PRIORITIZED LANDSCAPE ECOLOGY ASSESSMENT

OF

STRATHCONA COUNTY, ALBERTA

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EXECUTIVE SUMMARY

Conservation and production are at odds with each other in every part of the world, and the situation is likely to become worse as the human population increases and pressure on natural resources grows. In most cases, resource development has been driven by economic incentives with very little attention given to the ecological constraints associated with such development. As a result, natural ecosystems are becoming increasingly restricted to relatively small remnant areas in an increasingly fragmented landscape. Landscapes are now composed of mosaics of differing land uses, many of which are mutually incompatible. The management of such landscapes is also fragmented due to the involvement of numerous and diverse landowners and management agencies. Despite the allocation of portions of the landscape to one land use or another, the different portions remain strongly interlinked as events in one segment are very rarely restricted to that one segment but, rather, impact on adjacent segments as well. Management of individual landscape components in isolation ignores these interactions and can lead to serious ecological problems.

It is now clear that a fragmented approach to landscape management will not succeed if we are to manage our planet on a sustainable basis. Thus, emerging ecological and political paradigms are characterized by a recognition that resource management must be integrated across the whole landscape and cannot focus solely on isolated landscape segments. Recently, there has been a considerable amount of attention paid to the concept of "sustainability", particularly in a global context. This focal point was borne in 1987, when the World Commission on Environment and Development issued a landmark report entitled _Our Common Future_ - the results of worldwide public hearings chaired by Norway Prime Minister Madame Gro Harlem Brundtland. In the decade since the release of that document, sustainability continues to be a buzzword for environmentalists, land managers, and politicians. Nonetheless, there also continues to be considerable uncertainty as to the application of the term to natural resource management and land use conflict resolution. According to many authors on the subject, global sustainability is a very grand concept and is viewed by the population largely as an unattainable goal. As a result, _"think globally, act locally"_ has been adopted as the catch-phrase for sustainable development and resource management because, when the issues are reduced to a smaller scale, solutions begin to become more apparent. An analysis of the literature on this subject reveals that a majority of authors maintain that solutions generated at the local level of planning have the greatest chance of success.

With this Prioritized Landscape Ecology Assessment, we approach the question of sustainable development and nature conservation at the landscape level within Strathcona County, an administrative land unit located immediately east of the City of Edmonton, Alberta. Although the landscape assessment is limited to the landbase within Strathcona County, it is anticipated that the approach has a much wider relevance and application, both as an extrapolatory tool to

other areas of Alberta and as a nested component of a broader, province-wide conservation agenda.

The rural land base around Strathcona County has been described as a mixture of wetlands, lakes, sand hills, agricultural land, and urban residences. The presence of the Cooking Lake moraine (deposits of gravel, sand, and silt from the melting of stagnant glacial ice) results in a knob and kettle topography of small hills and depressions. In addition, the Strathcona County study area is located at the gradation between Alberta's northern boreal forest and the aspen parkland which typifies central Alberta. As a result, the diversity of vegetation associated with the equally diverse landscape provides habitat for numerous wildlife species, some with affinities to the conifer-dominated boreal forest and others with affinities to the more open aspen parkland. Within Strathcona County, it is these forested lands as well as the area's wetland and marsh habitats that have been cleared or otherwise altered to facilitate expanding land use. It is the intention of Strathcona County land use planners to use this document as a tool to identify existing priority wildlife habitats and incorporate their active conservation and/or restoration into the County's planning process, such that conflicts between land development and land conservation can be minimized. In doing so, remnant upland forested habitats of various compositions and wetland habitats are acknowledged as being of primary concern.

For most of this century, wetlands have been viewed narrowly either as wastelands or as areas providing little benefits beyond the support of wildlife populations. Over the past few decades, however, there has been a growing appreciation that wetlands are not only essential to waterfowl but also to protecting fisheries, drinking water supplies, and flood-prone landscapes. The link between maintenance of wetland ecosystems and preservation of biotic diversity has become increasingly clear as more and more initiatives such as the North American Waterfowl Management Plan are acknowledging the non-warterfowl resources supported by wetland and adjacent upland ecosystems.

Recent scientific advances in wetland ecology and increased understanding of wetland processes is now accompanied by an equally growing public concern over the loss of these productive ecosystems. As a result, governments and conservation organizations at all levels have been prompted to take steps towards stemming and reversing these wetland losses, particularly in the highly developed Canadian prairie and parkland landscapes.

Forested habitats, while occuring in a very fragmented state within the County, are critical components of the region's biodiversity. Wooded habitats ranging from fairly extensive stands of aspen to sporadic white spruce stands provide a diversity of life requisites such as forage, thermal cover, and security cover for species groups as diverse as songbirds, raptors, small mammals, ungulates, and even waterfowl.

Throughout this report, we will make reference to the application of *landscape ecology* and *conservation biology* principles to Strathcona County lands. Landscape ecology deals with the understanding of ecological processes at the landscape scale. The concept of a landscape functioning as an interconnected mosaic of ecological patches has profound implications for the development of ecologically sound land management and conservation practices. Conservation biology is an emerging field of science which attempts to explain how a given species meets its life requisites for persistence within a certain area and how these areas can best be managed by humans in order to insure persistence of a species. Together, these two fields of study - landscape ecology and conservation biology - can serve to integrate land use and conservation in Strathcona County. However, if we are going to apply these disciplines in Strathcona County, we must first define a few concepts on which these sciences are based:

- 🖊 fragmentation;
- 🖊 dispersal; and
- 🖊 connectivity.

The concept of habitat fragmentation in a broad sense is easy to define and as easy to comprehend. The landscape elements, or habitat remnants, which we have identified in this report have several ecological functions. Firstly, they serve as habitat patches or parts of habitat patches for certain wildlife species and, secondly, as corridors or stepping stones allowing those and other species to move from one habitat patch to another. As a result of the fragmentation witnessed throughout most of the Strathcona County landscape, these habitat patches are usually small and separated from each other by more or less hostile areas, or by a matrix which is simply not suitable as wildlife habitat. These small habitat patches can only support small populations of plants and animals; the smaller and more isolated the habitat patch is, the greater will be the chance of extinction of *local wildlife species from that patch*.

Local extinction can be prevented if there is some degree of exchange of individuals among the small populations and can even be compensated when enough individuals can reach an empty habitat patch. This exchange is termed dispersal. By means of dispersal, weak populations can be supported and empty habitat patches can be re-colonized. The effect of dispersal movements is influenced by the distance between the habitat patches, by the resistance of the landscape in between the habitat patches, and by the inherent biological characteristics of specific organisms.

The need for wildlife species to move derives from many basic biological requisites, ranging from the need to access resources such as food, water, and shelter, to the need to mate and outbreed and the need to colonize new environments. With that in mind, it follows then that many wildlife species in Strathcona County are highly vulnerable to forces that create impassable barriers between component habitats in the landscape. It can even be said that modifications to the environment that preclude movement between component subsystems may

be as devastating to certain wildlife species in the long run as are the forces which actually destroy wildlife habitat. Simply defined, natural areas that are used by a given suite of wildlife species for movement between component habitats have been, in this report, termed *corridors*; landscape elements which preclude movement between habitat components have been termed *barriers*. It is the interaction between corridors and barriers that dictates the overall *connectivity* of a landscape.

Based on this basic knowledge of landscape ecology and conservation biology, the following guidelines for landscape management in Strathcona County can be formulated, in order to increase the survival chance of faunal species in the County and to increase the conservation potential of the landscape in a regional context:

- ✐ Increase the size and quality of the habitat patches in order to increase the local population size and to decrease the risk of extinction;

- ✐ Increase the number of habitat patches in order to improve the possibility for exchange and re-colonization, and to lower the stochastic (random) extinction of the regional population; and

- ✐ Decrease the resistance of the landscape by including corridors and reducing the effect of movement barriers, thus enhancing the possibility of dispersal.

In North America, the traditional approach to implementing these guidelines has been to put aside protected areas in the form of parks and nature reserves. However, such an approach becomes increasingly impractical in fragmented landscapes such as Strathcona County, where multiple land uses and multiple land users combine with small habitat parcels to preclude the delineation of protected areas of any effective size. Thus, it is more efficient to incorporate the conservation of these wildlife habitats into local and regional land use plans rather than into any kind of protected areas strategy. Furthermore, these habitat "islands" are not in a dynamic state of creation and destruction as is often the case with habitat patches in continuous forested landscapes. Effectively, the habitat remnant units that have been identified through this project are the only natural habitat islands that will ever exist in the heavily developed agricultural and urban landscapes within Strathcona County. Hence, there is a desire from the County to avoid further destruction of the highest priority fragments of natural forested, wetland, and lake habitats.

Many of the remnant habitat patches identified in this report are on private land; these parcels must, nonetheless, be taken into account because of their conservation value to the overall network of corridors and refugia for regional fauna and for their contribution to overall ecosystem integrity. The lack of knowledge of how to manage remnant habitats has long been a

burden on private landowners but has also historically been accompanied by a simple lack of appreciation of the value of these habitats and the roles they play in the bigger ecological picture. Fortunately, this attitude is changing and many private landowners are now keenly interested in learning how best to retain, restore, or otherwise manage their remnant natural areas. This trend is very evident among private landowners in Strathcona County, where organizations such as Ducks Unlimited Canada, Alberta Prairie Care, the Prairie Farm Rehabilitation Administration, and Alberta Fish and Wildlife Division have partnered with local landowners to successfully implement various wildlife habitat retention, habitat creation and restoration, and land conservation projects on private lands.

The major impediment to the inclusion of wildlife and habitat values in land use planning is that these values are difficult to measure. Without an accepted unit of measurement, wildlife and habitat values cannot be compared to other land use values. While it is possible to measure some consumptive aspects of wildlife value, such as that for recreation, the more intangible aesthetic or philosophical values may be impossible to measure. Therefore, the methodology that we have used in identifying *Priority Wildlife Habitat Units* is qualitative rather than quantitative in nature. Supported by interpretation of aerial photographs and direct field observation, remnant upland and wetland wildlife habitat was identified and prioritized into a three-level hierarchy, Priority 1 habitats having the most value in a regional context. In addition, both upland and wetland wildlife habitats that had been partially fragmented or disturbed were also prioritized into *Priority Restoration Wildlife Habitat Units* on the basis of their restoration potential.

Priority Wildlife Habitat Units (WHUs) were categorized into one of three primary habitat types - upland, wetland, and lake WHUs - which were further categorized into specific habitat types (see Section 8.0). The following table provides a summary of the distribution of these main categories of existing WHUs in Strathcona County:

AREAL DISTRIBUTION OF WILDLIFE HABITAT UNITS IN STRATHCONA COUNTY		
Wildlife Habitat Unit (WHU) Type	**Total Area (ha)**	**% of Total Area**
Upland WHUs	27733.9	23.2
Wetland WHUs	12161.7	10.2
Lake WHUs	7910.0	6.6

Furthermore, these WHUs were prioritized on the basis of either (a) their value as good quality wildlife habitat in their existing state, or (b) their potential for restoration to increase their value as habitat to wildlife, either locally or on a landscape scale. The resulting distribution of Priority 1, 2, and 3 WHUs and Priority 1, 2, and 3 Restoration WHUs was as follows:

AREAL DISTRIBUTION OF PRIORITY WILDLIFE HABITAT UNITS IN STRATHCONA COUNTY		
Priority Level / WHU Type	**Existing WHUs (ha)**	**Restoration WHUs (ha)**
Priority 1 Upland WHUs	12237.8	3123.4
Priority 1 Wetland WHUs	4002.1	627.2
Priority 1 Lake WHUs	6665.5	0
Priority 1 WHU Subtotal	**22905.4**	**3750.6**
Priority 2 Upland WHUs	6108.8	1425.6
Priority 2 Wetland WHUs	3755.1	820.7
Priority 2 Lake WHUs	835.1	0
Priority 2 WHU Subtotal	**10699.0**	**2246.3**
Priority 3 Upland WHUs	4521.7	316.6
Priority 3 Wetland WHUs	2400.8	555.8
Priority 3 Lake WHUs	409.9	8.1
Priority 3 WHU Subtotal	**7332.4**	**880.5**

The prioritization of such Wildlife Habitat Units prior to development seems to be a realistic and useful approach for comparing the value of different components of the natural environment. While this method is applicable to other instruments such as environmental impact assessment as well, the key to its successful use lies in application early in the planning process. It should be used as a screening and flagging tool, not as an end-product. For practical application of the project, habitats of roughly equal value must be clustered so that they can be easily identified in an area of concern and so that they may guide Strathcona County's planning processes.