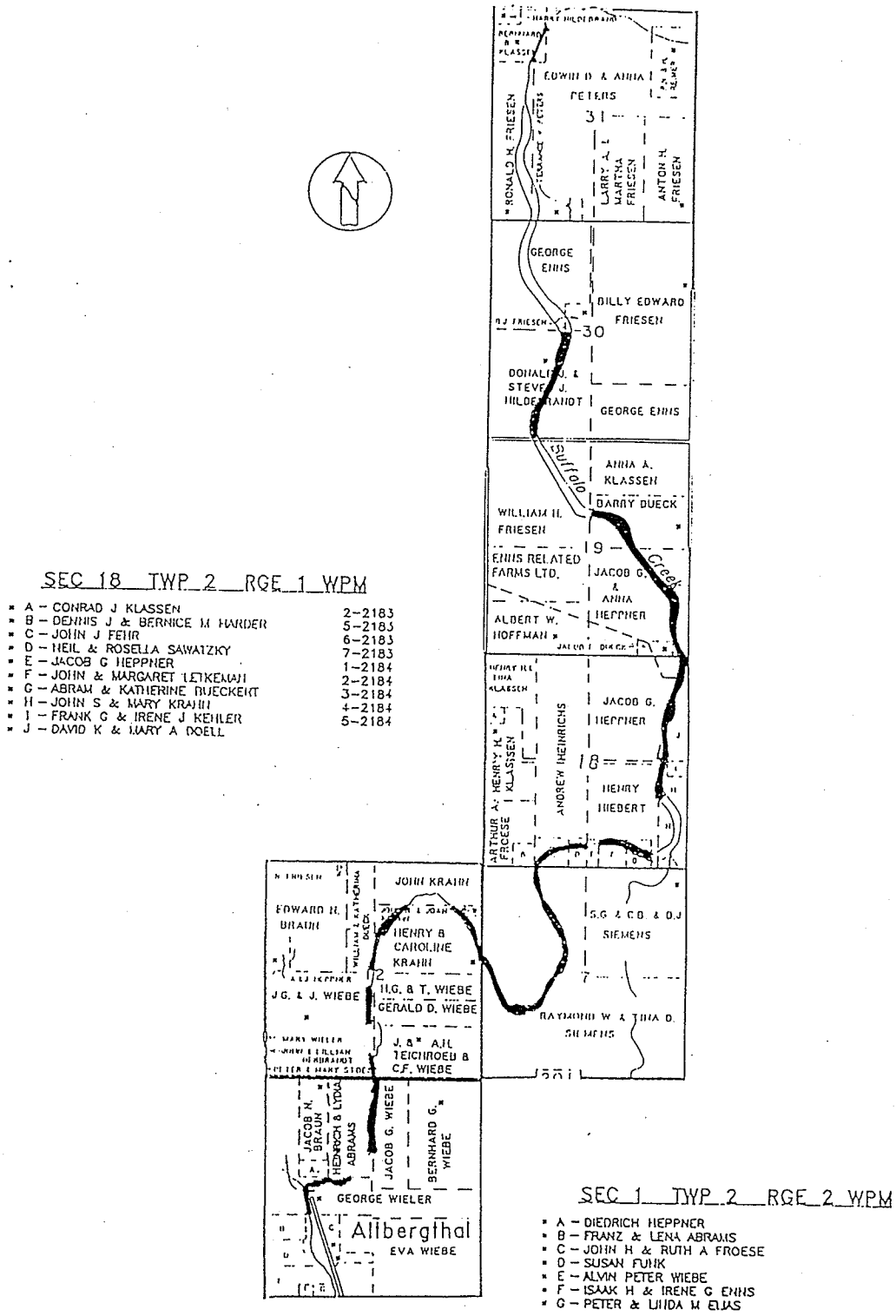


Figure 5.1. Registered Landowners Along Buffalo Creek
(Buffalo Plains Soil & Water Management Association 1992)

which were more or less tolerated, but considered pests. All respondents favored wildlife. Some (about 60%) wanted to see more bird and/or wildlife species in general; the remainder thought there was enough wildlife at the creek.

5.2 High Wildlife-Value Sites

As described in **2.3 Identifying High Wildlife-Value Habitat Sites**, interpretation of false color infrared aerial photographs of Buffalo Creek followed by field work identified 13 sites that are of high value to wildlife. Two additional sites were visited, but were not found to be of high value to wildlife due to lack of water, lack of diversity, lack of good cover, poor water quality, or a combination of these reasons. These poor sites were 7-3 and 12-2, and are described below. All sites that were visited appear as the shaded areas in Figure 5.2. Each one of these sites falls in an area covered by the **Wildlife Survey.** Permission to visit the sites and to take photographs was given by the survey respondents. The common characteristics of the high value sites are open water, diverse cover, and observed wildlife or signs of wildlife. All sites were wetter than anticipated. More water than appeared on the aerial photographs was found at the sites, and included many open and wetland zones. All sites (except 12-2, 7-3, 31-1, and 31-2) had at least approximately 0.5 continuous hectares of open water. Diverse cover (at least 3 different ground plants, some shrubs or trees) was recorded at sites 1-1, 7-1, 12-1, 18-1, 18-3, 30-1, and 31-3. The following descriptions of the sites resulted from the field work. Scientific names for the observed wildlife appear in **Appendix E: Existing Wildlife at Buffalo Creek.**

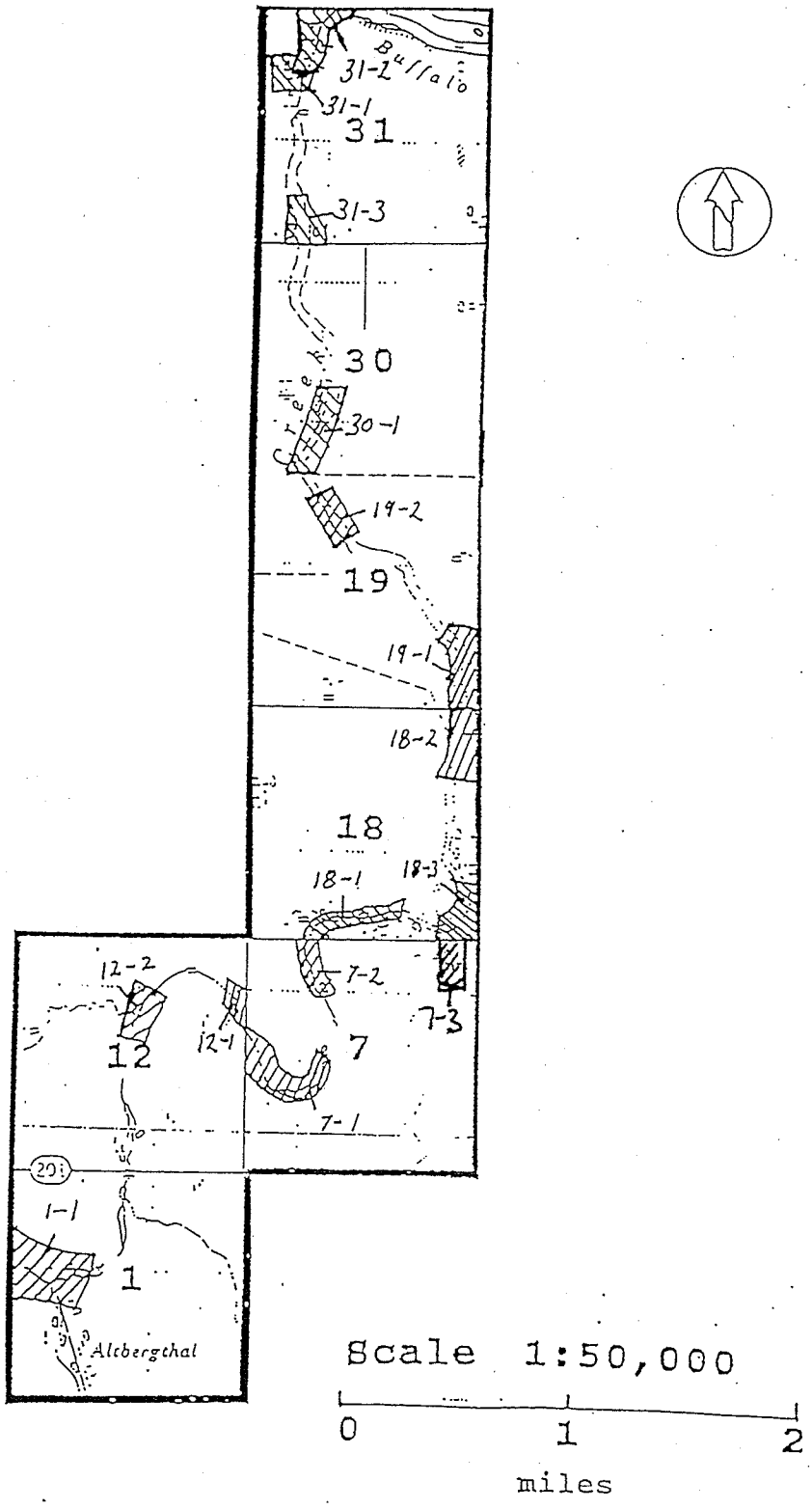


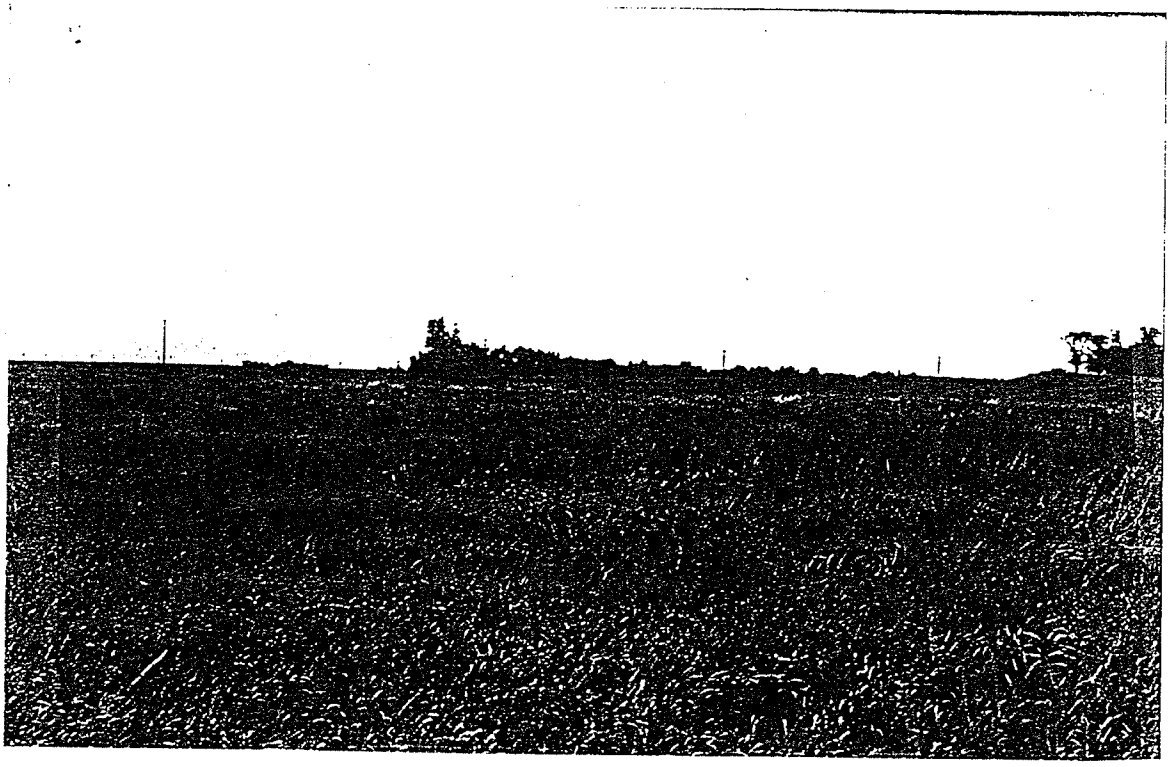
Figure 5.2. High Value Wildlife Sites Found at Buffalo Creek

Section 31

Site 31-1: red-winged blackbirds, yellow-headed blackbirds, blue-winged teals, mourning doves; the area appears much wetter than indicated on the cover maps, with some added open water used by blue-winged teals; signs of light grazing. Limited types of ground cover, but the creek area is very wet with dense emergent vegetation, and provides good cover for wildlife.

Section 31

Site 31-2: mourning doves, robins, yellow-headed blackbirds, red-winged blackbirds; mostly quackgrass and limited wetland with a small willow and aspen shelterbelt; no waterfowl were sighted, but there is extensive wet, dense emergent vegetation which provides cover for nesting wildlife.



Section 31

Site 31-3: yellow-headed blackbirds, red-winged blackbirds, barn swallows, common yellowthroats, blue-winged teals; one small high point has some brush; a dugout is sheltered by willows; one patch of grasses had dandelions, forbs, young salix, and clover.

Section 30

Site 30-1: killdeers, sparrows, common yellowthroats, yellow-headed blackbirds, red-winged blackbirds, bank swallows, American coots; blue-winged teals, mallards, ruddy ducks, wood ducks; fox; no road access; part is reduced-till; some cover, and some open water.

Section 19

Site 19-1: red-winged blackbirds, yellow-headed blackbirds, killdeers, blue-winged teals, American coots; garter snakes; muskrats; dead fish. Only linear cover, with open water. Beaver feeding.

Section 19

Site 19-2: mourning doves, barn swallows, killdeers, common yellowthroats, yellow-headed blackbirds, red-winged blackbirds, ruddy ducks, blue-winged teals; fox or coyote dens. Linear cover, with open water. Beaver feeding.

Section 18

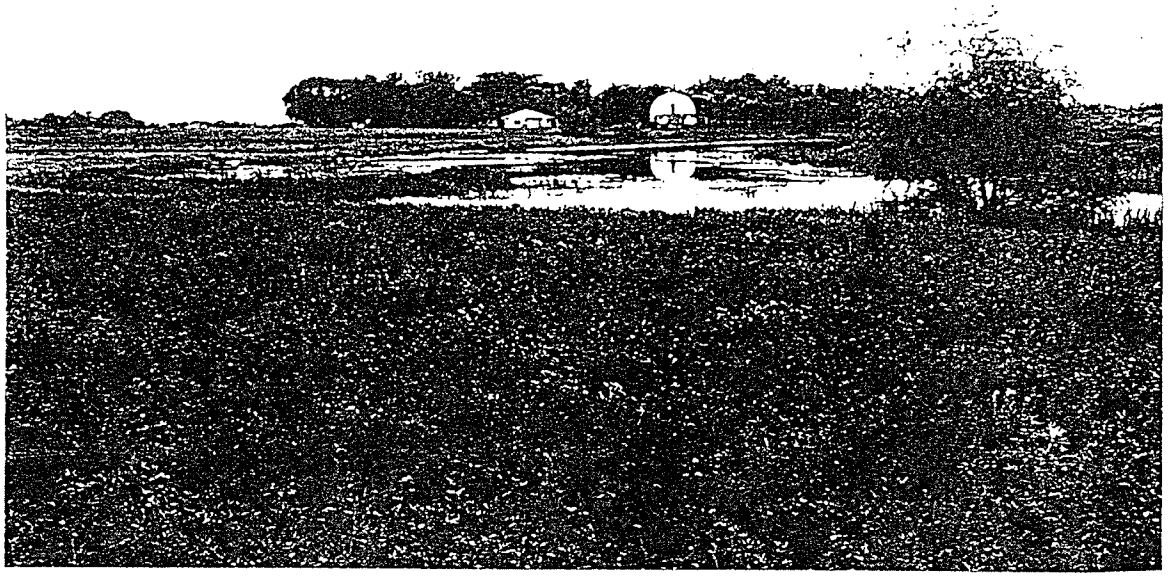
Site 18-1: northern flickers, red-winged blackbirds, yellow-headed blackbirds, meadowlarks, mourning doves, barn swallows, eastern kingbirds, killdeers, canvasbacks, blue-winged teals, robins, crows, magpies, ruddy ducks, American coots; beaver damage and feeding site; water was high; cattle grazing is heavy, horse pasture was lightly grazed. Cover includes grazed and ungrazed diverse ground grasses, forbs, and a dense shrub/tree buffer of varying width; open water is shallow to deep, with patches of emergent vegetation and islands; most numbers and diversity of waterfowl observed at this site.

Section 18

Site 18-2: red-winged blackbirds, yellow-headed blackbirds, killdeers, American coots, blue-winged teals; deer tracks; beaver damage and feeding site; muskrat lodges; linear cover and open water.

Section 18

Site 18-3: barn swallows, common yellowthroats, red-winged blackbirds, yellow-headed blackbirds, mourning doves, ruddy ducks, blue-winged teals; leopard frog; beaver. Some cover for small mammals, and some open water.

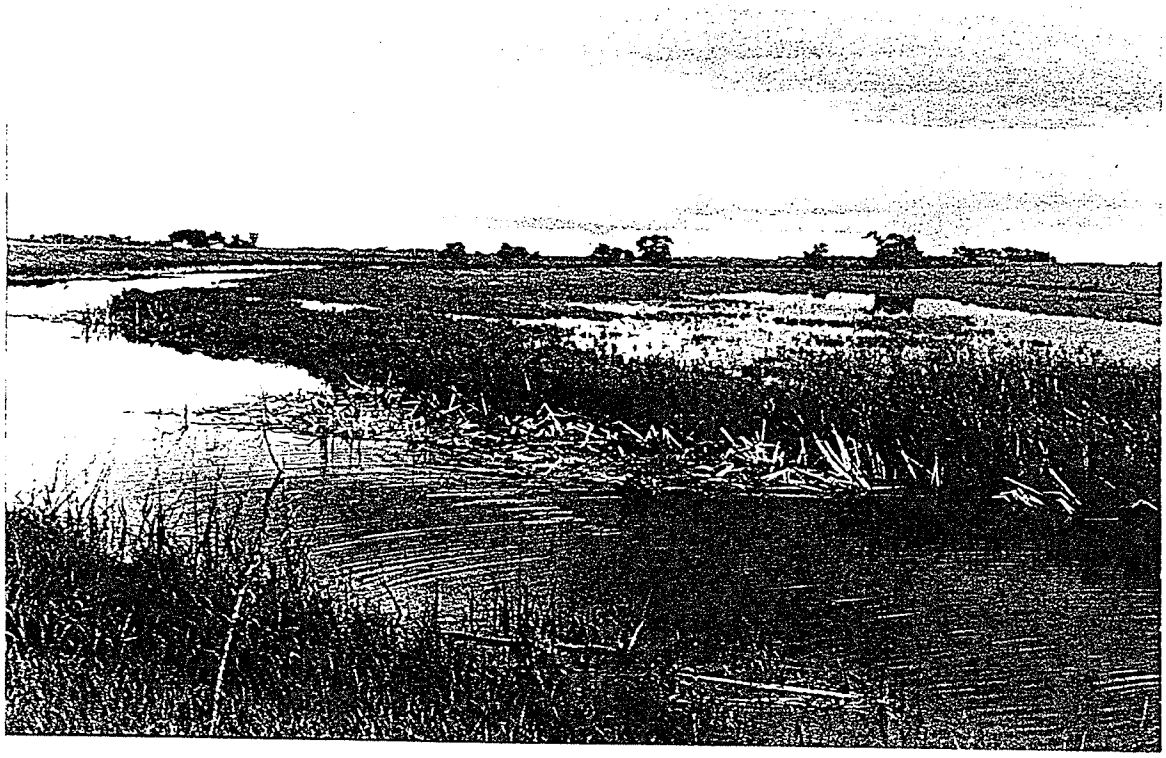


Section 7

Site 7-1: yellow-headed blackbirds, red-winged blackbirds, mourning doves, common yellowthroats, sparrows, killdeers, robins, barn swallows, Canada geese, canvasbacks, American coots, blue-winged teals; fox or coyote dens; only patch of river-bottom forest of ash, alders, oak in the study area; available wildlife habitat includes: clearings, shrub, marsh, forest, and open water. One of the largest blocks of natural habitat visited.

Section 7

Site 7-2: killdeers, robins, yellow-headed blackbirds, blue-winged teals, mallards, American coots, ruddy ducks; American coots (2) were seen on nests (15-40 m from shore), and additional nests (4) were unoccupied; 15 m buffer of quackgrass; very young shelterbelt; part of large wetland system described in section 18, supports many waterfowl. Not much land cover, but open water is available.

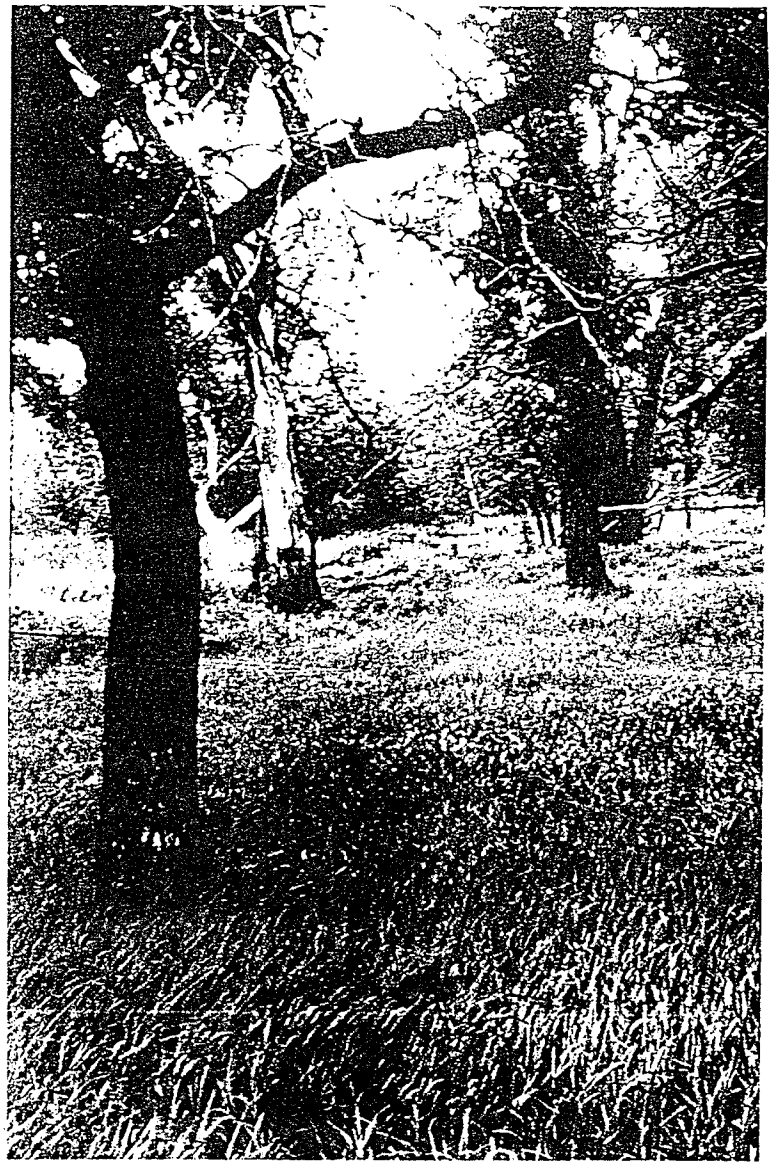


Section 7

Site 7-3: this site was viewed from the road, as permission was not obtained to visit the site. A small water course runs through the property, under the road, and into the creek. The site was close-cropped by several cattle, and the stream showed signs of this grazing: no cover, no stream banks, cattle waste in the water, straight flow, low flow, soil erosion, and no wildlife.

Section 12

Site 12-1: starlings, warblers, common yellowthroats, red-winged blackbirds, yellow-headed blackbirds, barn swallows, blue-winged teals, American coots; like the river-bottom forest (site 7-1), but thinner, including oak, hawthorn, alder, ash, many good snags; some heavy grazing. Shrub cover is available, as well as open water and marsh.



Section 12

Site 12-2: common yellowthroats, yellow-headed blackbirds, red-winged blackbirds, blue-winged teals; not very wet, little open water; farmed to the edge of the creek; very few waterfowl; no other wildlife sighted. No cover, no open water.

Section 1

Site 1-1: mourning doves, red-winged blackbirds, yellow warblers, magpies, eastern kingbirds, sparrows, blue winged teals, American coots, ruddy ducks; leopard frogs, garter snakes; burrows, and many muskrat lodges; not as much waterfowl as section 18; growing over with shrubs, grasses, forbs, trees; fish present; wetter than in photos. Much available cover. This site was one of the largest non-linear blocks of natural habitat visited.

5.3 Likely Wildlife Species

The wildlife species that will likely be enhanced are those that are consistent with a tallgrass prairie type buffer strip and existing habitat types along the creek, and present (existing wildlife) at the creek, or within individual species' immigration distances of the creek.

Once the tallgrass prairie type buffer strip is established, and in some cases, as soon as development actions are started (i.e. altered farming practices, land protection, plantings, etc.), many populations may begin to respond favorably, without the benefit of any other development actions (i.e. nestboxes, relocation, etc.). Wildlife species most likely to respond favorably to the buffer strip are those that are presently common along the creek (see **Appendix E: Existing Wildlife at Buffalo Creek**). These species generally are associated with prairie and wetland communities in the literature. Given an increased area to populate, including new available resources, numbers of individuals of likely species may increase. If the area of wetland or tallgrass type habitat is increased, a relative increase in species diversity may also eventually become apparent (Wilcox 1980; Luria et al. 1981). More species of small mammals, songbirds, and waterfowl immigrate to and colonize the added habitat; which species depends on the suitability of the new habitat, the species present (or species richness) in the source pools, the distance of the source pools, and the mobility of the species (Luria et al. 1981). For example, waterfowl and songbirds are very mobile. If source pools of blue-winged teal or common yellowthroats are present close to Buffalo Creek (i.e. the

Red River area), they may increase in numbers in response to the added available habitat soon after or during the establishment of the tallgrass prairie buffer strip. Less frequently found species at Buffalo Creek, such as canvasbacks and belted kingfishers (*Ceryle alcyon*), may also be enhanced by the buffer strip, provided source pools are available. Local, Buffalo Creek populations may also multiply and colonize the new available habitat. Eventually, a new species equilibrium may be reached (Purves and Orians 1987).

5.4 Potential Wildlife Species

Wildlife species that can potentially be enhanced are those that will not respond significantly if the only wildlife enhancement action is the establishment of a tallgrass prairie type buffer strip. These species need additional management actions in order to be encouraged. When management actions that provide limiting factors are identified and implemented, potential species may be attracted (Smith 1974; Smith 1980). Chapter **6.0 WILDLIFE ENHANCEMENT OPTIONS** describes the identified management possibilities that provide such limiting factors.

Wildlife species that need these additional management actions for enhancement are those that are already found at the creek, but not commonly (**Appendix E: Existing Wildlife at Buffalo Creek**). These species are consistent with tallgrass prairie and wetland type habitat, but are limited in numbers, or only transient in the creek area. Table 5.1 lists the wildlife species that can potentially be enhanced at Buffalo Creek, and was determined as described in 2.4.2

Table 5.1. Wildlife Species That Can Potentially be Enhanced at Buffalo Creek

* Species of concern: rare, threatened, or endangered, and potential species at Buffalo Creek. Scientific names are given in **Appendix E: Existing Wildlife at Buffalo Creek.**

Raptors
- Burrowing Owl*
- Ferruginous Hawk*
- Northern Harrier
- Rough-Legged Hawk
- Snowy Owl

Small Mammals
- Gray Squirrel
- Red Squirrel

Furbearers
- American Badger*
- Coyote
- Long-Tailed Weasel

Game Birds
- Scaup
- Canvasback
- Gadwall
- Green-Winged Teal

Nongame Birds
- American Avocet*
- American Goldfinch
- Baird's Sparrow
- Belted Kingfisher
- Blue Jay
- Brown-Headed Cowbird
- Dickcissel
- Eastern Kingbird
- Great Blue Heron
- Loggerhead Shrike*
- Sedge Wren
- Solitary Vireo
- Vesper Sparrow

Determining Potential Wildlife Species. The list should not be considered exhaustive, but representative of species that need wildlife enhancement actions.

Wildlife that can potentially be enhanced also includes wildlife that is rare, threatened, or endangered, and native to or present at Buffalo Creek. These wildlife species of concern are those in Table 5.1 marked with an asterisk. These species generally are of high priority to assistance sources, and are considered target species (see **Appendix B: Outside Assistance Sources**). Potential species no longer found at the creek, but with a historical presence include the Baird's sparrow and the ferruginous hawk.

6.0 WILDLIFE ENHANCEMENT OPTIONS

The wildlife enhancement options that are considered for the wildlife of Buffalo Creek are those that would provide, if implemented, one or more of the four basic limiting factors: suitable food, water, cover, or some specific reproductive need. Section **3.7.1 Riparian and Wetland Habitat** lists specific limiting factors for some Buffalo Creek wildlife species. Many wildlife management or enhancement actions that are designed to enhance only one of these species may benefit a whole group of species. For example, wetland development for the long-billed curlew can benefit other wildlife that uses wetlands. Similarly, wildlife enhancement designed for game birds may draw their predators as well. The following is a summary of some enhancement options for the different groups of wildlife found at Buffalo Creek. Sources include Shemnitz et al. (1980), Poston and Schmidt (1981), Dubis et al. (1988), De Smet (1992, pers. com.), Johnson (1992, pers. com.), and Poole (1992, pers. com.).

Raptors: enhancement options include the placement of nest boxes and nesting platforms. Food and cover for this group will be well provided for with the assumed development of a buffer strip. Ferruginous hawks and burrowing owls are in the first priority group with the World Wildlife Fund Canada (1991), and may be good target species for securing outside assistance. The Manitoba Wildlife Branch has had some success with introducing burrowing owls to artificial nesting dens. These owls are suited for short grass areas, and may do well in pastures. Ferruginous hawks are

encouraged by building nesting sites in snags or on platforms and by providing an ample prey base (small mammals, such as ground squirrels).

Nongame birds: enhancement of nongame birds will require careful planning of the proposed buffer strip. There must be a wide variety of food sources (berries, nuts, seeds, insects, etc.) and microhabitats (woody debris piles, snags, dead and down material, thick hedgerows, habitat edge, mudflats, etc.) present in the area for a good diversity of songbirds. **Appendix F** is a table of some commonly available landscaping plants and grasses that are favorites of many wildlife species, including songbirds, and consistent with prairie riparian zones and wetlands. In addition to planting preferred vegetation, a variety of nest boxes and structures can be provided.

Game birds: careful consideration of the habitat requirements of game birds should be incorporated into the buffer strip, but there are many enhancement options that can be considered for this group in addition to the establishment of the buffer strip. Nesting platforms and baskets can be placed throughout the creek, on land or in the water. Wetland can be created or otherwise managed by altering the creek bed or manipulating water levels. Altering farming practices to provide more cover for waterfowl or otherwise protect gamebirds is also possible. Outside assistance is available for enhancing gamebird species through a number of agencies (see **Appendix B: Outside Assistance Sources**).

Small mammals: no enhancement options that specifically target small mammals will be considered. Establishment of the buffer strip, enhancement of gamebirds, planting for nongame birds, and improving travel corridors for wildlife is considered effective enhancement for small mammals. For example, it was found that small mammal populations generally increase after a prescribed burn. It is assumed that these management actions combined with natural dispersal will increase the diversity of these species in the area.

Furbearers: there are a number of enhancement options that are possible for the potential species in this group. Establishment of the buffer strip will attract prey for these animals. Ensuring adequate cover, such as brush piles, thick shelterbelts, and improving travel corridors may be effective in enhancing this group.

6.1 Detailed Wildlife Enhancement Options

The following options are independent of establishing a buffer strip. Sources used in identifying the wildlife enhancement options are listed in section **2.5 Identifying Wildlife Enhancement Options.** Specific enhancement options include:

6.1.1 Identification and Protection of Remnant Tall Grass Prairie

Description and rationale: through the use of the aerial photographs and ground truthing, an expert could identify any remaining stands of tallgrass prairie (Morgan 1992, pers. com.). Should any be located, tallgrass remnants must

be protected from further degradation and enhanced with controlled burn management and spot treatment of undesirable species. These sites should be preserved and managed separately from any planted areas, to be used as a source pool of endemic plant species.

Costs: a private consultant would charge approximately $800 (at $400/day) to survey the creek; management may include cost of fencing, controlled burning, and spot treatments. This option could be undertaken by a Natural Resources Institute student for lower daily costs, and combined with **6.1.2 Survey for Critical Habitat and Species of Concern** to provide a good wildlife cover map of the area.

6.1.2 Survey for Critical Habitat and Species of Concern

Description and rationale: many agencies that provide outside assistance favor conservation of critical wildlife habitat for endangered, threatened, or rare wildlife species (see **Appendix B: Outside Assistance Sources**). The creek area should be surveyed for critical wildlife habitat and species of concern in order to obtain this assistance. For Buffalo Creek, assistance is available provided there is the habitat potential (Johnson 1992, pers. com.). There may also be critical habitat for a wildlife species, but none have yet been identified. Examples of critical habitat include snake dens, nesting or foraging areas for species of concern (such as the loggerhead shrike and ferruginous hawk), and mudflats for American avocets. Section **3.7.1 Critical Habitat and Limiting Factors** lists additional habitat requirements for some wildlife found at Buffalo Creek.

The prairie long-tailed weasel is one species that should be closely monitored. Only recently, the Manitoba Wildlife Branch recommended that this weasel be taken off COSEWIC's endangered species list (De Smet 1992, pers. com.). From the interviews with residents and local experts, it is evident that Buffalo Creek supports a population of prairie long-tailed weasels, but there is a lack of supporting research.

As an information base for the implementation of each subsequent enhancement option, detailed habitat cover maps are necessary (Yoakum et al. 1980). Such a cover map could be produced from the survey for critical habitat and species of concern. Cover maps also are used to record any management implementations. A cover map needs to show the location and quantity of such things as water bodies, deciduous and coniferous trees and shrubs, forbs, grasses, emergent vegetation, submergent vegetation, and physical features. Figure 6.1 is an example of a wildlife habitat cover map. The cover maps can be prepared from aerial photographs, with ground truthing to calibrate the interpretation. Groundtruthing should be undertaken at different times of the year for a more accurate record of seasonal features or problems, such as flooding and ice jams. The cover maps that are used throughout this practicum were drawn by digital analysis of false color infrared photos.

Costs: wildlife surveys and census projects can cost $5,000 or more. Digital analysis of aerial photos can cost more than $100 per photo. This project could be carried out by a

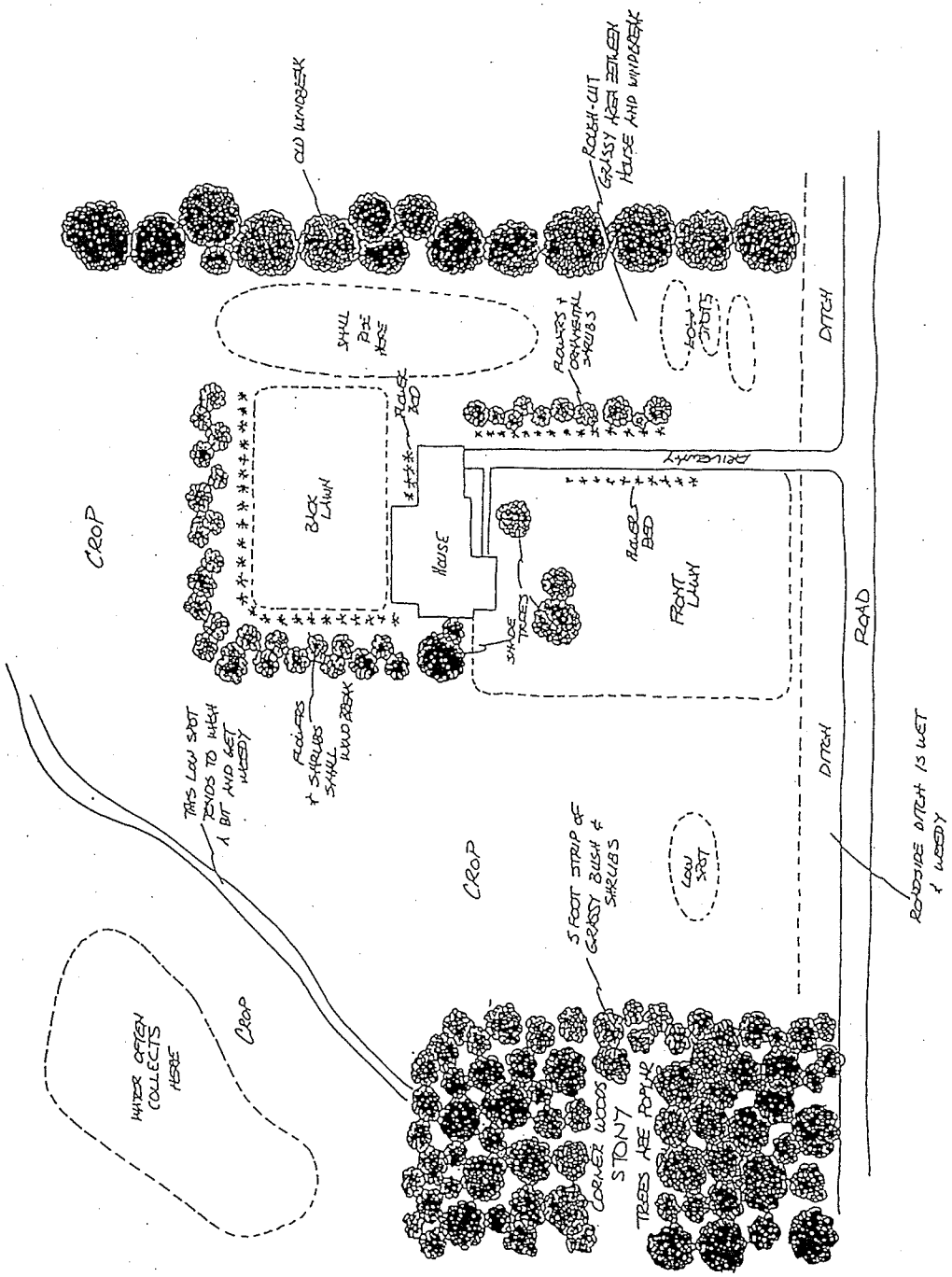


Figure 6.1. Buffalo Creek Wildlife Enhancement: A Cover Map for Wildlife
(after Poston and Schmidt 1981)

Natural Resources Institute student, and perhaps combined with **6.1.1 Identification and protection of remnant tall grass prairie.**

6.1.3 Discontinue Livestock Pasturing Along the Creek

Description and rationale: livestock pasturing along the creek removes cover, straightens stream channels, causes erosion, and adds organic pollutants to the creek. Livestock access to the creek should be restricted. The PFRA may be willing to waive fees for pasturing livestock on community pastures. Trucking costs to the pastures would have to be subsidized by the BPS&WMA. Landowners should be encouraged to employ rotational grazing techniques. At the very least, fencing can be installed along shorelines to prevent livestock from accessing the creek.

The PFRA also offers financial incentives to farmers who remove livestock away from sensitive habitat areas. Livestock are removed from marginal areas of land, such as creek shores, and put on more productive land that has been planted for forage. Costs: transport expenses for moving livestock may be as little as $150 for 50 head moved 20 km (Rudy 1992, pers. com.); a solar powered fence for rotational grazing can cost $300 per km (Poole 1992, pers. com.).

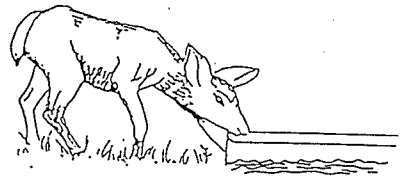
6.1.4 Modify or Design for Wildlife

Description and rationale: to improve habitat for wildlife, existing or planned physical structures can be modified or designed to accommodate wildlife (Shemnitz et al. 1980). Landowners must be encouraged to keep wildlife in mind when

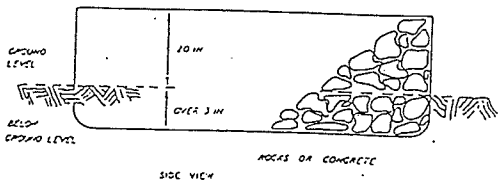
building on or developing land. For example, to make water sources safer for small mammals and birds, they may be fenced from livestock and predators. A solar powered electric fence is an inexpensive barrier for cattle, and when well maintained is a deterrent to some predators (Poole 1992, pers. com.). All water troughs should have escape ramps in case small wildlife fall in. To prevent predation, fence posts and other perches around water sources can be modified to keep predators from perching. To improve water accessibility for wildlife, all troughs should have drinking ladders and platforms, and be low to the ground (Figures 6.2, 6.3, and 6.4). Water depth in troughs should not exceed 51 cm (Wilson and Hannans 1977). Snags and posts can be left standing or installed for cavity nesters, insect feeders, and perching birds.

By equipping farm machinery with flushing devices, wildlife using fields for cover, foraging, or nesting are frightened away before death or damage from the machinery occurs. Shomon et al. (1966) recommend using flushing devices on mowers, and Poole (1992, pers. com.) recommends that flushers reach out at least 2 m in order to be effective. Materials used are various, and may include small trees or wooden and metal structures made from scrap materials.

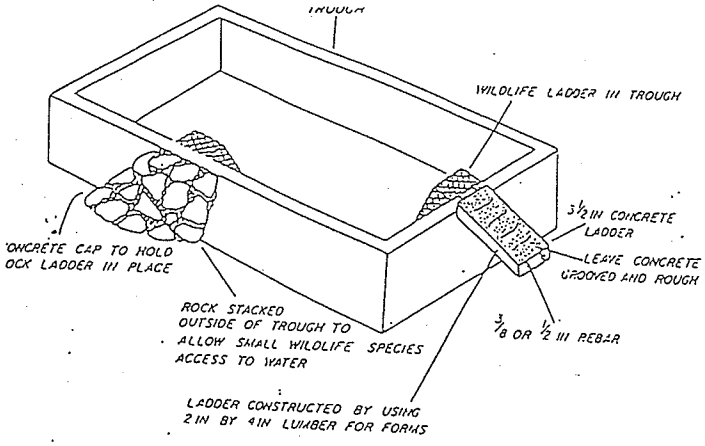
Costs: a solar powered electric fence can cost as little as $300 per km; modifications to troughs can be built inexpensively from scrap materials; posts and platforms cost between $50 and $150 installed; farmers can equip machinery at a very low cost, under $25.



A. When trough height is 20 in or less wildlife have better access to water

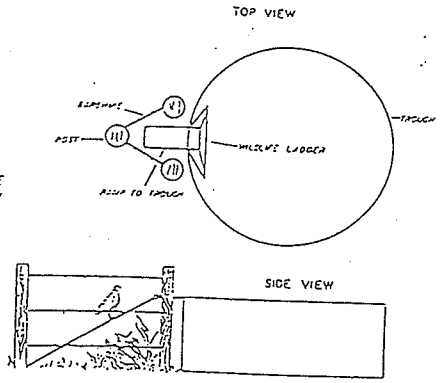


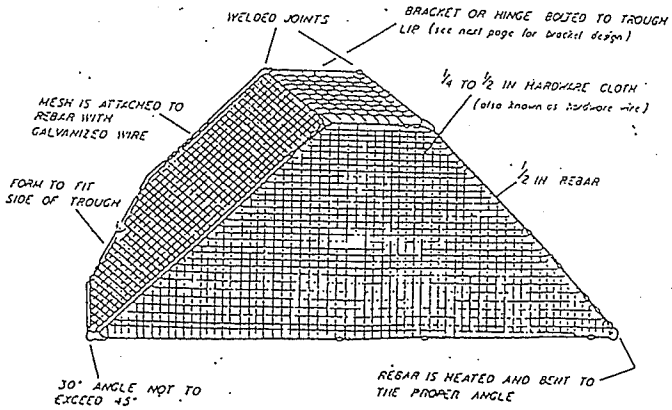
Placing of rocks, concrete blocks or other ramp facilities provide an escape route for wildlife where the water depth exceeds 20 inches



Details for a triangular shaped wildlife ladder

Fencing and post arrangement to protect wildlife ramp leading into a livestock watering facility.





Details for constructing a wildlife ladder.

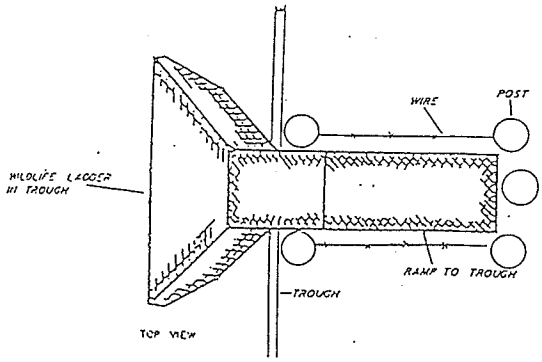


Figure 6.2. Buffalo Creek Wildlife Enhancement: Troughs for Wildlife 1
(after Shemnitz et al. 1980)

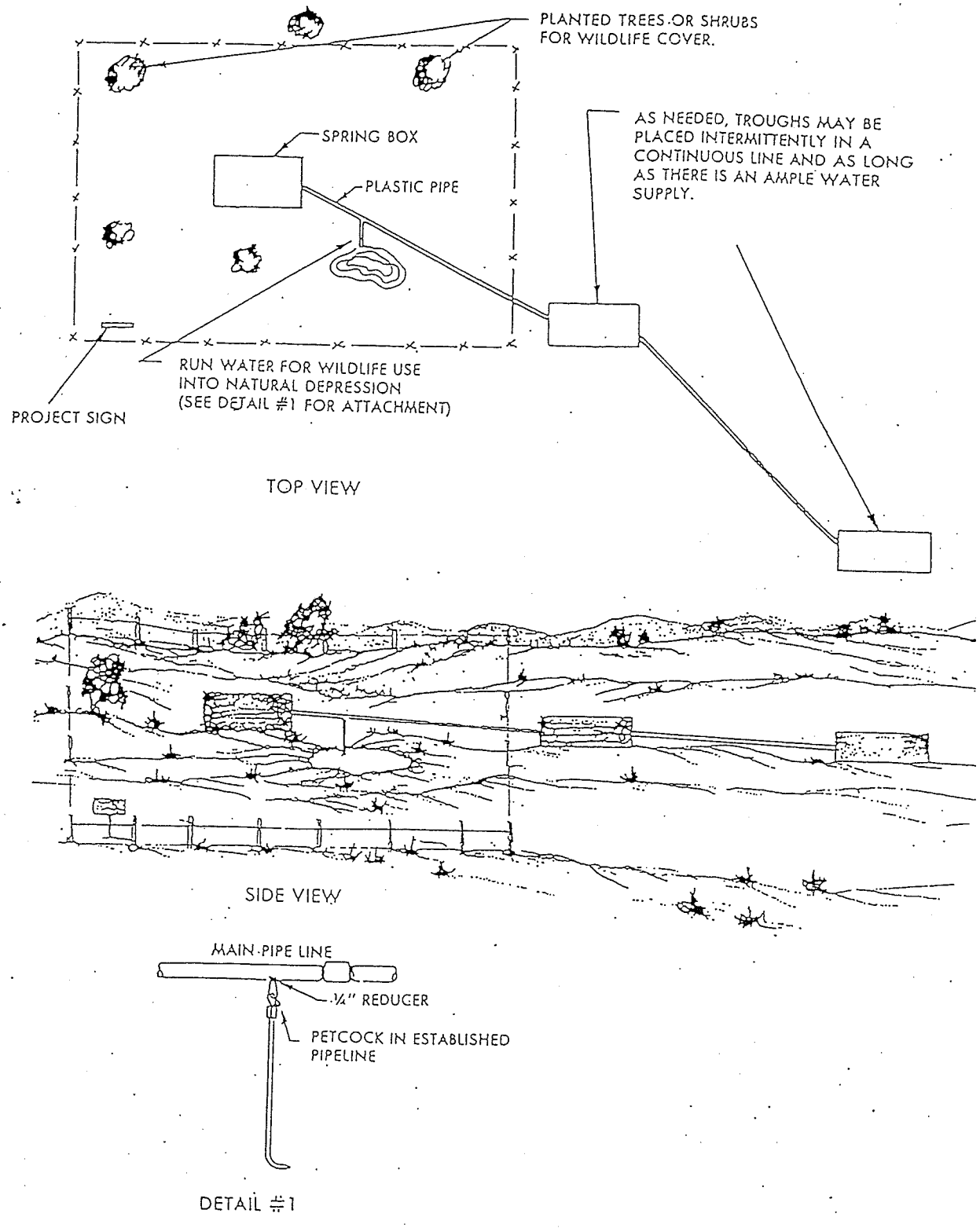


Figure 6.3. Buffalo Creek Wildlife Enhancement: Troughs for Wildlife 2
(after Shemnitz et al. 1980)

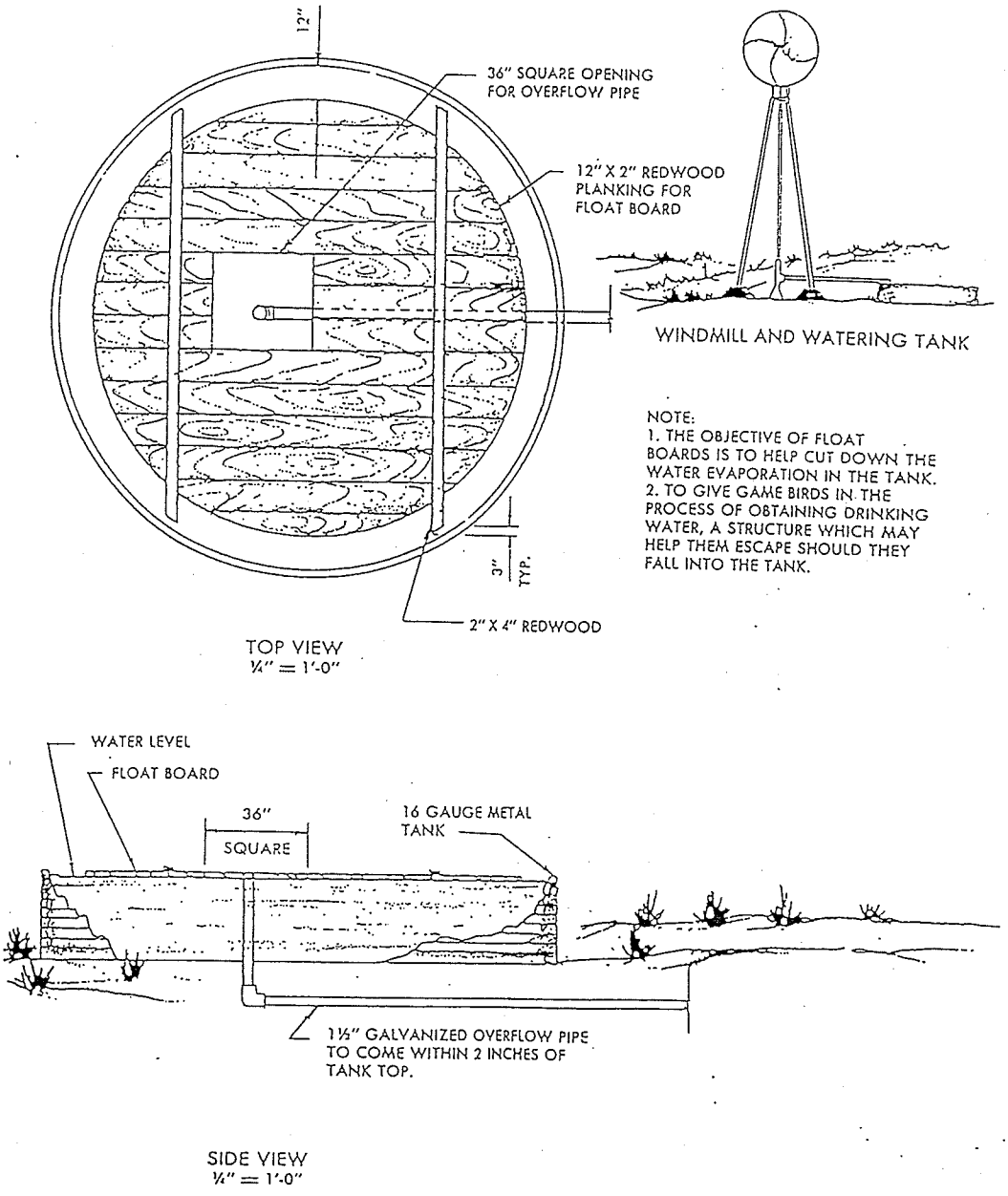


Figure 6.4. Buffalo Creek Wildlife Enhancement: Troughs for Wildlife 3
(after Shemnitz et al. 1980)

6.1.5 Provide Nesting Structures on Land for Wildlife

Description and rationale: nesting habitat may be the operating limiting factor for some species of raptors, small mammals, and birds. Platforms or nestboxes can be added for kestrels, ferruginous hawks, burrowing owls, geese, ducks, cormorants, songbirds, squirrels, etc. These structures are relatively inexpensive, and can be designed to be species specific. Table 6.1 lists structural details of some nestboxes. Figure 6.5 shows a nest platform that will be used by ferruginous hawks and other raptors. A nest basket for mourning doves is shown in Figure 6.6.

Physical structures should be installed in small increments only. It takes time for the effects of these structures to become apparent. For example, ducks may take as long as two years before colonizing nesting baskets (Cowan 1991, pers. com.). Wildlife (i.e. geese) may be very territorial, and may have density limitations. Too many structures may bring wildlife problems associated with large populations, such as crop damage from geese. Structures should be inspected in the early spring before mating seasons of targeted wildlife begins, and repaired if necessary. It is also important to keep a record of wildlife use of the structure, noting such things as frequency of use and type of use (ie. sleeping, mating etc). This will help determine the relative effectiveness of the structures, and if there is a need for alterations, relocations, or additional structures.

Costs: nestboxes and platforms may cost from $5 to $45 installed; yearly maintenance can account for higher costs.

Table 6.1. Buffalo Creek Wildlife Enhancement: Structural Details for Nestboxes (after Shemnitz et al. 1980)

Species	Floor of Cavity	Depth of Cavity	Entrance above Floor	Diameter of Entrance	Height above Ground[1]
	Inches	Inches	Inches	Inches	Feet
Bluebird	5×5	8	6	1½	5–10
Robin	6×8	8	(2)	(2)	6–15
Chickadee	4×4	8–10	6–8	1⅛	6–15
Titmouse	4×4	8–10	6–8	1¼	6–15
Nuthatch	4×4	8–10	6–8	1¼	12–20
House wren	4×4	6–8	1–6	1-1¼	6–10
Bewick's wren	4×4	6–8	1–6	1-1¼	6–10
Carolina wren	4×4	6–8	1–6	1½	6–10
Violet-green swallow	5×5	6	1–5	1½	10–15
Tree swallow	5×5	6	1–5	1½	10–15
Barn swallow	6×6	6	(2)	(2)	8–12
Purple martin	6×6	6	1	2½	15–20
Prothonotary warbler	6×6	6	4	1½	2–4
Starling	6×6	16–18	14–16	2	10–25
Phoebe	6×6	6	(2)	(2)	8–12
Crested flycatcher	6×6	8–10	6–8	2	8–20
Flicker	7×7	16–18	14–16	2½	6–20
Golden-fronted woodpecker	6×6	12–15	9–12	2	12–20
Red-headed woodpecker	6×6	12–15	9–12	2	12–20
Downy woodpecker	4×4	9–12	6–8	1¼	6–20
Hairy woodpecker	6×6	12–15	9–12	1½	12–20
Screech owl	8×8	12–15	9–12	3	10–30
Saw-whet owl	6×6	10–12	8–10	2½	12–20
Barn owl	10×18	15–18	4	6	12–18
Sparrow hawk	8×8	12–15	9–12	3	10–30
Wood duck	10×18	10–24	12–16	4	10–20

[1] Many experiments show that boxes at moderate heights mostly within reach of a man on the ground are readily accepted by many birds.

[2] One or more sides open.

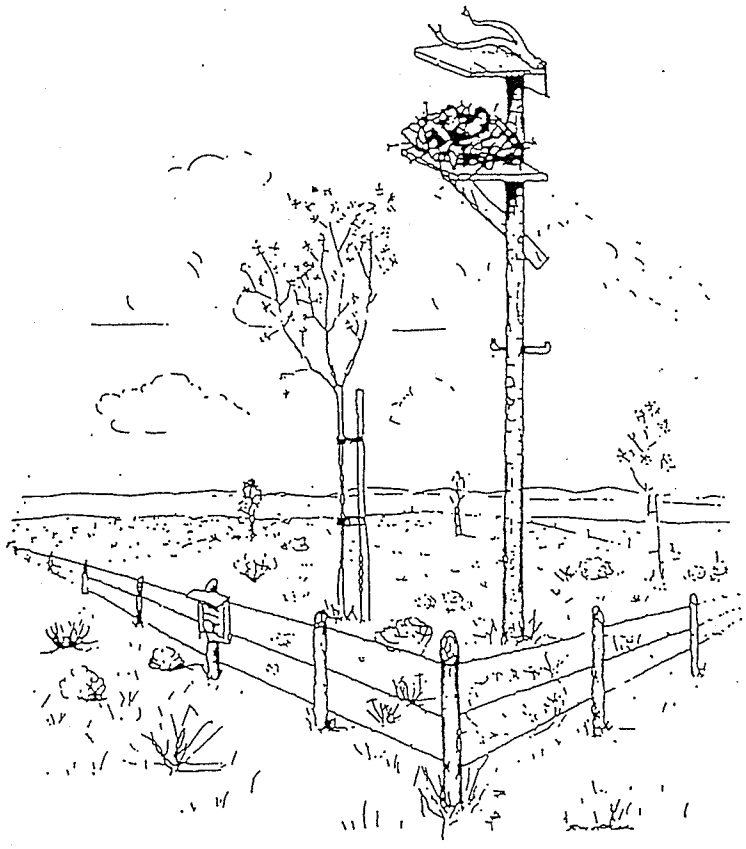


Figure 6.5. Buffalo Creek Wildlife Enhancement: A Platform for Wildlife
(after Shemnitz et al. 1980)

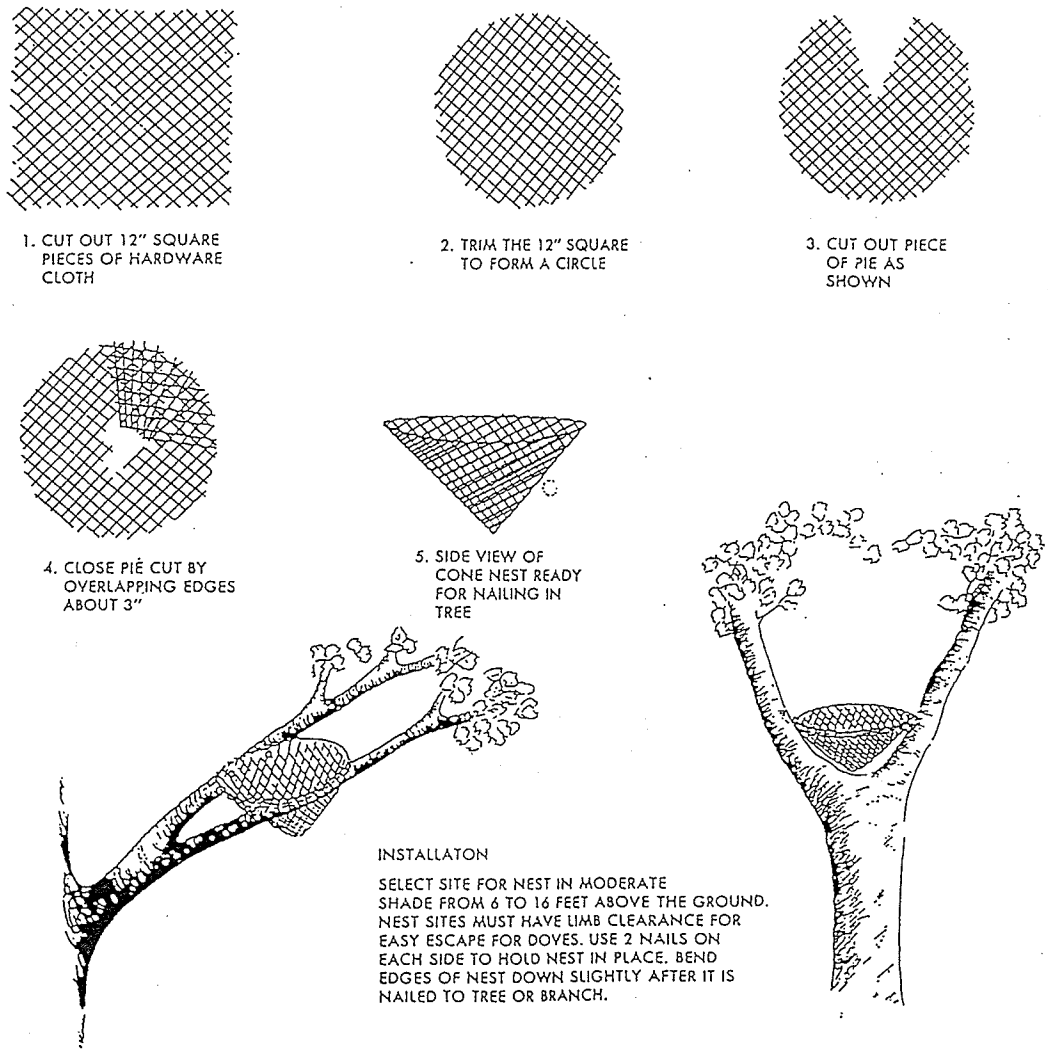


Figure 6.6. Buffalo Creek Wildlife Enhancement: A Basket for Mourning Doves
(after Shemnitz et al. 1980)

6.1.6 Provide Nesting Structures in Water and Marshes for Wildlife

Description and rationale: birds that will use constructed rafts, islands, nesting cones and baskets include ducks and geese, cormorants, herons, gulls and pelicans, etc (Shemnitz et al. 1980; Poston and Schmidt 1981; Trottier 1992). Such structures also serve as secure resting areas for wildlife that swim, such as raccoons, mink, weasels, shrews, etc. Using the cover maps, structures can be placed in the best locations, considering degree of isolation, food sources, and spacing. Baydack (1993, pers. com.) recommends nest cones as a superior nesting structure. Yoakum et al. (1981) recommend the following guidelines for waterfowl nest baskets:

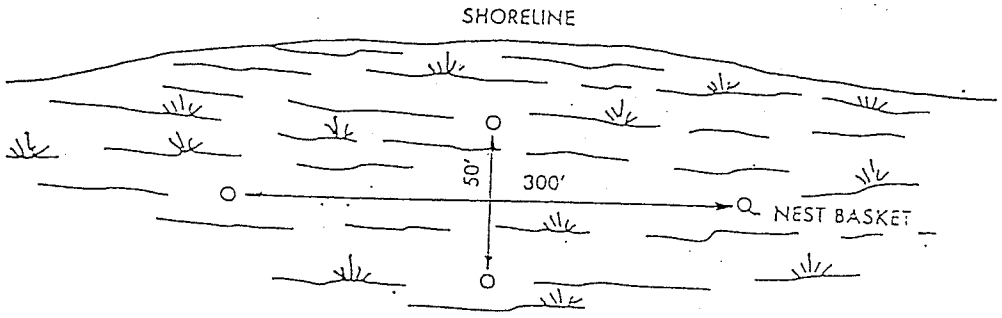
1- keep baskets completely filled with material such as flax, straw, sedge, grass, or upland wild hay, after securing a grass lining to the basket with loosely woven wire;

2- erect baskets in sheltered areas to reduce ice damage, and as close as possible to emergent vegetation;

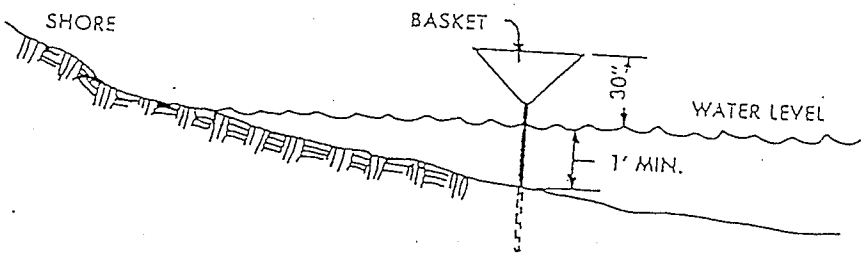
3- check baskets for damage immediately following spring breakup; and

4- group baskets in diamond-shaped clusters of four, one cluster for every 1.6 km of shoreline.

For rafts and islands the same recommendations can be followed, except that geese prefer to nest out of sight from their fellows, and only one island or raft for every 1.6 km is recommended. The management group may wish to experiment by using different combinations of structures. One suggestion is to try tying jute or hemp twine (formerly used to tie hay bales) into the duck baskets instead of the hay and wire to reduce the need for maintenance (Poole 1992, pers. com.). When installing physical structures in water for wildlife, the implementation recommendations described in **6.1.5 Provide Nesting Structures on Land for Wildlife** should be followed. Figure 6.7 shows basket placement, and Figure 6.8 shows some structural details of baskets and



BASKET LOCATION PLAN



SIDE VIEW OF BASKET

Figure 6.7. Buffalo Creek Wildlife Enhancement: Waterfowl Basket Placement
(after Schemnitz et al. 1980)

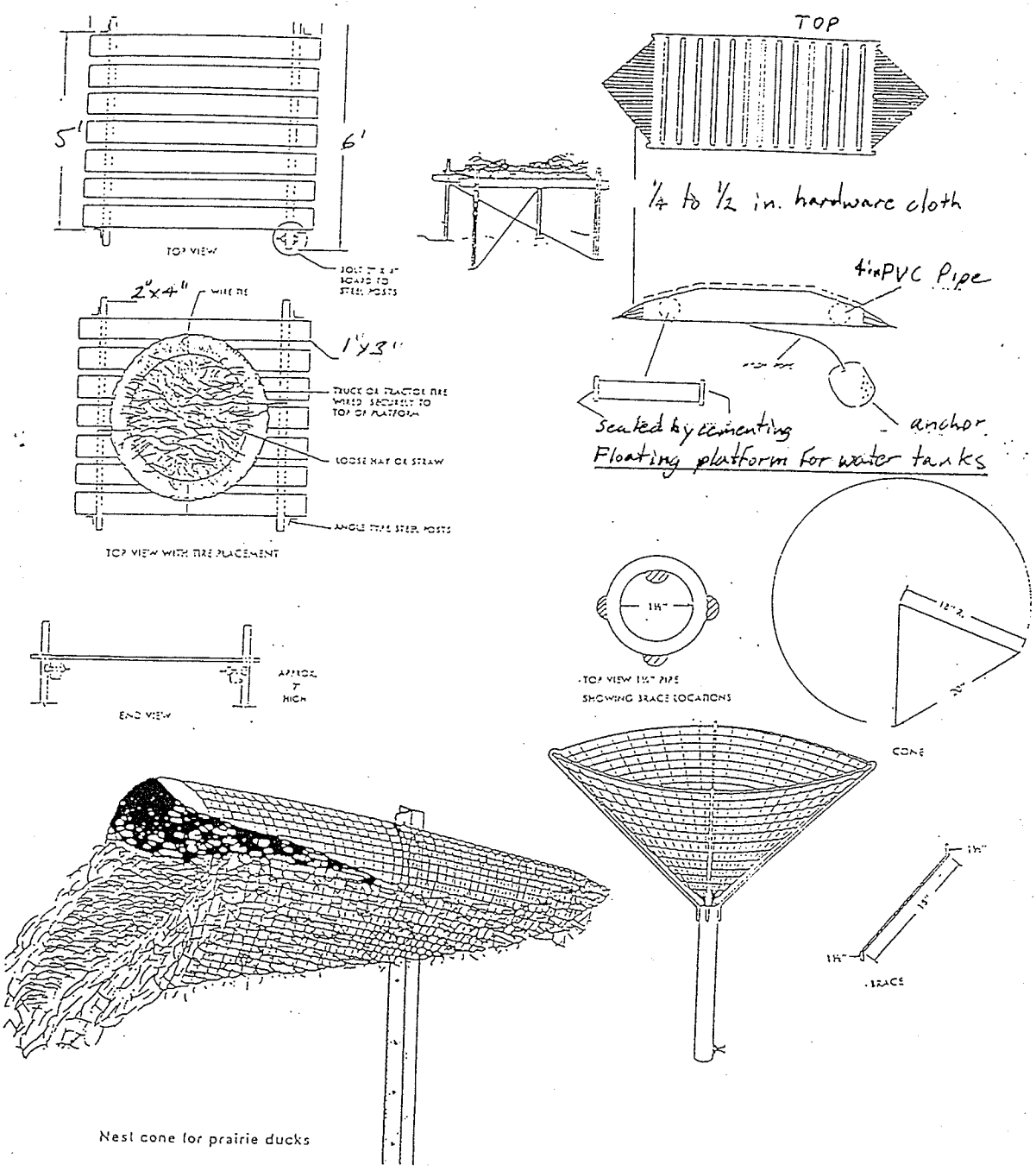


Figure 6.8. Buffalo Creek Wildlife Enhancement: Detail of Platform, Basket, and Cone
(after Schemnitz 1980; Poston and Schmidt 1981)

platforms. Increasing species diversity and overall wildlife numbers is the ultimate goal, but managing for waterfowl will help to enlist outside assistance for the entire plan.

Costs: physical structures cost between $20 and $60 apiece, installed; unless volunteer help is enlisted, yearly maintenance will account for a higher portion of costs for this action (Poole 1992, pers. com.).

6.1.7 Provide Wildlife Cover Outside the Buffer Strip

Description and rationale: providing cover will benefit almost all wildlife. Ground nesting ducks, geese, game and nongame birds, and mammals will all use cover to hide, live, forage, and reproduce. Additional cover can be provided by employing various reduced tillage techniques. Any till schedule which leaves some cover (standing vegetation or stubble) undisturbed in the fields until at least June 15 will be beneficial to field nesting species. Shomon et al. (1966) recommend refraining from dry land fallowing between April 15 and June 20, installing protective fences around some water sources, planting shrubby thickets along gulleys, and maintaining permanent, undisturbed cover on unused land. Improving existing hedgerows and leave strips can benefit wildlife as well. Most bird species raise more young from nests in shrubs than from those in trees, but a combination of both is ideal for farmland hedges (O'Connor and Shrubb 1986; Lack 1988). Some favorite plants and grasses that can be planted for wildlife on unused land are listed in **Appendix F.**

Costs: reduced tillage may benefit the landowner even without incentives; solar powered electric fencing is approximately $300 per km. Planting cover varies greatly in cost, depending on what species are used.

6.1.8 Improve Travel Corridors for Wildlife

Description and rationale: for wildlife to take full advantage of available habitat, there needs to be continuous cover between the patches of habitat for the wildlife to move in safety (Poston and Schmidt 1981). By providing travel corridors between habitat patches, the manager effectively increases the potential wildlife range for many species (Forman and Godron 1981). Figure 6.9 shows how a site can be improved to offer travel routes for wildlife. Planting or expanding the width of shelterbelts with a diversity of plant species, increasing the availability of dense cover, and allowing vegetation to grow up along fences, ditches, and marginal land all serve to improve travel corridors for wildlife.

Integration with other efforts such as the current shelterbelt program should include wildlife concerns. Shelterbelts become effective corridors if they are well designed. A good example of a shelterbelt designed with wildlife in mind is presented in Figure 6.10. Improvements include enlarging existing belts with perennial forage by as much as 3 to 5 m on either side; developing canopy and strata within the belt by planting trees, shrubs, grasses, and forage (see **6.1.7 Provide Wildlife Cover Outside the Buffer Strip** for suggested species), and establishing new shelterbelts, particularly if they will join up with

Flat terrain, mostly drained and farmed

Unimproved

A. The low area along the road gets cut for hay by early summer and so provides little in the way of cover.

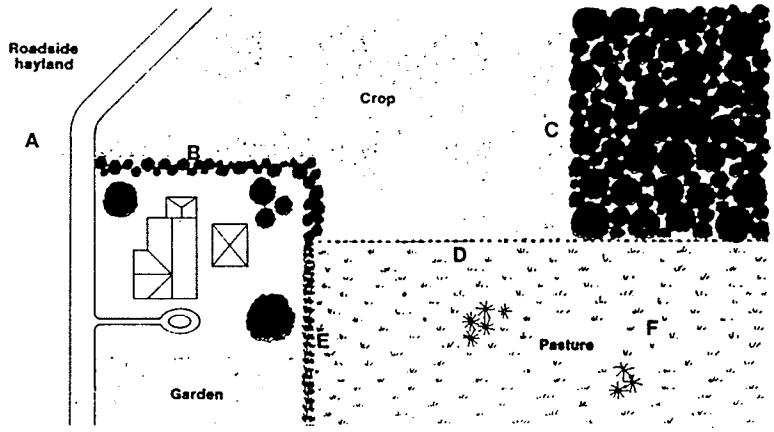
B. A two-row shelterbelt of medium-sized, single-stemmed trees is clean on both sides and underneath.

C. Some aspen woodland was cleared to enlarge this field. Now there is hardly any semi-wild border zone between field and woods.

D. The fenceline between field and pasture is bare of vegetation.

E. Trashy weed and shrub growth runs across the end of the garden, offering cover from which birds and small animals can raid the produce—an undesirable situation.

F. The pasture has been used too hard, but not to the point where roots have been destroyed and the sod broken. Aside from a few small shrubs, there is little cover.



Improved

A. Part of the roadside hayland is now a corner plantation of spruce surrounded by small trees, shrubs, grasses and forbs. This helps stabilize the roadbank as well as add cover to an otherwise unattractive site.

B. The shelterbelt has been expanded to 4 rows, with an undergrowth of grasses and forbs; the rows are uneven and not all of the same species.

C. The woodland border has extended a short distance into the adjacent field; the outer edge is a narrow band left for wildlife and serves as a "weed break". Loss of agricultural production is minimal.

D. A 10 to 20 foot (3 to 6 m) strip under the fence is seeded to small grains and tame forage—a good bit of connecting habitat for songbirds, game birds and rabbits.

E. Plants along the edge of the garden have been cut down. Such areas should be kept clean to reduce loss of fruits and vegetables to wildlife.

F. Clumps of shrubs have been planted (or allowed to volunteer) in the grazed area without eliminating much pasture. A reduced grazing rate has improved forage production.

Note: Wild cover extends from one side of the scene to the other, with few big gaps between. This provides birds and animals with travel corridors (arrows) and refuge.

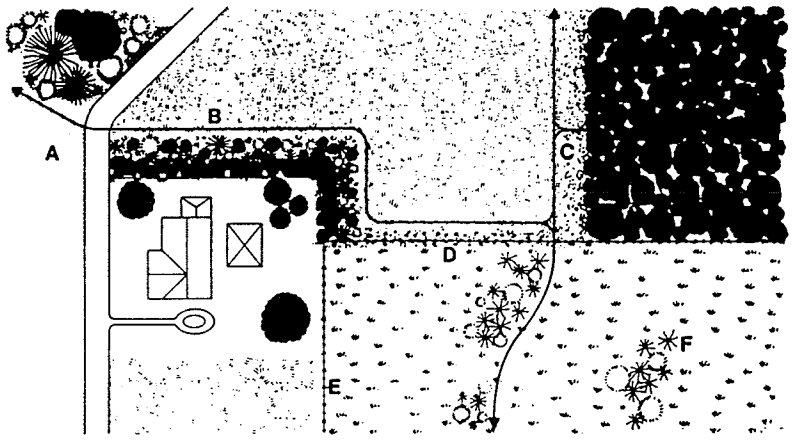


Figure 6.9. Buffalo Creek Wildlife Enhancement: Improving Travel Corridors for Wildlife
(after Poston and Schmidt 1981)

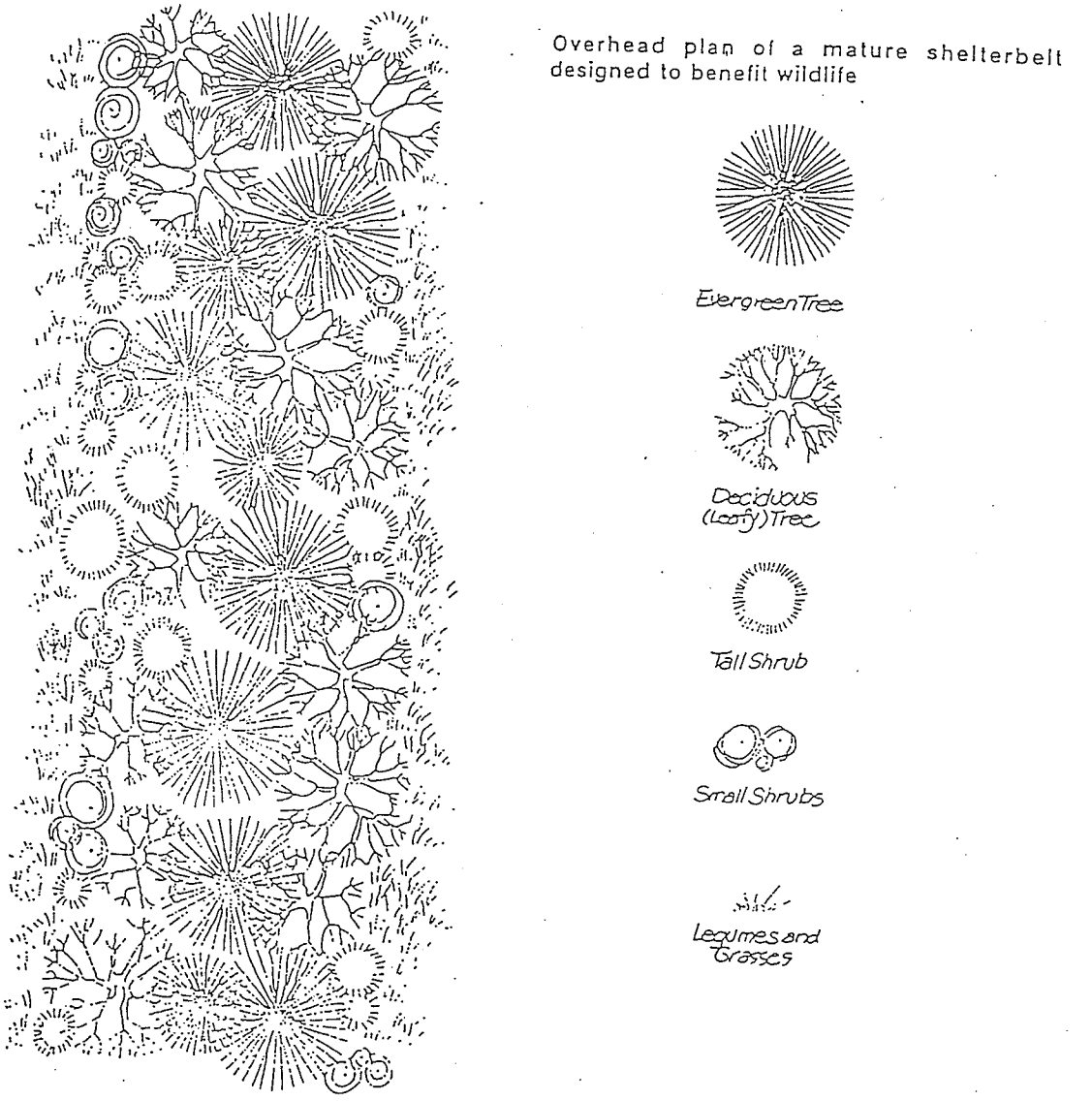


Figure 6.10. Buffalo Creek Wildlife Enhancement: A Wildlife Shelterbelt
(after Poston and Schmidt 1981)

existing habitat fragments (Poston and Schmidt 1981). Travel corridors are not always ideal habitat for prey species. Poole (1992, pers. com.) warns that such strips of habitat encourage predation by offering a narrow area easily covered by the predator, with little chance of the prey escaping detection. These corridors do, however, facilitate wildlife dispersal and access to connected patches of habitat. If many corridors are available, exposure of prey species to predation is reduced when compared to a few corridors. If the corridors are wide enough to provide cover (at least 7 m), and they are irregularly configured, prey susceptibility to predation is lessened.

Morgan (1992, pers. com.) recommends that wildlife corridors should represent a variety of different habitat types to accommodate the different needs of different species. For example, different wildlife will use grass and forbs only than will use grass, forbs and shrubs only, or grass, forbs, shrubs and trees.

Costs: the Prairie Farm Rehabilitation Administration provides seedlings at little or no cost, and volunteers may be enlisted for the planting.

6.1.9 Improve Water/Cover Ratios

Description and rationale: for maximum wildlife use of the creek the ratio of water area to cover area can be manipulated. For wildlife in general, the Manitoba Prairie Care Habitat Land Purchase program prefers managing properties with ratios of upland and riparian area to water area from 1:1 to 5:1 (Manitoba Prairie Care Fact Sheet

1991). In a marsh or wetland and for waterfowl in general, Ducks Unlimited Canada recommends maintaining the ratio of emergent vegetation to open water at 1:1 (Poole 1992, pers. com.). Morgan (1992, pers. com.) cautions that this ratio is mostly beneficial for mallards, and may be difficult to maintain on the creek. Management can include establishment of upland or riparian cover (buffer strip), control of emergent vegetation, and enlarging existing wetland (Tonneson 1991).

For Buffalo Creek, maintaining the ratio of thick emergent vegetation patches to open water between 1:1 and 5:1 would be possible, as an alternating pattern already exists. Open water will remain clear of emergent vegetation when at least 1 m deep. Encroaching emergent vegetation can be controlled by raising the water table or by lowering the water table and top burning the vegetation. Due to the small slope of the creek, the latter solution is preferable to the former if no control structures exist to prevent flooding upstream (Poole 1992, pers. com.). If there is too much open water, emergent species are simply left to expand.

Any water management options must be integrated with up and downstream users of the creek. Also, appropriate experts should be consulted to plan the control structures, map out floodplains, and design the system.

Costs: installing water control structures may cost from a few hundred dollars for a stop log culvert dam to several thousand for a reinforced dam and levees; dredging the stream can cost $100 per day; designing the water/cover

ratio may be the most expensive element, and will also depend on upstream and downstream users.

6.1.10 Control Nuisance Wildlife

Description and rationale: although this is not a wildlife enhancement action, some of the landowners may want to prevent attracted wildlife from causing damage to crops or livestock, or otherwise acting as pests. For example, some landowners have expressed a desire to control badgers in the area. This is a controversial management topic, given the declining and near-troubled state of badger populations in the province. Coyotes should not be directly encouraged, because they may become pests, and this species will surely find and populate the area before long.

Control methods may include exclusion (i.e. preventing perching, rat-proofing garbage and grain bins, fencing), cultural methods (i.e. lure crops, pasture selection), and elimination (i.e. trapping, shooting). See section **4.4.4 Wildlife Benefits, Drawbacks and Controls** for a description of control methods for each wildlife group. In any case, wildlife control should not be implemented without notifying the local conservation officer.

Costs: controlling perching birds is inexpensive, and may involve but a few spikes in the right places, or may become expensive, as with continued and comprehensive blackbird control, involving different scare and elimination methods; exclusion of undesired wildlife from grain, garbage, and buildings may be as much as several thousand dollars for rodent-proofing buildings. Costs of controlling larger

mammals will depend on the extent of the problem and the numbers of pest animals.

6.1.11 Control Beaver and Muskrat Activity

Description and rationale: some of the landowners have expressed concern over the effects of the beaver and muskrat populations at the creek. See section **4.4.4 Wildlife Benefits, Drawbacks and Controls** for a description of beaver and muskrat control methods.

Costs: this action may be very expensive, up to several thousand dollars for stabilizing stream banks and controlling water flow. However, if left to proliferate, beaver and muskrat may cause extensive damage through flooding and foraging.

6.2 Priority Evaluation

Once the enhancement options were identified, they were compared to each other to determine a rank order of priority. Table 6.2 arranges the identified enhancement options in a decision matrix developed by Morrisey (1993). Each option is written twice: once for each row, and once for each column. The option on the first row (row option) is compared to all the other options in the columns (column options). If the row option is given a higher priority than the column option by the evaluator, an x is placed in the box under the option it is compared to. This is repeated for each row option. The option with the most number of x's is assigned the highest priority.

Table 6.2. Buffalo Creek Wildlife Enhancement: Priority Evaluation

	id. and protect tallgrass	crit. hab./sp. of concern	discon. grazing at the creek	improve travel corridors	provide cover	mod./design for wildlife	prov. nest struct. water	provide nest struct. on land	water/cover ratios	control beaver/ muskrat	control wildlife	TOTAL
id. and protect tallgrass		X	X	X	X	X	X	X	X	X	X	10
crit. hab./sp. of concern			X	X	X	X	X	X	X	X	X	9
discon. grazing at the creek				X	X	X	X	X	X	X	X	8
improve travel corridors					X	X	X	X	X	X	X	7
provide cover						X	X	X	X	X	X	6
mod./design for wildlife							X	X	X	X	X	5
prov. nest struct. water								X	X	X	X	4
provide nest struct. on land									X	X	X	3
water/cover ratios										X	X	2
control beaver/ muskrat											X	1
control wildlife												0

(after Morrisey 1993, pers. com.)

In this evaluation, the logical sequence of implementation affected the relative importance of each option. Identifying and protecting remnant tallgrass prairie was given the highest priority because of the emergency nature of this option: there are not many remnants left, if any, and they are needed to provide both a model and a species pool for any future rehabilitation work at Buffalo Creek. Similarly, surveying for critical habitat and species of concern is a high priority. Establishing species and population inventories on cover maps for the area provides information that will guide any future management actions.

Higher priority was given to those options that benefit the most wildlife. For example, discontinuing grazing at the creek will improve water quality, which affects every wildlife species. This was given more importance (higher priority) than improving travel corridors, which is directed primarily at land mammals. Increasing the amount of available cover was considered more important than options that provide nesting structures for chosen species, because increasing cover benefits a greater range of wildlife. Providing nesting structures in water was given priority over providing nesting on land, because of the greater availability of outside assistance for implementing this option.

Improving water/cover ratios was assigned a relatively low priority because of the high costs of this option, and the present condition of Buffalo Creek. Water/cover ratios presently fall within the recommended range, or very nearly so. Once the higher priority options have been implemented,

water/cover ratios can be examined in more detail, and re-evaluated.

The two wildlife control options were given the lowest priority, because they are not actually wildlife enhancement options, but were included as a result of some landowner concern.

7.0 WILDLIFE ENHANCEMENT PLAN

7.1 Implementation Program

The following program is a plan to enhance wildlife along Buffalo Creek. The options are arranged in 3 implementation stages: **Year 1**, **Years 2-5**, and **Year 6 and Beyond.** This timeline follows that of the Buffalo Creek Study Site Management Plan (Dangerfield et al. 1992, vol.3). As identified in **6.2 Option Selection**, the recommended enhancement options remain in order of priority. Along with some possible implementation sites, the following program also suggests who might bear the costs of enhancement. For a more detailed description of the enhancement options, including implementation methods and suggestions, refer to chapter **6.0 WILDLIFE ENHANCEMENT OPTIONS.**

Stage 1: Year 1.

1- Identify and protect remnant tallgrass prairie.

Every one of the sites discussed in **5.2 High Wildlife-Value Sites** should be searched for remnant patches or isolated individual species of tallgrass prairie type plants. In particular, sites 31-3; 19-1; 18-1, 2, 3; 7-1; 12-1; and 1-1. The search need not be confined to the designated sites, but should include the entire creek area. Once tallgrass remnants are found, they must be considered priority land for wildlife enhancement. The responsibility of implementing this option should fall on the BPS&WMA, as the organization that is directing the wildlife enhancement plan, or the Management Group established through the Buffalo Creek Study Site Management Plan (Dangerfield et al.

1992, vol.3). Funding sources are available for this option (see **Appendix D: Outside Assistance Sources**).

2- Survey for critical habitat and species of concern.
Along with the identification of remnant tallgrass prairie, any remaining critical habitat for wildlife must be mapped and protected, and the presence and population parameters of any species of concern must be documented in a detailed cover map. The existing river-bottom forest at site 7-1, any remnant prairie, and the shrubby area at site 1-1 are likely critical habitat. Sites of interest include 30-1; 19-1, 2; 18-1, 2, 3; 7-1, 2; 12-1; and 1-1. The survey need not be confined to these sites, but may encompass the whole Buffalo Creek Study Site. The BPS&WMA or a the Management Group should direct this survey, and coordinate the results with the identification and protection of remnant tallgrass prairie. Funding sources are available for this survey (see **Appendix D: Outside Assistance Sources**).

Stage 2: Years 2-5

3- Discontinue livestock grazing at the creek.
Landowners must be persuaded to prevent adverse effects due to livestock grazing along the creek, leaving as large a buffer strip as possible. There are cattle or horses that graze along the creek at sites 31-1; 18-1, 2, 3; 7-1, 2, 3; and 12-1. In some cases, erosion and stream disturbance is severe, particularly at sites 18-1 and 7-3, where unrestricted access has damaged streambanks and shoreline vegetation. Landowners have the responsibility of not altering water quality, and should therefore bear at least

some of the costs of discontinued grazing along the creek. However, there are several sources listed in **Appendix D: Outside Assistance Sources** that can help, and the BPS&WMA or the Management Group should act as the coordinating agency that will inform the landowners, and aid in obtaining outside assistance or financial incentives.

4- Improve travel corridors.

With the cover maps drawn for **1- Identify and protect remnant tallgrass prairie** and **2- Survey for critical habitat and species of concern**, the areas with the most opportunity for improving travel will be more apparent. Ideally, all the high wildlife-value sites would be linked with such corridors. The vegetation components of hedgerows, ditches, and shelterbelts should be kept wide enough and thick enough for wildlife cover, at least 7 m across, and with several different plant species (Poston and Schmidt 1981). The responsibility of this option falls largely on the property owner. It is up to the landowner to leave larger belts of cover, and to let them grow in. The BPS&WMA or the Management Group can help by supplying adequate seed or seedlings for the cover composition, and integrating the corridors with the detailed cover map.

5- Provide wildlife cover outside the buffer strip.

Whenever possible, marginal land that is unused should be managed to provide cover for wildlife. Depending on the location, size, and present condition of the site, it can be developed for wetland, riparian, or upland habitat. All of the identified high wildlife-value sites have cropland near or adjacent to them. Reduced till practises on these

peripheral croplands is very important, and should be encouraged and supported. BPS&WMA or the Management Group should manage any marginal land themselves; several programs offer financial incentives for landowners who practice reduced till techniques (see **Appendix D: Outside Assistance Sources),** and shared seed drills are available.

6- Modify or design for wildlife.

Existing water sources (troughs and ponds) should be made accessible to and safe for wildlife by installing ramps, establishing surrounding cover or fencing, and preventing predation. Unprotected ponds are found at sites 31-1,3; and 7-2. Farmers should be encouraged by the BPS&WMA or the Management Group to use wildlife flushers on the farm machinery when working croplands. In some cases, the costs of designing or modifying a farm structure or machine are minimal, and the implementation is most efficiently done by the owner (i.e. flushers on farm tractors). The BPS&WMA should be prepared to provide technical support and design ideas when needed.

7- Provide nesting structures in water for wildlife.

Areas already frequented by waterfowl and other wildlife should be starting points for the placement of nesting structures. Such sites include 31-1, 2, 3; 30-1; 19-1, 2; 18-1, 2, 3; 7-1, and 2. The contacts listed in **Appendix G: Expert Assistance** should be consulted for structure placement. These structures should be furnished and maintained by the BPS&WMA or the Management Group, and recorded on the detailed cover map. Funding and aid can be obtained for this option (**Appendix D: Outside Assistance Sources**).

8- Provide nesting structures on land for wildlife.

Areas well suited for nesting structures on land depend on the target species. For example, hawks prefer platforms in open spaces, and wood ducks prefer more secluded nestboxes. The specifications listed in Table 6.1 should be used to design for target species, and the expert assistance sources listed in **Appendix G** should be consulted for optimum placement of structures. These structures should be furnished and maintained regularly by the BPS&WMA or the Management Group, and recorded on the detailed cover map. Funding and aid can be obtained for this option (**Appendix D: Outside Assistance Sources**).

Stage 3: Year 6 and Beyond

9- Improve Water/Cover Ratios.

This option cannot proceed before a detailed cover map has been completed for the creek, and actual cover ratios computed. Although the existing ratio can be determined in the short term, it will take time to plan and design a water control system, integrating with all users. Establishment and maintenance of an optimum ratio may take several years, and would be ongoing. Depending on the extent of the water control system, the BPS&WMA may wish to work with a neighbouring community, communities, or a consortium of agencies, provided the private owners support the option.

10- Control Beaver and Muskrat Activity.

There is damage due to beaver activity throughout site 18-1, and signs of beaver and/or muskrat were found at sites 19-1, 18-1, 18-2, 18-3, 12-2, and 1-1. These animals will likely

move throughout the creek system, and may respond to the wildlife enhancement options by increasing their numbers. While not a major problem today, they may become so in the future, and their activity should be monitored and controlled, if necessary. Landowners will likely be the monitoring agents, and the local wildlife officer is responsible for any control actions, perhaps in conjunction with the BPS&WMA or the Management Group.

11- Control Nuisance Wildlife.

At this point, very little negative response was received regarding any wildlife species. However, with the implementation of the enhancement options, some species may become nuisances. The BPS&WMA should encourage the practice of preventive measures (i.e. rodent-proofing storage bins) in anticipation of higher numbers of wildlife by informing the landowners and providing control suggestions. Should nuisance problems arise, control measures should not be undertaken without the consent and/or cooperation of the local conservation officer.

Figures 7.1 through 7.7 are cover maps digitized from aerial photographs of Buffalo Creek, during a dry period (July 1989). The 13 high wildlife-value sites are outlined, as are the two other sites that were considered. Some wildlife enhancement options that are specific to these sites are marked using the recommended option codes in Table 7.1.

Table 7.1. Buffalo Creek Wildlife Enhancement: Recommended Options

Code	Recommended Option
1	Identify and Protect Tallgrass Prairie
2	Survey for Critical Habitat and Species of Concern
3	Discontinue Livestock Grazing at the Creek
4	Provide Wildlife Cover Outside the Buffer Strip
5	Improve Travel Corridors
6	Install Flushers on Farm Machinery
7	Provide Nesting Structures in Water for Wildlife
8	Provide Nesting Structures on Land for Wildlife
9	Improve Water/Cover Ratios
10	Control Beaver and Muskrat Activity
11	Control Nuisance Wildlife

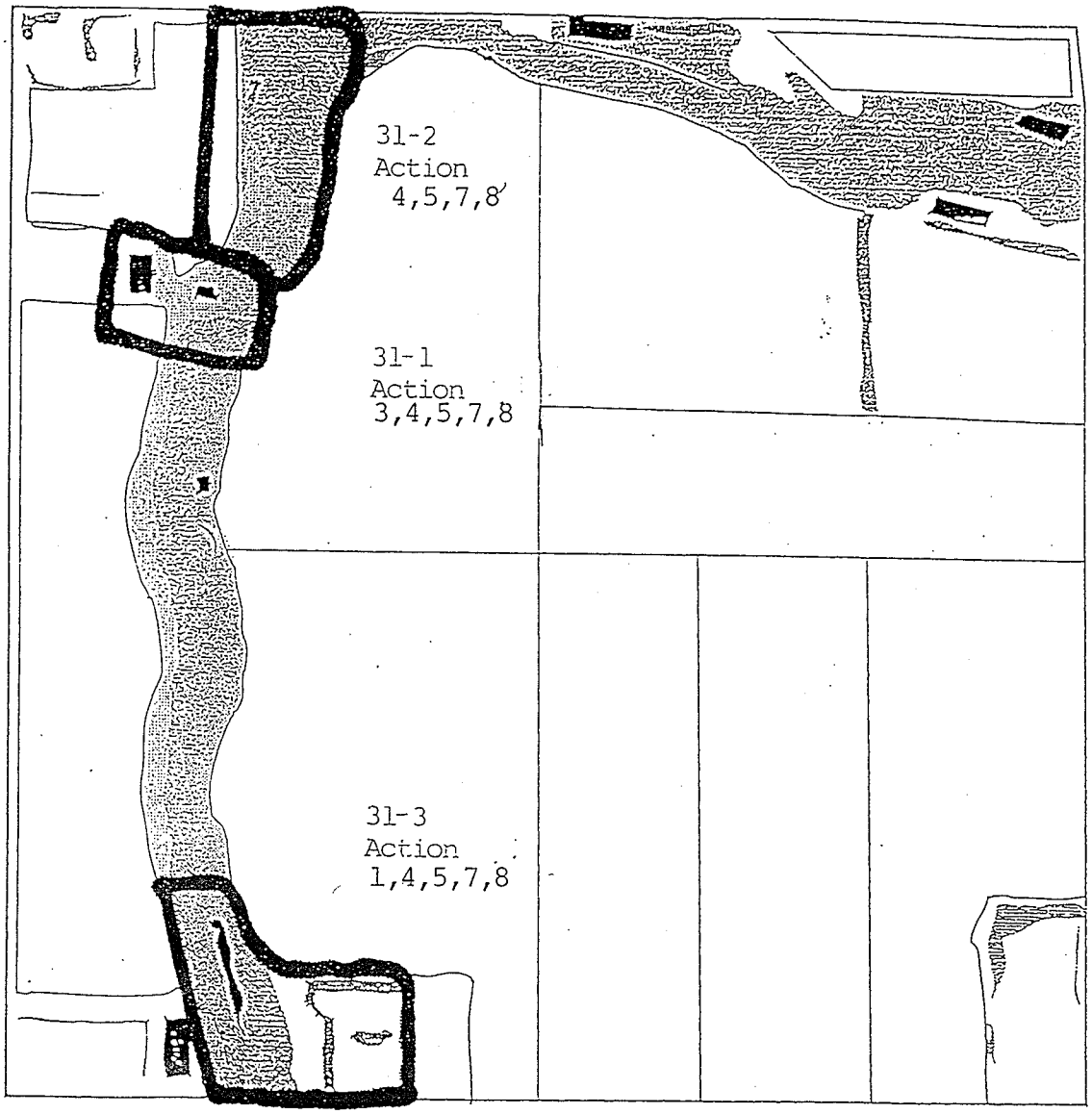


Figure 7.1. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 31

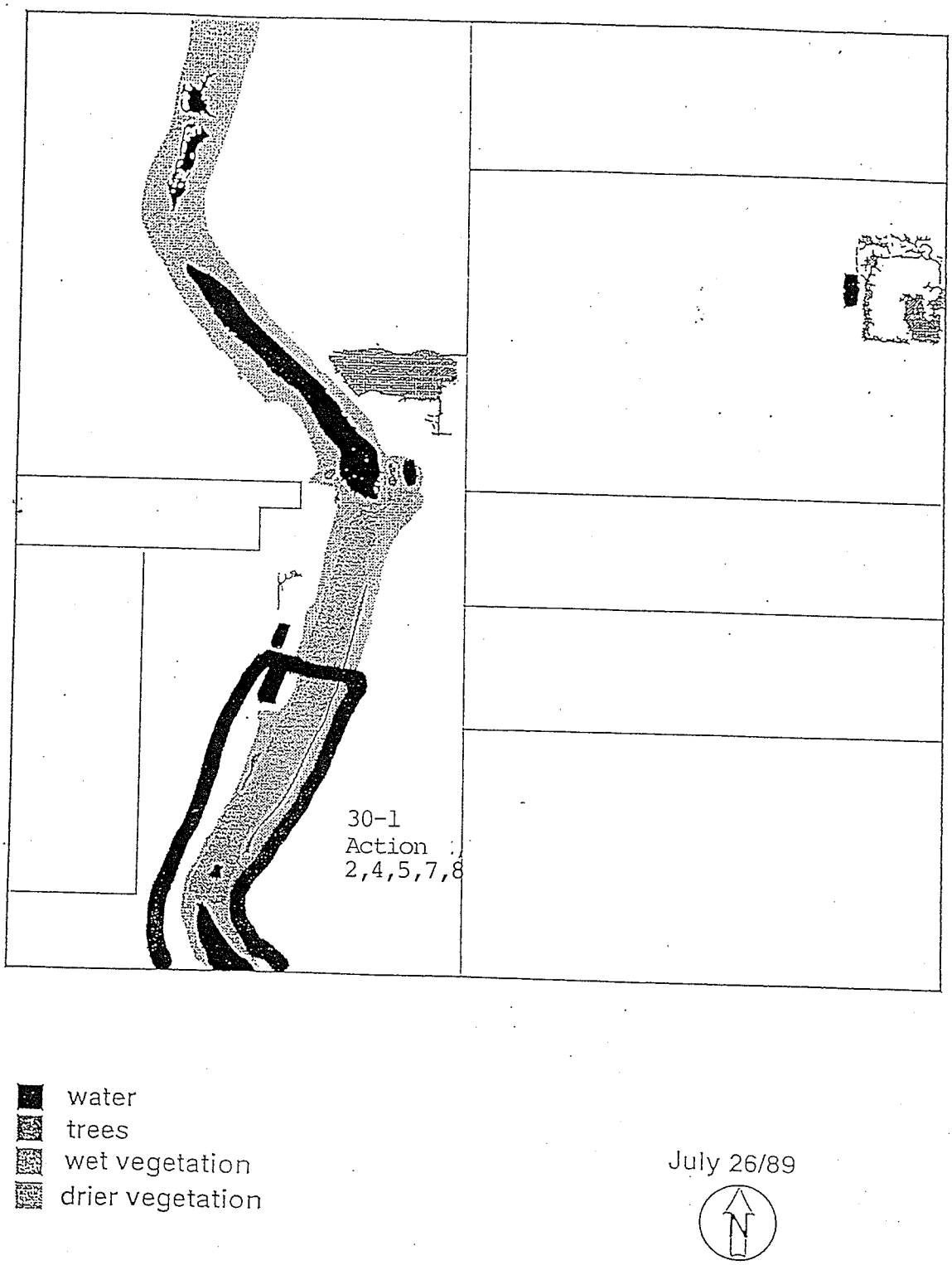


Figure 7.2. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 30

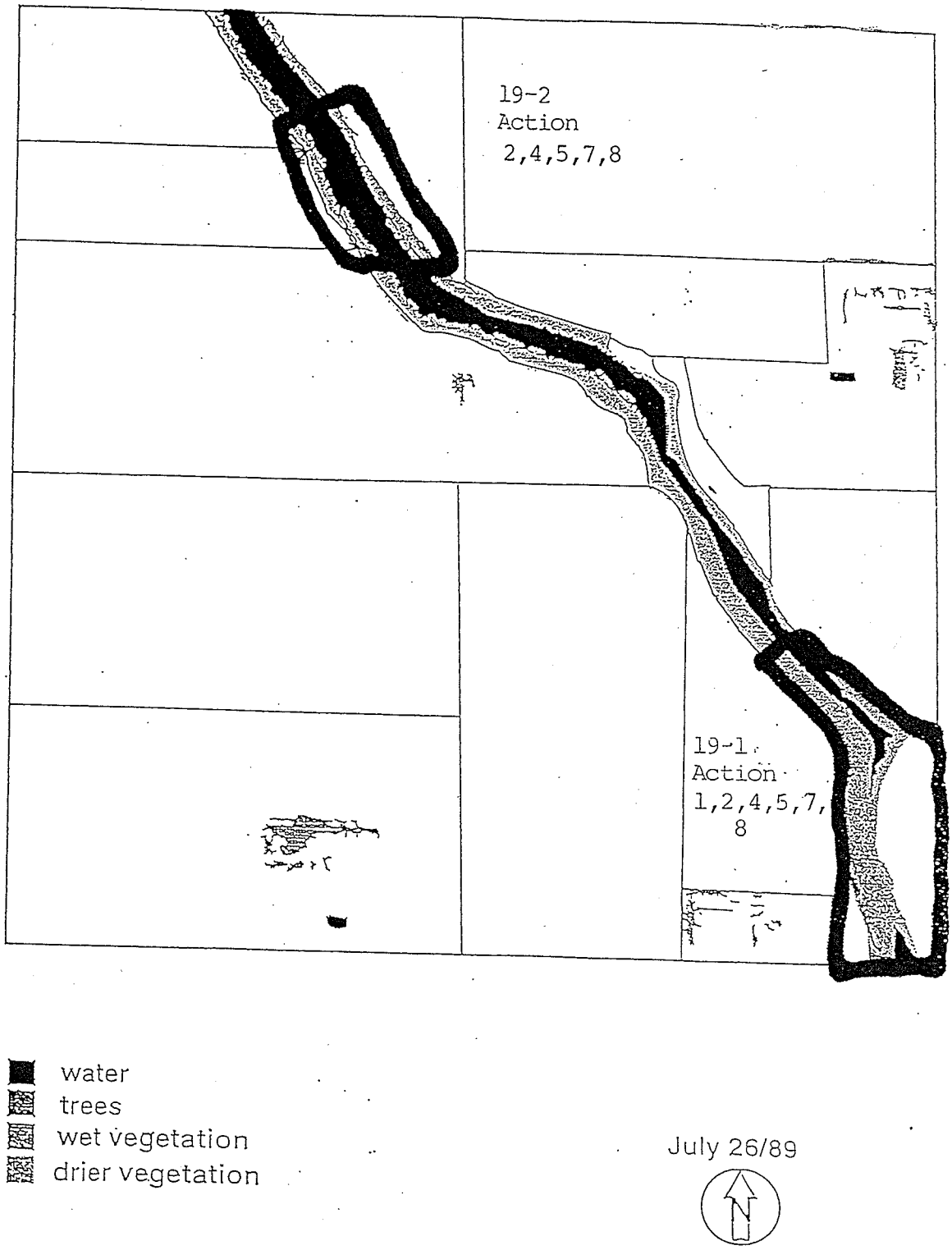


Figure 7.3. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 19

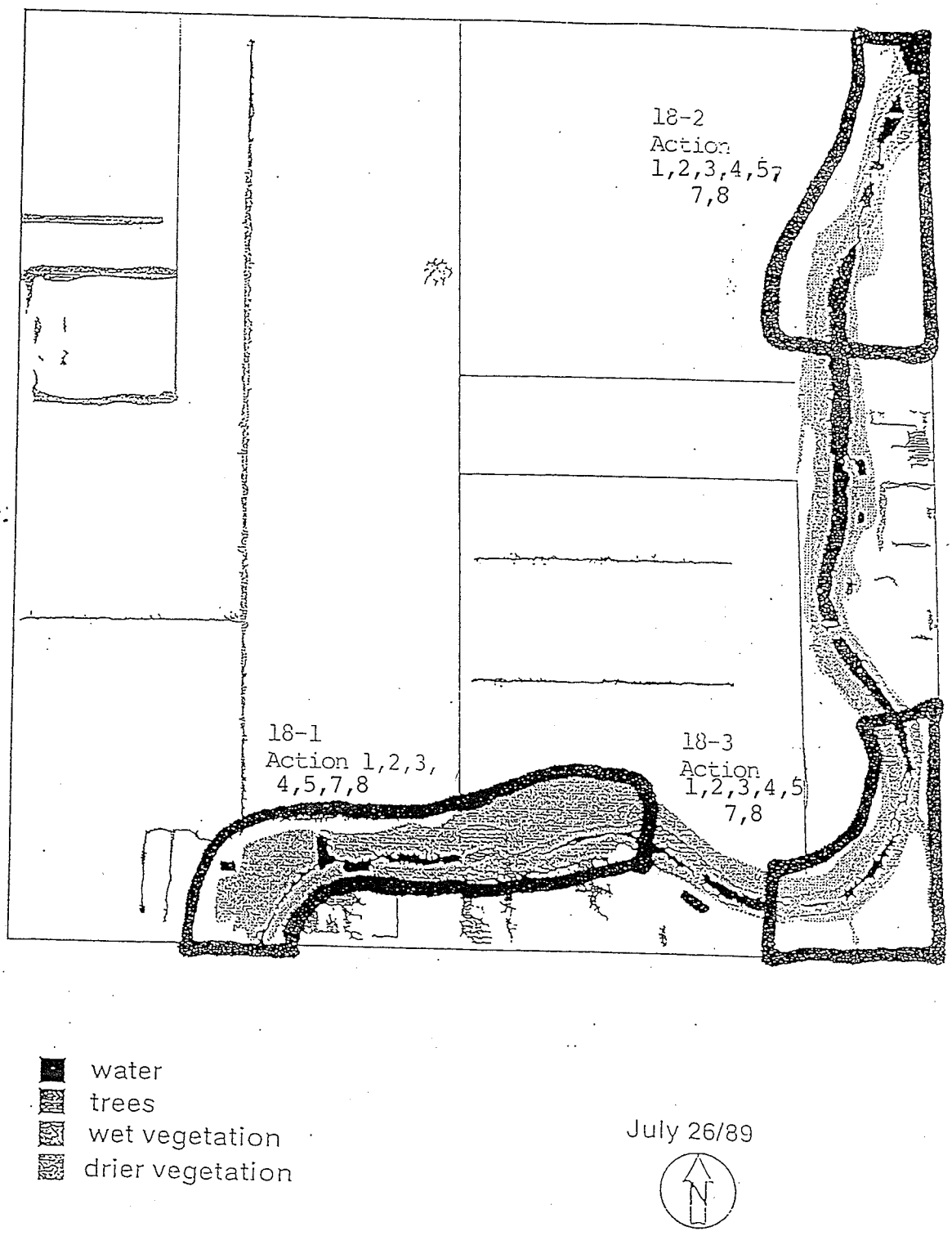


Figure 7.4. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 18

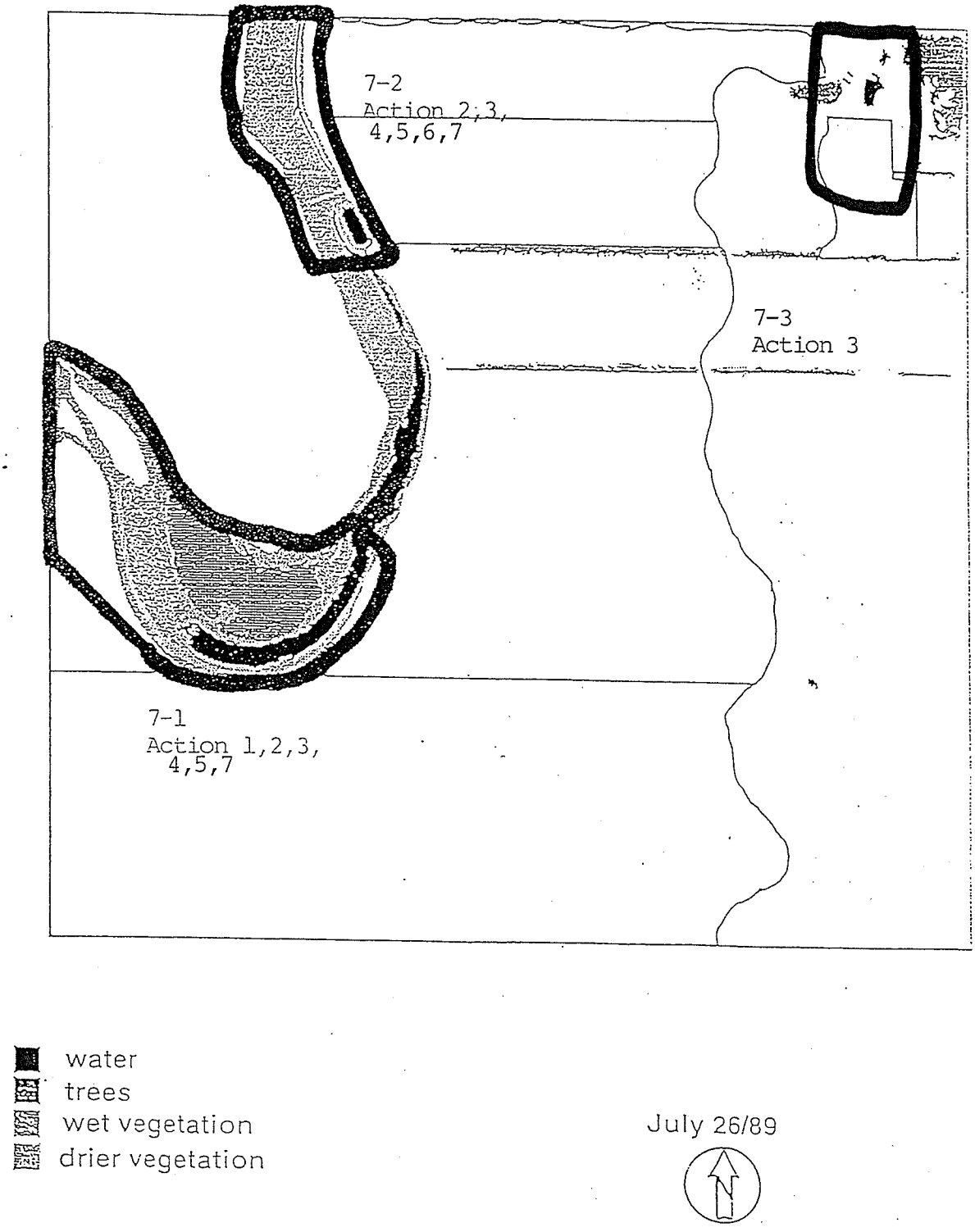


Figure 7.5. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 7

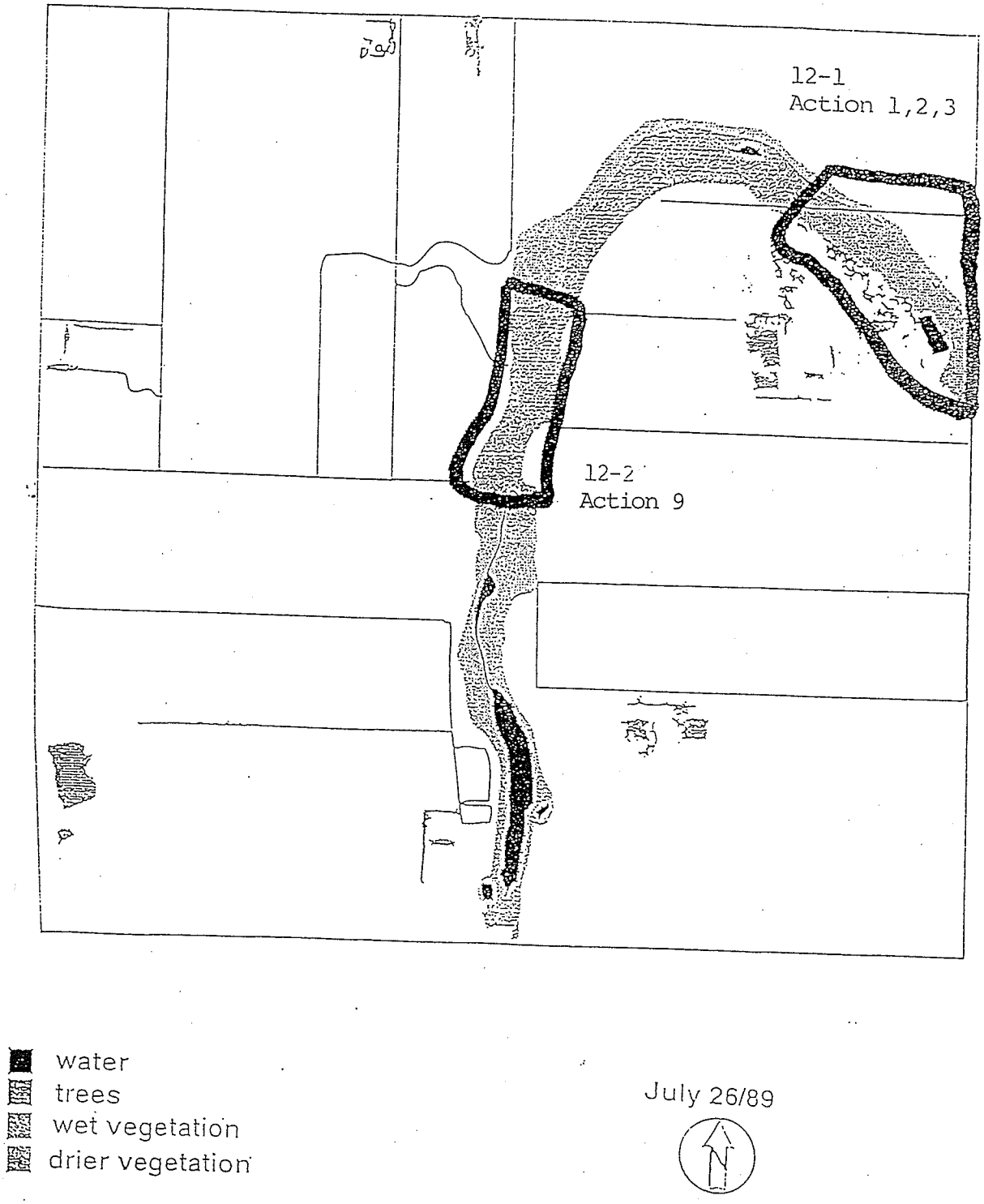


Figure 7.6. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 12

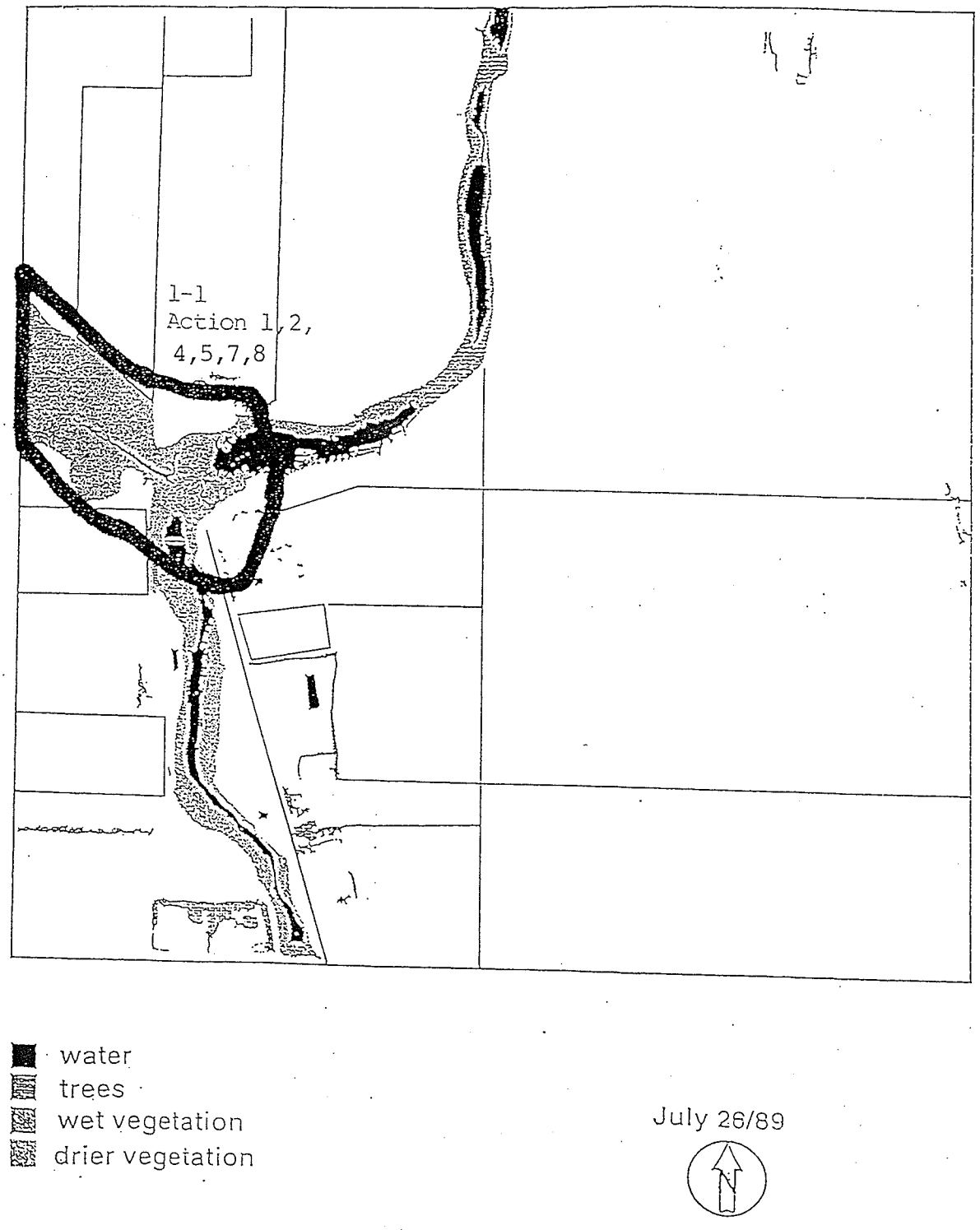


Figure 7.7. Buffalo Creek Wildlife Enhancement: High Value Wildlife Sites, Section 1

7.2 Wildlife Policy Recommendations

The enhancement options that were identified were presented in detailed form to be used for decision-making, in the event that the priorities that were assigned here are not those that the landowners, the community, or the BPS&WMA would set. Different individuals and organizations will place different levels of importance on each option, and wildlife managers will disagree as to the relative effectiveness of each option. The priority or degree of importance assigned to each enhancement option ultimately depends on the implementing agent.

Before implementing a wildlife enhancement option, the costs and benefits must be carefully weighed, addressing every relationship that will be affected by the option. An often underrated benefit that accrues with the added presence of a wildlife species is the increase in ecosystem stability through an increase in biological diversity (Centre Naturopa 1989; World Wildlife Fund 1989). Although it is recommended that waterfowl and species of concern should be targeted initially to help secure outside assistance, it must be emphasized that this is not the ultimate goal. A healthy wildlife system is based on diversity, but nongame birds and animals are often slated as pests or unimportant, which can lead to their disappearance from an area, to the detriment of the system. For wildlife enhancement to succeed, the principle of maintaining and promoting diversity must ultimately guide management actions.

When the implementation of an enhancement option is anticipated to bring some negative results, mediation

measures should be planned or implemented concurrently. For example, although the landowners did not express dislike of any raptor species, actions to prevent nuisance problems should accompany any wildlife enhancement for this group, such as applying perching deterrents to discourage raptors from frequenting water holes or barnyards.

Integration of wildlife enhancement with other existing or planned management actions is preferred. For example, shelterbelt programs should be carried out with wildlife in mind, by planting the belts wide and with a diversity of plant species.

7.2.1 Landowners' Responsibilities

Through the public participation process, it became evident that landowners and residents have an awareness of the value of wildlife, and the many aspects of wildlife/agriculture interactions at Buffalo Creek. There is also evidence of a trend to encourage wildlife. As the primary agents affecting wildlife, the landowners realize their responsibility towards it. These owners are stewards of the land, and, through the BPS&WMA, are guiding their actions and decisions with the effects on wildlife in mind. Individuals may act to enhance wildlife by implementing some of the enhancement options that were discussed, and by recognizing the real value of wildlife in daily operations. This stewardship is assumed, and landowners have decided not to wait for direct actions from agencies or governments, but have taken it upon themselves to integrate their activities with the needs of wildlife.

7.2.2 Community Responsibilities

The priorities of the BPS&WMA may change, but general wildlife policy must be established. There are some definite courses or methods of action that can be selected to guide and determine present and future decisions concerning wildlife. One such method of environmental decision-making is proposed by Sinclair (1991), and is shown in Figure 7.8. The model emphasizes the need to evaluate the alternatives in a broad context, consult with the public, and monitor results of implementation in an organized fashion. Dangerfield et al. (1992, vol.3) suggest the formation of a management group for this task.

Another avenue to explore in developing wildlife policy is further de-centralization of management in favor of a form of co-management. With respect to native communities in the James Bay area, Berkes et al. (1991) write that "local-level resource management and co-management may be seen as promoting ecologically sustainable use of the environment, social health and cultural sustainability of the local population, and their economic well-being". For Buffalo Creek, there is already some degree of locally based management in the form of community boards and organizations (i.e. BPS&WMA). There is enough support structure in government today to guide and assist local wildlife management, but not enough to effectively implement and address all the details of wildlife enhancement. The local community can take more control in managing its wildlife resource. Also, the community is responsible for networking with other agencies and communities that affect or are affected by the Buffalo Creek ecosystem. Dangerfield et al.

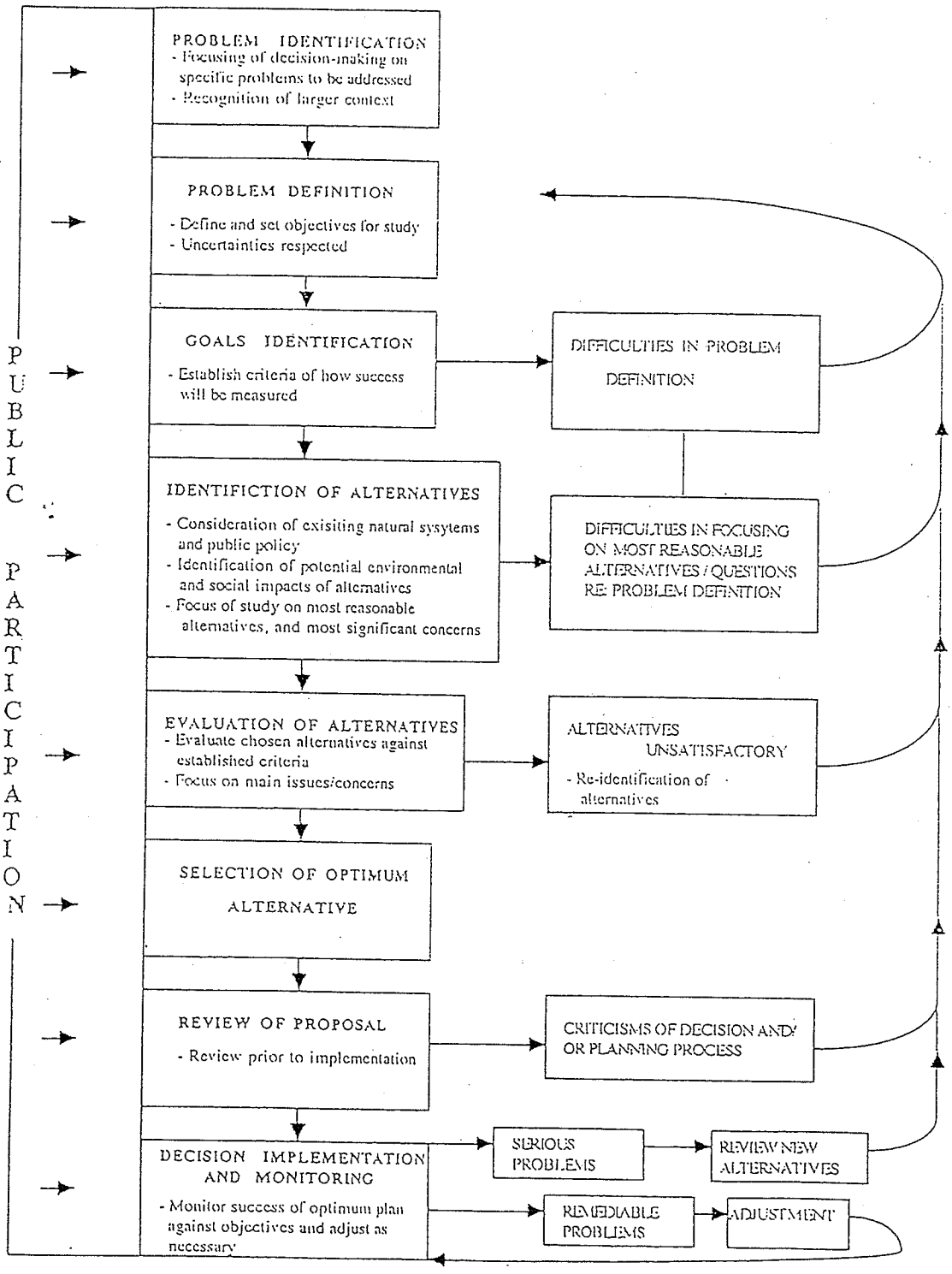


Figure 7.8. An Environmental Decision-making Model
(Sinclair 1991)

(1992, vol.3) suggest "establishing a working partnership with groups and individuals upstream". This should be extended to establishing a working partnership with all concerned and affected parties. Such partnerships can reduce overall costs and increase effectiveness by pooling resources of the various agents and eliminating redundancy.

7.3 Legal Concerns

7.3.1 Jurisdiction

Under the Constitution Act (1867), managing wildlife is a provincial responsibility, with the exception of migratory birds, for which the Migratory Birds Treaty (1916) gives responsibility to the federal government. Amphibians, reptiles and mammals are covered by the Manitoba Wildlife Act and regulations.

On private or public land, wildlife is the property of the crown in right of the province, and "the provinces... have exclusive legislative jurisdiction over the general regulation and control of land use within their boundaries" (Scarth 1984). For agricultural matters, such as soil conservation, both the federal and the provincial governments may create legislation (Scarth 1984).

7.3.2 Land Acquisition

All the land in the study area is currently privately owned, so there are basically two ways by which enhancement sites can be acquired: outright purchase or some agreement with the owner. Purchase and long term lease are the recommended methods of land acquisition.

Purchase

The study area is situated in prime agricultural land. Although the riverbank and creek sides can be considered marginal to a degree, the general high quality of the soil fetches a high price. Estimates range from $1400 to $2600/ha. In addition, subdivision of the land is restricted. Subdivision into lots of less than 40 acres (16 ha) is only permitted for specialized agricultural purposes, such as greenhouse operations. Dangerfield et al. (1992, vol.3) provides a complete description of the steps required for subdivision at Buffalo Creek.

Agreements

Because the price of land is often prohibitive for enhancement efforts, the most likely land acquisitions for enhancement will be in the form of agreements with current landowners. A few examples of agreement forms that are used by the Manitoba Department of Natural Resources Wildlife Branch, the Turtle River Watershed Conservation District, and Ducks Unlimited Canada are provided in **Appendix H.** There are some problems associated with agreements. First, who is responsible for enforcing the agreement? If the agreement is broken, what legal resources are there? Second, how does one assess what the loss of land is worth to the landowner? The Wildlife Branch is currently working on these problems.

Lease agreements: the advantages of lease agreements are that they are relatively affordable, and that there are no size restrictions. Short or long term, there are several methods for determining lease rates. the Manitoba Prairie

Care program has different rates for arable land converted to perennial cover, for existing idle native cover, and for idled pasture or hayland. Lease rates are usually determined by applying a formula to some estimate of the land value (i.e. 7% of average land rate per acre, as determined by the municipal assessment, or even crop insurance production ratings), and include detailed agreed conditions and management responsibilities for both parties. Site identification is satisfied by describing the leased portion in detail, and appending an air photograph with the leased section outlined.

Voluntary agreements: the Manitoba Wildlife Branch uses this form of agreement in the endangered spaces and endangered species programs. The landowner and the Wildlife Branch agree on respective duties and responsibilities and land use practises to protect a site. The agreement is dependent on the good faith of the parties, and there is very little legal recourse (if any) for enforcement.

7.3.3 Legislative Controls

Implementation of the identified wildlife enhancement options may be subject to legislative control. Poston and Schmidt (1981) identify the following common restrictions:

Highway protection - plantings and the placement of structures alongside a Provincial highway or a municipal road within prescribed distances without a permit are prohibited;

water protection - a licence or permit is needed to "use or divert water, or construct works that would divert, impede or otherwise interfere with water", and no structures that impede flow or "jeopardize the stability of the banks" are permitted;

fire prevention - permits may be required to set outdoor fires;

weed control - landowners are responsible for controlling noxious weeds on their property;

wildlife protection - regulations may restrict hunting, possession, and destruction of wildlife, as well as destruction of their habitat.

8.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

8.1 Summary

This wildlife enhancement plan is the result of 7 months of research into the identification of wildlife enhancement options for a 16 km section of Buffalo Creek, Manitoba. Commissioned by the Buffalo Plains Soil and Water Management Association (BPS&WMA), this plan develops from the wildlife component of the Buffalo Creek Study Site Management Plan (Dangerfield et al. 1992, vol.3). The following 4 step approach was employed to identify the wildlife enhancement options:

1- establishment of existing conditions. Baseline information was collected from existing data, interviews with landowners, residents, and experts, and from similar projects;

2- identification of high wildlife-value sites at Buffalo Creek. Through field work and photo interpretation, 13 high wildlife-value sites were identified and mapped;

3- determination of which wildlife species can likely and potentially be enhanced using existing data, interviews with landowners, residents, and experts, and from similar projects;

4- option identification. Wildlife enhancement options that could increase species numbers or species diversity at Buffalo Creek were identified using public input, existing information, and expert advice.

These options were then presented in suggested sequence as an enhancement plan.

8.2 Conclusions

In addressing the objectives of this practicum, four primary conclusions were drawn:

1- the historical wildlife species of the Buffalo Creek study site are those associated with riparian and wetland zones within tallgrass prairie habitat. Existing wildlife conditions of Buffalo Creek, Manitoba are not inconsistent with such hydric habitat, but local abundance and diversity of wildlife has been decreasing;

2- thirteen high wildlife-value sites were found at Buffalo Creek through field work and photo interpretation. Habitat types of the sites were varied, and supported wildlife species. Several wildlife enhancement options are possible for these sites;

3- the wildlife species that will likely be enhanced are those that are consistent with a tallgrass prairie type buffer strip and existing habitat types along the creek, and present (existing wildlife) at the creek, or within individual species' immigration distances of the creek. Wildlife species that can potentially be enhanced are those that will not respond significantly if the only wildlife enhancement action is the establishment of a tallgrass prairie type buffer strip. These species need additional management actions in order to be enhanced. What wildlife species will likely and potentially be enhanced by

developing habitat can be determined by the historical and existing wildlife, the influence of local landowners, and the identified wildlife enhancement options; and

4- wildlife enhancement options for Buffalo Creek were identified using the historical and existing wildlife conditions, available literature, professionals in the field, and public consultation. The enhancement options were programmed into a plan that was outlined and described fully (chapter **7.0 WILDLIFE ENHANCEMENT PLAN**), and incorporates relative benefits to wildlife, costs, stakeholders' concerns, as well as recommendations from existing literature and experts in the field.

The methods that were used to draw these conclusions are useful for any landowner, association, or other agency that would like to enhance wildlife habitat, or wildlife populations. By establishing the historical and existing conditions, identifying high wildlife-value habitat sites, determining which wildlife can likely and potentially be enhanced, then identifying enhancement options, a comprehensive enhancement plan was designed. All stakeholders views and concerns were incorporated into the enhancement process, throughout the development of the plan.

8.3 General Recommendations

Enhancing wildlife populations at Buffalo Creek is possible, and several enhancement options have been identified and detailed in this practicum. Should the BPS&WMA wish to proceed with wildlife enhancement, they may be guided by the following recommendations:

1- Establish working relationships and partnerships with relevant communities, districts, agencies, and governments. By communicating and cooperating, an ecosystem approach to wildlife enhancement can be taken, which may reduce costs and increase overall effectiveness.

2- Implement the wildlife enhancement plan. A review of the identified options and the priority ranking may be undertaken by the BPS&WMA or the appropriate committee to ensure that the plan's policy, goals, and objectives reflect those of the BPS&WMA. Costs can be shared between the BPS&WMA, the outside assistance sources, and stakeholders, including resident landowners.

3- Establish a monitoring and evaluation program that allows assessment of the implemented options. An important part of wildlife enhancement is the continuous assessment of the progress and effectiveness of the project to help ensure eventual success. The BPS&WMA should assume the coordination and assessment of implementation, and landowners can be enlisted for on-site monitoring.

4- Integrate the wildlife enhancement plan with other rehabilitation plans. Shelterbelt programs, the establishment of a buffer strip, and other restoration and rehabilitation projects can include wildlife enhancement, and vice versa. The interrelationships among various active programs should be exploited.

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Appendix A: Buffalo Creek Wildlife Survey

WILDLIFE SURVEY

Name of Respondent:
Address:
Phone Number:
Section Number:

1- Are there any birds or animals that you would like to see more of on your land?

2- Are there any birds or animals that you would not like to see more of on your land?

3- Please indicate if you have ever seen a:

burrowing owl
loggerhead shrike
prairie long-tailed weasel

indicate where on the wildlife map provided.

4- Are there any fish in Buffalo Creek? If so, what kinds:

5- How much land do you own along the creek?

6- How is this land used?

Appendix B: Outside Assistance Sources

There are a large number of groups and organizations which offer assistance for rehabilitation projects. For the outside assistance agencies presented, the following categories were devised:

Agriculture	Water Management
Environment	Wildlife
Science and Technology	Work Development

The assistance sources were compiled from the Handbook of Grants and Subsidies (1992), the Canadian Directory of Foundations (1992), the Conservation Program Directory For Agro-Manitoba (1990), and pamphlets describing various programs. The list is likely incomplete, due to the great number and variety of outside assistance programs that could possibly be related to the Buffalo Creek project. Also, assistance programs and aid policies change frequently, and some of the sources listed here may be combined with others, renamed, or scrapped entirely before this report is completed.

Only the information which is most relevant to developing habitat at Buffalo Creek is included. For example, a particular assistance source may have more target areas than are here listed.

The Canadian Centre for Philanthropy (1329 Bay Street, 2nd floor, To. Ont., M5R 2C4) tracks over 900 foundations, and can perform an assistance search for under $200. The Handbook of Grants and Subsidies is periodically updated, and can be purchased for under $400, from CCH/FM Publications ltd. (33 rue Racine, Farnham, Qc., J2N 3A3, (514) 293-5377).

The funding sources provided below have been prioritized using a five star system. Those sources that should be contacted first have been rated with five stars. Those that should be contacted last have been rated one star.

Agriculture

Canada Agri-Food Development Initiative - CAFDI ***
Form of Assistance: up to 50% of eligible project costs, to a maximum of $250 000 per year of $750 000 over the project's duration.

Target: to help improve livestock and crop production technologies and the adoption of appropriate production practices, and training and development, particularly in farm management.

Eligibility criteria: preference is given to organizations that represent a broad sector of the industry.

Deadline: letter of intent by November 1, application by December 15.

Contact:
CAFDI Coordinator
Agriculture Development Branch
Agriculture Canada
930 Carling Ave., 5th floor
Ottawa, Ontario K1A 0C5
Tel.: (613) 995-9554 Fax: (613) 996-9564

Farm Credit Corporation - syndicate loans *
Form of assistance: long-term loans for up to 80% of costs to purchase or improve buildings, sites or farm machinery, maximum $100 000 or $15 000 per qualifying member, whichever is least.

Target: to finance groups of 3 or more farmers to share the use of farm resources.

Eligibility Criteria: farmers must be of legal age, Canadian citizens or permanent residents, must provide security, management skills, a plan of operation, and must demonstrate repayment ability. Cooperative farm associations and certain farming corporations also qualify.

Deadline: none listed.

Contact:
Farm Credit Corporation
Regional Office
400 - 5 Donald Street
Winnipeg, Manitoba R3L 2T4
Tel.:(204) 983-4039

Farming For Tomorrow *****
Form of assistance: technical and financial assistance to cover a portion of costs for on-farm soil conservation activities; incentives will be offered to encourage conservation practice.

Target: on-farm soil conservation; alternate land use; conservation education and technology transfer; wildlife habitat enhancement.

Eligibility criteria: work plans of detailed activities are necessary.

Deadline: none listed.

Contact:
PFRA
Box 1047,
Morden, Manitoba R0G 1J0
Tel.:(204) 822-4078

Farm Shelterbelt Program ***
Form of assistance: seedlings provided; shipping, planting, and maintenance available.

Target: farming operations.

Eligibility criteria: farmers, or landowners with over 40 acres.

Deadline: none listed.

Contact:
PFRA Shelterbelt Centre
Indian Head, Saskatchewan S0G 2K0
Tel.: (306) 695-2184

Permanent Cover Program *****
Form of Assistance: initial payment of $20 per acre to offset costs related to planting forage or trees; second payment, $20 for 10 year agreements, $50 for 21 year agreements, to offset costs of switching from annual crops to permanent cover; maximum assistance to $80,000.

Target: lands where the growing of annual crops and summer fallowing is causing long term soil degradation and where conservation farming practices cannot reduce or eliminate the ongoing degradation; not aimed at lands which are well suited for growing annual crops.

Eligibility criteria: landowners must sign 10 or 21 year Land Use Contracts; registered owners only; lands which have been in summer fallow since August 1 of 1989, and are CLI class 4,5 or 6; minimum 20 acres, no maximum.

Deadline: last year's was December 15.

Contact:
PFRA Soil Conservation Office
Box 1047, Morden
Manitoba R0G 1J0
Tel.: (204) 822-6783

PFRA Community Pasture Program *****
Form of assistance: none, user fees cover grazing and breeding costs.

Target: improve land use.

Eligibility criteria: applicants must be 18 years or older; applicants must winter their cattle; based on need for grazing.

Deadline: none listed.

Contact:
Rón Moss
31 Main Street
100 Federal Building
Dauphin, Manitoba R7N 1C5
Tel.: (204) 638-6108

Prairie Farming Program *****
Form of assistance: 5 year lease of suitable lands, and development of dense nesting cover. PFP provides seed, weed control, gate sign, and monitors waterfowl.

Target: small acreage (less than 10 acres per unit, but may be more than one unit per quarter section) in or adjacent to cultivated land, and in danger of being drained.

Eligibility criteria: land was idle perennial cover, pasture, hayed, or cultivated, and is associated with wetland areas.

Deadline: none.

Contact:
Prairie Farming Program
N.A. Wildlife Foundation
37 - 11th Street
Brandon, Manitoba R7A 4J2
Tel.:(204) 726-9555

Rangeland Management ****
Form of assistance: administrative; financial.

Target: renovation; fertilization; rotational grazing; controlling undesirable native species.

Eligibility criteria: recipients must hold an Agricultural Crown Lands forage lease and be prepared to enter into an agreement of understanding to follow a land-based management plan developed in cooperation with Manitoba Agriculture.

Deadline: none listed.

Contact:
John Neabel, Director
Agricultural Crown Lands
1495 St. James Street
Winnipeg, Manitoba R3H 0W9
Tel.: (204) 945-8104

Environment

Canada 125 Corporation *
Form of assistance: network support, including advice, guidance, assistance, and information (no financial support).

Target: five themes are covered in the program, including a common concern for the environment.

Eligibility criteria: community initiatives involving non-controversial, non-partisan and apolitical activities.

Deadline: activities must take place in 1992.

Contact:
Canada 125 Celebrations
P.O. Box '92
Saskatoon, SK
S7K 8B8

Carthy Foundation ***
Form of assistance: grants.

Target: conservation, the environment, and wildlife.

Eligibility criteria: good for special projects, operating funds, building funds, emergency funds, endowment funds, equipment funds, matching funds, and seed money.

Deadline: none.

Contact:
Carthy Foundation, Box 2554
Calgary, Alberta T2P 2M7

Chawkers Foundation ***
Form of assistance: grants.

Target: environment.

Eligibility criteria: good for research projects, special projects, building funds, equipment funds, matching funds, and seed money.

Deadline: March 1 and September 1 each year.

Contact:
Chawkers Foundation, 251 Park road
Ottawa, Ontario K1M 0C9
Conservation Districts Program

Cooperating Associations and Parks, Environment Canada ***
Form of assistance: $250 000 in project transfer payments to be distributed nationally, annually.

Target: to support the natural and cultural heritage objectives of the Canadian Parks Service.

Eligibility criteria: for newly-formed, non-profit, incorporated, non-governmental and essentially voluntary organizations; contributions intended to help organization become operational, then self-sufficient; projects should be related to park themes that generate revenue while providing a service to the public.

Deadline: December

Contact:
The Canadian Parks Service
Cooperative Activities
10 Wellington Street
Hull, Quebec K1A 0H3
Tel.: (819) 994-5125

Critical Wildlife Habitat Program *****
Form of assistance: financial incentives to replace lost incomes of landowners who change land use to benefit wildlife, possible land purchasing.

Target: acquisition, protection, and development of essential habitat for rare or endangered species, nesting habitat, biological diversity; the identification of tall or mixed prairie, for which exceptional wildlife land may be purchased.

Eligibility criteria: land must be suitable.

Deadline: none.

Contact:
Critical Wildlife Habitat Program
Wildlife Branch
Box 24, 1495 St. James Street
Winnipeg, Manitoba R3H 0W9
Tel.:(204) 945-0135

Environmental Achievement Awards - non-profit organization *
Form of assistance: not specified

Target: to honour people and organizations working to protect and restore the environment.

Eligibility criteria: for non-government, non-profit groups that focus on conservation, wildlife, energy issues, toxic chemicals, or any other concern central to improved environmental quality, or has developed a program that deals with an environment-related topic.

Deadline: March 22

Contact: Environment Canada
Enquiry Centre
351 St. Joseph Boulevard
Place Vincent Massey, 6th floor
Hull, Quebec K1A 0H3
Tel.:(819) 997-2800

Environmental Partners Fund ****
Form of assistance: up to $200 000 over three years, 50% of total project cost (volunteer time can count as contribution).

Target: to establish partnerships for the good of the environment, and to help local groups take action in protecting, preserving, enhancing and restoring the environment at the community level.

Eligibility criteria: projects should be innovative, community-oriented, and aimed to protect, preserve, restore, or enhance the environment.

Deadline: June 1, December 1.

Contact:
Environment Canada
National Director
Environmental Partners Fund
Corporate Policy Group
Birks Building
107 Sparks Street, 2nd floor
Ottawa, Ontario K1A 0H3
Tel.:(613) 952-9449

Green Plan (program soon to be named) *****
Form of assistance: to be determined.

Target: sustainable farming practices.

Eligibility criteria: prepare a proposal based on the farming for tomorrow format.

Deadline: none yet.

Contact:
Erminio Caligiuri
Manager, Manitoba Regional Division
1 Wesley Avenue, suite 401
Winnipeg, Manitoba
Tel.: 983-3116

HELP (Habitat Enhancement Land Use Program) *****
Form of assistance: annual payments, 5-7 years; incentive payments; technical assistance, materials.

Target: preserve wildlife habitat; establish nesting cover, permanent forage on saline soil; improve wildlife habitat; prairie pothole region; might be amalgamated with the Manitoba Prairie Care program.

Eligibility criteria: HELP projects will be assessed on their capability to meet waterfowl habitat criteria relating to wetland diversity, brood water and upland nesting cover.

Deadline: none listed.

Contact:
Herb Goulden
Manager
HELP Project
Wildlife Branch, Department of Natural Resources
Brandon, Manitoba R7A 1L9
Tel.: 726-6444

Manitoba Conservation Districts *****
Form of assistance: annual provincial grants, municipal levies, landowner contributions, various external sources; $3.5 million annually in six Districts.

Target: to assist in developing and delivering rural conservation programs, primarily on a watershed basis.

Eligibility criteria: landowners must be within a Conservation District; specific criteria vary according to programs and Districts.

Deadline: none listed.

Contact:
Phil Weiss
Resource Planner
Conservation Districts Authority
711-330 Graham Avenue
Winnipeg, Manitoba R3C 4A5
Tel.: (204) 945-0971

Manitoba Habitat Heritage *****
Form of assistance: 5 year agreements; $8/acre/year, maximum $1,000/landowner/year.

Target: to provide permanent protection of critical wildlife habitats through land acquisition; to provide financial incentives to maintain existing habitat; to promote/fund projects that improve wildlife values of land; to assist organizations .

Eligibility criteria: Priority is given to lands situated south of P.T.H. #16 and west of the Red River; priority to leasing is given to lands that are vulnerable to development for agricultural use.

Deadline: none listed.

Contact:
Peter Hildebrand
Habitat Specialist
Wildlife Branch
1495 St.James Street
Winnipeg, Manitoba R3C 0W9
Tel.: 945-7760

Manitoba Heritage Marsh Program *****
Form of assistance: land acquisition; water control structures.

Target: to conserve, manage and develop some of the most significant marshes; marshes threatened by land use.

Eligibility criteria: large marshes.

Deadline: none listed.

Contact:
Marilyn Latta
Naturalist's Society
62 Glenthorne Crescent
Winnipeg, Manitoba R2M 2R4
Tel.: 253-9245

Manitoba Prairie Care Delayed Hay Cutting ****
Form of assistance: $7 per acre enroled in the program; 5 to 7 year agreements.

Target: land used by ground nesting waterfowl; southwestern lands are favored.

Eligibility criteria: land must be associated with wetland which is also protected.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Direct Seeding ****
Form of assistance: $5,000 per direct seeding unit per year for three years.

Target: to reduce soil erosion, improve water storage, and improve nesting habitat; southwestern lands are favored.

Eligibility criteria: participants must follow farming guidelines.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Forage Establishment Assistance ****
Form of assistance: provides a seed voucher and moneys up to $20 per acre, combined.

Target: to improve soil conditions, reduce erosion, and improve wildlife habitat; southwestern lands are favored.
Eligibility criteria: land must be associated with wetland, and participants must follow farming guidelines.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Habitat Land Lease ****
Form of assistance: covers costs necessary to develop and maintain suitable perennial cover on leased sites in addition to paying the annual lease fee.

Target: suitable land is leased for management as wildlife habitat; southwestern lands are favored.

Eligibility criteria: land associated with wetland that was in idle perennial cover.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Land Purchase ****
Form of assistance: purchase of land.

Target: land with a high capability for waterfowl and other wildlife; land within high priority townships; southwestern lands are favored.

Eligibility criteria: preferred lands are 40-160 acre parcels, relatively weed-free, marginal, and with a ratio of upland acres to water acres within the range of 1:1 to 5:1.
Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Planned Grazing Systems **
Form of assistance: ten-year agreements with a livestock producer to provide the materials for the grazing system's interior fences; may include help establishing tame forages.

Target: integration of grazing and waterfowl habitat management; southwestern lands are favored.

Eligibility criteria: land associated with wetland that is grazed.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Reduced Tillage Fallow **
Form of assistance: provides herbicide or assistance up to $10 per acre to offset program costs, 160 acres maximum per landowner.

Target: to entice farmers to try reduced tillage/herbicide summer fallowing; help reduce erosion, conserve soil moisture and provide nesting cover; southwestern lands are favored.

Eligibility criteria: grazing and herbicide application guidelines must be followed.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Manitoba Prairie Care Stubble Mulch Fallow **
Form of assistance: provides up to $5,000 per year in a two-year agreement to help lease a wide-blade cultivator.

Target: using a wide-blade cultivator to control weeds if summer fallowing is necessary; reduce erosion, retain moisture, provide nesting cover for waterfowl; southwestern lands are favored.

Eligibility: must follow implementation guidelines.

Deadline: none listed.

Contact:
Killarney NAWMP Office
405 Broadway/P.O. box 1240
Killarney, Manitoba R0K 1G0
Tel.:(204) 523-7567 Fax:(204) 523-8856

Marjorie and Gerald Bronfman Foundation ***
Form of assistance: grants.

Target: conservation.

Eligibility criteria: only to registered charitable organizations.

Contact:
The Marjorie and Gerald Bronfman Foundation
1245 rue Sherbrooke ouest, bureau 1700
Montreal, Quebec H3G 1H4

Molson Companies Donations Fund ***
Form of assistance: grants.

Target: environment.

Eligibility criteria: organization must be registered with Revenue Canada; good for special projects, operating funds, emergency funds, and scholarships.

Deadline: none listed.

Contact:
Molson Companies Donations Fund
40 King Street West, suite 3600
Toronto, Ontario M5H 3Z5

MWF Habitat Foundation Habitat Trust *****
Form of assistance: will sometimes purchase land; incentives toward soil conservation.

Target: preservation of critical habitat in Manitoba, and research, education and involvement in sustainable development.

Eligibility criteria: any program or property which falls within the mandate of the Foundation will be eligible.

Deadline: none listed.

Contact:
Randy Bean
MWF Habitat Foundation Inc.
1770 Notre Dame Avenue
Winnipeg, Manitoba R3E 3K2
Tel.:(204) 633-5967 Fax:(204) 632-5200

Noyes Foundation, Inc. **
Form of assistance: grants.

Target: Environment, environmental resources, water, agriculture, environmental problems, pollution, conservation; to prevent irreversible damage to natural resources; sustainable agriculture.

Eligibility criteria: good for special projects, seed money, and research projects.

Deadline: December 1, June 1 for letters of inquiry.

Contact:
Noyes Foundation, Inc.
16 East 34th Street
New York, NY USA 10016

Pew Charitable Trusts **
Form of assistance: grants.

Target: conservation, environment, environmental resources, environmental problems; improving the quality of life.

Eligibility criteria: good for research projects, operating funds, matching funds, seed money, program support, continuing support, and special projects.

Deadline: none listed.

Contact:
Pew Charitable Trusts
3 Parkway, suite 501
Philadelphia, PA USA
19102-1305

Rockefeller Brothers Fund **
Form of assistance: grants.

Target: conservation; counter world trends of resource depletion.

Eligible expenses: good for seed money, special projects, matching funds, continuing research, technical assistance, endowment funds, consulting services, and exchange programs.

Deadline: none.

Contact:
Rockefeller Brothers Fund
1290 Avenue of the Americas
New York, NY USA 10104

Rockefeller Foundation **
Form of assistance: grants.

Target: science-based international development in agriculture and the global environment.

Eligibility criteria: good for research projects, special projects, and matching funds.

Deadline: none listed.

Contact:
Rockefeller Foundation
1133 Avenue of the Americas
New York, NY USA 10036

Special Conservation Fund ****
Form of assistance: grants from lotteries fund; future funding to be determined; maximum $25,000 per year per project.

Target: to encourage community projects that sustain and enhance resource productivity and environmental quality; tree planting, wetland conservation, fish and wildlife habitat restoration, small scale water conservation.

Eligibility criteria: non-profit organizations and associations; conservation, rehabilitation, resource management projects are preferred; cost-sharing.

Deadline: none listed.

Contact:
Bob Sopuck
Executive Director
Sustainable Development Unit
305-155 Carlton Street
Winnipeg, Manitoba R3C 3H9

Wildlife Habitat Canada Research Program **
Form of assistance: grants.

Target: to discover new facts that can be applied directly or indirectly to enhancing, developing or protecting wildlife habitat in Canada.

Eligibility criteria: new, effective, practical, scientific, innovative conservation techniques that retain, restore, or enhance wildlife habitat in Canada.

Deadline: August 1.

Contact:
Wildlife Habitat Canada
Director of operations
1704 Carling Ave., ste 301
Ottawa, Ontario K2A 1C7
Tel.:(613) 722-2090 Fax:(613) 722-3318

Wild West Program **
Form of assistance: various.

Target: to mount demonstration projects for the recovery of endangered species; to increase public awareness and promote cooperative conservation projects.

Eligibility criteria: projects must involve identification, research, protection, or prairie ecosystem conservation.

Deadline: none listed.

Contact:
World Wildlife Fund Canada
60 St.Clair Ave. E., Suite 201
Toronto, Ontario M4T 1N5
Tel.: (416) 923-8173

<u>Science and Technology</u>

Natural Sciences and Engineering Research Council - NSERC *
Form of assistance: scholarships and fellowships.

Target: to support and promote excellence in research, assist graduate students, link universities and communities, and develop qualified manpower.

Eligibility criteria: awarded on the basis of high scholastic achievement and evidence of research skill.

Deadline: none listed.

Contact:
Research Manpower Programs Directorate
Natural Sciences and Engineering Research Council
200 Kent Street
Ottawa, Ontario K1A 1H5
Tel.:(613) 995-5521

Science Culture Canada ***
Form of assistance: up to 50% of the entire budget, from $5,000 to $60,000 in annual national competitions; general or youth core funding is available for long term projects.

Target: to increase general public awareness and understanding of scientific and technological achievements and potential, and to improve communications between scientists and non-scientists.

Eligibility criteria: formally constituted organizations engaged in projects that reflect Science Culture Canada objectives, and that have other income.

Deadline: project funding, April 15 and October 15; core funding, April 15.

Contact:
Programs Officer
Supply and Services Canada
Science Programs Branch
Science Culture Canada
12C1, Phase III
Place du Portage
Hull Quebec K1A 0S5
Tel.:(819) 956-1772

Water Management

Donner Canadian Foundation **
Form of assistance: grants.

Target: water.

Eligibility criteria: preference given to innovative project with extensive impact; research projects, special projects, matching funds and seed money.

Deadline: ten weeks before board meetings.

Contact:
Donner Canadian Foundation
402-212 King Street West
Toronto, Ontario M5H 1K5

On-Farm Water Management *****
Form of assistance: for $60 per quarter section, topographical information and proposed design elevations are furnished.

Target: to help farmers design water conveyance and control.

Eligibility criteria: agricultural producers.

Deadline: none listed.

Contact:
George Klassen
Manitoba Agriculture
915-401 York Avenue
Winnipeg, Manitoba R3C 0P8
Tel.: 945-1926

Rural Water Development *****
Form of assistance: technical advice; unit cost allowances or one-third of eligible costs (whichever is less); maximum is $1,650 per project, to $2,200 for irrigation projects; 30% of costs not shared by PFRA; abnormal costs (construction and mechanization).

Target: to secure water supplies; to sustain the productivity of soils.

Eligibility criteria: applicants must be farmers/ranchers, obtain approval before construction; projects must meet standards and specifications; for irrigation, soil and water must be suitable; groups of farmer/ranchers are eligible.

Deadline: none listed.

Contact:
Gerry Beaubier
PFRA Soil & Water Conservation Service
P.O. Box 275, 244-10th Street
Brandon, Manitoba R7A 5Z2
Tel.: (204) 726-7590

Science Subvention Program ***
Form of assistance: research subventions.

Target: to promote studies in fisheries, marine and aquatic research.

Eligibility criteria: must relate to husbandry and development of fisheries resources, preservation and improvement of fish habitat, and the understanding of aquatic ecosystems. Preference given to programs related to changes in fish populations with harvesting, effect of physical and chemical parameters, environmental factors, and human intervention, aquaculture research, improvement of fish quality, harmful algae, and economic and commercial impacts.

Deadline: December 14.

Contact:
Department of Fisheries and Oceans
The Science Subvention Program
Physical and Chemical Sciences Directorate
1280 - 200 Kent Street
Ottawa, Ontario K1E OE6
Tel.:(613) 990-0306

Wildlife

Endangered Species Recovery Fund ****

Form of Assistance: matching grants, $5-10,000 per year, up to 2/3 project costs (other 1/3 from any source, may be in kind)

Target: assist recovery of endangered, threatened, vulnerable, or extirpated native plants or animals. Practical, applied work reflecting national significance, such as supporting Recovery Teams, preparing Recovery Plans, re-introduction and captive breeding, practical field work, and public awareness.

Eligibility criteria: NGO's only,

Deadlines: Feb. 15, May 1, Oct 1, (1992); Jan 1, Apr. 1, July 1, Oct. 1, (1993 onward).

Contact:
Endangered Species Recovery Fund
Executive Co-ordinator
World Wildlife Fund
90 Eglington Ave. East, Ste 504
Toronto, Ont. M4P 2Z7.
Tel.:(416) 489-8800 Fax:(416) 489-3611

Murphy Foundation Incorporated *****
Form of assistance: grants.

Target: conservation, wildlife; wildlife and wildfowl and the management thereof.

Eligibility criteria: good for seed money, wildlife preservation and research; organizations registered with Revenue Canada.

Deadline: November 10.

Contact:
Murphy Foundation incorporated
167 Lombard Ave., suite 919
Winnipeg, Manitoba R3B 0V3

Waterfowl Damage Compensation (if needed)
Form of assistance: in 90/91, up to 80% of the MCIC established crop value.

Target: to reduce financial hardship of agricultural producers suffering waterfowl damage to crops.

Eligibility criteria: agricultural producers suffering damage. Some crops are not eligible.

Deadline: none listed.

Contact:
Local MCIC office.

Waterfowl Damage Prevention (if needed)
Form of assistance: assistance in scaring waterfowl from farm crops and by establishing alternate feeding for waterfowl in chronic damage areas.

Target: to assist agricultural producers in preventing crop damage caused by waterfowl.

Eligibility criteria: agricultural producers suffering damage.

Deadline: none listed.

Contact:
Gordon Graham
Wildlife Branch
1495 St.James Street
Winnipeg, Manitoba R3H 0W9
Tel.: (204) 945-7749

Wildlife Toxicology Fund ***
Form of assistance: grants, up to 50% of project costs.

Target: to provide high quality information to protect wildlife from toxic chemicals in the environment, and to enhance and develop private sector expertise, to stimulate joint funding of research projects.

Eligibility criteria: laboratory or field work, organization must provide overhead costs; proposals must be practical, applied research related to the effects of agricultural, forestry, and/or industrial pollutants on wildlife, success of mitigation, use of wildlife as environmental indicators, or toxicity pathways; wildlife includes plants, invertebrates, and all vertebrates.

Deadline: none.

Contact:
Executive Co-ordinator
Wildlife Toxicology Fund
60 St. Clair Avenue East, ste 201
Toronto, Ontario M4T 1N5
Tel.:(416) 923-8173

Work Development

Challenge ****
Form of assistance: minimum wage per participant for non-profit employers, student business loans, workshop financing, cost shared grants (up to $200 000 over 4 years).

Target: to give students work experience, and to create jobs.

Eligibility criteria: students must be returning to school full time.

Deadline: March.

Contact:
Canada Employment Centre

Job Development Program *
Form of assistance: wage subsidies, grants for overhead and training, up to $10 000 for special renovations for the disabled.

Target: job creation, skills training and work experience development.

Eligibility criteria: participants must be unemployed at least 3 months, or at risk of long-term unemployment. Hiring employment disadvantaged people is encouraged.

Deadline: none listed.

Contact:
Canada Employment Centre

Labatt's People in Action **
Form of assistance: funds for summer projects which assist Canada's disadvantaged, minimum wage and mandatory benefits for 10 weeks, up to 5 students per project.

Target: career related summer employment for students, and to assist Canada's disadvantaged or directly confront societal concerns.

Eligibility criteria: non-profit organizations hiring post-secondary students; working with disadvantaged Canadians on projects which indirectly address grave social concerns.

Deadline: mid-April.

Contact:
John Labatt Ltd.
451 Rideout Street North
P.O. Box 5870
London, Ontario N6A 5L3
Tel.: (519) 667-7552

National Welfare Grants-special competition community economic development *
Form of assistance: unspecified grants

Target: short term projects that enhance a community's well-being through increased economic activity.

Eligibility criteria: proposals must identify, describe and compare the types/forms of Community Economic Development initiatives that attempt to integrate both social and economic objectives.

Deadline: mid-January.

Contact:
National Welfare Grants
Brooke Claxton Building
Ottawa, Ontario K1A 1B5
Tel.:(613) 957-2901 Fax:(613) 954-1821

Skill Shortages Program ***
Form of assistance: up to 60% of regular weekly wages paid up to $7.50/hr and a weekly maximum of $300 per participant. Up to $20 per participant hour for off-the-job training costs. Up to $10 000 per disabled participant to help defray special costs. Relocation and travel assistance.

Target: to provide assistance to cover part of training costs in areas of current or potential occupational skill shortages.

Eligibility criteria: employees are existing or newly hired workers capable of undertaking designated occupational training.

Deadline: none listed

Contact:
Canada Employment Centre

Skill Investment ***
Form of assistance: grants to a training trust fund (50% 1st year, 33.3% 2nd year, 33.3% 3rd year, up to $400 000 total); financial aid to employers who train or retrain workers (up to 60% of wages during off-the-job training, 25% during on-the-job-training), up to $7.50/hr, $300/week per participant, $20/participant hour for training costs (off-the-job training), up to $10 000 for disabled special costs; travel and relocation assistance (up to $5 000).

Target: to provide assistance to employees whose employment is subject to change or elimination due to technological or market changes.

Eligibility criteria: trust funds set up by employee associations independently or with an organization, with a board of trustees for administration of the fund; minimum training time of 80 hours.

Deadline: none listed.

Contact:
Canada Employment Centre

Appendix C: Buffalo Creek Public Meeting Agenda

BUFFALO CREEK MULTIPLE USE RESOURCE PLAN

PUBLIC MEETING: NOVEMBER 18, 1991, 7:30 pm

Rhineland Pioneer Center, Altona

AGENDA

1- Pierre Johnstone - introductions

2- Jake Enns - background information

3- Pierre Johnstone -

i) how study group will proceed, 3 steps
ii) what has been accomplished so far
iii) how community will be involved

4- Guest speaker - Les McEwan, President Deerwood Soil & Water Management Association

5- Pierre Johnstone - questions and answers
- next meeting December 2, 7:30, what we want from the community at this meeting

BUFFALO CREEK MULTIPLE USE RESOURCE PLAN

PUBLIC MEETING: DECEMBER 2, 1991, 7:30 PM

Rhineland Pioneer Center

AGENDA

1.- Introduce Multipurpose Rehabilitation of Buffalo Creek

2 - Present Study Plan

3 - Tall Grass Prairie

4 - The Buffalo Creek Watershed Ecosystem

5 - Soils and Vegetation

6 - Wildlife

7 - Recreation/ Heritage

8 - Land Requirements

9 - Coffee Break

10- Poster Session/Questions

11- Discussion/Concerns

BUFFALO CREEK MULTIPLE USE RESOURCE PLAN

PUBLIC MEETING: FEBRUARY 3, 1992, 7:30 pm

Rhineland Pioneer Center, Altona

AGENDA

1- Pierre Johnstone

i) introductions
ii) recap project
iii) current status

2- Calvin McLeod

i) overview of existing conditions
ii) questions/comments re:existing conditions report

3- Sherry Dangerfield

i) explanation of the objective/option ranking process
ii) separation into work groups

4- Coffee Break

5- Pierre Johnstone

i) summary of responses
ii) discussion
iii) describe next phase
iv) announce next meeting date

BUFFALO CREEK MULTIPLE USE RESOURCE PLAN

PUBLIC MEETING: MARCH 9, 1992, 7:30 pm

Shoney's Restaurant in the Altona Mall

AGENDA

1- Pierre Johnstone

i) introductions
ii) recap project
iii) summary of Second Report
iv) discussion/questions on Second Report

2- Sherry Dangerfield

v) description of management plan
vi) discussion/questions on management plan

The Red River Valley Echo

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Team studies Buffalo Creek

• by Elmer Heinrichs

Buffalo Creek was described as a "wonderful resource" for recreation by a student study group at a meeting held in Altona last week.

The Buffalo Plains Soil & Water Management Association has initiated a study on preservation and proper management of the natural water and organized the meeting to seek public input on multiple use of the creek.

The student study team, headed by University of Manitoba professor John Sinclair, is studying a 16-kilometer segment of the channel running from section 31-2-1W to section 1-2-2W.

Recreational uses proposed by Sinclair's group include swimming and fishing.

The study area was a tall grass prairie 12,000-15,000 years ago. It was suggested that partial restoration of tall grass along the Buffalo Creek was a possibility.

The study group told 20 farmers in attendance that a green strip could be developed into a hiking trail or used as an outdoor classroom.

Farmers questioned how a green buffer strip with animal life could co-habit with agricultural management. Farmers were told these concerns would be addressed in the second part of the study.

Jake Heppner, who farms along the creek, complained about problems with blackbirds and beavers.

Jake Enns said he spent over $1,000 for bangers and shotgun shells to protect a sunflower field along the creek from blackbirds. "It's a staging area, and they feed off farmers' fields in the fall," said Enns.

As the study progresses, the study team will meet with farmers to discuss concerns they might have.

Students Cal McLeod, Sherry Dangerfield and Pierre Johnstone reported on the Buffalo Creek watershed ecosystem, soils and vegetation, wildlife, recreation and heritage and discussed land requirements.

Johnstone says a combination of soil siltation, salinization, chemicals and dying fish populations are reasons for developing a management plan for Buffalo Creek.

Benefits of development to retain water, as proposed in a plan by the Lake Aggasiz Irrigation Association would be better aeration, less algae growth and reduced fish kill. On the negative side, chemicals and sediment might stay rather than move out with larger flows.

Buffalo Plains S & W Assoc. shelterbelt program continues

Jan 21 1992

• by Elmer Heinrichs

Another 30.75 miles of shelterbelts were planted in 1991, along with five and a half miles of replants, said the manager of Buffalo Plains Soil & Water Management Association. The association held its third annual meeting Jan. 14.

One hundred and seven miles of trees were planted in 1990.

"Our crew hoed 145 miles of trees in often wet conditions," Darrell Reschke told the annual meeting attended by about 40 members.

On shelterbelt renovation, it was noted that it was up to the farmer to dispose of trees and branches, but members expressed an interest in purchasing a wood chipper.

Rabbit damage to new shelterbelts has been quite severe. Reschke said he's noticed that putting sunflowers on both sides of tree rows to trap snow was successful in keeping the rabbits off.

The use of a quick-disk for mechanical weed control may be tried next year if local manufacturer Elmer's Welding can put one together at the right price.

Green plan

Manitoba Agriculture's Carman soil conservationist Peter Entz introduced Canada's Green Plan on achieving environmental sustainability.

The plan's seven areas include promoting soil conservation, providing a clean water supply, integrating agriculture and wildlife, managing waste and pollution, protecting genetic resources, climate change and agriculture and dealing with pesticides.

Farming For Tomorrow program is funded by a joint federal provincial soil conservation agreement. Entz says on-farm soil conservation has an allocation of $6.4 million, with about a third going directly to soil and water associations.

Along with the Buffalo Creek study, $44,000 was allocated for a study on irrigation development, and establishing storages for water use.

Entz suggested there could be local direction in what could be included in the Green Plan, such as practical research to support on-farm activities, for example, residue management in special crops.

"Productivity centers would be another possibility for a group such as yours," added Entz.

Buffalo study

University of Manitoba students Sherry Dangerfield and Calvin McCleod reported to members on progress to date on the 16-km Buffalo Creek study extending northward from the Altbergthal district.

The four-member study team has looked at the existing conditions, explored alternatives, and will be meeting with area residents in the Rhineland Pioneer Centre to seek community input and decision making on

See Buffalo Page 2

Buffalo From page 1

February 3 at 7.30 p.m.

The study has looked at land and water uses, and recreation, and will look at developing a management plan after identifying community options obtained through feedback Feb. 3, said Dangerfield.

Establishment of a narrow 10-metre or a larger 200-metre (660 foot) buffer to support duck and wildlife habitat on both sides of the creek will be options presented to the meeting, she said.

Water management seen as a priority

Feb 11 1992

• by Elmer Heinrichs

Landowners and other interested persons met with the Natural Resources Institute study team last week to discuss the team's multiple use resource plan for the Buffalo Creek.

About 20 people attended the meeting. They were divided into four work groups to consider, discuss and priorize the five objectives set for the study team by the Buffalo Plains Soil & Water Management Association.

Another meeting tentatively set for March 3 will give a shorter list of options, with emphasis on water management strategies, seen by the meeting as the main priority.

The study team, headed by University of Manitoba professor John Sinclair, is developing a management plan for a 16-kilometre portion of the Buffalo Creek, west and northwest of Altona.

The study team of Sherry Dangerfield, Calvin McLeod and Pierre Johnstone began work last fall to identify, inventory and map existing resources and resource uses in the seven-section study area. The final report is due by March 31, 1992.

The first phase of the study also identified the most promising options for improvement and rehabilitation of the study area given the existing conditions.

Currently, the team is seeking to develop a clear and concise plan acceptable to all parties for the rehabilitation and management, including a series of management options.

Describing existing conditions of the study area, the team says the land is very productive and is currently being farmed extensively, in some areas to the creek's edge. Where natural vegetation exists, it consists of grasses, shrubs, willow, with some deciduous trees.

The study area is location within the ecological area designated grassland region, and prior to non-aboriginal settlement was tall prairie grass.

The study outlines the creek's varied past and present land, water and recreation uses, and projects some possibilities for expanded uses. It also gives background on the Native and European settlement of the area.

It also analyzed the natural systems, the physical characteristics such as topography and geology, hydrology, soils and climate, and the biological resources of vegetation, wildlife and fisheries.

Issues seen

The more serious issues seen by the meeting before going in to group discussions were pollution, fish kills, and damage of sunflower crops by the red-winged blackbirds.

Other objectives include improving wildlife habitat, preventing erosion, providing a filter strip for agricultural pollutants and providing a public green space for the community.

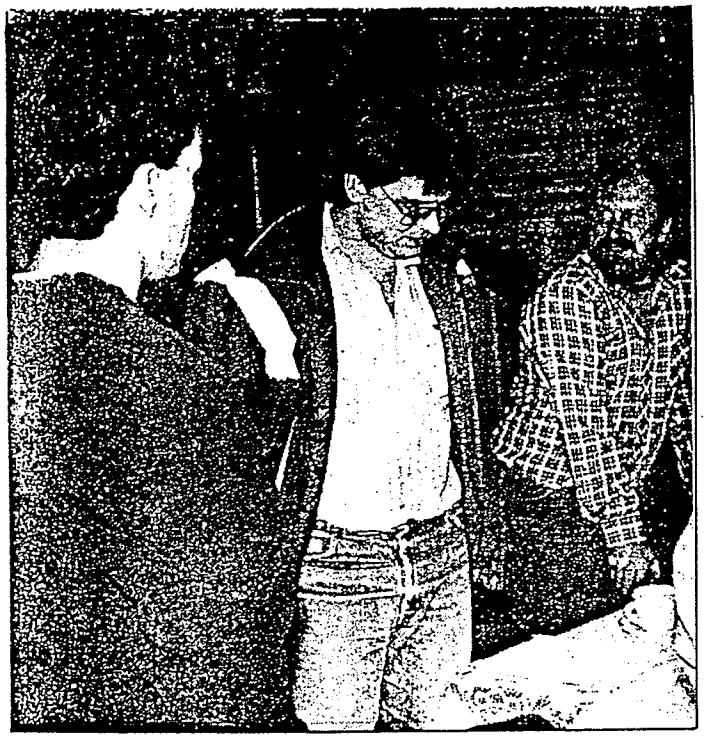
In one discussion group participants noted all objectives are inter-related and that discussions affecting one objective also affect other objectives.

They cited the example of how the creation of a buffer strip to improve water quality also reduces erosion, filters out pollutants, improves wildlife and aquatic habitat and provides green space.

The team's final report will include detailed management plans, and funding options for Buffalo Plans to consider.

Water improvement strategy recommended

Mar 24 1992



ELMER HEINRICHS/Echo

Calvin McLeod (right), member of the Buffalo Creek study team, talks to residents about proposals for a creek management plan.

• by Elmer Heinrichs

The first objective of the proposed management plan for the Buffalo Creek would be implementing water management strategies to improve water quality, water supply and flows.

About 20 people attended the final public meeting by the Natural Resources Institute study team which has been drafting the management plan for a 16-kilometre stretch of the Buffalo Creek.

The team of University of Manitoba students is headed by Dr. John Sinclair.

Sherry Dangerfield said short-term water management strategies would be alternate pastures to control livestock access to the creek, and water control structures such as pools or ripples.

She said a long-range action would be establishing a vegetation buffer strip adjacent to the creek.

To guide development

The team in its final report, said Dangerfield, will prepare a detailed plan to guide the Buffalo Creek initiative over several years of implementation.

It will provide a clear, concise direction for all stages of development, reflect local interests, be easily understandable and include a budget, schedule, potential funding sources and desired policies on land and water use.

Discussion turned to the vegetation buffer strip which could improve water supply and flow, and water quality. It allows more water to enter the soil, then stores, cleanses and slowly releases water extending the supply and summer flow in the creek.

Team member Calvin McLeod indicated that the width of the buffer might depend on how much land could be bought. The land up to the creek itself is now all privately owned by farmers.

Buffalo Plains president Jake S. Enns pointed out however that it may have to be wide enough to meet minimum requirements of potential funding groups such as Ducks Unlimited, and programs such as the Endangered Species Fund.

Mar 24
1992 (cont'd)

The general objective of the Buffalo Plains Soil & Water Management Association for this project is to develop and implement a multiple resource use approach for the development and management of the Buffalo Creek periphery lands.

Habitat wildlife biologist Pat Rakowski,working with the Canadian Wildlife Service, suggested that the local body might want to apply to the federal government's Environmental Partners Fund. It offers limited financial input toward local projects which involve making some physical changes, he explained.

Enns added as well that the Sill Foundation has expressed an interest in a project which would establish a green area.

While there is no evidence that chemicals are causing damage locally, "environmentally it would be a plus if we could eliminate (filter) agricultural chemicals from runoff," suggested Enns.

Dangerfield said a local management group would have to work with local livestock owners to seek a solution to animals affecting water quality.

Use of green space

She also suggested that in public green space and recreation a site plan might provide for viewing areas, interpretative signs and initiate an archaeological research plan.

A second stage might involve demonstration sites, a trail through the buffer strip with key features, such as endangered species receiving note. Over the long term - perhaps 75 years down the road - continued development of recreation might include an interpretative centre, centered on the Mennonite people, and perhaps on the aboriginal people, said Dangerfield.

Shelterbelts surrounding a buffer strip would be expected to leave enough headland space, perhaps 25 to 30 feet, for farm machines to turn around, while still keeping out ATVs.

Questions of allowing hunting while encouraging recreation and use of green areas would have to be closely weighed by a management group. Some merits to continued trapping were seen.

Dangerfield also suggested that it would be important "to work with local wildlife groups giving special attention to endangered species, protecting the burrowing owls."

The final plan will also outline options on land purchase possibilities and funding sources.

Appendix E: Existing Wildlife at Buffalo Creek

Mammals: Common Name (*Scientific name*)	Uncommon	Common
American Badger (*Taxidea taxus*)	X	
American Beaver (*Castor canadensis*)	X	
American Mink (*Mustela vison*)	X	
American Porcupine (*Erethizon dorsatum*)	X	
American Red Squirrel (*Tamiasciurus hudsonicus*)		X
Cottontail (*Sylvilagus spp.*)	X	
Coyote (*Canis latrans*)		X
Deer Mouse (*Peromyscus spp.*)	X	
Gapper's Red-backed Vole (*Clethryonomys gapperi*)	X	
Gray Squirrel (*Sciurus carolinensis*)		X
House Mouse (*Mus musculus*)	X	
Meadow Jumping Mouse (*Zapus hudsonius*)	X	
Meadow Vole (*Microtus pennsylvanicus*)	X	
Muskrat (*Ondatra zibethicus*)	X	
Northern Pocket Gopher (*Thomomys talpoides*)	X	
Prairie Long-Tailed Weasel (*Mustela frenata*)		X
Raccoon (*Procyon lotor*)	X	
Red Fox (*Vulpes vulpes*)	X	
Shrew (*Sorex spp.*)	X	
Star-nosed Mole (*Condylura cristata*)	X	
Striped Skunk (*Mephitis mephitis*)	X	

White-tailed Deer (*Odocoileus virginianus*)		X
White-tailed Jackrabbit (*Lepus townsendsii*)	X	
13-Lined Ground Squirrel (*Spermophilus tridecemilineatus*)	X	
Birds:		
American Avocet (*Recuvirostra americana*)		X
American Coot (*Fulica atra*)	X	
American Crow (*Corvus brachyrhynchos*)	X	
American Goldfinch (*Spinus trustus*)		X
American Kestrel (*Falco sparverius*)	X	
American Robin (*Turdus migratorius*)	X	
Barn Swallow (*Hirundo rustica*)	X	
Belted Kingfisher (*Megaceryle alayon*)		X
Black-billed Magpie (*Pica pica*)	X	
Black Duck (*Anas rubripes*)		X
Blue-winged Teal (*Anas discors*)	X	
Blue Jay (*Cyanocitta cristata*)		X
Brown-headed Cowbird (*Molothrus ater*)		X
Brown Thrasher (*Toxostoma rufum*)	X	
Burrowing Owl (*Athene cunicularia*)		X
Canada Goose (*Branta canadensis*)	X	
Canvasback (*Aythya valisineria*)		X
Catbird (*Dumetella carolinensis*)	X	
Chipping Sparrow (*Spizella passerira*)	X	
Common Flicker (*Colaptes auratus*)	X	
Common Grackle (*Quiscalus guiscula*)	X	

Common Yellowthroat (*Geothlypis trichas*)	X	
Common Redpoll (*Carduelis flammea*)	X	
Dickcissel (*Spiza americana*)		X
Double-crested Cormorant (*Phalacrocorax auritus*)	X	
Downy Woodpecker (*Dendrocopos pubescens*)	X	
Eastern Kingbird (*Tyrannus tyrannus*)		X
European Starling (*Sturnus vulgaris*)	X	
Gadwall (*Anas strepera*)		X
Grasshopper Sparrow (*Ammodramus savannarum*)	X	
Great Blue Heron (*Ardea herodias*)		X
Great Gray Owl (*Strix nebulosa*)		X
Great Horned Owl (*Bubo virginianus*)	X	
Green-winged Teal (*Anas carolinensis*)		X
Hairy Woodpecker (*Dendrocopos villosus*)	X	
Horned Lark (*Eremophila alpestris*)	X	
Killdeer (*Charadruis vociferus*)	X	
Loggerhead Shrike (*Lanius ludovicianus*)		?
Mallard (*Anas platyrhyncus*)	X	
Mourning Dove (*Zenaidura macroura*)	X	
Northern Harrier (*Circus cyaneus*)		X
Northern Pintail (*Anas acuta*)	X	
Pileated Woodpecker (*Dryocopus pileatus*)		X
Red-winged Blackbird (*Agelaius phoeniceus*)	X	
Redhead (*Aythya americana*)	X	
Red-headed Woodpecker (*Melanerpes erythrocephalus*)	X	
Ring-necked Pheasant (*Phasianus colchicus*)		X

Rock Dove (*Columba livia*)	X	
Rough-legged Hawk (*Buteo lagopus*)		X
Ruffed Grouse (*Bonasa umbellus*)		X
Sandhill Crane (*Grus canadensis*)		X
Scaup (*Aythya affinis*)		X
Sedge Wren (*Cistothorus platensis*)		X
Sharp-tailed Grouse (*Pediocetes phasianellus*)	X	
Snow Goose (*Chen caerulescens*)	X	
Snowy Owl (*Nyctea scandiaca*)		X
Solitary Vireo (*Vireo solitarius*)		X
Upland Sandpiper (*Bartramia longicauda*)		X
Vesper Sparrow (*Pooecetes gramineus*)		X
Western Meadowlark (*Strurnella neglecta*)	X	
Wood Duck (*Aix sponsa*)	X	
Yellow-Headed Blackbird (*Xanthocephalus xanthocephalus*)	X	

Reptiles and Amphibians:

American Toad (*Bufo americanus*)	X	
Northern Leopard Frog (*Rana pipiens*)		X
Painted Turtle (*Chrysemys picta*)		X
Plains Garter Snake (*Thamnophis radix*)	X	
Snapping Turtle (*Chelydra serpentina*)		X
Tiger Salamander (*Ambystoma tigrinium*)	X	
Tree Frog (*Hyla versicolor*)		X

Appendix F: Some Favorite Plants and Grasses for Wildlife at Buffalo Creek

(Barrickman and Chapman 1987; Frank and Woehler 1969; Grigson 1973; Joselyn and Tate 1972; Kirsch and Kruse 1973; Macdonald 1972; McMullen 1987; Merilees 1989; Morgan and Morgan 1992; Petrides 1972; Prairie Farm Rehabilitation Administration undated; Sanderson et al. 1973; Suggett 1991)

Common Name	Scientific Name
Trees and Shrubs	
alder	*Alnus spp.*
ash	*Fraxinus* spp.
aspen	*Populus* spp.
beech	*Fagus grandifolia*
birch	*Betula* spp.
cedar	*Thuja occidentalis*
cottonwood	*Populus deltoides*
crab apple	Pyrus spp.
dogwood	*Cornus stolonifera*
elm	*Ulmus* spp.
hackberry	*Celtis spp.*
hawthorn	*Crataegus spp.*
hazelnut	*Corylus cornuta*
hemlock	*Tsuga canadensis*
holly	*Ilex spp.*
juneberry	*Amelanchier spp.*
lilac	*Syringa vulgaris*
maple	*Acer* spp.
mountain ash	*Pyrus spp.*
mulberry	*Morus rubra*
oak	*Quercus* spp.
persimmon	*Dyospiros virginiana*
pine	*Pinus* spp.
poplar	*Populus balsamifera*
sassafras	*Sassafras albidum*
spruce	*Picea* spp.
sumac	*Rhus spp.*
sweetgum	*Liquidambar*
styraciflura	
walnut	*Juglans spp.*
willow	*Salix* spp.
buffaloberry	*Sheperdia spp.*
cherry	*Prunus spp.*
barberry	*Berberis spp.*
bayberry	*Myrica pensylvanica*
bittersweet	*Celastrus spp.*
blackberry	*Rubus allegheniensis*
buckthorn	*Rhamnus spp.*
raspberry	*Rubus idaeus*
blueberry	*Vaccinium spp.*

cranberry	*Vaccinium spp.*
elderberry	*Sambucus spp.*
firethorn	*Cotoneaster pyracantha*
grape	*Vitis spp.*
honeysuckle	*Lonicers spp.*
rose	*Rosa spp.*
spicebush	*Lindera spp.*
viburnum	*Viburnum spp.*
virginia creeper	*Parthenocissus Quinquefolia*

Grasses and Forbes

alfalfa	*Medicago sativa*
big bluestem	*Andropogon gerardi*
brome grass	*Bromus spp.*
chickweed, field	*Cerastium arvense*
clover	*Petalostemon spp.*
dandelion, false	*Agoseris glauca*
hop	*Humulus lupulus*
indian grass	*Sorghastrum nutans*
knotweed	*Polygonum achoreum*
little bluestem	*Schizachyrium scoparium*
milkweed	*Asclepias syriaca*
oat	*Avena sativa*
red clover	*Trifolium pratense*
sideoats grama	*Bouteloua curtipendula*
smartweeds	*Polygonum spp.*
sorghum	*Sorghum vulgare*
switchgrass	*Panicum virgatum*
thistle	*Cirsium flodmani*
timothy	*Phleum pratense*

Water Plants

arrowhead	*Saggitaria cuneata*
bulrush, common	*Scirpus validus*
burreed	*Sparganium eurycarpum*
cattail	*Typha latifolia*
pondweed	*Potamogeton spp.*
sedges	*Carex spp.*
tapegrass	*Vallisneria americana*
waterlily, scented	*Nymphea odorata*

Appendix G: Expert Assistance

Canadian Wildlife Service
269 Main Street
Winnipeg, Manitoba R3C 1B2
(204) 983-5259

Ducks Unlimited Canada
5- 1325 Markham Place
Winnipeg, Manitoba R3T 4J6
(204) 269-6960

Manitoba Agriculture

Manitoba Museum of Man and Nature
Tel.: (204) 956-2830

Manitoba Naturalists' Society
302-128 James Avenue
Winnipeg, Manitoba R3B 0N8
Tel.: (204) 943-9029

Manitoba Surveys and Mapping
1007 Century Street
Winnipeg, Manitoba R3H 0W4
Tel.: (204) 945-6666

Manitoba Wildlife Branch
1495 St. James Street
Winnipeg, Manitoba R3H 0W9
Tel.: (204) 945-7769

PFRA
Development Services
Box 2906
822, 220 4th Ave. S.E.
Calgary T2G 4X3
Tel.: (403) 292-4901

Prairie Habitats
Box 1 Argyle, Manitoba
R0C 0B0
Tel.: (204) 467-9371

Appendix H: Sample Agreement Forms

NUMBER_____

CONSENT OF ENTRY

TO: TURTLE RIVER WATERSHED
CONSERVATION DISTRICT
STE.ROSE, MANITOBA

I/We_____
of the Post Office of _____in the Province of Manitoba, being the owner(s), tenant(s) or occupier(s) of the following land, namely:

_____

_____

_____

hereby authorize you, your engineers, agents, servants and/or employees with the necessary equipment, to enter into, come upon, or pass through the above described land for the purpose of:

a)_____
b)_____
c)_____
d)_____
e)_____

as you may deem necessary. This consent is made on the understanding that my rights to any compensation are in no way prejudiced should it be decided to acquire the property to which this consent is granted.

In the event the District deems it necessary to acquire any right, title or interest in the said lands, same shall be acquired by separate agreement.

DATED at_____in Manitoba, this_____
day of_____A.D. 19___.

_____ _____
WITNESS OWNER

Manitoba Prairie CARE Lease Rates

Effective 91 10 ~~28~~ 31

1) For Arable Land Converted to Perennial Cover (Seeded DNC):

- 7% of the average rate per arable acre for the quarter-section containing the leased site.

NOTE: This rate would apply to seeded DNC (new or previously-existing plantings) on both upland and interpothole sites where the planting is being managed as nesting cover.

- The average rate per arable acre by quarter-section is available from regional Assessment Branch offices on their report SFL01. It is classification "AL" on that report.

2) For Existing Idle Native Cover:

- Base rate - The greater of $7.00 per acre or 7% of the average rate per non-arable acre on the quarter-section containing the leased site.

Existing idle native cover is land which has not been used for agricultural purposes for three years or more prior to the time of the agreement. The method described in this section should be used to determine the lease rate for all lands fitting that description.

NOTE: The average rate per non-arable acre by quarter-section is available from regional Assessment Branch offices on their report SFL01. It is classification "NL" on that report.

- The base rate is subject to the following modifiers to reflect cover quality:

a) May-condition Robel pole readings:
$\geq$ 2 = good quality cover = no adjustment
1-2 = fair cover = base rate x 70%
$\leq$ 1 = poor cover = base rate x 40%

b) Modifier to account for contiguous blocks of closed-canopy woodland (ie) densely-wooded areas, on a leased site:
- first 20% of site densely-wooded = no adjustment
- next 20% of site densely-wooded = $5/acre
- final 60% of site densely-wooded = no payment

(eg.) 160 acres with 80 acres open, 50 acres densely-wooded and 30 acres of wetlands.

- 80 acres open +	first 20% wooded	= 80 +	(50 x .2)	= 90 x	$7	= $630
	next 20% wooded	=	(50 x .2)	= 10 x	5	= 50
	final 60% wooded	=	(50 x .6)	= 30 x	0	= 0
	Total lease payment					$680

- Where the base rate has been modified because of low Robel pole values, the agreement should include a provision for subsequent inspections so the lease rate can be adjusted as cover quality improves. When low Robel pole values occur as a result of high Poa populations, remedial measures (interseeding,

burn management, etc.) should be considered since it is unlikely idling alone will result in good quality cover.

3) For Idled Pasture or Hayland: This is land which has been hayed or grazed in one or both of the two years immediately preceding the year of the agreement. Lease rates for all lands fitting that description should be established using the method(s) described in this section.

a) For that part of a leased site in seeded forages:

- Base rate - 7% of the average rate per arable acre for the quarter-section ie) (ie) the same rate as seeded DNC.

NOTE: The base rate should then be nodified (if necessary) based on Robel pole readings by the same method used for idled native cover (see Section 2a).

b) For that part of a leased site in non-seeded cover:

- Base rate- $20 per Animal Unit Month (AUM), calculated by the method attached.

(eg.) Assume 320 acres of Waskada clay loam with 210 acres of good quality open upland, 40 acres of dense bush, 30 acres of open bush and 40 acres of wetlands.

- Waskada soil = soil productivity group 3.

- AUM calculation (from Table) for soil productivity group 3

- 210 acres	upland meadow	divide by 1.5 acres/AUM	=	140.0
- 40 "	dense bush	divide by 12 acres/AUM	=	3.33
- 30 "	open bush	divide by 3 acres/AUM	=	10.0
- Total AUM rating			=	153.33

- Lease rate = AUM rating x $20 = 153.33 x $20 = $3066.60

NOTE: The base rate for upland or lowland meadow acres should be modified (if necessary) based on Robel pole readings by the same method used for idled native cover (see Section 2a). The AUM Table adjusts bush acres already, so no modifier is required for wooded acres.

- Where the base rate has been modified because of low Robel pole values, the agreement should include a provision for subsequent inspections so the lease rate can be adjusted as cover quality improves. When low Robel pole values occur as a result of high Poa populations, remedial measures (interseeding, burn management, etc.) should be considered since it is unlikely that idling alone will result in good quality cover.

ANIMAL UNIT MONTH & LEASE CALCULATION

1. Determine the soil type from a soils map or assessment branch field sheet.

2. See the following pages for the forage productivity index of that soil type. If the soil type is not listed, contact the Provincial Agrologist or regional Crown Lands staff.

3. Note the acreages of different cover types on the subject land parcel.

   a) Bush -Density of cover of woody species, not actual size of trees and shrubs, should be considered.
   -Consider degree of shading.

   b) Meadow -Upland consists of native upland grass species only.
   -Lowland consists of lowland species (eg. sedges) only or a mixture of lowland and upland species.

4. Divide the number of acres of each vegetative cover type by the acres required per animal unit month (from the table below) to determine the Animal Unit Month (AUM) rating for each cover type.

Acres Required per AUM

Soil Productivity Group

Cover Type	1	2	3	4	5
Bush					
-Dense	6	8	12	24	48
-Medium	3	4	6	12	24
-Open	1.5	2	3	6	12
Meadow					
-Upland	1	1	1.5	3	6
-Lowland	1	1	1	1	1

5. Total the AUM ratings for each cover type on the subject land parcel.

6. To determine lease rate, multiply the total AUM rating by $20.00.

Note: If the parcel also contains seeded tame forage, the lease rate for the tame forage acres is calculated by using 7% of the assessed value of the land in tame forage.

Source of AUM information - Ag. Crown Land Branch.

Soil Type	Forage Productivity Index Group	Soil Type	Forage Productivity Index Group
Agassiz	3	Chesterfield	3
Alluvium	6	Cayer	6
Almassippi	3	Clarkleigh	3
Altamont	1	Clarksville	3
Altona	2	Crane	6
Arborg	2	Crestview	3
Arden	2	Coulter	1
Arnes	1	Dauphin	1
Arrowhills	4	Davidson	3
Assiniboine	2	Deep Point	6
Badger	5	Darlingford	2
Balmoral	1	Davis Point	2
Baynham	6	Dencross	2
Bede	3	Durban	2
Bell River	3	Dutton	1
Bell Site	3	Duck Mountain	3
Benchard	3	Edwards	1
Benton	4	Egilson	2
Berlo	3	East Bank	4
Beresford	3	Elma	1
Big Lake	2	Emerson	2
Birch Point	2	Erickson	1
Birch River	2	Fairford	3
Birds Hill	4	Favel	4
Birnie	2	Firdale	3
Blackstone	1	Foley	3
Blumstein	3	Fort Garry	2
Brokenhead	1	Frammes	2
Bullhead	6	Fyala	3
Burnside	1	Garson	3
Caliento	4	Glenfields	2
Carrot	1	Glenmoor	2
Carrick	3	Gilbert	3
Carroll	2	Gladstone	2
Cartwright	3	Glenboro	3
Chatfield	4	Gretna	1

Granville	3
Greenway	3
Grifton	3
Harding	2
Hadashville	1
Harlington	2
Heaslip	3
Hecla	4
Hilton	3
Hodgson	1
Holditch	6
Holland	1
Homebrook	2
Horndean	3
Horad	3
Indian Bay Complex	6
Indian Springs	3
Inwood	3
Isafold	3
Julius	6
Kenville	1
Keld	3
Kelwood	3
Kerry	4
Kilkenny	6
Kittson	3
Kinwow	2
Kipling	2
Lakeland	2
Ladywood	1
Ledwyn	2
Lee River	2
Lenore	3
Lenswood	3
Leary	4
Le Pas	3
Le Pas Drained Phase	1
Lettonia	2
Libau	2
Lonesand	3
Lorteau	1
Lundar	3
Malonton	3
Manitou	3
Marquette	2
Meadowbrook	1
Medika	1
Meharry	2
Meleb	4
Menesino	4
Merringhurst	3
Middlebro	1
Miniota	3
MacArthur	4
McCreary	2
Molson	6
Morden	1
Monis	2
Morton	2
Myrtle	1
Narcisse	4
Neelin	1
Nels	1
Newdale	2
Norgate	3
Norva	3
Oakville	1
Onanole	3
Okno	6
Oliver	2
Osborne	2
Oxbow	3
Pasquia	3
Pequis	1
Pelan	2
Pembina	3
Pine Valley	3
Pine Ridge	4
Piney	4

Pipestone	2
Polson	4
Poppleton	3
Plainview	1
Portage	1
Plum Lake	2
Proven Lake	2
Quercus	2
Red River	1
Rackham	3
Renwer	3
Riverdale	1
Ridley	2
Rose Ridge	3
Richer	5
Saltel	3
St. Norbert	1
Sand Dunes	5
Sandilands	5
Seech	5
Selena	4
Sand Beach	6
Saline Flats	6
Shallow Peat	6
Shallow Peat (Drained Phase)	3
Semple	3
Seven Sisters	2
Shorncliffe	1
Stead	6
Sirko	4
St. Labre	3
Souris	2
Snowflake	3
Sperling	1
Springbank	2
Spearhill	3
Stockton	4
Steinbach	1
Stonewall	2
Swan	2
Swanford	2
Sundown	3
Tarno	1
Thalberg	1
Tiger Hills	3
Tobamore	4
Tolstoi	3
Turtle Mountains	1
Valley	3
Valpoy	4
Vassar	4
Vita	3
Waitville	3
Wampum	3
Wapus	3
Waskada	3
Wellwood	2
Wentland	2
Westbourn	3
Whitemouth	1
Whitewater	3
Westray	4
Wintergreen	3
Woodlands	3
Woodridge	4
Zaporza	4
Zora	1

NOTE: Organic soils and soil complexes classed as forage productivity index 6 require site-specific assessment of carrying capacity.

PRAIRIE CARE LEASE AGREEMENT

THIS AGREEMENT made in duplicate this _____day of _____, 19____.

BETWEEN THE LANDOWNER(S):

_____

_____

AND: DUCKS UNLIMITED CANADA (DU), a corporation having its Head Office in the City of Winnipeg, Manitoba,

The Landowner is the registered owner of the lands legally described as:

_____

_____

_____

A portion of the Lands shown on the sketch plan (Schedule A) consist of Wetlands and a portion consist of Uplands;

In consideration of DU agreeing to lease from the Landowner the Uplands for payment described the Landowner agrees:

a) to allow DU to implement on the Uplands a program of_____

_____

_____ as described in the Management Plan, (Schedule B);

and

b) to preserve the Wetlands as habitat for waterfowl and other wildlife according to the terms of this lease;

I. WITH RESPECT TO THE UPLANDS:

A. DU SHALL:

(1) pay to the Landowner rental in the amount of _____ _____dollars per year payable on or before _____of each year during the term of this lease.

(2) erect _____sign(s) promoting the project;

(3) have the right to terminate this agreement in the event that the Landowner fails to perform any of the terms of this lease.

B. THE LANDOWNER SHALL:

(1) lease to DU the Uplands for a term of _____ years commencing _____, 19____.

(2) pay all taxes, local improvement rates and other levies and charges against the Uplands;

(3) grant to DU, its employees, agents and contractors a right of access to and upon the Lands and the right to develop and manage nesting cover on the Uplands for the purpose of creating a suitable habitat for waterfowl and other wildlife in accordance with the Management Plan.

II. WITH RESPECT TO THE WETLANDS:

A. THE LANDOWNER SHALL:

(1) preserve the Wetlands in a natural state as habitat for waterfowl and other wildlife and prohibit burning, haying, cultivation and grazing within _____ feet of the wetlands' edge as shown on the plan attached as Schedule A, for a term of _____ years, commencing _____, 19____;

(2) upon expiry of the term in paragraph II.B.(1), this lease pertaining to the Wetlands shall be renewed automatically from year to year thereafter unless either party gives to the other written notice of termination. Nothing herein pertains to the agreement on the Uplands.

III. WITH RESPECT TO THE UPLANDS AND THE WETLANDS:

THE PARTIES HEREBY AGREE THAT:

(1) this lease shall be binding upon the parties and their respective executors, administrators, successors and assigns;

(2) this lease shall run with the Land and DU shall have the rights to register same in the land titles office;

(3) the Landowner releases DU and its officers, employees, agents and contractors from all actions, suits, claims, demands or damages, which it now has or may be connected with the Lands by DU or its contractors;

IN WITNESS WHEREOF this agreement has been executed by the parties on the day and year above.

_____	_____
Witness	Landowner
_____	_____
Witness	Landowner
	DUCKS UNLIMITED CANADA
_____	Per: _____
Witness	
	Title: _____

==========

Project Name: _____ Project Number: _____

PRAIRIE CARE LAND MANAGEMENT AGREEMENT

THIS AGREEMENT made in duplicate this _____day of _____, 19____.

BETWEEN THE LANDOWNER:

_____

_____

AND: DUCKS UNLIMITED CANADA (DU), a corporation having its Head Office in the City of Winnipeg, Manitoba.

The Landowner is the registered owner of the lands legally described as:

_____

_____

_____

A portion of the Lands shown on the sketch plan (Schedule A) consist of Wetlands and a portion consist of Uplands;

In return for DU agreeing to provide financial assistance, the Landowner agrees:

a) to implement on the Uplands a program of _____

_____

_____ as described in the Management Plan, (Schedule B);

and

b) to preserve the Wetlands as habitat for waterfowl and other wildlife according to the terms of this agreement;

I. WITH RESPECT TO THE UPLANDS:

A. DU SHALL:

(1) provide to the Landowner a one time payment of _____ _____ dollars on _____, 19___; and/or materials as listed and valued in Schedule C to assist in the establishment of_____ _____ _____ _____ on the Uplands;

(2) provide to the Landowner financial assistance in the amount of _____dollars per year payable on _____ _____of each year for a term of _____years commencing in 19_____.

(3) erect _____sign(s) promoting the project;

(4) have the right to terminate this agreement in the event that the Landowner fails to perform any of the terms of this agreement.

B. THE LANDOWNER SHALL:

(1) cultivate, seed, harvest and manage the Uplands according to the Management Plan for a term of _____years, commencing _____, 19____;

(2) be responsible for all costs of farming the Uplands except as otherwise described in this agreement;

(3) repay to DU any unearned portion of the financial assistance referred to in paragraph 1.A.(1) in the event of termination of this agreement by DU under paragraph I.A.(4) The unearned portion of the financial assistance referred to in paragraph I.A. (1) shall be determined by the following formula:

$$\text{Financial Assistance} \times \frac{\text{Years Remaining in Upland Agreement}}{\text{Total Years of Upland Agreement}}$$

II. WITH RESPECT TO THE WETLANDS:

A. THE LANDOWNER SHALL:

(1) preserve the Wetlands in a natural state as habitat for waterfowl and other wildlife and prohibit burning, haying and grazing within _____ feet of the wetlands' edge as

shown on the plan attached as Schedule A, for a term of _____ years, commencing _____, 19____;

(2) upon expiry of the term in paragraph II.A.(1), this agreement pertaining to the Wetlands shall be renewed automatically from year to year thereafter unless either party gives to the other written notice of termination.

III. WITH RESPECT TO THE UPLANDS AND THE WETLANDS:

THE PARTIES HEREBY AGREE THAT:

(1) The landowner grants to DU, its employees, agents and contractors, a right of access to, and on the Uplands and Wetlands.

(2) this agreement shall be binding on the parties and their respective executors, administrators, successors and assigns;

(3) this agreement shall run with the Land and DU shall have the right to register it in the land titles office;

(4) the Landowner releases DU and its officers, employees, agents and contractors from all actions, suits, claims, or damages which it now has or may be connected with the Lands or their use by DU or its contractors;

IN WITNESS WHEREOF this agreement has been executed by the parties on the day and year above.

_____ _____
Witness Landowner

_____ _____
Witness Landowner

DUCKS UNLIMITED CANADA

_____ Per: _____
Witness

Title: _____

==========

Project Name: _____ Project Number: _____

SCHEDULE B - MANAGEMENT PLAN

CONVERT TO GRAZE

1) To provide and enhance waterfowl nesting habitat, suitable seed will be supplied to the landowner to establish a perennial forage crop in close proximity to permanent wetlands. The program will involve approximately ___ acres located on _____ (see attached sketch plan - Schedule "A").

2) DU will provide to the landowner a Voucher for sufficient seed to assist in the establishment of the forage crop in 199_. The voucher will allow the landowner to pick up ___-50lb bags of seed at _____ _____ in _____.

3) If a companion crop is used, the seeding rate of the companion crop should be 1/2 to 1/4 of normal in order to reduce competition with the forage crop. Straw resulting from companion crop harvest should be baled or spread evenly over the field at or shortly after combining. For more detailed information on seeding guidelines refer to Manitoba Agricultures' Forage Establishment factsheet. Newly seeded forage will not be grazed in the year of establishment unless otherwise agreed to by both parties with terms and conditions outlined by Ducks Unlimited Canada.

4) If stand establishment is not successful in year one, sufficient seed for one re-seeding operation of the poorly established area will be provided.

5) The forage stand will be considered to be successfully established when it meets the following criteria:
- grass seedlings have developed adventitious (permanent) roots and some evidence of tillering and/or rhizome development,
- legume seedlings have developed a tap root with secondary and tertiary roots, and
- weed populations occupy less than 5% of the field area.

An established grazing planting must have a minimum average of four seeded forage plants per square foot throughout the planting. Forage plants and weeds will be counted by DU staff according to the procedures specified in "Seeded Grass Stand Establishment and Evaluation Guidelines"(1991) .

6) The recommended seed mix to provide good quality grazing and nesting cover will be as follows:

__ acres of _____ at __ lbs. per acre

SCHEDULE B - MANAGEMENT PLAN

FORAGE ESTABLISHMENT WITH DELAY CUT

1) To provide and enhance waterfowl nesting habitat, suitable seed will be supplied to the landowner to establish a perennial forage crop in close proximity to permanent wetlands. The program will involve approximately _____ acres located on _____(see attached sketch plan - Schedule "A").

2) DU will provide to the landowner a Voucher for sufficient seed to assist in the establishment of the forage crop in 199_. The voucher will allow the landowner to pick up ___ - 50lb bags of seed, Mix #___, at _____ in _____.

3) If a companion crop is used, the seeding rate of the companion crop should be 1/2 to 1/4 of normal in order to reduce competition with the forage crop. Straw resulting from companion crop harvest should be baled or spread evenly over the field at or shortly after combining. For more detailed information on seeding guidelines refer to Manitoba Agricultures' Forage Establishment factsheet. Newly seeded forage will not be hayed in the year of establishment unless otherwise agreed to by both parties with terms and conditions outlined by Ducks Unlimited Canada.

4) The landowner is limited to one hay cut per year to be taken no earlier than July 15th. It is recommended that a minimum stubble height of six inches be maintained. No grazing or second cut is to take place on the land during the term of the agreement.

5) If stand establishment is not successful in year one, sufficient seed will be provided for one re-seeding operation of the poorly established area.

6) The forage stand will be considered successfully established when it meets the following criteria:
- grass seedlings have developed adventitious (permanent) roots and some evidence of tillering and/or rhizome development,
- legume seedlings have developed a tap root with secondary and tertiary roots, and
- weed populations occupy less than 5% of the field area.

To be eligible for the delayed cut payment, the established forage stand must have a minimum average of two grass and two alfalfa plants per square foot throughout the planting. Forage plants and weeds will be counted by DU staff according to the procedures specified in "Seeded Grass Stand Establishment and Evaluation Guidelines" (1991).

7) This entire agreement will be considered null and void if the forage establishment is deemed unsuitable one year after reseeding.

8) The recommended seed mix to provide good quality hay and nesting cover will be as follows:

___ acres of Mix #___ - (describe mix and rates of seeding)

VOLUNTARY HABITAT CONSERVATION AGREEMENT

THIS AGREEMENT made in triplicate this day of A.D. One Thousand Nine Hundred and ninety-one.

BETWEEN:

(hereinafter called the "Grantor"),

OF THE FIRST PART,

AND

THE MANITOBA HABITAT HERITAGE CORPORATION,
(hereinafter called the "Corporation"),

OF THE SECOND PART.

WHEREAS the Corporation is also representing Wildlife Habitat Canada, World Wildlife Fund (Canada), the Province of Manitoba and the Manitoba Naturalists Society, who have formed a "Steering Committee" to implement the cooperatively funded "Critical Wildlife Habitat Program".

AND WHEREAS the Grantor is the owner and in possession of the lands legally described as follows:

and more particularly shown on the aerial photography outlined in red, containing acres, more or less, and attached hereto as Schedule "A" and forming part of this Agreement, hereinafter referred to as "the land";

AND WHEREAS The Corporation wishes to preserve and maintain the wildlife habitat on "the land";

NOW THEREFORE THE PARTIES AGREE as follows:

1. This 5 year Agreement shall commence on the day of , 1991, and conclude on the day of , 1996.

2. The Grantor hereby grants to the Corporation the exclusive right and privilege of preserving and maintaining "the land" for the purposes of conserving and maintaining wildlife habitats.

3. The Grantor hereby agrees that he will not clear, burn, break, graze, hay, spray, drain, fill, level, or in any way cause or permit to be caused, damage to "the land" in such a manner as to derogate or render ineffective, whether in whole or in part, the maintenance or enhancement of wildlife habitats upon "the land" except under those conditions as shown in Schedule "B" attached hereto and forming part of this Agreement.

4. The Grantor hereby grants to the Corporation the right to enter over and upon "the land" for the purposes of this Agreement, and in particular the right to undertake such activities towards the maintenance and enhancement of wildlife habitats as shown on Schedule "B" attached hereto and forming part of this Agreement.

...2

Grantor's Limited Use of the Land

Forming part of this Agreement dated , 1991, between the Corporation and

_____

_____

The Grantor is entitled to use "the land" under this Agreement for the purpose of _____

_____

Corporation's Rights Upon the Land

Forming part of this Agreement dated , 1991, between the Corporation and

_____

_____

The Grantor hereby grants to the Corporation the right to enter over and upon "the land" for the purposes of

1. Erecting signs on "the land" to indicate the purpose and source of funding for protection of this habitat
2. Inventorying wild plants and animals on "the land" and
3. Periodic field inspections by persons authorized by the Corporation.

THE MANITOBA HABITAT HERITAGE CORPORATION

_____

_____
Grantor

_____
Grantor