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Department of **Soil Science**

The University of British Columbia
Vancouver, Canada

Date 28 August 1998
Abstract

With a limited land base of only 5% of the province, agriculture is viewed as a critical resource for British Columbia. Demands to use agricultural land for urban and industrial expansion saw thousands of hectares converted during the 1950's through to the mid seventies, until the introduction of the Provincial Agricultural Land Commission and its efforts to save farmland. Pressure to use farmland for other purposes however has not lessened. Marginal farmland is especially prone to conversion to non farm uses. It is this land that often has been left for wildlife habitat. Therefore with the loss of this land other uses and the expansion of existing farms onto marginal lands, wildlife habitat is disappearing.

This purpose of this study was to examine the potential integration of small farm operations within the Agricultural Land Reserve in support of wildlife habitats. The study focused on the Greater Vancouver Regional District, as this region represents the largest urban region in the province, yet also accounts for 26% of the province's total farm gate receipts. Although regional studies are being undertaken linking habitat management with large-scale farm operations, small farm operations have not been included in this research. The Greater Vancouver Regional District, while containing numerous large-scale farm operations, also accounts for the highest percentage of small farms (2 - 4 ha) in the province. This study demonstrated the of twinning two land uses within a region. Similar efforts are being undertaken by the regional district to match outdoor recreational uses within a rural area.

In order to effect the proposed land use strategy, the study utilized planning methodology. General planning processes were reviewed to develop an understanding of how rural land use planning could be effectively used to develop the strategy. The rural plan in this study drew upon
a variation of an ecological planning model and adapted the processes for the land use strategy. As a result, the study included a general review of agriculture in the regional district, farmland habitats, wildlife and wildlife habitat management practices as they relate to agricultural land uses. Further, the study examined small farms within the regional district, and part-time farming in the region. Decision-making and implementation within the plan included a review of past and current policies, and regulations as they relate to potential stewardship programs.

To demonstrate the application of the rural plan within a regional context, the study included a case study. The site in question focused on the southwest corner of the Township of Langley. Included in the case study was a review of the region's social and cultural background, biophysical aspects, plan criteria and objectives, a resource inventory, analysis, a plan map and summary. The highlight of the case study was the connection made between current agricultural land uses and their potential to support habitat management practices. The plan illustrated that the land use strategy has a good potential for maintaining and enhancing not only wildlife habitats in the region but also agricultural land use as it pertains to small farm operations. The case study area also focused on Campbell Valley Regional park as a protected source for wildlife in the immediate area.

The study emphasized potential cooperative land uses between agriculture and wildlife. Through the utilization of a planning approach, the land use strategy was reviewed and applied within a regional context. Similar applications can be designed throughout the regional district. In many cases regional parks are contiguous to small scale agricultural land uses. Management programs focusing on private land stewardship, coupled with zoning and incentive programs, would allow for the employment of comparable rural plans throughout the regional district.
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1.0 Introduction

This study examines the suitability of using a planning approach to formulate a strategy which will act as the foundation for integrated land uses between small farm operations and wildlife habitat. The proposed planning model incorporates parks or protected areas into the rural land use plan as an integral component of wildlife habitat preservation and enhancement. Habitat preservation in this study concentrates on management practices which can be carried out on small farms within the Greater Vancouver Regional District (GVRD). This research surveys the role that private stewardship can play in maintaining sustainable agricultural land uses which complement wildlife habitats. Incorporated into this concept is the part which provincial and local regulatory programs and policies play in supporting the development of sustainable agricultural land uses and wildlife biodiversity. Without habitat, there is no wildlife.

A similar approach is being applied nationally by Agriculture and Agri-Food Canada; known as "Agriculture in Harmony with Nature". This program entails the promotion of sustainable agriculture development within the agri-food sector (Agriculture and Agri-Food Canada, 1997). Like the federal initiative, the strategy developed in this study focuses on the integration of present land use and wildlife habitat.

Wildlife is for the most part (excluding such operations as game farms) a public resource, while agriculture on the other hand is largely a private enterprise. In British Columbia, the Lower Mainland represents 51% of the province's overall farm cash receipts, yet contains only 1.6% of the province's total agricultural land area (GVRD, 1990). At the same time the Lower Mainland and more specifically, the Greater Vancouver Regional District (GVRD), Figure 1, is the province's focal point for urban growth. As the GVRD's population continues to grow, land use management of the region's remaining agricultural land and natural areas has become a critical factor.
Figure 1. Location of Greater Vancouver Regional District within the Lower Mainland.
Loss of farmland for non-farm purposes has resulted in an intensified use of the region's remaining land. In turn, land which once was considered marginal has now been put into production. Much of this marginal land served as wildlife habitat. As the GVRD's urban shadow spreads, this trend will continue and suggest strongly the need for land use planning and management of rural areas.

Provincial farmland protection has been undertaken by way of the Agricultural Land Commission Act (ALC), Bill 42, 1973 and locally through Official Community Plans (OCP). However, little has been undertaken within the GVRD to preserve areas suitable for wildlife habitat's. Regionally, the GVRD has purchased land as part of its parks program. These units have provided habitat areas throughout the region but act largely as isolated protected zones. This study explores the methodology and application of using a land use strategy as a means of managing wildlife habitat and agricultural together as a single resource within the GVRD. Specifically the strategy focuses on small farm and rural residences which run contiguous to established regional parks.

1.1 Problem Statement

Current research involving agricultural land uses and wildlife habitats has concentrated for the most part on large scale agricultural operations and their role in conservation and enhancement of waterfowl habitats. The North American Waterfowl Management Plan (NAWMP) was started in 1986 with its goal of protecting and enhancing wetland habitat throughout North America. In Canada its goal is to protect 1.5 million hectares of land suitable for migratory wildlife habitat (Kaarik, 1994). Prairie farmers have become involved in NAWMP by preserving and enhancing
approximately 526,000 ha of farmland for wildlife habitat under the Permanent Cover Program (Fullen et al., 1994).

Resource management is undertaken at all scales given that ecosystems exist at different scales in the landscape. The proposed strategy has as its goal the integration of sustainable agricultural land uses and biodiversity conservation. This study will explore the question of how a land use plan can be used to integrate wildlife habitats comprising a park or protected area and surrounding small farms. The small farms included in this study vary in size from 2 to 4 ha and are used primarily as rural residences. Both the park and its surrounding farms described in this study fall within the GVRD urban shadow. The development of rural plans which support environmentally based land use strategies has become a major issue for such municipalities as the Corporation of Delta. In the Delta Rural Land Use Study (1994), the corporation indicates that the future of Delta depends on the resolution of key issues including the management of agricultural lands and wildlife habitat.

1.2 Methodology

This paper will review processes as they apply to the development of a rural plan which will be used to develop and implement a land use strategy based on the integration of agriculture and small farm operations. Planning processes will be examined to provide the reader with a basic understanding of how planning works. This will be followed by a review of rural land use planning and the framework of the plan used in this study. Components incorporated in the land use plan include: parks and their importance for wildlife habitats, agriculture within the context of the GVRD, small farms, and wildlife in British Columbia. The plan will define habitats on farmland and
land use management practices supporting habitat conservation. Decision making and implementation within the plans framework is undertaken by way of a review of past and current legislation, policies and programs.

The research includes a Case Study involving small farms and Campbell Valley Regional Park, located in the southwest corner of the Township of Langley. The summary will review the processes involved in developing and implementing the strategy.

2.0 Background

2.1 Introduction

Well over two decades ago the International Union for Conservation of Nature and Natural Resources established as its goal "to ensure Earth's capacity to sustain development and support all life" (Caza and Kaarik, 1994, p.33). This philosophy has been adapted by the government of British Columbia and forms a central theme for land use throughout the province (Commission on Resources and Environment, 1994). When linked to resource management, this concept can be summarized into two land use goals: (a) sustainability, and (b) stewardship.

2.2 Sustainability

Sustainability can be defined as "the capability to maintain long term production with as many options as possible for future generations" (Environment Paper 47, 1986). Within the scope of agriculture this definition can be further fine tuned to include the concept of the lands ability to produce food for a long term. Sustainability can also act as a measure by which to gauge land management practices.
2.3 Stewardship

Stewardship of land resources in British Columbia is divided into two primary sources, private and Crown lands. Crown lands fall under the jurisdiction of the British Columbia Ministry of Environment, Lands and Parks (BCMOELP). The management of crown land is further allocated to other agencies such as the Ministry of Forests which uses this public resource for timber licenses and associated activity. The stewardship of Crown land is therefore closely regulated through government agencies. The other form of stewardship is linked to private property ownership. Land use under private control includes vast tracts of urban, industrial and agricultural land throughout the province. This includes a majority of the land within the province's Agricultural Land Reserve (ALR). The ALR is the principal land base controlled by the Provincial ALC Act. Given this factor close to 5% of the province's total land area of 95 million hectares would fall under some form of private stewardship. A rural land use plan based on sustainability and stewardship, can provide the nucleus for management plans or programs focusing on the integration of small farms and wildlife habitats.

2.4 Goals

Within British Columbia, recent programs such as the Greenfields Project, (which is now incorporated into the Delta Farmland and Wildlife Trust (DFWT)) have emphasized the twinning of current agricultural land uses and wildlife. This program has focused primarily on migratory waterfowl and large scale farm operations. The goal of this study is to develop a land use strategy focusing on land use practices which support the sustainability of small farms in the GVRD in conjunction with the preservation and enhancement of wildlife habitat which is contiguous to small
farm operations. To achieve this goal the following objectives were pursued: (a) to detail the strategy along with those components necessary for land use integration, (b) to develop a rural plan for the implementation of the land use strategy, and (c) the identification of critical plan components including farmland habitat, habitat management practices, small farm operations and part-time farming in the GVRD, and management practices through legislation, policies and stewardship programs, both private and public.

3.0 Land Use Strategy

3.1 Introduction

The goal of the strategy to provide for the development and maintenance of sustainable land use practices in association with small farms in the GVRD, and to preserve and enhance wildlife biodiversity in the GVRD through a broad range of habitat management practices based on current land uses. The implementation of a land use strategy concentrating on the integration of small farm operations and wildlife habitat management practices requires the use of a comprehensive rural plan. By using a planning approach the strategy can promote land uses which "anticipate and prevent" rather than "react and cure" to changes within a regions land use (Agriculture and Agri-Food Canada, 1997). The rural plan provides a procedure through a planning process which allows for the realization of those components which make up the strategy. This in turn allows for the formulation of management programs and land use schemes which concentrate on the integration of land uses that are mutually beneficial for both small farms and wildlife habitats.
3.2 Components

The challenges of maintaining current land uses within a region of small farms and natural areas can be met through a strategy utilizing methods which support the enhancement and preservation of wildlife habitat, and methods for sustainable agriculture. The strategy proposed in this study would reflect land use criteria which favours habitat management practices and act as a foundation for sustainable agricultural land uses. Principle concepts of the strategy include:

A. To preserve:
   - farmland and those present land uses conducive to both agriculture and wildlife habitats,
   - environmental quality and the natural assets of the region,
   - to maintain the region's options for the future through monitoring and public feedback of the rural plan.

B. To enhance:
   - wildlife habitat in the region without detrimental effects on contiguous farmland,
   - a range of agricultural land uses which are sustainable and contribute to the continued identity of the region as one of small farms and rural residences,
   - opportunities for compatible land uses between wildlife habitat management and agriculture
   - stewardship programs promoting wildlife habitat management on privately held land.

These objectives provide the basis for the strategy and allow for the development of elements which provide a rational for the rural plan. Included as part of the integration strategy are policies which concentrate on:
A. Small farms and part-time farming. The land use strategy would support the preservation and enhancement of farms in the region. It supports part-time farming as a way of life and encourages sustainable land uses. Plans for the region should encourage the maintenance of farm units in their present state and limit non-farm uses in the region.

B. Farmland habitats. The strategy would support land uses on farms and rural residences in the region which ensure sustainable land uses. It would encourage land uses which are not only sustainable for agriculture but preserve and enhance wildlife habitats. These types of practices would limit soil erosion, maintain and improve soil structure and improve the level of soil fertility, as well as limiting the use of pesticides. Land use plans for the region should designate areas sensitive for wildlife habitat, as well as those having a high, moderate or low potential for integrated land uses (specifically, current agricultural land uses which support habitat management practices).

C. Wildlife Habitat. The strategy would support and encourage the acquisition of parkland and areas of significant high biological production. It would encourage the multiple use of land both within parks and protected areas for recreation and habitats, as well as, on small rural holdings combining agriculture and habitat management. The strategy would limit incompatible uses contiguous to parks or protected areas such as large scale urbanization or greenhouses. Concurrently, the plan should address the need to designate areas as parks and/or protected areas with significant high biological productivity. Further, these areas should be isolated from urbanization through buffered land uses such as small farm operations. The plan should also indicate areas designated as significant for fish, wildlife or waterfowl, including major water areas and wetlands. The development of the land use strategy and any subsequent rural plan would encourage not only the involvement of private land owners in management programs, but also
public participation in determining land use designations, policies and programs for the region. Components of the land use strategy in turn form the bases for the rural plan. Currently within the GVRD, municipalities such as the Corporation of Delta has developed land use strategies which focus on proactive environmental protection while recognizing the need to maintain a strong base for agriculture (Corporation of Delta, 1994).

4.0 Planning Structure

The plan would have as its objectives: (a) the preservation and enhancement of land uses which are sustainable for agriculture and for wildlife habitat, and (b) include resource management by way of stewardship programs. This section will examine what type of planning framework would support a land use strategy incorporating agriculture and wildlife habitat conservation. Land use planning utilizes land-based data such as soils, topography, climate, vegetation, as well as social and cultural features relating to human activity (i.e. settlement areas) as the basis for land use problem solving and decision making (American Society of Agronomy, 1979).

4.1 Planning Process

The aim of land use planning is to conserve and improve the collective landscape (Turner, 1987). The use of basic planning processes provides a critical framework in which data is gathered, analyzed and prepared as a working document. A basic principle of the planning process is integration and the synthesis of many elements beyond single issue problems and solutions (Brand, 1992). Integration can include numerous resources in a region ranging from natural resources and a variety of land uses to social and cultural aspects. The goal of the plan is to provide some form
of benefit to the community (Brand, 1992). In this study, the rural plan supports the implementation of a land use strategy which would realize enhanced wildlife habitat and sustainable agricultural land practices.

4.1.1 Purpose of Planning

The primary purpose of planning is to make decisions about resources, both social and natural. Regional planning is centralized around the concept of accommodating changes within a defined geographic area, resulting primarily from social and cultural (human) modifications (Solberg, 1971). These changes are the result of shifts in the population, as well as perceived needs, problems, and opportunities. The resulting planning effort is grouped into two broad classifications: (a) planning orientated towards the decision-making process, and (b) technical planning (Marsh, 1983, p. 9).

Decision-making planning provides the necessary information to carry out on planning process which focuses on formulating decisions and implementing programs (Marsh, 1983, p.9). As well this type of planning establishes regional conditions now and forecasts future trends, defines policies and goals, drafts courses of action and selects preferred plans.

Technical planning involves a variety of analysis and related technical activities supporting the decision-making process. Included in this process is the use of environmental inventories such as soil and vegetation mapping, suitability studies and impact assessments. The line separating these two types of planning activities is indistinct and both types often merge with each other. The planning process gives the public a sense of direction and alternative choices.
4.1.2 Planning Sequence

Rural planning is a process designed to provide possible solutions to problems within a region (American Society of Agronomy, 1979). The overall planning process consists of:

Establish goals and terms of reference. This would stipulate the goal of the plan, the objectives and the terms of reference. In terms of agriculture and wildlife conservation, sustainability would emerge as a primary goal. The terms of reference would apply to the specific methodologies involved in the process of developing a rural land use plan,

Analyze the problem. This process involves an analysis of the existing land use situation, problems and needs of the central players. Constraints to change are identified and documented. The proposed strategy would focus on the problem of how integration of two definable land uses, small farm operations and wildlife habitats, can be planned for and managed within the specified region,

Identify opportunities for change. Document those land use changes which will help resolve the problem or the goals of the plan,

Evaluate land suitability. Match the possibilities with the characteristics of the property and its land use potential,

Choose the best options. Decide which changes in the region should be made and integrated into the primary focus of the land use plan,

Prepare the land use plan. Based on the best options prepare a land use plan for the appropriate land use management scheme,

Implement the plan. Set the plan into action either through local authorities or by the cooperative effort of the planning agency and the land owner(s),

Monitor the plan. Is the plan achieving its goal, does it need revisions?

(FAO, 1993). Figure 2 illustrates the basic planning stages discussed above.
Figure 2.

Illustration demonstrating a generalized method for land use planning.

Formulation of Goals and Objectives

↓

Inventory and Analysis

↓

Development of Alternatives

↓

Study/Evaluation of Alternatives

↓

Selection of Plan/Management Program

↓

Implementation

Source: American Society of Agronomy, 1979
4.2 Approaches to Planning

4.2.1 Rural Land Use Planning

Rural planning is a process, not a product (Brand, 1992), in which the resources of an area both natural and cultural are inventoried and prioritized to allow for the formulation of land use strategies. This process includes the documentation and itemization of natural resources within a region to allow for the identification and prioritization of land use strategies (Brand, 1992). It is based on the following principles:

A. Land use planning in rural areas is multipurpose and deals with very large areas,

B. Rural planning requires the development of mutual relationships for sustainable rural development,

C. In the process of establishing sustainable rural development, land use planning has become the bridge between rural planning and rural development. It is important for sustainable rural development to have a solid background of land use planning (Kitamura and Kobayashi, 1992). Objectives of the plan can include such issues as soil and water conservation, rural development, and wildlife habitat preservation and enhancement (Brand, 1993).

The planning process involves two types of planning themes: planning which deals with societal problems and planning devoted to land use and resource management. Rural land use planning focuses on site specific problems and will allow for the implementation of a strategy based on integrated land uses. Kitamura and Kobayashi (1992) indicate that the main difference between urban planning and rural planning is linked to several elements. Rural planning often covers a larger land base than urban planning, thereby necessitating the need to determine a working scale. Secondly, land use in rural areas must not only take into account cultural and infrastructure aspects
but also a variety of natural conditions. These conditions can be determined through regional resource inventories. A third condition is that rural planning must account for a variety of land uses such as agriculture, forestry, parks, recreation zones and settlement areas (Kitamura and Kobayashi, 1992, p. 319).

The strategy allows for the development of these planning concepts through its formulation of: (a) the use of a regional approach to the land use strategy. The rural plan employs a "middle land use" scale (Kitamura and Kobayashi, 1992, p. 320) in that the strategy would focus on land uses such as agriculture (or settlement areas or forestry) which are smaller than major land uses (i.e. the regional district) yet larger than minor land uses (i.e. lot by lot planning), (b) the plan focuses not only on small farms and their role within a rural community but takes into account the areas natural resources in the form of wildlife habitats, (c) the plan also reviews the potential of not only combining a land use management program based along with habitat management, but also the potential of providing sustainable agricultural land uses, and (d) in implementing the plan, potential policies and programs focus on involvement of the public in the planning process and stewardship programs.

Rural planning focusing on sustainable land uses can employ a variety of processes. A planning process for the proposed land use strategy has been adapted from Steiner's Ecological planning model (Steiner, 1991). The proposed rural planning model would encompass seven steps. These include: (a) problem identification, (b) goal establishment, (c) planning concepts (d) regional level inventory, (e) detailed studies, (f) plan decision making, and (g) implementation. Steiner's adapted planning model provides the basis for the planning framework used in the land use strategy. It allows for the development of a vision, by way of established planning criteria, the development
of a plan through a resource inventory, coupled with decision making and action by selection of appropriate policies and plan implementation incorporating a stewardship program focused at private land owners.

5.0 Rural Plan

5.1 Introduction

As its main goal, the proposed rural plan will allow a vision (a strategy for integrated land use between small farms and wildlife habitat) to be put into action (Brand, 1992). The plan will utilize components which support the development of the land uses which are compatible with the stated strategy. As discussed in section 3.0, the purpose of the strategy is to encourage compatible land uses and management practices arising from small farm operations which preserve and enhance wildlife habitats. In furthering this concept, the rural plan will need to detail:

i. The planning concepts on which the plan is based,

ii. Inventories or studies which form the applicable components of the plan,

iii. Decision making factors and potential implementation programs which would allow the strategy to be applied within its regional context.

The employment of planning processes directed at integrated land use planning has been developed at several scales. Regionally, the GVRD has put into place its the Livable Region Strategic Plan (1995) fostering improved planning for urban development, transportation, agriculture, parks and wildlife. At a municipal scale, both the Corporation of Delta and the Township of Langley have produced plans focused on multiple land uses. Some of the stated goals of the Delta Rural Land Use Study, state a need to protect the agricultural land base as well as
maintaining the overall habitat capability throughout Delta (Corporation of Delta, 1994). The Township of Langley's Rural Plan includes in its objectives: "to protect the quality of the environment in rural areas" and "to support the agricultural use of land and the agricultural industry in the rural area" (Corporation of the Township of Langley, 1993, p. 9).

5.2 Plan Concepts

5.3 Farmland Habitats

5.3.1 An Overview of Agricultural Land Use in the GVRD

The GVRD occupies the western third of the Fraser Valley yet is less than 1% of the province's entire land mass. Serving as British Columbia's metropolitan centre, its population represents 49% of the province's total population (GVRD, 1997). Agriculture is an important part of the GVRD. The region has approximately 92,000 ha of land of which 64,200 ha is within the ALR. Richmond (5180 ha), Delta (10,200 ha), Surrey (8900 ha) and Langley (23,740 ha) total 48,000 ha or 50% of the region's total agricultural land area (GVRD, 1997). It is within this area that potential habitat preservation and enhancement programs can be developed.

The role of agriculture within the GVRD has been well defined in the regional district's plans and mission statements. In the Livable Region Strategic Plan, the GVRD (1995) indicates that the livability of the region is greatly enhanced by its rural areas and the presence of the farming community.

The continued support of agriculture in the GVRD has been detailed within the district's long range land use goals. These include: (a) site planning including buffers and setbacks protecting agricultural land, (b) integrated pest management, (c) soil and water conservation programs, and
(d) fish and wildlife habitat considerations in cooperation with agricultural land use (GVRD, 1990).

Policies initiated by the GVRD have provided a platform for land use management and land use plans concentrating on the integration of farms into wildlife conservation programs. Farms are one of the few remaining sources of land in the GVRD available for habitat preservation programs.

5.3.2 Farm Habitats

Most rural properties have several habitat types within their boundaries. Moen (1983) in his review of agriculture and wildlife management used the term: "Farm Habitat". His work detailed farm habitats as including tilled and untilled land. Tilled land includes cropland and pastures actively used for grazing. Untilled land includes old meadows, woodlots, hedgerows, and marshes. These are habitats which do not change each year, but may change slowly over a period of years (Moen, 1983). The identification of habitats allows for the establishment of connectivity between land uses and the designation of common linkages within the landscape and therefore within the rural plan. These land uses include:

Croplands. Cropland can be divided into three sub categories: (a) key cropping area uses for field crops, horticulture and speciality crops, (b) fragile croplands which may be useful in the short term but risk soil loss through water and wind erosion and soil compaction, and (c) marginal croplands which are not profitable to farm, as they may be steep and dry or have shallow, stony or very poorly drained soils. Within the GVRD, croplands provide valuable rest and feed areas for migratory waterfowl including Canada Geese, Wigeon, Snow Geese and Trumpeter Swans (Smith, 1997). Mammals ranging from small mice and voles to hares and rabbits along with deer will seek out croplands for both food and cover (Ministry of Agriculture, Food and Rural Affairs, 1996).
Pasture. Most pastures are used for livestock grazing and generally are established on land with less capability for crop production. Pastures can be extensively grazed (low density grazing) or intensively grazed. Land with a higher capability are also used for hay. Pasture land is often combined with cereal-forage rotation. Regionally, within the GVRD, birds such as the American Goldfinch use marginal pasture land for nesting purposes. Small mammals including mice and voles use this land as part of their habitat (Taitt, 1996). Mice and voles in turn provide a ready source of food for large mammals such as coyotes and the red fox, as well as red tail hawks, owls, great blue herons and northern harriers (Corporation of Delta, 1994).

Odd and Abandoned Areas. These type of units often occur between croplands and natural areas. Odd areas can include such features as small uncropped areas, field corners, farmstead ruins, very steep slopes and wet spots. Abandoned farmlands often include those pastures and croplands which are too fragile or marginal to farm. Throughout the GVRD many old and abandoned farms provide a wide range of food and cover for many species of birds (e.g. grouse), mammals (i.e. ranging from squirrels to raccoons to coyotes) and reptiles (e.g. snakes, frogs and toads) (Greenfields, 1995).

Farmsteads. While seen as an integral part of the farm unit, farmsteads also provide for a variety of wildlife habitat. Farmsteads can include; homes, lawns, gardens, barns, utility sheds, other buildings, lanes, the farmyard, farm ponds, exercise yards and paddocks. Birds such as the Song Sparrow tend to feed and nest near farm homes and outbuildings (Ministry of Agriculture, Food and Rural Affairs, 1996).

Windbreaks, Shelterbelts, Hedgerows and Fencerows. These strips of permanent vegetation provide protection for crops, livestock and the farmstead. At the same time they play an integral part in connecting habitat nodes as important wildlife corridors. They can be found along roads,
beside ditches and agricultural fields and provide perching sites, nesting and roosting potential, food and a safe corridor for moving from one location to another (Corporation of Delta, 1994). Some mammals using this habitat include mice and voles, squirrels, rabbits and hares, raccoons, porcupines, skunks, deer and coyotes, as well this habitat is also inhabited by a wide range of song birds, grouse and ducks and geese (Ministry of Agriculture, Food and Rural Affairs, 1996).

Woodlots and Plantations. Woodlands are dominated by forest tree cover and associated forest vegetation and often form a dominant part of the farm landscape. Woodlots can vary in size from farm to farm and may contain a combination of deciduous and coniferous trees or exclusively deciduous. Plantations may concentrate on nursery stock, Christmas trees, and filbert trees in the GVRD. Woodlots and stands of trees provide habitat for raptors both in the form of nesting and for perching while hunting. In the GVRD, these areas are used by such species as the Red-tailed Hawk and Barn Owl, as well as hummingbirds, woodpeckers, Great Blue Herons and songbirds (Langley Field Naturalists). Raccoons, opossums and deer are some of the mammals which rely on woodlots and tree stands as part of their habitat range (Corporation of Delta, 1994).

Wetlands. This classification allows for a transitional separation of land use, such as a marsh which separates pastures from ponds. Wetlands are considered to be the most productive type of habitat (Ministry of Agriculture, Food and Rural Affairs, 1996, p. 16). Numerous fish and wildlife species depend on wetlands for their life cycles. Characteristically wetlands consist of four types: (a) swamps, permanently or periodically flooded and dominated by trees or shrubs, (b) marshes, which are permanently or periodically flooded and dominated by rushes, reeds, cattails, sedges and similar vegetation, (c) bogs, usually with a stable water level, that may change as a result of rainwater or snowmelt. The dominant vegetation includes sphagnum moss and occasionally low shrubs and
smaller trees, and (d) fens, are usually located where ground water discharges to the surface. The dominate vegetation includes sedges, mosses, grasses, reeds and low shrubs. Wetlands contain a wide variety of species including aquatic habitat suitable for fish nurseries and vegetation which can provide cover for small mammals and song birds. Regionally, butterflies including the anise swallowtail and the red admiral use wetlands for reproduction (Corporation of Delta, 1994).

Other key habitats within the context of transitional zones are riparian zones or strips of land which separate streams, ditches, lakes and ponds from surrounding lands.

**Watercourses.** Watercourse like vegetation corridors cross numerous farm properties and therefore provide a vital source for connected habitats. Watercourses include streams, creeks, rivers and ditches. Many streams in the GVRD are listed as fish-bearing and are an important habitat for young salmon. Beavers and muskrat also use these habitats for food, cover and reproduction (GVRD, 1988).

**Lakes and Ponds.** Lakes and ponds and their shorelines can provide habitat for many species of fish and wildlife. This is especially true when the shore line is planted with a vegetative buffer. Lakes are standing bodies of water greater than eight ha in size (Ministry of Agriculture, Food and Rural Affairs, 1996, p. 20), anything smaller is considered a pond. Ponds include: instream (created by damming permanently flowing watercourses), bypass (located beside a watercourse), impoundment (created by damming intermittent watercourses or valleys), isolated or dugout (created by pumping in water or feeding it from a spring), and sheetwater (ponding on field soils which are saturated). Bird species such as the belted kingfisher, Canada goose, Wood duck, Mallard and American Wigeon depend on lakes and ponds as a source of habitat in the GVRD. Further, these areas are important zones for amphibia including the bullfrog and the Red-legged frog.
Some of the mammals which use lakes and ponds in the region consist of Muskrats and the American beaver (Langley Field Naturalists).

These basic agricultural landscapes are therefore subdivided into classifications which can be applied to habitat preservation and enhancement. While a plan would compile possible land uses, its implementation can be carried out through a detailed stewardship program.

5.4 Wildlife and Habitats

This section examines the significance of wildlife habitats as components of landscapes and the question of what is wildlife and biodiversity. Most of British Columbia's wildlife inhabit forests, wetlands or grasslands. There are 630 species of vertebrates (excluding fish) in British Columbia, including 448 species of birds, 143 species of mammals, 19 species of reptiles and 20 species of amphibians (Ministry of Environment, 1991, p.4). Wildlife management within the province is the responsibility of the BCMOELP Wildlife Branch.

5.4.1 Definition of Wildlife

The Wildlife Branch has established its operational mandate based on the definition of wildlife in accordance with the British Columbia Wildlife Act (see Section 8.3.2). Included in its definition of wildlife are raptors, threatened species, endangered species, game and other species of vertebrates prescribed as wildlife. Raptors are further defined as eagles, vultures, ospreys, hawks, falcons and owls. Within British Columbia there are no threatened species, but the Vancouver Island marmot, sea otter, white pelican and burrowing owl are on the endangered list. Game includes both big and small game animals and animals designated as fur bearers and game
birds. Birds are also protected under the Federal Migratory Birds Convention Act. The act does not cover the protection of many mammals such as the eastern cottontail rabbit, mice, voles and ground squirrels. Recently however, several species of bats, amphibians and reptiles were brought under the protection of the Wildlife Act (BCMOELP, 1997).

A broader definition of wildlife is that of the Ontario Ministry of Agriculture, Food and Rural Affairs: "Wildlife includes wild organisms such as mammals, birds, reptiles, amphibians, fish, invertebrates (e.g., insects, worms, crayfish) and plants" (Ministry of Agriculture, Food and Rural Affairs, 1996).

5.4.2 Definition of Habitat

Habitat is the environmental setting in which the animal or plant normally lives, grows and reproduces (National Research Council, 1982). The conservation of habitats is a strategic component of the Wildlife Branch's program. Managing wildlife for diversity and sustainability has been established as the Branch's first goal. The Wildlife Branch has also established five criteria that habitat should provide for species. These are:

i. Abundance,

ii. Distribution,

iii. Maintenance of population trends,

iv. Reproductive potential,

v. Habitat integrity.

(Ministry of Environment, 1991)
In order to achieve management programs focusing on the above criteria, the Wildlife Branch has concentrated its habitat policies on managing for diversity. Managing habitats for diversity is a primary objective of land use management. Programs which involve habitat preservation and enhancement must provide four basic needs for wildlife. These are:

i. Food (and water),

ii. Shelter,

iii. Cover from predators,

iv. Space for reproduction.

(Bunnell, 1993)

Traditional habitat management focused on species and their individual needs. Conservation planning of this nature however, frequently resulted in the emergence of dominant species and the loss of other species. Over the last two decades, resource planning has shifted towards land use management based on biodiversity. Prior to the mid-nineteen eighties, the BCMOELP based it's planning objectives on species management, with regional plans targeting a given number of animals of a select species. Over the years however, these planning objectives have changed and now incorporate planning for diversity. Environmental quality is accessed in it's ability to support a variety of species in different densities dependent upon the area's capability (Harcombe, 1984).

5.4.3 Biodiversity

The BCMOELP in its current wildlife program has orientated its habitat programs away from species management to planning for biodiversity. Biodiversity refers to the variety of life on earth. It is based on the idea that all plant and animal species, their habitats and the relationship
among them are valuable and worth preserving. A loss in habitats results in a loss in biodiversity (Ministry of Agriculture, Food and Rural Affairs, 1996).

The BCMOELP has categorized biodiversity into four elements:

i. Biotic or species and community richness (both plants and animals),

ii. Physical richness (soils, topography, water, dead vegetation, etc.),

iii. Evenness (relative abundance of richness elements),

iv. Pattern (distribution, shape, and juxtaposition of richness elements).

(Harcombe, 1984)

The need to incorporate a wide ranging biodiversity throughout a region will support the above listed factors. Within the GVRD, the need to maintain a diversity of habitats throughout the landscape has proven itself through the retention of "old field" habitat. Intensification in the use of agricultural land has seen the loss of vole habitat, which are major food resource for Barn Owls throughout the region. By encouraging the use of old and abandoned structures for Barn Owl nesting sites and limiting the conversion of marginal land into production, vole populations can be retained and the Barn Owls hunting territory can be maintained (Mackintosh, 1996). The application of regional endeavours to maintain species (both flora and fauna) richness has also been incorporated into the Green Zone policies for the GVRD (see section 8.8.3). Regional ecology will be protected through such measures as an interconnected system of wetlands, upland habitats and wildlife corridors (GVRD, 1995).

The Ministry of Forests is also involved in wildlife and habitat management (see Section 8.3.2). As part of the Forest Practices Code (FPC), guidebooks have been written on forest land use management practices including biodiversity. The FPC guidebook (1995) defines biodiversity
as; "Biological diversity (or biodiversity) is the diversity of plants, animals and other living organisms in all their forms and levels of organization and includes the diversity of genes, species and ecosystems, as well as the evolutionary and functional processes that link them". Land use management should be directed at those processes which take into account a managing for habitat diversity rather than habitats focusing on a single species.

Land use management takes place at three levels: provincial, regional and local. As part of the planning process, plans should include the maintenance of native species and ecological processes. This would include: (a) maintaining a variety of patch sizes, seral stages and forest stands, (b) maintaining connectivity of ecosystems or habitats across the landscape, and (c) providing areas of sufficient size to maintain habitat conditions and to prevent excessive edge habitats.

Another significant aspect of biodiversity is the need to define and to match differing land use types such as parks and protected areas. Habitat modifications occur more frequently in land uses associated with urbanization and agriculture, while the greatest biodiversity can be maintained in parks and protected areas (if properly managed) (FPC Guidebook - Biodiversity, 1995).

5.5 Habitat Management Practices

Land management practices centred on wildlife habitats have been assembled as a series of: "Best Management Practices" (BMPs) by the Ontario Ministry of Agriculture, Food and Rural Affairs. Advice is provided to land owners on the preservation and enhancement of wildlife habitat on private land holdings. Specific methodologies are applied to any given property in order to accommodate conservation practices. These practices in turn provide the basis for implementation
of the resource management program, its goals and objectives. These management practices provide a opportunity to incorporate the concept of agricultural sustainability for the farm operation.

5.5.1 Crop Conservation

Crop conservation is a technique use to conserve soil and water and at the same time minimize damage or even enhance wildlife habitats. Management methods involve alternative tillage practices, limited fertilizer application and reduction in pesticide use through Integrated Pest Management (IPM). Specific methods include crop rotation, planting cover crops, managing crop residues, contour strip cropping, and erosion control through grassed water ways, windbreaks, shelterbelts and fencerows. As part of the Greenfields project in Delta, cover cropping has been employed as one practice for soil conservation. At the same time the use of cover crops also provides feed habitat and refuge for Wigeon, Snow Geese, Canada Geese and Trumpeter Swans during their winter migration in the lower Fraser River delta (Smith, 1997).

5.5.2 Pesticide Control

In the control of weeds and insects, alternatives to traditional chemical controls are now focusing on integrated pest management (IPM). IPM is an approach to pest management involving the use of natural and cultural pest control measures, including resistant or tolerant plants, with pesticides applied only when alternative practices do not provide adequate control. Factors affecting wildlife include the timing of pesticide applications, use of granules versus sprays, limiting the amount used, the employment of biological controls along with chemicals and avoiding spraying non
target habitats. The DFWT has undertaken a program focused on biological control versus the use of pesticides in the control of potato pests as part of its mission to encourage the retention of hedgerows. Hedgerows and grass margins may provide overwintering sites for insect pests which can prove to be detrimental to adjacent crops. The IPM focused on the employment of Lady Bird Beetles and Aphidius matricariac (a tiny parasitic wasp) both of which have been used to control pest aphids (Henderson and Short, 1996).

5.5.3 Other Farm Practices

Farm planning can incorporate methods which are beneficial for wildlife habitats and can become part of the farm's operating procedures. These include:

i. Establishing, protecting and enhancing windbreaks, shelterbelts and fencerows,

ii. Rotating grazing and limiting livestock access to watercourses, ponds and lakes,

iii. Delaying haying or using flushing bars,

iv. Providing feeding structures,

v. Managing woodlots and plantations,

vi. Maintaining wildlife trees and shrubs,

vii. Managing restoring and enhancing wetlands on the farm,

ix. Protecting and enhancing vegetative buffers,

x. Maintaining watercourses, drains and ditches.

A similar focus has provided the basis for the DFWT. The DFWT have established land use schedules concentrating on the use of:

Field Programs. The field programs provide land owners with incentives and opportunities to
participate in soil conservation practices which would prove beneficial for the property and wildlife. Such practices include the use of:

i. Grassland set-asides - which enhance soil organic matter and soil tilth. Set-asides provide valuable habitat for many species and in particular, small mammals and birds of prey,

ii. Cover crops - which provide for soil surface protection, weed control and improved soil organic matter. Cover crops have become an important source of food for migratory waterfowl,

iii. Proper soil drainage practices - allowing for improved soil fertility and productivity of spring crops, as well as survival of winter cover crops. Soil structure is maintained by a reduction in the puddling associated with traffic and cultivation on wet soil,

iv. Integrated pest management - which has encouraged producers to seek sustainable practices through the use of biological controls and a reduction in chemical applications.

Field Margins Programs The field margin program is an inexpensive means of providing habitat while at the same controlling weeds and certain crop pests. Methods include use of:

i. Boundary ditches - which allow for the removal of excess water from fields, maintain a controlled water table and provide a source of irrigation water when required. They are beneficial habitats for nesting birds, small mammals, amphibians and insects,

ii. Boundary hedgerows - which, while acting as erosion guards for certain crops, are a very significant form of habitat. They provide a natural area for numerous birds, mammals, reptiles and insects,

iii. Grass strips and margins - which have been introduced as a transitional zone between agricultural fields and natural hedges. Native plants species left to grow in this area tend to replace agricultural weeds and thereby limit weed infestations.
Other Programs  Some of the other programs employed by the DFWT have sought to reverse the trend of draining and infilling wetlands and removing of woodlands to increase agricultural production. The program has attempted to enhance marginal farm areas for habitat through:

i. Ponds and wetlands, which are considered to be significant areas for wildlife habitat. A wide diversity of habitat features can be found in wetlands. Retention of these areas can be critical for many species;

ii. Farm trees and woodlands, which include both woodlots and field corners. These areas provide shelter for livestock and are integral part of the farm landscape. They provide nesting habitat for birds of prey and song birds as well as areas for feeding, reproduction and cover; and

iii. Farm yards and buildings, which have become habitats for many birds such as barn owls and barn swallows. Incorporated into the farm yards, landscaping features such as trees and shrubs can afford habitats for many birds and small mammals. (Greenfields, 1995).

6.0 Significant Land Use Factors in the GVRD

Within the GVRD, "contact points" are a significant factor in defining land uses that encompass both wildlife and agriculture. Three points of contact were reviewed by Porter (1992) in his report on the economics of agriculture and wildlife in the Fraser River Estuary. These include: (a) concurrent land use, (b) adjacent land use, and (d) linked land use.

Land use plans based on concurrent land uses rely on wildlife using the same fields and in some cases structures as the farm operation. This type of land use has been demonstrated in field cover crops planted for migratory waterfowl or barn owls using the same buildings as farm machinery.
Adjacent land uses entail the utilization of agricultural land which has been left idle or cannot be incorporated into the farm's operating area. These types of landscape features provide for a broader range of habitats and biodiversity. Agricultural land included in this classification are such areas as ditches, fence lines, idle and fallow fields, hedgerows, and ponds.

Linked land uses refer to agricultural land uses which render a degree of habitat support from a distance or over a large land base. An example would be a region's dyking and drainage systems.

7.0 Plan Components, Inventories and Studies

7.1 Parks

Planning strategies which incorporate parks and protected areas as key components of the plan have a distinct advantage in developing a management program in which significant areas can be set aside to preserve natural functions, limit competitive land uses and provide a large amount of control over the land base.

It is important however, that parks and protected areas are not used exclusive of surrounding land uses. Caza (1994) suggests that parks may only contain parts of an ecosystem and need to incorporate surrounding land areas. The ability to expand the habitat potential of some parks may also be limited due to the sites limited capabilities (Caza and Kaarik, 1994). The integration therefore, of parks and protected areas into a rural land use plan is essential.

The Canadian Parks Service in its 1992 report on the Ecosystem Management Task Force identified the need for parks to be part of a holistic and ecosystem based management program integrated into regional forest models. This approach relied on stewardship and sustainability as enabling objectives (Caza and Kaarik, 1994). A similar philosophy can be applied to the integration
of regional parks as part of a regional plan which incorporates the park as part of the larger land use concept for areas within the GVRD. While not containing national parks, the GVRD has 22 parks covering 11,200 ha located throughout the Lower Mainland (GVRD, 1997). The synthesis of these protected land uses into surrounding land uses where applicable, can form the basis for rural plans which support wildlife habitats and sustainable agriculture.

7.2 Vegetation

A principal influence in a land use plan centred on wildlife preservation is the region's vegetation. The BCMOELP (Harcombe, 1984) has indicated that the common denominator between wildlife and other sustainable land uses is vegetation (plant community). Vegetation is the foundation of wildlife habitat. It is the primary source of food and shelter (Harcombe, 1984).

Environmental changes are most often detected in the changes which take place in an area's vegetation (Marsh, 1983). It is the most viable factor in the landscape and determines the trends in land use conditions. Vegetation helps to control run off, soil erosion, slope stability, microclimate and noise. The type of vegetation, its spacing and change impact directly on the area's variety of biodiversity and species.

Key factors used in formulating an effective land use plan and in turn resource management program include:

A. Description of vegetation in conjunction with land use classification or inventories,

B. Vegetation schemes classified into:

i. Floristic (or Linnaean) categories based on individual plant species, genera and families,
ii. Form and structure (or physiognomic) classes such as forest or grassland with special attention to dominant plant species (most abundant or large species),

iii. Ecological schemes which group plants according to their habitats.

7.3 Land Use Components

Although vegetation can be considered to be a keystone element in the proposed rural plan, other elements should also be considered in plan as they apply to wildlife habitat preservation. These include:

A. The use of as large a working scale as possible for a given area. This will allow of the incorporation of a variety of habitats and management practices, thereby potentially yielding a greater biodiversity within the planning area,

B. Connectivity is an important element in the landscape. The use of corridors, easement, and other physical attributes of the region such as fence lines, hedgerows and water courses can serve as wildlife corridors connecting habitats. This is a significant feature as some species will require a variety of habitats at various stages in their life cycle. Some habitats provide a source of food, others protection from predators and still others space for reproduction,

C. The plan should encourage the maintenance and creation of edges as part of existing and future land uses,

D. Land uses which concentrate on those habitats which are sustainable in meeting the basic requirements of wildlife, food, water, shelter and space should be considered as key components of the plan,
E. Land uses should also encourage the incorporation of native plant species over non native vegetation as these promote ecosystem stability and species variety,

F. Land uses within the planning area should protect water courses and ponds,

G. As part of the rural plan, land use management principles or programs should discourage species specific management. While encouraging a habitat suitable for one species, this same habitat could prove to be detrimental to others,

H. Incorporate human activity into the plan, such as recreation, if it is not detrimental to the habitat. Education and exposure to habitats are key elements in developing strong public support of these types of land use management practices,

I. The plan should favour, by way of designation, existing balanced land uses between current land operations and contiguous wildlife habitat. (Ministry of Agriculture, Food and Rural Affairs, 1996).

A rural land use plan will allow for the management of a resource through habitat protection, restoration and creation. The concept of integrated resource use is encouraged by the BCMOELP as part of its habitat program. Lands which have been modified by human use will be actively enhanced and managed for wildlife species (Harcombe, 1984). Lackey (1994) indicates that a fundamental concept of ecosystem management is the development of a strategy or plan which provides for all organisms as opposed to a strategy or plan managing for individual species.

A basic factor in defining various aspects of the region is the identification of similar units. In dealing with a strategy focused on sustainable agriculture and wildlife conservation, the following categories provide a basis for detailing a regions land use:
**Protected zones.** Natural systems function relatively undisturbed by other activity and should continue to be protected,

**Productive zones.** Natural systems are modified by other activity most often those used in connection with the production of food and fibre,

**Nonvital zones.** Where other activities have totally supplanted natural systems,

**Compromise zones.** Are areas which include a combination of the above listed zones. These zones have been referred to as multiuse zones (Fabos, 1979).

### 7.4 Important Regional Features

Land use features in the GVRD which are significant are those with contact points between agriculture and wildlife. Many of the farms in the region have cleared fields which are no longer in production. These units are referred to as 'old field habitat' and provide excellent resources for food and reproduction space for both birds (especially waterfowl) and a variety of smaller mammals. In turn these animals are a source of food for birds of prey.

Other factors in regional land use which support wildlife habitat in the GVRD are based on local land use conditions. These include:

**Parkland and open fields.** Of relevance to wildlife are the parklands, pastures and old field habitats. These areas are important to small mammals, raptors, herons and other predator species.

**Wet meadows.** These consist of field vegetable crops and green fallow fields subject to ponding (Porter, 1996).

The need to preserve these wildlife habitats can be greatly facilitated by the maintenance and continued preservation of existing agricultural areas.
The GVRD can be described as different landscapes joined together by dominant land uses including urban, agriculture and natural regions. Dominant land uses however do not always reflect a continuous land use pattern. Within the GVRD land uses are fragmented and tend to reflect suitability rather than capability. This despite the fact, that land uses in the GVRD have been regulated through the use of Official Community Plans, zoning bylaws (section 8.4.1 and 8.4.2) and in the case of agricultural land the ALC.

Two factors which have affected the fragmentation of land uses in the GVRD are subdivision and non farm uses. Agricultural regions in the Lower Mainland have been subject to subdivision and the severance of larger farm units into smaller, part time farm operations. In 1986 the Lower Mainland had 1963 farms classified between 2 to 4 ha in size, by 1991 this number had increased to 2065 (Statistics Canada, 1987, 1992). This represents an increase of 102 farm units within a five year span.

In addition to subdivision of farm land, three major trends in agriculture have occurred which have affected wildlife habitats. These include: (a) more intensive and efficient use of existing crop lands, (b) conversion of lands formerly in pasture, range and wood land into crop land, and (c) loss of prime farmland to other uses including non soil bound operations such as greenhouses.

The expansion of non soil bound agriculture on farmland contributes to the further conversion of marginal land into crop production with a resulting loss of habitat. The conversion of soil bound farm operations into non soil bound enterprises such as greenhouses also represents a direct loss of habitat and food source for wildlife (Corporation of Delta, 1994, p 7-12).

Expansion of small, estate-like farms, however, is not always detrimental for wildlife habitat. Small farm holdings often consist of grass meadows, smaller livestock units and old-field habitats.
This type of agricultural operation can be considered as a distinctive type of regional landscape. As well, the GVRD has recognized the need for hobby farms as an opportunity for developing an understanding of rural lifestyles in so far as these units do not infringe on high capability lands (GVRD, 1990).

7.5 Small Farms and Their Role in Rural Land Use

There is a very distinctive difference in the definition of small farms between such operations in North America and in the remainder of the world. The Food and Agriculture Organization of the United Nations (FAO) indicates that about half the world's population is dependent on subsistence agriculture which is centred upon small farm settings (FAO, 1993). A wide diversity exists in small farms from country to country and region to region. A common trait however, is the fact that small farms have a limited resource base from which to work and consequently the income level achieved on these units is considerably lower than on large farm operations (FAO, 1993). Small farm units in North America and specifically in Canada are largely considered as part-time farm operations. Since the 1940's the government of Canada has recognised part-time farm operations as part of the larger farm community (Winter, 1978).

7.6 Part-Time Farms in the GVRD

The development of part-time farms in the Fraser Valley began in the 1950s with the expansion of Vancouver's urban population into the Fraser Valley. Farm holdings were subdivided to accommodate the expanding inter-urban complex (Strong, 1973). The year 1941 saw the Fraser Valley at the peak period of farms, with 133,650 ha in production (Strong, 1973). By 1981 this
total was reduced to 100,889 ha, and by 1991 to 91,265 ha (Statistics Canada, 1982, 1992). Changes in land use not only included rural to urban, but also alternative farm sizes from large holdings to smaller, part-time farms. The number of farms within the GVRD classified in size between 2 - 4 ha had grown from 1986 to 1991 from 515 to 1054 units (Statistics Canada, 1987, 1992). In 1986, farms classified between 2 to 4 ha within the GVRD represented 12% of the provincial total, by 1991 the figure had grown to 18% (Statistics Canada, 1992). Indeed, of the total 2065 farms between 2 and 4 ha reported in 1991, in the Lower Mainland, 1,054 or 51% fall within the GVRD jurisdictional boundaries (Statistics Canada, 1992). This change has resulted in a permanent concentration of part time farm activity within the GVRD and its member municipalities.

7.6.1 Part-Time Farming within a Rural Region

The three main reasons why most people choose to engage in part-time farming versus full-time farming are:

A. those who are in a transitional stage leaving full time farming and gaining some additional income from non farm sources,

B. those who see it as a means of supplementing a non-farm income,

C. those who are seeking an alternative life style to that of an urban setting (Fuller and Mage, 1975).

Part-time farming of smaller land units is simpler, less time demanding and allows the owner some degree of connection with adjacent urban areas (Strong, 1973). For many people, living and operating a small farm unit can be considered a form of recreation and an alternative life style. For
others, maintaining a part-time farm operation allows for individual economic gain through preferential taxation.

Part-time farm operations are very distinctive from large scale farms. While often occupying the same general location in a region, these small part time farms have several distinguishing components which provide a basis for their integration into a habitat landscape plan and stewardship management program.

These elements include:

A. Small farms have often more pasture land and require a limited amount of operating time. Because of the lessened dependency on the farm as a source of income, alternative land uses can be considered:

B. Many small farms are the result of subdivision of larger farm units. This process has resulted in abandoned areas and old farm buildings,

C. People have entered the smaller farm unit as a matter of choice and are willing to consider alternative land uses,

D. Smaller operations can be more varied as income sources can be gained from a variety of sources such as wood lots, Christmas tree sales, wool sales, etc.,

E. Often the part time farm operation has been established on the lower capability lands. The topography of much of this land lends itself more to the creation of habitat than intensive farming (USDA, 1978).

Other factors which should be considered in developing a strategy encompassing small farm units in a land use plan are:
A. Most owners enjoy part-time farming due to its aesthetics and recreational values,
B. Land owners are less dependent on the farm operation as a source of primary income and see any income derived from the part-time farm as means of supplementing their off farm income,
C. Many farm owners felt that their farms provide them with a pleasant environment for raising a family (USDA, 1978).

8.0 Plan Implementation and Decision Making

8.1 Stewardship Programs

Stewardship programs are critical for the success of the land use plan, however, most resource management programs are carried out on private land. The stewardship of privately owned land relates directly to the value which land owners give to habitat preservation relative to other land uses. Stewardship of agricultural land requires: (a) a greater planning effort in so far as the resources of a region are distributed amongst numerous owners, and (b) a change in attitude by private land owners who often face the question of maintaining economic viability, while not viewing habitat preservation as a primary management objective (Bryn, 1996).

A primary strategy of land stewardship is a coordinated delivery of management programs over a land use area. This includes the provision of tools and techniques for land owners to integrate wildlife habitat preservation into dominant land uses such as agriculture (Caza and Kaarik, 1994). The Corporation of Delta has developed a range of options which encompasses a series of stewardship practices. These include: (a) that wildlife managers and the agricultural community develop and maintain an inventory of habitat diversity, (b) the designation of habitat management programs which will identify habitat requirements in Delta and use this information to plan and
designate habitat which will minimize effects on agriculture through adaptive management practices, (c) include the consideration of habitat in the development of non-soil bound agriculture, and (d) recognize that as agriculture changes, related strategies will be required by property owners and managers to ensure habitat preservation (Corporation of Delta, 1994).

8.2 Guidelines and Regulatory Programs

The legislative basis for resource management in the province falls within three jurisdictions; (a) provincial legislation and programs, (b) zoning bylaws and plans developed by regional districts and municipalities, and (c) applicable federal legislation and programs. At the provincial level the management of wildlife and agriculture is undertaken through a series of ministerial acts, regulations, polices and programs.

8.3 Provincial Status

Land use planning and the development of regulations within the province of British Columbia are a joint responsibility of the provincial government, regional districts and municipalities. Provincial planning is directed at the areas of finance, social services, natural resources, economic development, and transportation.

Planning at the local government level involves land use planning and policies to deal with issues resulting from changes in the region's population. Under the authority of the Municipal Act, local governments can make and implement land use plans and zoning bylaws to accommodate population shifts and resulting land use changes.

The British Columbia Ministry of Agriculture and Food (BCMAF) has the mandate to deal
with issues concerning provincial agriculture. Wildlife and wildlife habitats are the responsibility of the British Columbia Ministry of Environment, Lands and Parks (BCMOELP, 1997).

8.3.1 British Columbia Ministry of Agriculture and Food

The BCMAF has as its mission: "to foster a competitive, economically viable and environmentally responsible agriculture, fisheries and food system throughout British Columbia" (BCMAF, 1998). This mandate in turn has provided the ministry with strategic objectives. One objective is of Resource Management in which the ministry seeks to promote land use management and planning that maintain the quality and availability of land for provincial agriculture. Legislation administered by the BCMAF closely follows its operating strategy.

Legislation which directly affects agricultural land use planning in the province includes:

A. The Agricultural Land Commission Act (ALC) (RSBC 1996). This act provides the basis for the preservation of farm land throughout the province. The act calls for the creation of a Provincial Agricultural Land Commission and details its objectives and powers. Within the scope of this legislation all non-farm use within the Agricultural Land Reserve (ALR) is closely regulated including subdivision and exclusion from the ALR. The ALC most recently indicated its interest in assisting local governments and the Ministry of Municipal Affairs with the development of regional growth strategies (Provincial Agricultural Land Commission, 1996). Under section 849 of the Municipal Act, regional growth strategies promote efficient use of land and other resources including the establishment of environmentally sensitive areas (ESA). The recognition of ESA's within the ALR would promote the preservation and enhancement of wildlife habitats as part of a sustainable agricultural landscape,
B. Agricultural and Rural Development (B.C.) Act (ARDA) (RSBC 1996). ARDA allows for the minister responsible for the BCMAF to enter into agreements with the federal minister to finance projects for alternative uses of the land, for rural development and for soil and water conservation. The use of ARDA financing is important in its potential for compensation of private land owners and formation of stewardship programs associated with wildlife habitat programs,

C. Municipal Act (RSBC 1996), Chapter 323, Section 916 - 919. While responsibility for the act lies with the Minister of Municipal Affairs, sections 916 - 919 provide administrative responsibility through the BCMAF for governance over local bylaws dealing with farms. These sections of the act allow for the creation of special bylaws for farms and farm land by local governments, in so far as they meet and do not contravene provincial standards. The creation of special bylaws governing regional land use is potentially a vital element of any proposed landscape plan. Through special zoning, local governments can effectively merge the development of agricultural land with land uses that promote wildlife habitat,

D. Farm Practices Protection (Right to Farm) Act (RSBC 1996). The Act ensures that farmers can farm in the agricultural land reserves by protecting them from nuisance lawsuits, nuisance bylaws and prohibitive injunctions when using normal farm practices. Changes to the Municipal Act provide for zoning and rural land use bylaws created by local governments to be in compliance with the Act. Farmers wishing to pursue methods of sustainable agriculture (e.g. the use of manures as organic soil amendments) are protected by the act from possible pressure placed on a region by residents not familiar with a rural lifestyle.

These acts are key to the formulation of land use policies for sustainable agriculture and the formation of collaborative land uses including wildlife habitats.
8.3.2 British Columbia Ministry of Environment, Lands and Parks

The Ministry of Environment, Lands and Parks is responsible for the management, protection and enhancement of British Columbia's environment. This includes the protection, conservation, and management of provincial fish, wildlife, water, land and air resources as well as the management of Crown land, provincial parks, recreation areas and ecological reserves (BCMOELP, 1997). A key goal of the ministry is the protection, conservation and restoration of a full range of biological and physical diversity native to the province.

The management of wildlife and habitat while not exclusive of each other has been categorized into two groupings. Maintaining the province's wildlife is the responsibility of the ministry's Wildlife Branch, while habitat enhancement falls largely within the jurisdiction of the Lands and Parks branches.

8.3.2.1 Wildlife Branch

The Wildlife Branch through its wildlife program has established as its central goal "the maintenance of biodiversity and ensuring an abundance of native species and habitats throughout British Columbia" (BCMOELP, 1997). Legislation and regulations administered by the Ministry and its Wildlife Branch fall within the program's conservation section and are governed by the Wildlife Act:

A. Wildlife Act (1982) (RSBC 1996). This act provides for the protection of all native wildlife, provides for the protection of habitat essential to wildlife, provides a means for the enhancement of habitat and allows for integrated land use plans involving wildlife. Two important definitions in the act are those for:
i. Habitat, which means "the air, soil, water, food and cover components of the environment which wildlife depend directly or indirectly upon to carry out their life processes" (Section 1.1),

ii. Wildlife, which means "raptors, threatened species, endangered species, game and other species of vertebrates prescribed as wildlife" (Wildlife Act, Section 1.1, RSBC 1996).

8.3.2.2 Lands and Parks Branch

Linked closely with the protection of wildlife is the need to preserve and enhance wildlife habitats. The following Acts, administered by the Lands and Parks branches, provide a means of planning and regulating this resource:

A. Environment Management Act (1981) (RSBC 1996). The Act provides for the management, protection and enhancement of the environment, including preparation of environmental management plans which may include measures for wildlife management, and the development of policies for the management and use of the environment. Under the Act, "environment" includes air, land and water on which animals and plants live or are developed,

B. Land Act (1979) (R.S.B.C. 1996 chap 214). While not including any direct references to wildlife, the Act includes guidelines for the use of all Crown lands including parks, provincial forests and protected areas. Section 11 allows for reserve status for important wilderness areas. Further, section 101 allows for the transfer of Crown land to other ministries including administration and control,

C. Parks Act (1979) (R.S.B.C. 1996 chap 309). The Parks Act gives the Parks Branch jurisdiction and responsibility for the management of all resources including wildlife and its habitats in all parks. This can also include the hunting of wildlife in parks and recreation areas,
D. Greenbelt Act (1977) (R.S.B.C. 1996, chap 36). The Greenbelt Act allows for the acquisition, regulation and management of land for the purpose of establishing and preserving greenbelt land. Such land can be of key importance in transitional land use areas between urban and rural land uses and often forms a valuable habitat area,

E. Ecological Reserves Act (1971) (RSBC 1996) This Act allows the Minister to reserve Crown land for ecological purposes including "areas in which rare or endangered native plants and animals in their natural habitats may be preserved".

The control of habitat both in provincial forests and on dedicated Crown range land is controlled by the Ministry of Forests Act (1978), the Range Act (1978) and Forest Act (1978). These Acts along with the Forest Practices Code Act, Bill 40, 1994, allow the Ministry to plan the use of forest and range resources for the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife and other natural resource values. While directed at the development of forest resources, many of the principal guidelines generated in the Forest Practices Code Guide books can be adapted for other non forestry resource management programs. A review of the role of Biodiversity developed within the Forest Practices Code is included as part of Section 5.4.3.

8.4 Regional Districts and Municipalities

Throughout the province there are 27 regional districts and 157 municipalities. These regions are guided in their legislative authority by the Municipal Act, except for the City of Vancouver which is governed by its own charter. Directed by appointed boards, in the case of regional districts or elected councils at the municipal level, resource management has been
implemented through local government development and planning offices. The two principal land use planning and management methods at the disposal of regional districts and municipalities are Official Plans and Zoning Bylaws.

8.4.1 Zoning Bylaws

One of the primary means of regulating land use and resource management by municipalities and regional districts has been through the implementation of zoning bylaws. Zoning is a way of regulating the use of the land by designating properties for a specific range of permitted uses, densities, siting and building form. A local government, pursuant to section 903 of the Municipal Act, may by bylaw, do one or more of the following:

i. create, name and establish zoning boundaries in whole or part of any municipality or regional district:

ii. regulate within a zone

   (1) the use of land, buildings and structures,

   (2) the density of such uses,

   (3) siting, size and dimensions,

   (4) uses that are permitted on the land

iii. regulate the minimum and maximum size of parcels created by subdivision.

Land use zones created through bylaws can include: agriculture, rural residential, industrial, light industrial, recreational, commercial, institutional, transportation, utility and urban lands. The Municipal Act also provides for the designation of bylaws that would directly support wildlife habitat and encourage sustainable agriculture. Under sections 886 to 889, regional districts and
municipalities have been given the right to adopt one or more rural land use bylaws for a given area. The content of rural bylaws can include:

i. a general and broad statement of the board respecting present and proposed land use and development in the area covered by the plan,

ii. provisions, regulations and maps respecting the following:

   (a) the location of areas for residential, commercial, industrial, institutional, agricultural, recreational or public utility land uses,

   (b) conditions, requirements and restrictions on the use of land that is subject to hazardous conditions or that is environmentally sensitive,

iii. Power to regulate includes the power to prohibit any use or uses in an area or areas.

A rural plan thereby has the same effect as an official community plan and the same powers as a zoning bylaw.

In producing a landscape plan orientated towards wildlife preservation and enhancement, zoning bylaws and the use of rural plans provide the local authority with extensive control over land use development and management.

One such example is the Township of Langley's Bylaw 2500, section 105 - Flood Control, (Township of Langley, 1993). The primary purpose of this bylaw is to provide development setbacks from watercourses within the township. This bylaw has developed a series of riparian areas contiguous to watercourses, lakes, swamps and ponds. This bylaw has effectively established conservation corridors throughout the township.
8.4.2 Official Community Plans (OCP)

While zoning bylaws equip local governments with a procedure for controlling land use, community plans provide local authorities with the ability to engage in long range planning and resource management. The purpose of a community plan, as detailed in sections 875 to 885 of the Municipal Act, is to provide for rational, logical and orderly development through controlling land uses. A community plan is a general statement of the broad objectives and policies of the local government respecting the form and character of existing and proposed land use and servicing requirements in the area covered by the plan (section 876, Municipal Act RSBC 1996). OCPs function as the basis for land use planning and management both now and in the future. Critical components of a community plan include: (a) the approximate location, amount and type of present and proposed land uses, (b) restrictions on the use of land that is subject to hazardous conditions or that is environmentally sensitive, and (c) policies of the local government respecting the maintenance and enhancement of farming on land in a farming area or in an area designated for agricultural use in the community plan (Porter, 1992).

In addition to the content and policies of a community plan, section 879 details designated areas in a plan which directly affect the establishment of land uses comprising agriculture and wildlife habitat. These include; protection of the natural environment, and protection of farming.

In its present context, community plans and zoning bylaws support the concept of a rural land use plan by furnishing regional districts and municipalities with a means to engage in regional planning. A rural land use plan focusing on a strategy for land use integration should incorporate the following:
The use of Official Plan designations. As a land use control, the use of designations provides for a series of regulatory controls within a dedicated area. Designations establish allowable land uses and those prohibited, most often land uses detrimental to habitat conservation. Land owners are compelled by law to work within the confines of the Official Plan. A land use plan can also include areas designated as environmentally sensitive or in need of special protection. This further provides property owners with a guide for potential land use restrictions in such areas.

Flowing from an Official Plan are Zoning Bylaws. The basis for zoning decisions is the OCP which sets the direction in which a community will grow. While the OCP provides a broader picture of regional land uses, zoning bylaws fine tune what is and what is not allowed on land within a specific zoning designation. Land uses which are compatible with habitat conservation would be detailed in the zoning bylaw. This would also include those land uses that promote sustainable agriculture.

8.5 Federal Programs

Wildlife programs have been developed at the federal level through the Canadian Wildlife Service (CWS) and Wildlife Habitat Canada (WHC). The principal direction of programs formulated by the CWS has been the conservation and enhancement of habitat suitable for migratory waterfowl. The WHC has concentrated on supporting private agencies in land acquisition for the purpose of habitat conservation or creation. An example of WHC involvement has been its support of Ducks Unlimited and its restoration programs across the country.

As part of its habitat enhancement program for migratory waterfowl, the CWS has reviewed several habitat conservation options. These include:

A. Restrictive land use options including provincial regulations and local zoning,
B. The purchase of partial property development rights thereby allowing local agencies the right to establish conditions on the development of the property and the implementation of conservation easements,

C. Incentive programs which encourage the land owner to participate in conservation programs aimed at migratory birds.

The federal Canadian Fisheries Act provides rules and regulations governing fish protection and the protection of fish habitat in all waters under federal jurisdiction. This act prohibits destroying fish and discharging deleterious substances that would harm fish or fish habitat.

8.6 Other Policies and Programs

In addition to the use of legislation, other measures which can be used for habitat preservation and protection on agricultural land include:

i. Land Acquisition,

ii. Land Transfer,

iii. Density Transfers,

iv. Transferable Development Rights,

v. Land Management and Stewardship Programs,

vi. Covenants (Restrictive and Conservation),

vii. Preferential Taxation,

ix. Performance Bonds,

x. Education and Extension.

(Steiner, 1991)
8.6.1 Land Purchasing

Habitat preservation and enhancement programs have at their disposal both regulatory means as well as incentive and voluntary programs as management tools. One option involving private land owners is the outright acquisition of property. Property purchases have been undertaken either by the government or private agencies, such as Ducks Unlimited. Development of acquired property can be limited in favour of wildlife habitats through restrictions placed on the property by way of land title or zoning. The outright acquisition of property is costly and limits the land's use for agriculture in that most of the land purchased is leased back to the farm community. Leasing however provides insecure tenure and does not lend itself to long term agricultural investment.

8.6.2 Purchase Development Rights (PDR)

In lieu of outright land acquisition, the use of Purchase Development Rights (PDR) have proven an effect alternative. Programs of this nature are active throughout New England, New Jersey, California, North Carolina and Washington (Porter, 1992).

PDRs are not an outright purchase of the land but are a means of controlling a property owner's development rights as accorded by local legislation. The use of PDRs is expensive but does allow for the restriction of land uses that are contrary to habitat conservation. Land use controls under a PDR program include:

i. Purchase and Sale Back. Land is purchased from private land owners, conservation restrictions are then placed on the property and the land is then resold to the public,
ii. Conservation Easements. While the property owner has the right to develop the land within existing legislation, the rights to develop the property along designated corridors deemed essential for habitat would be purchased by agencies involved in the conservation program. Land use restrictions in the easement or right of way would bind future land owners,

iii. Leasehold Estate. An arrangement is entered into with the property owner to lease the property or a portion thereof, over a set period of time, thereby making the area available for wildlife habitat. Such lease would give the lessee exclusive rights to the land under the leasehold,

iv. Management Agreements. An agreement is reached between the landowner and the public agency to manage a property or portion thereof for wildlife habitat. The landowner enters into such an agreement as part of a compensation package or with the understanding that the public agency will cover the costs of managing the designated area.

The use of PDR does not remove the need for zoning. While often seen as a program initiated and controlled by government agencies, PDRs can also be undertaken by private groups.

8.6.3 Transfer of Development Rights (TDR)

Used initially as a means of farmland preservation, TDR's can also be employed as a method of protecting land suitable for wildlife habitat. The guiding principle behind TDR's is the acknowledgment that property owners have a series of "rights" which can be separated from the property. These rights include those associated with the development of the property within established legislation. A TDR allows for compensation of the property owners whose rights have been limited or excluded through the introduction of land use designations such as those dealing with habitat preservation. Compensation within a TDR program most often involves the transfer
of development rights from one property to another or to another part of the property on the same parcel of land. The authority responsible for land use designation, while restricting land use on a parcel of land or portion thereof, at the same time would lift certain development restriction on other property or portions of the same land title (Figure 3). Compensation may include allowing for different types of land uses or a higher density of uses. The landowner can either use these development rights or sell them to another party. Therefore, the landowner receives compensation for the development restrictions placed on the land. Transferable development rights are a means of overcoming the rigidity of local and regional zoning.

Figure 3. Illustration of a transfer of development rights concept.
8.6.4 Restrictive Covenants and Conservation Easements

Restrictive covenants and conservation easements are important tools for habitat conservation. Attached to the Land Title, these instruments allow for a variety of restricted land uses binding not only the current property owner but future owners to specific land uses. Restrictive covenants most often restrict the land owner to protect specified portions of their property including vegetative buffers, trees, wetlands and water courses. Traditionally, restrictive covenants have been placed on the property through government action. In developing a cooperative landscape approach, incentive (compensatory) programs can be used to voluntarily enlist private land owners to place covenants and easements on their property for habitat purposes.

Federally held land is often subject to this type of land use control. The CWS has placed restrictions and obligations on land use contracts on Westham and Reifel Islands (Porter, 1992). Covenants can also detail land uses such as cropping practices, crop choice, rotation, location of ditches and fence lines, clearing and pesticide application (Porter, 1992, p.54)

8.6.5 Preferential Taxation, Charges and Standards

Methods and techniques which seek to involve a land owner in preservation and enhancement programs based on incentives are important means in initiating and maintaining stewardship programs. In Britain, voluntary initiatives on the part of the producer supported by grants or compensation have been the main means by which the farming community and the government have sought to protect and manage wildlife, landscape and farmland (Green, 1985, p.96). The land owner, mainly through financial incentives, is encouraged to maintain the property in its original state. Financial incentives can be used to change management behaviour. In a 1994
survey of the Greenfields Project, 81% of its participants indicated that financial incentives were the main reason for participation (Porter, 1996). They can be used to encourage good land use practices and discourage poor practices. Some of the methods used as part of an incentive program include:

A. Preferential Taxation.

Taxation programs dealing with private land owners are classified into two major groupings, property taxes and income taxes. The development of preferential taxation based on property ownership is granted through municipalities in the form of tax exemption or tax deferral. The granting of preferential taxation in British Columbia is gained on agricultural land through a set minimum amount of farm-generated income gauged against the total farm property size (ha). Within British Columbia, preferential taxation is administered by the British Columbia Assessment Authority. A property owner would lose this special tax status if the farm income drops below the prescribed level.

Preferential income taxation can be obtained at the federal level if the property is donated to the government. As a public donation, all or part of the value of the property can be claimed by the property owner. This amount can then be declared on the owner's personal income tax as a deduction. The value of the property can be partitioned and claimed over several successive years, thereby benefiting the owner over the same time period. The land becomes the property of the crown and can be incorporated into a habitat preservation program.

B. Charges and Standards

Development charges for selected land uses can be applied or reduced depending on the land use. Municipal cost charges for development permits can be reduced for properties involved in
habitat programs. This, in effect, allows the property owner to develop land at a reduced rate in so far as other portions of property are used for conservation purposes. Performance bonds can be used to limit land uses that may prove to be detrimental to habitat preservation and enhancement. A performance bond ties the property owner financially to a set of land use standards and ensures compliance with such provisions.

8.7 Private Programs

Agriculture and wildlife policies have largely been generated through government sources including the BCMAF and BCMOELP. Private agencies however, have also become involved in habitat preservation programs including programs focusing on agricultural land. Participants in this process include, private lobby groups, producer institutions and associations (such as cooperatives and conservation trusts), professional organizations and nature groups.

Of provincial significance are those involved in private and public conservancy. Private conservancy can be achieved through such means as conservation easements, restrictive covenants and density swapping. As each of these types of land restriction incurs a lost value of development, voluntary involvement of private individuals has been limited.

In its place, private agencies such as the Pacific Coast Joint Venture (PCJV), Ducks Unlimited (DU), the B.C. Nature Trust and the Pacific Estuary Conservancy Program (PECP) have stepped in to purchase land for wildlife habitat. Land purchased is then subject to development restrictions aimed at habitat preservation and enchantment. The land is leased or sold back with the restrictions in place. In some case such purchase and lease back ventures are undertaken in cooperation with local governments.
Public conservancy involves the establishment of environmentally sensitive areas on crown land under the British Columbia Land Act. As a means of leasing the land, incentives can be put into place as part of the leasehold to meet land use practices favouring habitat (i.e. cover crops, restricted land uses, etc.). The BCMOELP has used its Habitat Conservation Fund since 1981 to provide funding to private conservation agencies involved in habitat land acquisition (BCMOELP, 1997)

8.7.1 GVRD Habitat Preservation Methods

The GVRD, as part of its livable region plan, has also developed conservation programs. The plans designates wilderness refuges, recreation wilderness and productive agricultural land throughout the GVRD. To establish this program the GVRD has used; public education, land acquisition, acquisition of development rights, density transfers, regulatory frameworks (zoning), and the provision of incentives for private stewardship in the form of compensatory packages (GVRD, 1991)

The formulation of preservation programs within the GVRD has included the emergence of several common interest groups. These include: Pacific Cost Joint Venture and its directing Federal service, the Canadian Wildlife Service, Ducks Unlimited, Pacific Estuary Conservation Program, British Columbia Nature Trust, Wildlife Habitat Canada, Wildlife Branch and Crown Lands (BCMOELP), Agriculture and Agri-food Canada and representatives from British Columbia's Native Community. Their common goals include; habitat securement (through land acquisition, restrictive covenants, conservation easements, and land transfers), enhancement and restoration programs, land management programs, demonstration farms, political advocacy and public
education. Another joint venture is the combination of the Greenfields Program and the Delta Farmland and Wildlife Trust. The program is focused on developing land uses suitable to accommodate migratory waterfowl wintering in the Fraser Estuary.

Many of the above listed private programs depend on "public spiritedness" and the involvement of the property owner as a volunteer. In such cases the land owner offers freely to designate the subject property into zones for preservation. In return the land owner would receive special recognition or monetary assistance in establishing habitats. Recognition can include special certification, presentations, signs marking the property as part of the conservation program and acknowledgment by local agencies including municipal councils. Public education has become an integral part of many conservation programs.

8.8 Evaluation and Implementation

Land use management options can be grouped into three broadly defined sections:

i. Those focusing on government legislation, planning and policies,

ii. Programs involving private agencies focusing on land acquisition, leasing and cooperative projects based on compensation and financial incentives,

iii. Voluntary participation in conservation programs based on public education and awareness.

A study by Environment Canada (1983) surveyed the potential of land use management techniques. Focusing on wetland preservation, the survey indicated that the favoured methods for habitat preservation include: (a) programs utilizing financial payments gauged against the area of land set aside for habitat, and (b) the implementation of conservation easements based on compensation for the loss of development rights (Environment Canada, 1983)
The study undertaken by Environment Canada focused primarily on federal programs and cited examples in the United States including; the 404 Permit Program and the Water Bank Act. Both programs are under federal administration and based on the concept of preserving significant wetlands in exchange for yearly payments to the land owners. This concept is similar to the use of PDRs and to a lesser degree TDRs.

The theory of conservation easements is based on the United States Fish and Wildlife Service wetland preservation program. A one time payment was afforded to landowners in exchange for the implementation of conservation easements on land containing significant wetlands. Connected to property's land title, such easements provide for long term control. The adoption of these programs has been undertaken in Canada by the CWS and WHC through their support of habitat conservation funds as discussed earlier.

While this survey was undertaken in the early 1980's, current programs within the GVRD have shown a similar response. A 1995 survey of the Greenfields Program questioned farmers as to the most worthwhile aspects of the program? The top two responses were:

i. Financial incentives for planting cover crops; and

ii. Better communications between farmers and wildlife agencies. (Greenfields, 1995).

Other habitat preservation methods have also been evaluated:

A. Official Plan and Zoning. The use of these provisions is intensely regulatory, binding the land owner to land use restrictions. Detailed land development can be controlled over a larger region, but this preservation technique can be subject to redesignation by regional boards and municipal councils. Over a period of time regional boards and municipal councils may perceive the needs of a region to have changed (e.g. the desire for more tax revenues). To limit the potential of
land use changes governed by local authorities, official plans and zoning bylaws can be strengthened through the application of supporting provincial legislation.

One such example is the ALC which prevents the non farm use of land within the ALR and requires that all local zoning bylaws and community plans do not contravene the act. (Provincial Agricultural Land Commission, 1986)

B. Purchase and Sale Back. Preservation programs can be implemented on land purchased by conservation agencies or the government. Development restrictions are connected to the title of the land over a long period of time. This program however is limited through the high cost of administration and regional real estate costs. However, with development restrictions in place, resale of the land is usually below current market prices. This would make it more accessible for purchase as farmland.

C. Conservation Easements. The establishment of easements or wildlife corridors can be equated to the establishment of "utility rights of way". Under such an agreement, the land owner would grant access and certain development rights to another party. Incorporated as a preservation program, payments to the land owner are considerably less than full fee acquisition. The land owners retain control over a majority of the property and given the circumstances of the easement, may also retain certain development rights which do not inhibit habitat preservation. Management of the easement remains with the land owner, thereby lessening the administrative costs. An easement can be tied to the Land Title and would remain in place regardless of changes in the property's ownership.

D. Preferential Taxation. Tax incentives provide the land owner with an inducement to retain portions of the property for habitat preservation. This program however is limited in that it may
provide only a short term guarantee of preservation. Given the nature of agriculture in the region, a land owner may decide to use the land for other purposes with a higher economic return than that provided by tax relief. A land owner could opt in or out from year to year. Those choosing to accept preferential taxation would also see the land subject to zoning or other land use restrictions.

The previous methods of habitat preservation have concentrated on management avenues available to local governments and private agencies. Provincial legislation, programs and policies also have a direct effect on potential stewardship programs.

8.8.1 Provincial Legislation

The major strength of provincial legislation is its direct acknowledgement of agriculture, wildlife and wildlife habitat as a provincial resource. Acts listed earlier in this study provide concise definitions of the resource in question, allowable uses and related legal implications. These provide land owners, local and regional governments and other interested parties with a standardized management program applied equally throughout the province.

A major weakness of provincial legislation is a limited ability for interagency land use management. Administration of the resource in question is under the direct control of one Ministry, although, land use control, from time to time, may be transferred from ministry to ministry (i.e. the control of Crown land). There is very little inter-ministry land use integration and coordination (Harcombe, 1984). While a tool of municipalities, community plans have provided a platform for inter-ministry cooperation and integration of agriculture and wildlife resources.

Policy statements within local official plans are structured to comply with provincial legislation. Community plans detailed common land use between agriculture and wildlife habitat
by way of land use designation and policies. Examples of how Ministry mandates can be fulfilled within the framework of a community plan are:

A. City of Surrey Official Community Plan (Division A)

D.14 Co-ordinate Farming and Environmental Protection

1. Support sound environmental farm practices in accordance with the Ministry of Agriculture and Food’s Environmental Guidelines.

2. Encourage wildlife management and habitat protection practices to minimize impact on agricultural lands without jeopardizing habitat and wildlife resources (City of Surrey, 1996).

B. District of Coquitlam Official Community Plan

Section 3.6 Parks, Open Space and Agricultural Lands

3. Lands important to the preservation of fisheries habitat. These include: "leavestrips" along municipal creeks. There are further creekside areas which, while not designated as public open space, are still important to the preservation of fisheries habitat, and need to be protected when adjacent development takes place, by the use of sediment control, restrictive covenants, or other appropriate measures (District of Coquitlam, 1991)

C. Corporation of Delta Official Community Plan (Schedule A)

Section 6 - Agricultural Lands

F. The Natural Environment

F.1 Preservation of Vegetation. Encourage the preservation, in their natural states, of existing trees and significant vegetation as wildlife habitat.

F.4 Assist Wildlife Management. Encourage the property owners to consider management of all or portions of the farmland on the Southlands and north of the urbanized areas in a manner which is suitable for wildlife management.

F.5 Drainage Patterns. Protect farms, existing developments, wildlife habitats and other properties from deterioration caused by changes in drainage patterns or water table levels (Corporation of Delta, 1992).
In 1993 the Township of Langley adopted its Rural Plan. The plan addressed specific issues relating to environmental and development concerns within the township. Goals within the plan include:

i. to protect the quality of the environment in rural areas; and

ii. to support the agricultural use of land and the agricultural industry in the rural area.

(Corporation of the Township of Langley, 1993, p. 9)

The plan also places importance on the need for the region's rural landscape to provide habitat for fish and wildlife as well as scenic green space.

8.8.2 Program Implementation

Implementation of conservation programs on agricultural land has been carried out through a variety of programs in Canada, the United States and Great Britain. The methodology used in establishing a stewardship program can be broadly classified as follows:

A. Incentive and Compensation programs. These programs involve the use of preferential taxation, direct compensation and grants. Taxation is gauged against the amount of land set aside for habitat and the quality of farm land involved in the program. The Ontario Conservation Land Tax Reduction Program provides for 100% rebate for wetlands preserved on agricultural land classified as prime according to the Canada Land Inventory (Corporation of Delta, 1994).

Programs employing direct compensations or payments to the land owner include in Canada: the Manitoba's Habitat Enhancement Program, Saskatchewan's Prairie Pot Hole Program and Alberta's Landowners Habitat program. These projects provide cash incentives (and in Alberta's case this also includes the use of tax incentives) in exchange for the land owner entering into set agreements (i.e. 5 or 10 year contracts) which allow the establishment of easements, leases and
related land use contracts between the land owner and the government.

Great Britain's Hedgerow Incentive program, its Agricultural Management Program and the Environmentally Sensitive Areas Scheme rely on monetary payments in exchange for land use agreements. The Farm and Conservation Grant Scheme involves the issuance of grants to cover capital expenditures for farm operators involved in habitat improvements on their land.

B. Education. The Ontario Natural Heritage Steward Program, Prince Edward Island's Cooperative Watershed Program, Carolinian Canada and the Ontario Land Stewardship Program have employed extensive education programs focused on involving the farm community and individual farm operators in various habitat projects. Awards and public recognition of participants is a central component of these programs. A similar scheme is employed by Great Britain's Farming and Wildlife Advisory Group.

C. Regulatory. Stewardship programs in the United States rely on both compensation but most frequently employ regulatory means. The Conservation Reserve Program, Padilla Bay National Estuarine Reserve and Puget Sound Water Quality Authority incorporate a combination of land acquisition and applied legislation. The use of zoning regulations has proven to be the most popular means, in the United States, of initiating land use management programs focused on agriculture and wildlife conservation (Steiner, 1991, p.24).

A leader in this approach has been the Corporation of Delta. A 1994 Rural Land Use Study developed goals and strategies focusing on its agricultural community. The study resulted in statements detailing the following: (a) emphasis is placed on the use of incentives rather than restrictive means, (b) ensuring the viability for agriculture and the management of environmental resources, and (c) cooperative planning between representatives of the federal, provincial
government, local interest groups, local government, producer associations and local land owners.

The evaluation of management programs, showed that cooperative land management programs have been favoured as a means of implementing conservation polices on farmland. A strategy focusing on the integration of small farms and wildlife habitats should be based on a combination of regulations, incentives and education.

Habitat preservation programs in Canada have primarily concentrated on the use of compensation and preferential taxation as stewardship incentives. These programs have been closely followed by those concentrating on education and public awareness. Similar programs have been developed within the GVRD. As well, the involvement of land owners was shown to be a critical ingredient of any regional management scheme.

As a majority of agricultural land is privately owned, emphasis has been placed on stewardship programs. Clayton Rubec (1992), in his review of Conserving Canadian Landscapes (1992), indicates that involvement of the private sector in protecting Canadian landscapes for conservation is crucial. Their contribution towards conservation efforts has been major and may include over 3 million hectares of land across Canada.

8.8.3 Strategic Programs within the GVRD

In 1995 the GVRD released its Liveable Region Strategy for the Greater Vancouver Regional District. Both agriculture and wildlife are incorporated into the plan under the Green Zone classification (Figure 4). The GVRD's Liveable Region Strategic Plan states: "The Green Zone is intended to protect Greater Vancouver's natural assets, including major parks, watersheds, ecologically important areas and farmland. By doing so, the Green Zone also establishes a long
Figure 4. Green zone map for the Greater Vancouver Regional District.

term boundary for urban growth. Municipalities nominate lands to be placed in the Green Zone. In total the municipal submissions comprise two-thirds of the GVRD's total land base, including half the region's developable lowlands." (GVRD, 1995, p.2)

Some of the Green Zone policies important to both agriculture and wildlife include:

A. Develop new tools for the protection of Green Zone areas, including a land trust for parks and conservation areas, and legal mechanisms,

B. Seek and develop the viability of the region's ecology through such measures as an interconnected system of wetlands, upland habitats and wildlife corridors,

C. Increase the viability of agriculture through enhanced planning for agriculture as part of the region's economic base.

The green zone recognises the significance of the ecology of the Fraser River Basin and the variety of integrated ecosystems in the region. The plan policy calls for the strategic development of agriculture and conservation areas in spite of increasing urban pressures.

As a result of the 1995 strategic plan, the GVRD has produced a study which formulates a regional outdoor recreational strategy of which agriculture and wildlife are integral components.
Many of the concepts arising from this document can be applied broadly to a regional habitat management program and landscape plan.

They include:

A. Develop corridors through farm land and along such areas as streams. These rights of ways would be left in a natural state for outdoor activities but would also be beneficial for wildlife,

B. Develop zoning bylaws and other regulatory controls to encourage access to farm land for recreational purposes. Linked to such programs would be the overall concepts of habitat support,

C. Establish farmland/recreation trusts to develop land use plans and programs. Under the same umbrella trusts can be formed such as the Delta Farmland & Wildlife Trust to encourage cooperative planning boards,

D. Develop a Rural Watch program to report activities detrimental to the farm and recreational zones. This same watch can be used to guard against activity damaging to wildlife habitats,

E. Public education programs,

F. Encourage policies that protect wildlife, wild plants and trees.

(GVRD, 1996)

These objectives can be further adapted into management objectives as follows:

A. Landowners should be protected from liability associated with normal farm practices and habitat preservation,

B. There should be minimal or no financial costs to the land owner for participating in conservation programs,

C. Habitat preservation should be directed wherever possible to the periphery of the farm unit,

D. Planning and management processes should build mutual understanding, respect and trust between the farm community and conservation programs.
The Liveable Region Strategic Plan and resulting working documents therefore provide a basis for cooperative land use strategies. The principal concepts arising from the strategic plan are the integration of land uses through clearly defined policies, land use designations, stewardship programs and education.

A coordinated approach to land use planning, employing both the GVRD's regional strategies and local planning initiatives, can be employed in developing a regional stewardship program and a landscape approach for wildlife preservation. There are four key elements which should be included in an approach of this nature:

A. Extension, involving individual farmers, farm organizations and government agencies,
B. Planning, involving wildlife agencies, government planning offices and farming associations,
C. Management, including individual farmers, private conservation organizations and local government,
D. Legislation, developed by input from farmers, land owners, conservation agencies and provincial and regional governments.

A similar approach incorporating user participation, education, compensation, and appropriate applied regulations can be applied regionally in establishing stewardship programs focused on resource management.

9.0 Case Study Area - Township of Langley (South West Region)

The Case Study Area (CSA) concentrates on the southwestern portion of the Township of Langley (Figure 5), and is defined by administrative boundaries established in the Rural Plan (1993) for the Township of Langley. Specifically, the study examines the potential integration of small farm
Figure 5. Case study area within the Township of Langley.
operations and wildlife habitat management practices within a region bounded by properties designated as "Small Farms/Country Estates" (Corporation of the Township of Langley, 1993). Details of the Rural Plan and the subject designation are examined in section 9.1.1. The strategy was developed and implemented using a rural planning model as discussed in section 4.2.1.

9.1 Background

The Township of Langley has developed significantly over the past two decades. In 1976 the population was recorded at 36,659. In 1997 it had risen to 85,069, an increase of over 100%. This growth in Langley has seen a rise in urban and other non agricultural land uses, as well as changes in the region's farms. Within the township 48.7 % of the lots range in a size from 2 to 8 ha, with 37 % less than 2 ha. Further, the Official Community Plan designates approximately 75% of the township as Rural Residential/Agriculture (Corporation of the Township of Langley, Plan, 1993). The township, as part of its land use strategy, in 1993 adopted an amendment to the Official Community Plan, schedule "A", (Rural Plan) Bylaw 1993 no. 3250. This bylaw provides the township with a rural plan setting forth land use designations and policies. Of importance to the CSA are those bylaws dealing with small farms and country estates, as well as, environmental considerations.

9.1.1 Township of Langley - Rural Plan

The plan recognises the variety of farm operations which exist within the municipality. These include: livestock, poultry, small fruits, mushrooms, vegetable crops, flowers / nursery stock, fur bearing animals (mink), turf, organic produce, grapes, nuts and a variety of recreational farms
including an intensive equestrian industry. Plans for the expansion of agriculture within the township call for growth in its horticulture and equestrian operations.

The plan also recognises four dominant lifestyles within its rural community; primary farming families whose income is derived from the farm; part-time farming or hobby farms - families whose income includes off farm work; rural residential - families who reside in a rural environment but do not undertake any farm activity and; rural business - families who run a home based business out of their country homes.

As part of the overall plan Langley has also included several environmental considerations and plan goals. These include: (a) to support the quality of the environment in rural areas, (b) to provide habitats for fish and other wildlife as well as scenic green spaces.

Under this umbrella the plan calls for the establishment of Environmentally Sensitive Areas, the protection of watercourses, floodplains, restricting access to watercourses by farm animals, soil conservation practices, integrated pest management plans, maintaining tree cover, and the regulation of fill, both its placement and removal near sensitive areas (Corporation of the Township of Langley, 1993).

A majority of the plan is dedicated towards the establishment of agricultural districts throughout the township. This planning process helps to delineate zones for agricultural land use (Figure 6).

The major components included in the plan are:

- Agriculture/Countryside
- Small Farms/Country Estates
- Salmon River Uplands
Figure 6. Zoning designations within the case study area as consolidated within Township Of Langley zoning bylaw No. 2500.
Section 5.6 of the rural plan deals with Small Farms / Country Estates designations. This designation provides for the agricultural land uses on lots to a minimum size of 1.7 ha. Some intensive land uses may also be limited in the region. The rural plan gives special consideration to equestrian operations:

Section 5.6.4 Development of an equestrian service centre to provide for a variety of services for the equestrian industry and recreational horse owners may be considered in the small farms/country estates area in southwest Langley.

Equestrian operations are an important component of the CSA present land use as indicated in the resource inventory.

9.1.2 History

The southwest area of the township was settled by Europeans in the latter part of the 1820's. activities in the region included hunting, trapping and logging. At that time the region contained a wide diversity of animal species including elk, bear, lynx, beaver and other fur bearing animals. Habitats which existed at the time ranged from dense forests to marshlands. The Little Campbell River which flows through the region contained numerous fish species and was used for the transportation of logs.

By the second half of the 19th century, logging and hunting gave way to the establishment of farms in the region. The introduction of farm operations saw considerable changes to wildlife habitats with the clearing of large areas for fields along with the drainage of the uplands and infilling
of marshes. The river was reduced to a series of ponds which soon in filled with vegetation. Through the later part of the 1960's and into the early 1970's many of the larger farms in the region had been abandoned and subdivided into the small farm units currently in the area (Langley Field Naturalists).

Lands within CVRP have been allowed to revert to a natural state. Former farm fields and pasture land is slowly transforming into open meadows containing patches of shrubs and immature trees. A thick second growth of deciduous and coniferous trees has covered the uplands. Remnants of the initial farmsteads in the area have been incorporated into the park as a historic site.

9.1.3 Physical Attributes

A. Surficial Geology

The geography of the area was shaped during the Wisconsin glaciation approximately 12,000 years ago. A glacial meltwater channel, runs north and south through the region and forms a broad valley in CVRP. The valley's width ranges from 300 to 760 meters. On the average the valley sides are 30 meters high (Langley Field Naturalists).

B. Soil Materials

The soil of the region can be generalized against the area's topography, with the valley bottom containing Abbotsford Outwash overlain with gravelly and sandy loam. The uplands comprising a majority of the small farm operations have soils classified as Whatcom Glacio-Marine deposits with a high clay concentration (Luttmерding, 1980). Topography throughout the area ranges from gently undulating to steep hillside. The region contains numerous depressions which are subject to ponding. In the winter, rapid surface run-off from the uplands results in flood
conditions in the valley bottom which also suffers from a water shortage in the summer.

C. Biogeoclimatic Classification

The region lies within the Fraser Wetter Maritime Coastal Douglas-fir (CDFb2) biogeoclimatic variant. This zone is characterised by cool moist winters and moderately warm summers which contribute to the development of the region's soils and vegetation (GVRD, 1988).

D. Flora

Vegetation in the region's uplands is mainly improved and unimproved grassland as pasture for livestock and second growth forest typical of the lower Fraser Valley. Red alder, bigleaf maple, western redcedar, western hemlock, Douglas-fir and black birch can be found in tree stands both in the park and on surrounding small farms. Regions which have been left untended contain an understorey of vine maple, salmonberry, stinging nettle, various briars and occasionally dogwood, cascara and red-berried elder.

The valley bottom contains many plant species found in the uplands but dominant species include red alder, Sitka spruce, vine maple and red-osier dogwood. Marshes paralleling the Little Campbell River contain stands of cattail, water hemlock, and various sedges, rushes and grasses. Included are coontail, sago pondweed, lesser duckweed, yellow water lilies, broadleafed arrowhead, yellow arum and water crowfoot. Numerous species of flowers and fungi are prevalent throughout both the uplands and the valley bottoms (Langley Field Naturalists).

F. Fauna

Wildlife species are greatest in number within CVRP but many species have extended their range to include surrounding farms. There are 44 species of mammals within the park and surrounding area and over 130 species of birds, 7 amphibian species and 4 species of reptiles. Many
animals such as the coast deer, coyote, numerous song birds and raptors move freely between the
park and surrounding farmlands (GVRD, 1988).

G. Parks

CVRP is unique both in the fact that it is located within close proximity of several urban
centres, yet has been able to combine protected areas for both flora and fauna along with
recreational opportunities. The park, which opened in 1979, is 535 ha in size and has a wide range
of biodiversity. As a single land region of this nature it is an important feature within the township
of Langley.

The park is operated by the GVRD and is one of 22 parks within the Lower Mainland run
by the GVRD. Resources in the park include; two entrances for the public, one at the north end of
the park and the other at the south end, a nature house for demonstration purposes and a heritage
farm site at the southern end of the park, and marked trails flow throughout the park and are
mirrored by an equestrian trail. The park is made up of both land which has been purchased by the
GVRD and other portions which have been acquired by way of long term leases (GVRD, 1988).

9.2 CSA - Rural Plan

9.2.1 Land Use Strategy

Goal. The main goal of the strategy is to develop a land use scheme which integrates agricultural
operations designated as small farms/country estates in the south west corner of Langley Township
with habitat management practices suitable for the preservation and enhancement of wildlife habitat
in the region.
Objectives. The objectives of the land use strategy for the case study area include:

- maintaining overall habitat capability in the study area,
- encouraging habitat management on farmland in the study area which is adjacent to CVRP,
- preventing the loss of habitat in the study area,
- encouraging sustainable land uses on small farms in the region,
- encouraging participation in regional stewardship programs which focus on a combination of zoning and incentives.

Based on the strategy's goal and objectives, the rural plan can formulate criteria for the resource inventory, decision making factors and an implementation scheme. In developing the rural plan the following concepts have been included:

A. The integration of habitat management practices suitable for the preservation and enhancement of flora and fauna diversity in the region. These have been reviewed in section 5.5.

Within the scope of the CSA habitats are deemed important for:

- Birds
- Mammals
- Amphibians
- Reptiles
- Insects
- Plants
Sustaining regional biodiversity is dependent directly on the preservation of local habitats.

B. Ensuring habitat management practices are suitable for sustaining existing and future small farm operations in the region. The factors which contribute to sustainable agricultural include:

- limiting erosion through water run off and wind
- limiting soil compaction
- improving water infiltration
- improving soil structure through introduction of organic material
- improving soil nutrients
- limiting the amount of fertilizer and pesticide application

9.2.2 Rural Plan Goals and Objectives

The main goal of the rural plan for the CSA is to use a planning process in support of the implementation of the land use strategy in the study area. Objectives of the plan include: (a) complete an inventory of the resources in the study area based on present land uses, (b) designate zones which indicate a low, medium and high land use integration of the components listed in section 3.2, (c) establish guidelines for the land use management based on the strategy, and (d) provide a procedure for the implementation of the land use strategy (i.e. zoning bylaws, incentive programs).

9.2.3 Plan Criteria Used

The information gathered for the resource inventory is based on the following factors:

A. The collection of data has been generalized, for the areas surrounding the park, into the regions immediately north, east, south and west. The park has also been described to indicate the
type and variety of flora and fauna which act as the region's wildlife resource.

B. Land use has been detailed by way of present land uses concentrating on activities and cover as defined by Ministry of Environment Manual 8 on Land Use Classification in British Columbia (MOE 8, 1986).

i. Land activity is defined as the current land use of the property. This does not include such items as tenure, ownership, economic activity or assessed land value. Land cover is regarded as vegetative, natural or artificial construction material covering the land surface (MOE 8, 1986). The detailing of existing land use tends to reflect the current suitability of the land rather than the lands capability.

ii. Land Cover, including vegetation types of various forms (crops, pasture, grassland, wild pasture, wood lots, hedge rows field margins, ditch and aquatic plants), will impact the landscape through insect populations, microclimates and soil conservation factors.

The criteria will allow for the development of the resource inventory and later in the plans decision making and implementation process. In addition, these factors will support the strategy's concept based on land use integration. Specifically the plan will demonstrate aspects within the study area as they relate to wildlife habitat management practices and the enhancement of regional resources linked to food, shelter and space, as well as sustainable agricultural practices including soil erosion control, pest control and stewardship.

9.3 Resource Inventory

9.3.1 Background

Within the CSA there are three distinctive areas of focus (Figure 7).

The Little Campbell River. This river is recognised as a significant salmon bearing watercourse and
Figure 7. 1:25,000 federal aerial photograph (July 14, 1994. # 47, 49) indicating the location of the Little Campbell river, Campbell Valley Regional park and surrounding subject area.
an integral ecosystem within the Lower Fraser Estuary (Porter, 1992). Areas adjacent to the Little Campbell river have produced significant wetlands and are an important habitat resource for the region. Wetlands are defined as land having the water table at, near, or above the land surface or which is saturated for a long period of time to promote wetland or aquatic processes as indicated by hydric-soils, hydro-phylic vegetation, and various kinds of biological activity which are adapted to the wet environment (Corporation of Delta, 1994, p. 6-25),

Campbell Valley Regional Park (CVRP). This is part of the GVRD's regional park system. The park is designated as a protected area for wildlife and contains a diversity of wildlife habitat. Limited recreational uses are allowed in the park including hiking and equestrian trail riding. CVRP acts as a focus point for the region's wildlife and is a critical component of the CSA.

The park consists of a wetland area in the valley bottom which parallels the Little Campbell river and adjacent uplands, which contain patches of open meadows, shrubs and a mixture of deciduous and coniferous trees. Uplands are defined as all land which does not have a water table at or near the ground level, and is not saturated long enough to promote wetland or aquatic process (Corporation of Delta, 1994, p. 6-25),

Regional Small Farm Operations. The region surrounding CVRP has been designated by the Township of Langley as small farms / country estates. The area surrounding CVRP consists primarily of small, part-time farm operations ranging in size from 0.4 ha rural residential lots to 4 ha sized farms. Equestrian operations are common throughout the CSA.

The resource inventory is based on present land use. Land use priorities for the proposed planning strategy are set against the following criteria: (a) sustainability of small farms, (b) preservation of habitat and biodiversity.
9.3.2 Current Land Use Inventory

The following section represents an inventory of current land use for the CSA. Information for the inventory was obtained from aerial photographs, a land use survey undertaken by the Township of Langley and onsite field verifications.

9.4 Present Land Use - South West Langley

9.4.1 Subject Area 1

Location: South of Campbell Valley Regional Park

Description: Township 7, Section 1, SE 1/4, SW 1/4, Section 2, SE 1/4, SW 1/4, NW 1/4, and Section 3, NE 1/4.

Community Plan Designation: Small Farms / Country Estates

Zoning: RU - 1 (Rural Zone)

Permitted Uses (see appendix A)

Present Land Use:

A. Land Activities: The area consists of small livestock operations, improved grassland for grazing and equestrian operations. Of special note, the region contains some intensive agriculture in the form of greenhouses and mushroom production. The southern area contains several former large scale farms with a series of resulting abandoned buildings and farm yards. The small farms in the area are interspersed with several rural residences.

B. Land Cover: The subject area consists of patches of improved grassland used as pasture. Woody vegetation consists of stands of mature trees throughout the region. There are numerous points of potential contact between the park and the region's small farms. Several open fields and wooded areas could provide linked land uses however these units are severed by local roads.
Figure 8. Subject area 1
9.4.2 Subject Area 2

Location: West of Campbell Valley Regional Park

Description: TOWNSHIP 7. SECTION 10, SE 1/4, NE 1/4, and Section 15, SE 1/4, NE 1/4.

Community Plan Designation: Small Farms / Country Estates

Zoning: RU - 1 (Rural Zone)

Permitted Uses (see appendix A)

Present Land Uses:

A. Land Activities: The area contains numerous rural residences surrounded by small farm operations concentrating on livestock and forage production. Equestrian operations are more numerous in this area than to the south of the park. There are no major vestiges of former large scale agricultural operations in this area.

B. Land Cover: A majority of the cover in the area is classified as improved grassland and is used for pasture. There is some forage production and minor patches of unimproved grassland left as abandoned fields. The westerly portion of the subject area contains some stands of mature but irregularly spaced trees. This region contains few potential contact areas with old field meadows in the park being across from improved grasslands. One abandoned pasture in the region is opposite from a similar land cover within the park, however, a major transportation arterial runs north and south through the site.
Figure 9. Subject area 2.
9.4.3 Subject Area 3

Location: North of Campbell Valley Regional Park

Description: Township 7, Section 14, NW 1/4, NE 1/4 and the eastern half of SE 1/4

Community Plan Designation: Small Farms / Country Estates

Zoning: SR - 2 (Suburban Residential)

Permitted Uses (See appendix A)

Present Land Use:

A. Land Activities: The western portion of the subject area is predominantly rural residences on .4 to .8 ha sized lots. Some property owners maintain small equestrian operations in the area. The eastern portion is made up of large lots but orientated towards rural residences. There is some small scale livestock production and horse stables. The land in this area is outside the ALR and therefore subject to rezoning.

B. Land Cover: The western portion of the area is a mixture of lawns, gardens, some large patches of unimproved grassland and numerous small stands of trees. Cover on the eastern portion consists of large areas of improved grassland as pasture and some forage production. Many of the large lots also contain stands of mature trees. Several wooded areas currently abut on to park property and form a direct point of linkage. Contiguous land use in this area has been maintained with limited road access.
Figure 10. Subject area 3.
9.4.4 Subject Area 4

Location: East of Campbell Valley Park

Description: Township 7, Section 13, SW 1/4, Section 12, NW 1/4, SW 1/4, Section 1, the north half of NE 1/4, and Township 8, Section 6, NW 1/4, SW 1/4.

Community Plan Designation: Small Farms / Country Estates

Zoning: RU - 1 (Rural Zone)

P - 2 (Community Care Facility)

Permitted Uses (see appendix A)

Present Land Use:

A. Land Activities: The region contains numerous large lots devoted to livestock production, forage and improved grassland. As well, the region is heavily devoted to equestrian operations. There are a few large scale farm operations in the area concentrating on poultry and beef production. The southern portion of the subject area contains an institution for emotionally challenged youth and adults.

B. Land Cover: The region is a mixture of large stands of mature trees and improved grassland used for grazing. As well, the area contains land for forage production and some small filbert plantations. The region contains numerous small streams and ponds with associated small shrubs and vegetative cover. Potential connectivity is very high in this area with limited roads and similar land uses. Several large stands of trees connect directly with similar land uses in the park. This applies also to open meadows and a significant wet land area paralleling the Campbell River. Topography in the area undulates more steeply than other regions surrounding the park, thereby limiting the area available for agricultural use.
Figure 11. Subject area 4.
9.4.5 Subject Area 5

Location: Campbell Valley Regional Park

Description: Township 7, Section 1, remainder of the NE 1/4, NW 1/4, Section 2, NE 1/4, Section 11, NE 1/4, SE 1/4, NW 1/4 and SW 1/4, Section 12, southwest portion of the SW 1/4, Section 14, remainder of the SE 1/4 and the SW 1/4 less lot 11.

Community Plan Designation: RP (Regional Park)

Zoning:
- P - 1 (Park)
- RU - 1 (Rental property within the Park boundary)
- C - 7 (Commercial Bakery)

Permitted Uses (see appendix A)

Present Land Use:

A. Land Activity: Regional park with associated recreational hiking trails, equestrian riding area, nature house and historical farm site. There are several properties within the park boundaries which are rented for rural residences. Former farm activity has ceased, but several old farm structures remain with the park. One property is zoned as rural and does not fall within the park jurisdiction. This applies as well to a commercial bakery located on the western park boundary. A Scouts Canada camp is located on the north side of the park.

B. Land Cover: Land cover within the park is grouped into three categories; wetlands, which contain a 3 km stretch of the Little Campbell River, coniferous and deciduous forests and meadows. Each of these categories has its own ecosystem critical for a variety of animal, bird and insect species. Within the confines of the park boundaries land cover has been further grouped into wetlands and uplands. This division follows a distinctive break in the park's topography as described earlier. A complete listing of the flora and fauna has been inventoried by the GVRD.
Figure 12. Subject area 5 - Campbell Valley Regional Park
Figure 13. Campbell Valley Regional Park land use map.

Source: GVRD Parks and Recreation
9.5 Resource Inventory Analysis.

The resource inventory, while including CVRP, has concentrated on lands surrounding the park. It is this region that is integral to the development of a land use plan. Data from the inventory has allowed for an analysis of the present land uses in the CSA.

Present land use in the CSA, including both activities and cover, shows a definable hierarchy in terms of conceivable integration of agricultural land use (small farm) and wildlife habitat (based on established management practices). Section 7.3 discussed criteria critical in defining land uses which can be effectively used in habitat preservation on farmland. These factors included, connectivity in the landscape, maintenance and creation of edges, land which serves to meet the basic needs of animals (food, water, shelter and space), land which contains native plant species, land containing water courses, wetlands and ponds/lakes as well as land providing for biodiversity.

Linked closely to these factors are Porter's (1992) hierarchy of contact points (see section 6.0). Viewed as significant land use factors in the GVRD, contact points provide three definitions of relating agricultural land use and its integration with wildlife habitat. Land use within the CSA was gauged against this planning criteria in the establishment of a land use integration scheme for the study area. Ranging from the lowest to the highest are: subject area 3, subject area 2, subject area 1 and subject area 4 (Figure 14).

Subject area 3 meet few of the land use criteria and was designated as low. This designation is due to its exclusion from the ALR and potential rezoning to small single family sized lots. Integration and management of a land use scheme would prove very difficult.

Subject area 2 is largely comprised of rural residences with land use that has been intensified to limit natural areas and potential contact points. Area 2 was designated as having a low possibility for integration.
Figure 14. Land use integration zones between small farms and wildlife habitat management practices within the case study area.
A similar pattern exists in subject area 1 however, this region contains a higher number of small farms with more patches of open fields and wood lots. This area has a larger number of potential contact points with similar habitats in the park. The nature of the land use in the area provides for a higher likelihood of existing pasture and tree stands being used as a wildlife corridor between the park and a large forested area bordering 0 avenue to the south. Subject area 3 is designated as moderate.

Subject area 4 has the highest likelihood of land use integration. This region consists of numerous large stands of trees and open fields of improved grassland. Many of these landscape features are joined by streams flowing throughout the region. The riparian area of these streams has been left largely in a natural state. Ready access can be gained by wildlife between the park and the surrounding small farms, as the road construction has been limited in this area. Land use activity focuses on equestrian operation and limited livestock production. Land use changes in the region are further limited as the area is within the ALR and abuts on larger farms. Subject area 4 is designated a high.

9.6 Resource Inventory Summary

Present land use in the area has shown a significant potential for an overall focus on selected land use features compatible with habitat management practices. Areas consisting of large farms can incorporate land uses such as cover crops and field margins. These uses are very limited in the CSA. Due to the large number of smaller lots with similar land use patterns, the region would prove suitable for other types of habitat management practices. These include:
Old and Abandoned Farm Yards and Structures. Subdivision of large farms in the area has resulted in the region containing many old, abandoned farm structures (Figure 15).

Fences and Hedgerows. Land use changes have been limited in the region due to limited involvement in crops. As a result, farms in the area have retained many of their original fences and hedgerows. These are numerous throughout the CSA (Figure 16).

Old Fields and Meadows. With many of the properties being used as rural residences or for limited farm activity, many pastures and fields have been left untended and are classified as unimproved grassland. As a result the CSA contains numerous meadows (Figure 17).

Wet Lands, Streams and Ponds. The region contains many small streams which act as feeders to the Little Campbell and Serpentine Rivers. With limited cropping in the area, a natural riparian area has been maintained along side these water courses. Depressions in the topography of the area have also resulted in numerous natural ponds. Infilling of these ponds has not taken place as much of the land is not commercially farmed. A substantial area of wet land parallels the Little Campbell River. Due to flooding of the river this area has been limited in its development and has allowed a natural riparian zone to exist (Figures 18 and 19).

Ditches and Drainage Channels. Ditches and drainage channels in the CSA are very numerous due to the large number of small lots, and resulting irregular lot patterns. They provide a vital source of food and water for species in the region (Figure 20).

Wood Lots and Plantations. Wood lots are numerous throughout the region due to the limited need to convert land for commercial agriculture. Small farms have concentrated on livestock production and equestrian operations which in turn have a more limited need for large areas dedicated to grazing. Clearing is substantially reduced in comparison to larger farm units east of
Figure 15. Odd and abandoned buildings found in the study area now serve as potential habitat for wildlife.

Figure 16. Fencerows and hedgerows are commonly found throughout the subject area.
Figure 17. Old field habitats, such as abandoned meadows, provide habitat for numerous species.

Figure 18. The case study area contains several wetlands and streams, in this instance the Little Campbell River.
the CSA. Woodlots, when located contiguous to old field habitats and pastures, provide for numerous edge habitats in the region (Figure 21).

Rural Residences. The predominant land use in the study area is small farm operations, most often containing some outbuildings used to house small numbers of livestock. A dominant land use is equestrian operations (Figure 22).

In relating the plan back to the goals and objectives of the strategy the case study indicated that the potential integration of small farm land uses with wildlife habitat management practices would allow for wildlife habitat enhancement and agricultural enhancement. The preservation of such landscape features as hedgerows, fencerows, windbreaks and shelterbelts would benefit local farm operations through a reduction in soil loss due to wind erosion, creating shade for livestock while providing valuable food and cover as well as travel corridors for wildlife (Wildlife Habitat Canada, 1995).

9.7 Analysis

In determining the appropriateness of the proposed strategy, decisions must be made based on the suitability of the proposed plan. The following factors are the guiding principles of the proposed land use strategy for the CSA and provide a rational for suitability analysis:

A. Significance of Wildlife and Wildlife Habitat. Present land use within CVRP demonstrates a diversity of both flora and fauna. The valley bottom wetlands and surrounding uplands contain a variety of plant species which in turn have allowed for a wide range of bird, mammal, reptile and amphibian species to exist in this region. Plants and animals in the park are not limited by its legal boundary and are using farmland as a source of habitat. As noted earlier, parks can no longer be
Figure 19. Ponds, both natural and artificial, have been incorporated into the present land use of the study area.

Figure 20. Ditches and drainage channels surround most farms within the study area and serve to connect patches of habitat.
Figure 21. Woodlots form a common part of many small farm units in the study area and are an important land use for habitat preservation.

Figure 22. Present land use in the case study area ranges from small farm operations to rural residences.
viewed as isolated pockets of wildlife habitat (Caza and Kaarik, 1994), but that their effect spreads beyond legal park boundaries. This factor has been noted by the Township of Langley who have noted that rural areas serve an important role in preserving ecological and environmental factors in association with protected areas (Township of Langley, 1993). The Corporation of Delta has also included this concept as part of its Rural Land Use Study (1994). Two parks within the municipality have been highlighted as having high habitat value. The municipality indicates that the natural attributes within the park can be maintained and enhanced through the protection and encouragement of landscape features such as hedgerows, drainage ditches, woodlots and trees. (Corporation of Delta, 1994).

B. Significance of Small Farm Operations. Land activity in the CSA has demonstrated that large scale commercial agricultural production is limited. Production has concentrated on small livestock units with accompanying areas of pasture for grazing. There is a limited amount of forage production and some minor crops. Equestrian operations are numerous throughout the region.

The region contains an abundant number of rural residences which have maintained land cover in either patches of unimproved grassland such as old fields, stands of trees or a mixture of these land uses. Farm income for these units is limited and investment into the land for agricultural production is marginal.

C. Significance of Habitat on Small Farms.

Land uses in the CSA show a significant amount of habitat on small farm units in the region. Their importance as part of a planning strategy include:

A. Linked land uses: Connectivity between compatible land cover such as trees stands and pasture land, are found throughout the small farms surrounding CVRP. These points in turn link
potential habitat areas on the small farm units with the larger habitats within the park. The region immediately east of the park has the highest potential for integrated land uses, followed by the region to the south.

B. Select individual features with the landscape: Land within the CSA has been subdivided into smaller sized lots over the past three decades, as well, major land use changes are very limited as both the land within CVRP and surrounding farms (with the exception of the area north of CVRP) is ALR and subject to the ALC act. As a result, land use patterns have been stabilised reflecting a land use based on lifestyle rather than economics. See Section 7.5 on small farm operations.

Changes within the landscape have been minimized and have resulted in features conducive for wildlife habitat. These include old over-grown fencerows, hedgerows throughout the region, a massive system of drainage ditches, small abandoned meadows, patches of trees and several old abandoned farm buildings and yards. Several properties have maintained a wide riparian zone along streams running through the region and some land owners have established ponds in the area. This pattern has been repeated on a multitude of lots in the regions and have therefore provided a variety of land cover for wildlife.

9.8 Implementation

To ensure that the proposed strategy is successful and worthwhile, a means of implementation must be formulated as part of the planning process. A regional strategy combining sustainable small scale agriculture and wildlife habitat can be managed for an area such as the CSA through a blend of education, planning and zoning guidelines and incentive programs.
Habitat protection within CVRP is governed by the GVRD and its park policies and bylaws. On surrounding properties, this procedure is currently regulated by the policies contained within the Township of Langley's community plan. As indicated earlier in this study, the plan details policies regarding environmental protection. A strategy focusing on land use integration however, will require zoning or policies addressing specific conservation issues.

Procedural means of preserving habitat and biodiversity along with sustaining agricultural practices are an integral part of any proposed plan for the CSA. Designation and application of land use zones and policies would focus on:

i. The designation of land sensitive for habitat,

ii. The formulation of permitted land uses which encourage sustainable agriculture and habitat management practices. Zoning of this nature would restrict development rights of the property owner and in turn require that the proposed strategy address this problem. Properties affected by this zoning would also face a change in land value with a further reduction in development potential.

An implementation scheme would also address the question of compensation for the property owners. Potential means would include methods reviewed earlier in this study. Included would be:

i. Preferential taxation as currently applied to farm operations,

ii. Proportional taxation, in which those areas of the property affected would not be included in Tax assessment calculations,

iii. Direct compensation for the establishment of registered conservation easements,

iv. Development credit which can be applied to lower future development costs (i.e. permits, accessing utilities, etc) on the remainder of the property,
v. Compensation for the application of restrictive covenants favouring habitat conservation.

Successful implementation is also dependant on stewardship factors. The development of a regional private stewardship program as part of the areas strategy for farming and wildlife will require an educational focus. Information about habitat management procedures, their significance for wildlife and the need to incorporate farms into a working regional strategy are central components of any educational program. Land owners must be cognizant of what is happening in their area and how they can participate in the planning process. Planning agencies have recognised that in order to respond to changes in land use, several approaches to land management must be considered. The most desirable method is a cooperative effort with land owners, private agencies concerned with wildlife habitat and local government (Corporation of Delta, 1994). Land uses changes in the CSA would therefore benefit from an adapted management approach towards habitat preservation and enhancement.

9.9 CSA Strategy and Plan Summary

The proposed rural land use plan is based on existing land use, zoning, and a potential use of small farms to integrate habitat management practices. The plan includes the adoption of planning guidelines established by the Township of Langley:

A. to protect the quality of the environment in rural areas;

B. to support the agricultural use of land and the agricultural industry in the rural area; and

C. to provide a land use pattern that supports the rural economy, preserves a land base for agricultural production and is compatible with the agricultural industry (Corporation of the Township of Langley, 1993)
Other management guidelines would take into account current provincial legislation including the ALC act and Right to Farm Legislation.

The CSA provides an opportunity to examine the potential for the use of a rural plan in the development of an integrated land use strategy. As described in section 3.1, the strategy would provide for sustainability of land uses as applied to habitat management practices and small farm operation. Further, an integrated land use strategy would also allow for the plans implementation though the use of stewardship programs as a central element of the plan. The CSA also demonstrated the need to incorporate a park or protected area, in this case CVRP, as a central resource for wildlife. The park provided a focal point for the rural plan and the resource analysis as applied to this specific land use strategy.

An area like southwest Langley may have a limited value for commercial agriculture, but has a high potential as an area for integrated farm and wildlife land uses. Farms that may only contain common habitats like hedges and woodlots will still make a valuable contribution to the fabric of the countryside by managing them in ways sympathetic to the needs of wildlife (Andrew & Rebane, 1996). An increased public awareness of potential integrated lands uses in the study area would lend support and involvement to the rural plan and add to the public's knowledge of the land use strategy. The rural plan provided a process in which the land use strategy could effectively provide direction for municipal land use policies concerning integrated resource management the township. This would be consistent with similar existing programs such as those developed by the who state as a rural land use goal, to encourage development that is consistent with the overall goals of sustaining agricultural viability and habitat capability (Corporation of Delta, 1994).
10.0 Summary

This study examined the use a rural plan as a process for developing a land use strategy concentrating on the integration of small farms and habitat management practices. The strategy included objectives which served to develop sustainable agricultural land use practices, which in turn served to support wildlife habitat management practices and regional biodiversity.

10.1 Land Use Strategy

The strategy contains two keystone elements: sustainability, and stewardship. These concepts form the guiding philosophy of the strategy and the plan's framework. Each element produced a set of parameters in which habitat management and small farm operations could be assessed within the planning process.

10.2 Planning Considerations

The rural plan provided the strategy with the means to;

i. explore a problem,

ii. set goals and objectives,

iii. develop a data base on which decisions could be made, and

iv. formulate a plan and implementation process.

The planning process used in the study focused on rural planning principles. The plan incorporated multiple land uses, specifically that of, agriculture and wildlife habitats. The planning area concentrated on a regional scale and demonstrated the potential of land use integration throughout a regional planning area. As well, the rural plan allowed for the formulation and
incorporation of the land use strategy's objectives as possible regional land use designations. Those designations having been developed as part of the initial strategy. See section 3.2.

10.3 Land Uses and Habitats

The formulation of a regional strategy relies on understanding potential land uses and their utilization within the decision making component of the rural plan. In the Lower Mainland, land use changes result from an expanding urban population. Within the growing urban shadow, large farms have been subdivided into small farms to meet the desires of a growing population interested in a rural lifestyle. Land uses in these areas have focused on small scale livestock production, pasture, woodlots and a growing equestrian community.

At the same time, land uses, as demonstrated within the CSA, indicate a good potential for being compatible with wildlife habitats. Emerging from this process is an identification of wildlife habitat management practices suitable for the area. In turn, these management practices form the core of a strategy centred on the integration of small farms and habitats. Management practices for wildlife highlight the fact that the basic habitats must provide for food, cover from predators and space for reproduction. The land use plan developed for the CSA demonstrated that small farms can provide these basic requirements and at the same time maintain land uses which are sustainable.

Land management procedures of particular importance to small farm operations include:

A. Tree cover on properties adjacent to parks should be retained,

B. Contiguous types of land use should be maintained especially if they contain native plant species,
C. Farm structures suitable for both wildlife and farm use should be maintained and receive preferential taxation as an incentive,
D. Pesticide application should be minimized in low intensity operations such as small farms. Any application should be undertaken during periods of dry weather as to lessen the potential run off into surrounding collection ponds and waterways,
C. Cropping of meadows for hay, whenever possible, should be timed to follow the nesting schedule of birds in the region,
D. Hedgerows, fencerows and shelterbelts should be maintained on all properties and interproperty boundaries, and
E. Involvement of property owners should take place early in the formulation of any plan, providing opportunities for voluntary participation.

The use of the words "farm habitat" would therefore allow for the strategic development of management principles covering both agriculture and wildlife within the same region. Many of the management practices applicable to small farms can be implemented on "untilled land". The relationship between habitat and biodiversity can be maintained within a farm habitat.

10.4 Small Farms

Implementation of the strategy is highly dependant on the management scheme. A management program should present not only methodologies for habitat management, such as the conservation of edges, corridors and land patterns, but would provide methods for the administration of land use program. As mentioned earlier, a positive means of accomplishing this process involves regulations, incentives and education. A region configured of small farms would
include strategies for;

A. Cooperation between small farm land owners and environmental interests and local government,

B. Providing mechanisms to develop a land use plan centred on integration,

C. The designation and protection of those areas suitable for land use integration,

D. The protection of farm values and the local rural community,

E. Ensuring land owners are provided with the means for sustaining land uses compatible for both agriculture and wildlife. This would include compensation for implementing habitat measures and education regarding agriculture and wildlife,

F. Implementing means of educating the general public regarding the importance of land use integration between small farms and wildlife.

10.5 Programs and Policies

Plan implementation focused on past and current land management programs. These programs employed the use of legislation, regulations and other land uses policies to invoke habitat preservation and enhancement on farm land. The principal factor which was revealed in the plan and central to the strategy was the use of programs centred on the stewardship of private lands. The study indicated that a workable regional land use strategy would rely on the following factors:

A. Policies or programs should include incentives that will encourage integrated land use management centred on conservation practices on a majority of rural private lands,

B. That private lands be incorporated into plans concentrating either primarily of wildlife or on multi-sectoral management units,
C. To provide information, advice and incentives to incorporate integrated management on privately owned land,

D. That OCPs and zoning bylaws not be used in isolation but provide the necessary incentives to encourage private landowners to maintain or improve conservation practices on their land, thereby leading to sustainability.

Land use programs in British Columbia have emphasized land use management through legislation. The British Columbia government has proposed to develop legislation which meets the challenge of diversity and sustainability. However, within the province, the blending of regulations and stewardship programs has been undertaken by regional districts and municipalities. Community plans have placed priority on regulations coupled with stewardship incentives and education.

10.6 A Management Strategy for Small Farms and Wildlife Habitats

A strategy integrating small farm units and habitats requires the development of land use parameters along with an implementation scheme. Some basic considerations are:

1. An inventory of both agricultural and natural resources available for the program. These assets form the foundation of the land use plan and are critical in the decision making process.

   Linking land use activities and land cover within the limits of a "farm habitat" as described by Moen, allows for the delineation between farm uses and habitat management practices. Key considerations are the sustainability and suitability of vegetation types in the region. This would include native plant species and cover commonly associated with small farms or rural residences, such as woodlots and unimproved grassland for grazing. The inventory would provide a means documenting twinned land uses. This would include wildlife requirements for food, cover and space
along with sustainable agriculture land uses.

2. Formulation of policy for the region's land use. Not all land uses on small farms will be compatible for use in a management scheme. Priorities must be part of the strategy process. Those affecting a region consisting of small farms could include:

A. Integration of land uses supporting biodiversity of species threatened or endangered,
B. Integration of land uses focusing on sustainable farming methods,
C. Integration of land uses which provide contact points between privately owned property and similar land cover in parks or protected areas,
D. Integration of land uses which support the viability of farm operations.

Regionally, the integration of small farms and wildlife habitat can be applied in numerous locations throughout the GVRD and the province. The changes which took place in the Lower Mainland's land use over the past three decades are being duplicated throughout British Columbia. Large farms have been subdivided into smaller holdings which now have established themselves and contain similar land uses as explored in the CSA. Such regions would form the basis for future strategies based on land use integration.

As urban populations expand in the Lower Mainland and in other provincial centres, the development of small farms will also continue. The consolidation of wildlife conservation schemes into these new rural communities will require strategies and planning frameworks similar to those developed in this study.
References


City of Surrey. 1987. **Survival Kit for First-Time Developers.** City of Surrey, British Columbia. 1 p.


Appendix A

Corporation of the Township of Lanlgey Bylaw Number 2500

Permitted land use within the following zoning designations:

Rural Zone RU-1

In the RU-1 zone the following uses are permitted and all other uses are prohibited:

(1) accessory buildings and uses
(2) accessory home occupations
(3) accessory parking of commercial vehicles
(4) agricultural uses
(5) commercial greenhouses
(6) equestrian centres and riding stables
(7) feedlots
(8) group children day care centres
(9) intensive swine operations
(10) mushroom farms
(11) residential uses
(12) veterinary clinics

Suburban Residential Zone SR - 2

The following uses are allowed in SR -2 zones, all other uses are prohibited:

(1) residential uses, including a single family dwelling or mobile home on any one lot
(2) all uses as listed under RU - 1 with the exception of:
    - feedlots, mushroom farms and intensive swine operations.
Civic Institutional Zone P-1

In the P-1 zone only the following uses are permitted and all other uses are prohibited:

(1) accessory buildings and uses
(2) adult day care facilities
(3) assembly uses
(4) agricultural uses if the lot is included in the Agricultural Land Reserve
(5) cemeteries
(6) government institutional buildings and facilities
(7) hospitals, medical clinics and related uses
(8) public parks, playgrounds and recreation facilities
(9) public transport depots
(10) residential uses
(11) rest homes

Community Care Facility Zone P-2

The following uses are allowed in P-2 zones, all other uses are prohibited:

(1) adult day care facilities
(2) rest homes
(3) hospitals, medical clinics and related uses
(4) government institutional buildings and facilities
(5) residential uses
(6) agricultural uses subject to the lot being located in the Agricultural Land Reserve.