10.2.3 Priority 3 Wildlife Habitat Units

Priority 3 Wildlife Habitat Units are distributed throughout Strathcona County in areas of highly fragmented and converted native vegetation. These WHU's are dominant in the intensively agricultural Leduc Plain and areas of high density county residential development in the Cooking Lake Upland Ecodistrict.

11 HABITAT RESTORATION ECOLOGY AND APPLICATION TO STRATHCONA COUNTY

11.1 Restoration Ecology Theory

Throughout North America, natural landscapes are rapidly diminishing while agricultural, industrial, urban, and recreational areas are substantially increasing. A concomitantly growing human population has considerably changed the global face of natural resources and has necessitated an adaptation in resource management paradigms. Cultivated landscapes in and around Strathcona County are mosaics of agricultural areas, forests, and urban-industrial complexes. As a result, these lands are not immune to the very stresses that currently characterize many ecosystems worldwide. Given that many of the changes taking place are deleterious to the biodiversity of any given region, a major question arises: *"What can we do to remedy these problems and trends towards declining biodiversity?"* Answering this question is what the field of ***restoration ecology and management*** is all about (Jackson 1992). Restoration ecology is growing as a discipline (Cairns 1986, Allen 1988, Jordan et al. 1988), but there are, as yet, few general principles available.

Restoration ecology deals specifically with research and management experimentation to determine ways to safely restore ecosystems and ecosystem components to more nearly natural conditions. For purposes of this project, we define ecological restoration as *the process of intentionally altering a site to establish a defined, indigenous, historic ecosystem*. The goal of this process is to emulate the structure, function, diversity, and/or dynamics of the specified ecosystem.

Habitat restoration has been recognized by the County as a means of mitigating the adverse effects of fragmentation and of minimizing the threats to small natural areas from surrounding land uses. In a strict sense, mitigation means simply to lessen adverse effects and the concept can be considered in a larger context, as summarized by Jahn (1979) to include:

1. Avoiding the adverse effects altogether by not taking certain actions;

2. Minimizing adverse effects by limiting the degree or magnitude of certain actions;

3. Rectifying adverse effects by repairing or rehabilitating the affected environment;

4. Reducing or eliminating the adverse effects over time by preservation and maintenance operations during the course of the actions; and

5. Compensating for adverse effects by replacing or providing substitute resources or environments.

When applied to Priority Wildlife Habitats in Strathcona County, these mitigation activities can more appropriately be described in one of three categories, including (1) habitat protection, (2) habitat enhancement, and (3) habitat creation:

Habitat protection measures usually involve the securing of portions of the land base for conservation, or the removal of a portion of the land base from use. Habitat protection measures are being implemented in Strathcona County through the identification of Priority Wildlife Habitat Units and the incorporation of these priority habitats into the County's future planning processes.

Habitat enhancement involves the improvement and/or expansion of existing sites and natural habitats to provide more suitable or larger areas of habitat for both terrestrial and wetland wildlife than presently exists.

New habitat creation projects involve the construction or significant modification of existing sites to provide habitats with significantly different biological and physical conditions than existed previously.

Habitat enhancement and habitat creation are the two categories of mitigation activities that are relevant to identifying Priority Restoration Wildlife Habitat Units in the County.

11.2 Habitat Restoration Tools

Successful enhancement of disturbed areas for wildlife must provide the basic requirements for food, water, and cover for a pre-defined target species or guild. Consequently, habitat restoration attempts will need to address plant species diversity, composition, and interspersion, water regimes and proximity to water, and topography, all factors which determine the target species' ability to meet its life requisites in the habitat unit. Generally, four major classes of landscape modification are used to restore wildlife habitats: (1) topographic modification, (2) watershed re-establishment, (3) revegetation, and (4) special supplementary methods. Some of these methods are more applicable and feasible for consideration in Strathcona County than others.

The primary land uses in Strathcona County dictate the types of restoration projects that are both required and at all feasible. Three types of habitats - wetlands, riparian wetland / watercourse margins, and upland forests - can be targeted for restoration with similar management regimes. Because of the shortage of tree and shrub cover in most agricultural landscapes, restoration for wildlife in much of the County should include the creation of small shrublands and woodlots. In addition, the significance of wetlands in the County for waterfowl production warrants that the creation and/or enhancement of wetlands be considered with a view towards waterfowl conservation. Furthermore, if these wetlands are to be managed for waterfowl, adequate areas of tall grass must be made available directly adjacent to the wetland in order to provide suitable nesting habitat.

Numerous habitat restoration tools are available to land and resource managing agencies in the County, ranging from high intensity management activities such as implementing artificial nest islands to simply re-seeding and allowing vegetation to re-establish itself in certain areas. Following is a brief summary of a few restoration concepts and some available options for the restoration of wetland, riparian, and forested habitats within the County.

11.2.1 Restoration of Aquatic and Wetland Habitats

Waterfowl are the primary and most identifiable obligate users of aquatic habitats in Strathcona County. As a result, wetlands, lakes, and other aquatic habitats that are targeted for restoration are likely to demand such attention on the basis of their capability to support waterfowl populations, either during the breeding / nesting or the molt / migration periods. The active manipulation of wetlands for waterfowl can take two basic forms, the first being a complete change to conditions which favor use of the wetland by waterfowl, and the second being the implementation of artificial nesting structures to attract waterfowl to the wetland.

Marsh-type wetlands are generally considered to provide the most productive waterfowl habitats because they provide suitable water depths which allows the establishment of vegetation, a ready supply of nutrients through natural fertility, recycling, or artificial sources, and ecotonal habitats where two different types of habitat meet and overlap. Thus, the major factors which limit waterfowl use of wetlands are: (1) ***too much water*** resulting in insufficient emergent vegetation; (2) ***too little water*** because the wetland is flooded in early spring and dry by early summer, before young ducks are able to fly; and (3) ***insufficient nutrient levels*** which translates into a lack of food for waterfowl further up the food chain. A fourth limiting factor, the ***lack of upland cover***, may be included in this list, however restoration techniques associated with this factor are dealt with in the following section on riparian and wetland margin habitats. This section is intended to deal strictly with open water, aquatic habitats.

Numerous techniques are available to manipulate water levels in existing wetlands (Poston and Schmidt 1981, Ducks Unlimited Canada n.d.). The required size and depth of the basin being manipulated will ultimately depend on the desired function of the wetland. As we have already stated, wetlands used by waterfowl, particularly dabbling ducks, can perform adequately even if they are fairly shallow and ephemeral in nature. Conversely, wetlands which are designed to house overwintering mammals (such as beaver or muskrat) or fish will need to be considerably deeper to prevent winter-kill (Green et al. 1984).

For existing wetland basins, Green et al (1984) suggest that enhancement of basin depth may be accomplished through diking outflow areas or dredging out the existing basin. In shallow, drought-prone wetlands, Poston and Schmidt (1981) recommend the excavation of "*1 or more small pits 1-2 m deep and about 4.5-6 m across near the center of wetland at a time when it is dry, or nearly so.*" Damming or diking, in turn, is generally accomplished through the use of earthen dams stabilized by sandbags or rip-rap at potential outflow areas.

Active seasonal manipulation of water levels may also be desirable on some restored wetlands in order to influence the productivity of the area for wildlife. Occasional prolonged flooding or drawdown of water, for example, during one or more growing seasons can control the density and distribution of emergent and shoreline vegetation. Such water level manipulation, however, is generally only possible where outflow control structures have been incorporated into dams or dikes. Green et al. (1984) report that Ducks Unlimited Canada has developed a number of dam and water control structures for this purpose.

In some instances, the restoration of previously drained wetlands or the creation of new wetlands where previously none existed may be warranted. Construction of new wetlands, either for ecological or practical agricultural reasons, can be accomplished through damming of existing outlet areas in naturally occurring depressions, or by excavating by backhoe or blasting out depressions in suitable basin sites (Poston and Schmidt 1981). Wetlands constructed for

agricultural purposes (such as dugouts, watering holes, et cetera) can also provide an ecological service by providing an alternative water source for livestock, preventing them from utilizing and negatively impacting local streams and creeks.

Active management directed towards specific species or species groups of wildlife using open water wetlands may be accomplished through the development of nesting islands, push-ups, and floating nest rafts for many water-based species such as loons, terns, Canada geese and other waterfowl, the creation of shallow basins to enhance amphibian reproductive habitat, and the shallow flooding of flats for shorebirds (NAWMP 1992).

Canada geese are known to favor island nesting sites since these sites provide increased protection from predators such as coyotes and foxes (*Vulpes* spp.) AFWD (n.d.) report that there are numerous wetlands, particularly small sloughs and marshes, in Alberta that could be used as nesting sites if islands were present. Round straw bales placed in sloughs have been used successfully for this purpose in Alberta. Generally, AFWD (n.d.) offers the following guidelines to the implementation of artificial nest sites for geese:

- flax straw should be used because it lasts longer than other types of straw;
- bales should be located in areas where goose densities are naturally high;
- bales should be placed on the periphery of an existing "core" nesting area;
- bales should be placed within 20 - 45 m of the shore unless there is a shield of protective vegetation between the bale and the shore;
- bales should be placed at least 90 m from each other on the same wetland to avoid interspecific competition;
- the depth of water where a bale is placed should not exceed 1 m;
- bales should be placed toward the leeward side of the wetland to guard against wind and ice damage; and
- bales should be located on wetlands and on sites within wetlands where disturbance from vehicles, human travel, and the like is minimized.

Push-up islands and nesting mounds are used by many species of waterfowl for much the same reasons that geese use nesting platforms. These islands, when designed for waterfowl, provide breeding and brood-rearing habitat by making food, cover, nesting, and loafing sites available. Islands increase the land:water edge ratio which, in turn, increases the area of wetland available to each breeding pair of ducks. Species of ducks that have been documented to use island nesting sites in Alberta include mallard, northern pintail, gadwall, northern shoveller, blue-winged teal (*Anas discors*), redhead (*Aythya americana*), and lesser scaup (*Aythya affinis*).

Island construction, utilizing dredge material or floating structures anchored to the wetland substrate, offers a cost-efficient means of increasing complexity and provides ideal nesting and loafing areas for waterfowl. Both structures, if properly landscaped with appropriate cover, have been found to increase the production of young waterfowl, particularly on larger wetland complexes. Comparisons of island characteristics and productivity showed that smaller islands located farther from shore with greater vegetative cover were most productive. Rectangular islands are most appropriate because they have greater perimeter:area ratios than do circular, elliptical, or square islands (Giroux 1981).

11.2.2 Restoration of Shoreline and Riparian Habitats

Riparian vegetation communities occur in moist or saturated soils adjacent to watercourses, waterbodies, and seeps. They usually consist of dense shrubs such as willows and alders, with varying levels of grass and forb cover. Riparian habitats provide all of the essential elements for the existence of a wide variety of wildlife, both obligate and facultative wetland species, including songbirds, raptors, waterbirds, small mammals, ungulates, reptiles, and amphibians. Of primary concern for conservation purposes, and therefore, for habitat restoration potential, are riparian margin grasslands and extensive littoral zones of wetlands that provide critical overland nesting sites for numerous waterfowl species.

Excessive removal, alteration, and trampling of vegetation by livestock is the primary impact of agricultural land use in and around riparian habitats. Allowing livestock unrestricted access to watering sites in streams and wetlands may cause a range of problems for both the livestock and other associated wildlife, as summarized by Fisheries and Oceans Canada (n.d.):

> *Hooves trampling a soft, moist streambank make footing dangerous and increase erosion, releasing sediment to the water. [Furthermore,] livestock drinking water is contaminated by the animal's own waste when free access to streams is allowed and leptospirosis and bovine virus can easily be transferred under these conditions. Open range grazing tends to destroy shorelands. When cattle trample banks, vegetation that stabilizes the soil cannot grow. Erosion increases, and streams get wider and shallower. Shorelands hold less water because there is little vegetation to slow runoff, leading to water shortages in summer.*

Of additional concern is the capacity of these riparian and lake littoral zones to host nests of various waterfowl and other bird species and the risk of these nests being trampled by unimpeded use of the area by livestock. Thus, fencing of wetland riparian zones has been widely recommended to accomplish two main objectives:

1. To protect critical breeding and nesting sites from trampling by cattle; and

2. To establish marshland vegetation where it does not already exist or where it is heavily grazed by cattle.

Many riparian areas are grazed continuously by domestic livestock, a practice which often results in the gradual degradation of these areas. Some agricultural uses of these areas can be integrated with wildlife use through seasonal separation of agricultural activities and periods of sensitive or critical wildlife use. For example, grassy meadows can be hayed or used as part of a rotation-grazing system with few impacts on waterfowl if agricultural use is limited to the mid-July to early-August period. By the start of this period, most nesting and brood-rearing activity is complete yet there is still sufficient time for regrowth of the ground vegetation to provide adequate nesting cover during the following spring (Green et al. 1987). NAWMP (1992) provides further guidelines for the management of livestock and suggest that grazing can be eliminated or reduced from shoreline areas by:

- providing alternate grazing sites, fencing cattle from critical habitats and providing alternate watering sites (i.e., dugouts) or fenced and graveled watering sites on the waterbody;

- reduction of stocking rates and delayed grazing commencement date (proper stocking rates and active range/pasture management will also increase forage production); and

- changing the class of livestock using the pasture during spring (steers do not graze riparian areas as heavily as cows with calves and distribute themselves more widely over available pasture).

If the main objective of restoring a riparian or shoreland habitat unit is to enhance the ecological integrity of the site, the re-establishment of vegetation is a critical benchmark which can be used to meet this goal. Natural re-vegetation is the preferred method and should be exercised if a remnant composition of desirable plants exists within the site. Most riparian shrubs are capable of re-sprouting and can recover from extensive use. However, active planting or seeding may be required if the site has been severely degraded.

As has been stated earlier, the primary habitat use of riparian zones and shoreland littoral zones of wetlands are for nesting waterfowl. The type of vegetation preferred for nesting cover varies among waterfowl species and geographic locations, but generally waterfowl can be said to prefer dense, moderately tall vegetation. It is generally accepted that nest success is positively correlated with vegetation height, canopy cover, and concealment values. A variety of vegetation types have been recommended for use in establishing nesting cover. Giroux (1981)

and Duncan (1986) recommended planting forb and grass, or forb mixtures. Duebbert and Kantrud (1974) and Duebbert and Lokemoen (1976) also recommended forb and grass mixtures but they added that rejuvenating the stand every 5 to 10 years by burning or mowing was desirable. Hines and Mitchell (1983) recommended snowberry or nettles or plants with similar physiognomy. Sugden and Beyersbergen (1986, 1987) recommended tall, dense cover such as snowberry as a behavioral deterrent to crows. Klett et al. (1984) found seeded, native grasses to be as attractive to ducks as seeded, introduced grass and native prairie.

Dense Nesting Cover (DNC) is a mixture of grasses that is planted to provide permanent cover for nesting waterfowl in areas adjacent to wetlands. The restoration of grasslands by converting cropland to DNC has been one of the primary delivery programs of the Alberta NAWMP program since 1994. The importance of DNC, however, must recognize the additional significance of an interspersion of short grass areas, taller shrubs, and unharvested grains (for forage) within DNC plots. Recent research conducted throughout the prairie provinces also suggests that nest success in planted DNC plots alone have been lower than expected (Ducks Unlimited Canada 1996) and that high quality native cover may be more valuable than has been acknowledged in the past.

Where native cover is known to exist and waterfowl populations are known to be high and productive, the implementation of nesting cylinders and nest tunnels are anticipated to increase nesting success by various species, particularly mallards, redheads, and buffleheads, the species reported to be most easily attracted to these nest tunnels. Ducks Unlimited Canada currently provides guidance, assistance, and information to landowners and managing agencies who are interested in purchasing and erecting such structures.

11.2.3 Restoration of Upland Forested Habitats

Most modern agricultural practices which have evolved over the past half century have favored the reduction of tall shrubs and trees in order to increase the accessibility to arable lands. In addition, overall fragmentation of the landscape in Strathcona County by other factors such as industrial development and roadway infrastructures has also resulted in an overall loss of forested habitat.

However, the recent emergence of conservation farming practices has recognized the negative effects of these types of actions and has resulted in the development of numerous mitigation measures intended to offset or minimize these negative impacts. In addition to implementing soil and water conservation programs on farmsteads, the retention or incorporation of trees for wildlife is now being seen increasingly on many farms. Forested tracts of land that have been retained on otherwise productive farmland have been variously termed “shelterbelts”,

"windbreaks", "hedgerows", or "fencerows". While these terms are characterized by utilitarian farming nomenclature because their primary roles are to reduce wind speed and soil drifting and to retain moisture, it cannot be denied that the retention of such treed areas on farmland also provides numerous advantages for local wildlife species as well, including protection from wind and adverse weather, escape or refuge cover, food and foraging sites, reproductive habitat, and travel corridors.

Throughout the Strathcona County study area, there are numerous examples of habitats that have been degraded and are further at risk due to exposure caused by a lack of adjacent cover. In addition, numerous habitat specialists, particularly forest-interior dwellers, are becoming increasingly more rare as their range is being propagated northward following patterns of human development and associated habitat depletion. Therefore, the recognition of potential Priority Restoration Wildlife Habitat Units must include forested habitats which have been slightly degraded and which can be returned to a state of integrity such that they are able to function as wildlife habitat. It must be recognized that, while shelterbelts and windbreaks are significant (in some cases they are the only wooded habitats within a very large area), they generally provide only transitional, temporary, or partial habitats for most species. Typically, shelterbelts in and of themselves cannot be large enough, diverse enough, or complex enough to provide all of the life requisites for most terrestrial vertebrates. For species that are dependent on forested habitats, then, it is essential to retain or create upland forest patches of sufficient size to maintain some level of ecological integrity and structure.

Forested habitat patches that include a wide variety of vegetation types (e.g., deciduous and coniferous trees, shrubs, grasses, and forbs) plus well-developed canopy and understory layers are desirable. Snags are also a structural feature of significance to many species such as woodpeckers and other bark-gleaning birds, providing nesting, foraging, and perching sites. If such diverse habitats are provided in a forested habitat patch, it has been identified in this study as a Priority Wildlife Habitat Unit (WHU). However, most forested stands of this nature have been fragmented to some extent and, thus, require restoration and have been identified as Priority Restoration Wildlife Habitat Units.

Restoration of upland forest habitats may involve one of two general methods, either rehabilitation of existing forest communities or planting of new forest communities. For reasons that are fairly obvious, the rehabilitation of existing forest communities is the preferable method of restoration. The fencing of existing remnant woodlots has been widely advocated in fragmented landscapes for the primary purpose of protecting and/or restoring undergrowth that has been subjected to heavy livestock grazing (or other disturbances). Dense understory habitat is important for nesting, brooding, foraging and hiding of passerines and upland gamebirds associated with the forest floor and shrub layer; providing food and cover for small mammals which are often staple prey species for raptors and small carnivores; and providing browse and

hiding cover for ungulates. Thomas (1979) states that "without dense understory, the distance required to provide effective hiding cover for deer is greatly increased." Similarly, Ewaschuk and Westworth (1983) noted a drastic reduction in concealment value for deer in Alberta parkland habitats due to even moderate grazing pressures in forested understories.

Additionally, the fencing of existing wooded habitats may be desirable if valuable nesting trees have been identified within the habitat patch. As an attempt to enhance the longevity and productivity of trees that provide nest sites, perches, and/or roosts for birds and other wildlife, the exclusion of livestock and beavers by fencing has proven to be successful in some areas.
Establishing new forest communities through planting or seeding is often prohibitively expensive and time-consuming, particularly in the context of urban planning. However, in cases where such action is deemed necessary to restore native upland vegetation, the establishment of a self-sustaining forest community generally is regarded as an acceptable objective. In doing so, restoration of upland forests should be initially directed towards the establishment of early seral plant communities for the following reasons, proposed by Green and Salter (1987):

1. Plant associations in early seral communities are floristically more simple than those in mature or climax communities and, as a result, restoration requirements for re-establishing these communities are less complex;

2. The establishment of early seral vegetation communities is a realistic and attainable goal for restoration and, within a relatively short term, provides a means of evaluating the habitat enhancement program. In contrast, a program aimed at developing a mature plant community will involve a complex array of enhancement methods and, because the results may not be evident for 50 to 100 years or more, it will be extremely difficult to evaluate the success of the program;

3. Early successional wildlife species will respond to, and are most likely to benefit sooner from, the re-establishment of plant communities in restoration areas than wildlife species that are adapted to more mature plant communities; and

4. Because results of the program will be evident in a relatively short period (<15 years), there is a positive psychological feedback to landowners which is more likely to encourage continued or increased participation in habitat restoration projects.

Methods of re-vegetation include natural regeneration, direct seeding, and replanting. These techniques also follow a gradient of intervention and cost. Natural regeneration is the preferred method in conservation terms because it would allow the re-establishment of native species, but it is debatable if it is a viable option for re-vegetating land that has been extensively modified by agriculture for long periods. Long periods of cultivation (and the addition of chemical fertilizers) have been reported to make it difficult for native species to re-establish (Bradley

1994).

While the complete re-planting of new forest vegetation may be impractical for most habitat communities in Strathcona County, some human modification and management of existing forests is likely to be required in order to maximize the diversity of species that may use the restored forested habitats. Snags, for example, are structural features associated with older-aged forests and are relatively rare in forested habitats within the County. Thomas (1979) defined a snag as "*any dead or partly dead tree at least 10 cm in diameter at chest height.*" These snags provide singing perches for passerines, foraging perches for flycatchers, cavity nests for woodpeckers, and roosting sites for many other birds. NAWMP (1992) also added that snags play a significant role in allowing light to penetrate to the forest canopy, thus stimulating the growth and production of shrubs, forbs, and grasses in the understory.

Due to their ecological significance, the retention and/or creation of snags has been advocated by land-managers ranging from municipal planners to timber harvesters. The number of snags that may need to be retained within a landscape depends on both the size of the forested habitat unit and the target species that is to benefit from the snags. For example, NAWMP (1992) reports that approximately 50 snags / 40 ha of aspen poplar community will provide for the habitat requirements of northern flickers (*Colaptes auratus*). In contrast, more than 200 snags / 40 ha are required to meet the needs of downy woodpeckers (*Picoides pubescens*). Once specific restoration objectives have been set for a forested habitat unit or habitat complex, manual creation of snags may be accomplished by a number of methods. Bull and Partridge (1986) and Aulen (1991) describe methods of girdling living trees to kill them and promote their use by cavity nesters and insectivorous feeders.

The creation of snags around wetland margins will also enhance the availability of habitat for cavity nesting waterfowl such as bufflehead (*Bucephala albeola*) and common goldeneye (*B. clangula*), two of many secondary cavity nesters that rely on excavated and abandoned cavities of primary cavity nesters such as woodpeckers and flickers. Gauthier and Smith (1987) report both of these ducks to prefer nesting in abandoned flicker cavities in either deciduous or coniferous trees within 200 m of the water edge. However, both buffleheads and goldeneyes have been shown to readily accept artificial nest structures as well. Thus, the implementation of nest boxes for these species may be a more economically viable initiative than the creation of snag habitat in some areas.

11.3 Habitat Enhancement and Restoration Initiatives in Strathcona County

Formal enhancement and restoration of wildlife habitat in Strathcona County has only been undertaken since 1986. Prior to this time, virtually no government-sponsored conservation initiatives had been undertaken in Strathcona County (Schreiner et al. 1993).

The Strathcona County Planning Department formulated a development plan in 1985 in response to a survey of County residents. This survey, undertaken to determine the future priorities for Strathcona County's Recreation and Parks Department, made a strong case for the preparation of a master plan that addressed outdoor recreation, environmental protection, and environmental education (Schreiner et al. 1993). The *Outdoor Master Plan* was completed over an intensive 18-month period between mid-1986 and December 1987 with the participation of the public, consulting companies, and municipal and provincial levels of government. The participation of the public, notably private landowners, was particularly important. The large percentage of private ownership (97 percent of county lands) gave private landowners a key role in the preservation and enhancement of ecosystems and wildlife habitats in Strathcona County.

The *Outdoor Master Plan* produced three policy sections that have shaped the manner in which Strathcona County has approached conservation strategies: Environmentally Significant and Sensitive Areas; Private Initiatives; and Outdoor Education and Awareness. These strategies have formed the basis for habitat enhancement and restoration initiatives, which have been pursued by several conservation organizations working with Strathcona County. ConservACTION, a cooperative effort between Environment Canada's "Partners Fund", Alberta Fish and Wildlife Division's "Buck for Wildlife" program, the Sherwood Park Fish and Game Association, and Strathcona County, was the first project to follow the conservation strategies outlined in the *Outdoor Master Plan*. This project, which ran from 1989 to 1993, addressed the need to curb the accelerating loss of habitat through an overall land management program that would focus on the retention and enhancement of wildlife habitat in Strathcona County. A total of 601 projects were undertaken through ConservACTION by private landowners as of March 31, 1992 (Schreiner et al. 1993). These projects included the fencing of sensitive lake shorelines, cross-fencing of pastures to implement rotational grazing schemes, construction of earthen nesting islands, leasing and seeding of upland cultivated land to provide nesting cover and wildlife habitat, and negotiation of a common law restrictive covenant for lakeshore habitat. In addition, 56 duck boxes (for cavity nesting species) and 327 nesting rafts were installed by landowners in Strathcona County. In total, these projects enhanced 4,047 hectares (10,001 acres) of wetland and riparian wildlife habitat (Schreiner et al. 1993).

The success of the ConservACTION Program encouraged Ducks Unlimited Canada Inc. to launch the Cooking Lake Moraine Pilot Project as an extension of the Alberta Prairie CARE

Program. The objective of the project has been the development and implementation of a waterfowl habitat program on the Cooking Lake Moraine. This is in keeping with waterfowl restoration programs outlined in the North American Waterfowl Management Plan (NAWMP). The NAWMP cooperatively funds soil, water, and wildlife conservation programs designed to restore, maintain, and enhance North America's wetlands and associated uplands. Alberta Prairie CARE and Alberta Environmental Protection are working partners in NAWMP. Their involvement in NAWMP stems from, among other reasons, the fact that one of the highest priorities of the NAWMP is the protection and enhancement of habitat in the Canadian Prairies (Alberta Environmental Protection 1995).

The Cooking Lake Moraine Pilot Project has enjoyed high levels of landowner participation since the project commenced in April, 1996. The participants have signed conservation agreements (the purpose of which is to keep the land in a natural state) and have participated in programs designed to enhance wetland and upland habitat for waterfowl and other wildlife. Practical aspects of conservation programs include the placement and maintenance of waterfowl nest boxes and cylinders in wetlands on the landowners' property (Strathcona County 1996). The types of formal agreements are as follows:

- a *conservation agreement*, in which the landowner agrees to keep upland and wetland habitat in its current "natural" state, and, in most cases, agrees to the maintenance of nesting boxes (for bufflehead and common goldeneye) or nesting tunnels (mostly used by mallards) for 10 years;

- a *wetland agreement*, in which the landowner agrees to leave wetland(s) unaltered and agrees to maintain nest boxes and nest tunnels for 10 years;

- a *letter of understanding for the maintenance of nesting structures*, which is a 5 year agreement whereby a landowner agrees to maintain nest boxes or nest tunnels but makes no official commitment to preserving other wetlands on his property.

The Cooking Lake Moraine Project started in April 1996 and is scheduled to run until March 1997. As of October 15, 1996, 35 conservation agreements had been signed by landowners, 31 percent of those for property with an area of more than 34 hectares (81 acres) (Mercier and Martin 1996).

Alberta Fish and Wildlife's "Buck for Wildlife" Program has been in existence since 1973. It was set up in response to increasing public concern over loss of fish and wildlife habitat to agricultural, forestry, industrial, urban, and recreational land uses. The "Buck for Wildlife" Program is built around habitat conservation and enhancement projects proposed by individuals, clubs, private organizations, and government agencies. These projects are almost entirely funded

through a levy on the sale of fishing and hunting licenses and tax deductible donations (Alberta Forestry Lands and Wildlife 1989).

The Landowner Habitat Program within "Buck for Wildlife" is designed to encourage ecologically sound agricultural practices, such as rest-rotation grazing, selective hay cutting, and soil conservation strategies, in combination with the preservation of residual wildlife habitat patches within the agricultural matrix. The most recent participant in this program within Strathcona County has signed a 20-year conservation agreement for a wetland named Bretona Pond. This habitat improvement project included construction of fence lines to limit cattle access to the wetland emergent zone (to allow dense-nesting cover to establish adjacent to Bretona Pond) and an interpretive waterfowl viewing area (Alberta Forestry Lands and Wildlife 1994). In addition, placement of nesting bales in Bretona Slough and reforestation of adjacent uplands has been considered (Griffiths 1987), although the current status of these projects is unknown.

The Riparian Habitat Program within "Buck for Wildlife" is intended to protect fish habitat, maintain water quality, and retain forage and shelter for wildlife (Alberta Forestry Lands and Wildlife 1989). The program offers financial incentives to landowners for the retention of habitat.

The Small Wetlands Project is another landowner-based initiative through "Buck for Wildlife". Landowners are contacted if good quality wetlands for waterfowl are located on their property, and various wetland enhancement opportunities are identified. Placement of rock islands, nest bales, and seeding of upland habitat adjacent to wetlands are the most common methods of wetland enhancement implemented in the Small Wetlands Project.

12 PRIORITY RESTORATION WILDLIFE HABITAT UNITS

Designation of Priority Restoration Wildlife Habitat Units (PRWHU) focuses on those units which have the potential to restore essential ecological function to the landscape. Wildlife habitat units which have the potential to restore connectivity between fragmented wildlife habitat will increase the overall ecological integrity of the landscape (Godron and Forman 1986). Core wildlife habitat units that have been heavily impacted by human activity may be approaching or may have passed an ecological threshold where species diversity decreases. Wildlife habitat units, such as wetland complexes within an agricultural or country residential landscapes may be approaching this threshold. In these cases, habitat restoration would retain wildlife species, which, otherwise would be unable to utilize the degraded habitat units.