3 PLANNING FOR SUSTAINABLE LAND USE IN STRATHCONA COUNTY

3.1 The Emerging Paradigm of Ecosystem and Landscape Management

The active conservation of wildlife in Alberta has seen the development of two varying management themes. The fine-filtered approach of single species management has specifically provided for sustainable populations of game species, protection of provincially rare and sensitive species, and recovery of federally listed endangered species. However, it is now realized that traditional species-specific management may be inadequate to address the recently rising concerns over maintaining biological diversity, including ecological processes and threatened habitats such as wetland and riparian ecosystems and old growth forests. This has resulted in a shift to coarse-filtered species management (Hunter 1991), also variably referred to as ecosystem (Salwasser 1991), community (McIntyre 1992), or biological template (Knopf 1992) approaches to wildlife conservation. All of these definitions share the assumption that conserving landscapes and representative habitats will provide for the needs of associated species and ecological processes. In Alberta, implementation of the provincial Forest Conservation Strategy (Alberta Environmental Protection 1994) and the North American Waterfowl Management Plan are indicative of this recent trend.

Managing representative ecosystems as complete units for preserving ecological diversity will conserve some, if not most, wildlife species under the umbrella of the ecosystem but this approach will not conserve all associated species. The persistence and viability of an optimal number of species requires the integration of coarse-filtered landscape approaches and fine-filtered management specific to individual species. The question then arises as to which wildlife species warrant specific attention within the context of conserving biological diversity and sustainability of resource use. While rare and endangered species justifiably demand attention in most conservation approaches, other species may also be particularly sensitive or may be critical to the functioning of the ecosystem due to the ecological niche which they fulfil.

Even though ecosystem (Tansley 1935) and ecosystem management (Van Dyne 1969) concepts have existed for decades, there remains considerable ambiguity regarding the definition and application of these terms. Ecosystems have been defined in numerous biology and ecology textbooks as energy - nutrient processing systems. A widely

accepted definition has been proposed by Odum (1971) as *any unit that includes all of the organisms in a given area interacting with the physical environment so that a flow of energy leads to a clearly defined trophic structure, biotic diversity, and material cycles.* In reality, however, the concept need not be so stringently delineated. A working definition deemed more appropriate for use in prioritizing Wildlife Habitat Units in Strathcona County can be developed. In such a context, an ecosystem becomes any portion of the land base chosen as an area of interest, with the line around that area being the ecosystem boundary and anything crossing the line being input or output. The ecosystem has been described as a "one size fits all" concept (Spies et al. 1991) and can be represented by a unit as small as a single vegetation unit or as large as an entire wetland complex, dependent upon the scale and components of interest. Thus, ecosystems are characterized as being spatially and temporally variable and as being comprised of overlapping and interacting components (Johnson and Agee 1988).

The primary evolving characteristic of ecosystem-based management, in contrast to more traditional multiple-use management, is a shift in attitudes and priorities of managers. Where the emphasis of multiple use management is to sustain product yields, the focus of ecosystem management is on ecological health, integrity and long term productivity (Norcross 1991). The assumption inherent in the ecosystem-based management approach is that the values of the land base exceed the multiple uses or outputs of the land base. The maintenance of ecosystem structure and function and enhanced species diversity is anticipated to, subsequently, yield sustainable products while conserving the integrity of the ecosystem.

This relatively recent concept of "ecosystem-based management" can be viewed as landscape-level planning through manipulation of (1) internal ecosystem structure and function and (2) ecosystem inputs and outputs. While the meaning of ecosystem-based management has not been universally defined or accepted, common threads do run through its utilization, regardless of context. Ecosystem-based management is geared towards the maintenance of ecological processes within and through an ecosystem and, ultimately, to maintaining functional stability of that ecosystem. Functional processes which contribute to ecosystem stability include (Ricklefs et al. 1984):

- biogeochemical cycles (i.e., hydrological cycles);
- primary and secondary production (energy flow);
- mineralization of organic matter in soils and sediments;
- storage and transport of minerals and biomass; and
- predator - prey interactions.

Because ecosystems encompass many species and their inherent genetic variability, ecosystem-based management will aid in conserving diversity at all levels. Ecological processes such as predation, pollination, and parasitism as well as evolutionary processes such as mutation, hybridization, and geographic isolation must be maintained at rates characteristic of the natural ecological system (O'Connell and Noss 1992). Regional landscape management, however, does not dismiss species-level management in areas where it is deemed necessary. Nonetheless, active long-term management must be ecosystem-based in order to maintain sustainable resources and desired levels of biological diversity.

A holistic ecosystem-based approach to resource management demands "*an integration of ecological evaluation methodologies; coordinating data ranging from individual species occurrences to regional landscape patterns*" (Noss 1983). Throughout North America, the impetus to conserve diversity through ecosystem-based management now lies with land managing agencies, including private, provincial, federal, and cooperating institutions. Strathcona County's adoption of a broad landscape or ecosystem perspective enlarges the focus of land management and resource conservation to whole ecosystems rather than selected parts or species and, most notably, does not deny the importance of producing resources needed by society. Rather, it focusses on sustaining desired ecosystem conditions of diversity, long-term productivity, and resilience, with yields of desired uses, such as residential and agricultural development, being commensurate with the larger goal of sustaining those conditions.

3.2 The Role of Prioritized Landscape Inventory in Land Use Planning

It is widely recognized that adequate inventories are necessary to assess the impacts of land use on biodiversity and to devise and implement both conservation strategies and land-use strategies (Rice 1990). The integration of natural resource inventory with land-use planning is not a new philosophy. The concept has evolved from Hill's (1961) ecological basis for land use planning to more recent endeavours such as the A-B-C (abiotic, biotic, cultural) resource survey method detailed by Bastedo (1986).

By identifying priority wildlife habitats prior to the development of land-use plans, biodiversity conservation can be incorporated into both private and public land management. The overall goal of employing this Prioritized Landscape Ecology Assessment into Strathcona County's planning process is to maintain viable populations and natural distributions of native species and communities in the regional landscape. By managing these priority landscapes and habitats, Strathcona County planners and land managers are able to cultivate a responsible land ethic which does not preclude

development, habitat alteration, or even loss of certain species from a given area. Conservation of such priority, or critical, habitats is all too often called upon as a crisis intervention tool when, in reality, the recognition of these areas can incorporate a *"no net loss"* principal and avert, rather than resolve potential crises. The philosophy underlying *no net loss* is characterized by the flexibility to allow development while maintaining present, or increasing, levels of diversity within the context of a regional landscape. This Prioritized Landscape Ecology Assessment, therefore, plays an integral role in the future of biodiversity conservation in the County by providing the inventory of biological and physical resources and ecological processes which are either significant in the County or which represent the County's biodiversity, both in a local context and in a broader, regional context.

Through the development of this County-wide Prioritized Landscape Ecology Assessment, Strathcona County land managers will be able to ensure that ongoing development and subdivision planning does not conflict with the preservation of critical natural resources in the area. Specifically, the following components of the County's biodiversity have been addressed by this endeavour:

- gene pool preservation will allow the maintenance of genetic variety for the future;
- preservation of representative ecosystem samples will allow the maintenance of ecological processes;
- preservation of special and unique environments will have economical, educational, research, and cultural advantages;
- preservation of environmentally sensitive areas will allow the persistence of areas which have little resilience to ecosystem disturbances;
- preservation of refuges, breeding areas, and otherwise critical habitat for rare and endangered species (on any scale) will minimize the risk of anthropogenic extinctions; and
- maintenance of extant landscapes (including wetlands and waterbodies) is a prerequisite to the maintenance of ecological processes.

3.3 Implementation of Conservation Easements on Private Land

In Strathcona County, wildlife is a publicly owned resource which is not subject to any form of confinement but is resident on largely privately owned lands. Landowners control activities on their land and there is little opportunity for formal protection of natural areas for wildlife conservation purposes. The designation of parks and ecological reserves, while remaining a necessary feature of a protected areas network, are not usually feasible in areas such as Strathcona County, given the amount of privately held land and the already high level of fragmentation. Therefore, other existing legislative powers that control or regulate the use of the land must initiate sustainable development programs which allow for the mutual use of the land base for both conservation and production.

Under the Canadian constitution, regulation of land use in Canada is largely the responsibility of the provincial governments. All provincial legislatures have enacted statutes providing for the creation of plans to guide development, establishing policies for particular planning areas, and giving municipalities the power to pass zoning by-laws limiting the uses for various classes of land. Provincial statutes are designed to involve the local authorities, to provide for public input, and to allow for review by government agencies. It is the provincial department responsible for municipal affairs that is in charge of applying these statutes. The involvement of local authorities is often done through either a planning act or a municipal act. Thus, administration of land use planning is generally assigned to local authorities such as Strathcona County, including the power to make decisions on the current and long-range uses of land.

The purchase of partial property rights (tenures) for the purpose of placing restrictions on land use is one of the most attractive mechanisms available to Strathcona County if land use planning in the area is to proceed in an ecologically compatible manner. Alberta's Environmental Protection and Enhancement Act has recently been amended to include the establishment of *conservation easements*, or voluntary agreements between private landowners and conservation groups.

Most of these agreements are simple contracts in that they bind the signatories but they do not bind anyone else. However, a special form of agreement is possible to deal with that problem. Called an "*easement*" or a "*restrictive covenant*", it binds future owners as well as the present owner and protects portions of the land in perpetuity. Public authorities in the United States have had a long-standing policy of purchasing easements and covenants from landowners for various conservation purposes. However, the use of easement legislation has been uneven in Canada and has only recently been introduced to Alberta.

The conservation easement provides a practical, legally effective tool for a private landowner to protect forever the significant features of a property, or a portion of a property, while retaining private ownership. By defining and removing particular rights from the ownership of a parcel of land, the conservation easement creates permanent safeguards against uses of the land that could damage or destroy its ecological, scenic, recreational, or resource values. Each conservation easement is written specifically to address the needs and desires of the owner, the natural characteristics of the land, and the conservation objectives of the protecting organization.

The literature on conservation easements has often discussed the advantages that such agreements have over other arrangements. For example, Reid (1988) summarizes these advantages as follows:

(i) initial costs of aquisition may be less;
(ii) management of land is provided by the landowner;
(iii) the land remains on the municipal tax roll;
(iv) the land remains in production or use; and
(v) social disruption is minimized.

Other advantages and issues concerning the implementation of conservation easements have been detailed in Haigis and Young (1983) and, most recently, in the *Proposal for Conservation Easement Legislation in Alberta* (Alberta Environmental Protection 1996).