KAMLOOPS, BC

# An Ecological Assessment for the Aberdeen Area Plan

Working together for the conservation of BC's grasslands

Grasslands Conservation Council of British Columbia

# An Ecological Assessment for the Aberdeen Area Plan, Kamloops, B.C.

**PREPARED BY**:
The Grasslands Conservation Council of British Columbia
954a Laval Crescent
Kamloops, BC
V2C 5P5

And

Biospherics Environmental Inc.
3-1175 E. 14th Ave.
Vancouver, BC.
V5T 2P2

**PREPARED FOR**:
City of Kamloops
105 Seymour Street
Kamloops, BC
V2C 2C6

February 22, 2008

# TABLE OF CONTENTS



# LIST OF FIGURES



# LIST OF TABLES

# EXECUTIVE SUMMARY

A partnership between the City of Kamloops and the Grasslands Conservation Council of British Columbia was established to complete an ecological assessment for the Aberdeen Area Plan, an area in south Kamloops slated for future development. The ecological assessment was divided into two components: a field survey and assessment where data for wildlife and plants were compiled into species lists, and the delineation of draft Ecological Communities based on the field data.

Building on the field assessment and preliminary delineations, a priority ecosystem analysis was completed, resulting in the categorization and ranking of the relative importance of ecosystem values within the study area. Priority ecological zone mapping was completed to assist development planning and to provide the means for evaluating tradeoffs between conservation and development within the study area. The study area was stratified into three zones: the “Red Zone” delineates a conservation area defined by a large concentration of high and moderate ecosystem values, including important and highly suitable habitat for species at risk and rare ecosystems. It is recommended that the activities within this zone be primarily directed towards maintaining ecological, wildlife habitat and agricultural values. The “Amber Zone” delineates a sustainable development area defined by moderate ecosystem values on the broader landscape level with specific high priority sensitive ecosystems, such as wetlands. High priority ecological features within this zone are recommended for environmental consideration as park, environmentally sensitive areas, or protected with other conservation tools. A third zone, the “Green Zone”, delineates a development area. This area has lower conservation values, but there are ecological features within this area that should be considered for urban green space or park.

In addition to the zoning recommendations, the GCC is recommending that the City of Kamloops complete a comprehensive ecosystem plan as part of the Aberdeen Area Plan, as well as a broader conservation strategy that considers a series of strategies, including, but not limited to: the designation of high priority sensitive and important ecosystems as Environmentally Sensitive Areas, the establishment of buffers and connecting corridors between high priority ecosystems, the establishment of Development Permit Areas to protect sensitive areas, and incentives such as density bonusing for developments in exchange for the retention of sensitive ecosystems. The GCC is also recommending that the city adopt the *Green Bylaws Toolkit* for use in all future land use planning exercises.

## ACKNOWLEDGEMENTS

Funding for this ecological assessment was provided by the City of Kamloops. Other partners who have contributed to the Priority Grasslands Initiative include: Ministry of Agriculture and Lands, Integrated Land Management Bureau, Ministry of Environment, Ministry of Forests and Range, BC Gaming Commission; Habitat Conservation Trust Fund, The Real Estate Foundation of British Columbia, Nature Conservancy Canada, Tula Foundation, The Bullitt Foundation and Western Economic Diversification Canada.

This document was produced as a collaborative effort between the Grasslands Conservation Council of British Columbia and Biospherics Environmental Inc.

Sincere thanks are extended to the following contributers for the production of this report: Bruno Delesalle, Richard Doucette, Ian Mackenzie, Terry McIntosh, Tasha Sargent and Ken Wright for writing and editing the report; Terry McIntosh, Tessa Richardson and Ken Wright for the field work required; and Ian Mackenzie for the GIS mapping and analysis.

# 1. INTRODUCTION

## 1.1 Project Background

In 2004, the City of Kamloops developed KAMPLAN, the *Official Community Plan* for the City of Kamloops. This plan recognizes the importance of natural habitats within city boundaries, specifically grasslands and wetland habitats, which are particularly sensitive to urban development (City of Kamloops 2004). In KAMPLAN, comprehensive area plans are included to outline land use to direct growth and development. A background report for the Aberdeen Area Plan was completed by True Consulting Group in 2005. The background report, although mainly focused on infrastructure concerns, states that "New Urbanism supports preservation of agricultural lands and environmentally sensitive areas through compact development" (True Consulting Group 2005) and emphasizes KAMPLAN policies that encourage the protection of parkland and open spaces for their contribution to the quality of the Aberdeen neighborhood. The report includes environmental considerations, draft assessments of Ecological Communities, and identifies two environmentally sensitive areas: Coal Hill and Guerin Creek; however, the ecological description and information is limited and does not identify the biodiversity or other ecological values in the area.

Following the GCC's *Planning for Change* workshop in May 2007, the City of Kamloops and the Grasslands Conservation Council of British Columbia (GCC) embarked on a pilot project to complete an ecological assessment of the Upper Aberdeen area on the south side of Kamloops (Figure 1). This project was initiated on September 11, 2007. With increasing pressure for development from major landowners and a recognized gap in ecological information of the Aberdeen area, the City of Kamloops is taking steps to address information needs and to fulfill the environmental objectives of the Aberdeen Area Plan and ultimately, KAMPLAN. Conservation of natural ecosystems within urban areas is becoming a leading concern for city planning departments, and it is increasingly recognized that conservation of natural lands not only protects wildlife habitat and promotes a healthy environment, but also contributes to the quality of urban life, human experience and a healthy community. This report provides the City of Kamloops with baseline scientific information that will assist to plan for the conservation of agricultural lands and environmentally sensitive areas within the Aberdeen Area Plan. In addition, this report informs the city's planning department about the importance of natural habitats within the study area, particularly grasslands, wetlands and riparian ecosystems.

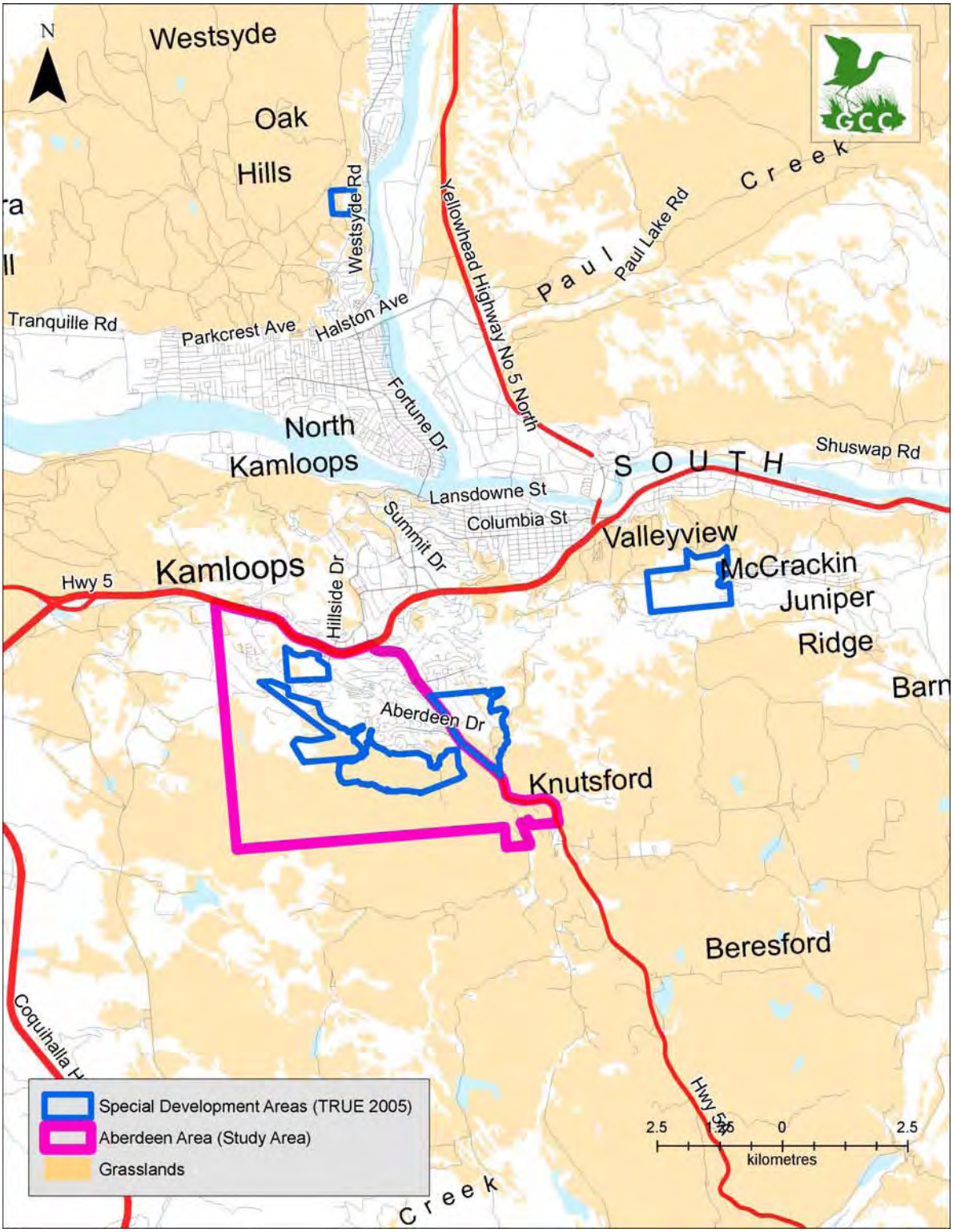


**Figure 1: Map of the Aberdeen Study Area in Kamloops, British Columbia**

## 1.2 The Study Area and Ecological Context

The study area is located in the northwest corner of an expansive grasslands-dominated landscape, which covers approximately 17,000 hectares from Kamloops to Shumway Lake (see purple dashed-dotted line, Figure 2), after which the grasslands narrow to a small corridor for several kilometres before expanding into another expansive grasslands-dominated landscape at Nicola Lake (not shown). At a more local scale, the study area constitutes the northern section of contiguous grasslands, accounting for approximately 2,200 hectares (see maroon dashed line, Figure 2). Figure 2 provides an effective visual of the fragmentation of the larger landscape caused by roads, with the exception of the contiguous 2,200 hectares in the area immediately south of the present day Aberdeen neighbourhood.

The study area is approximately 1,960 hectares, with urban development making up 26% of the land base and the remaining 74% as undeveloped land (i.e. grasslands = 59% and forest = 15%). The majority of the grasslands are working landscapes with livestock grazing being the main land use (historically, as not all grasslands are currently grazed). Land use and encroachment from roads, development and other uses influenced the spread of invasive plants in certain areas.

The GCC defines grassland as land on which grasses are the dominant plant cover (GCC 2004a)[1]. The ecosystems contained in grasslands are characterized by perennial bunchgrasses, shrubs (most often a species of sagebrush), a diverse forb component, and, in the spaces between the vascular plants, a biological soil crust comprised mainly of mosses and lichens. Grassland ecosystems are ecologically complex and are a result of long term post-glacial establishment through the interactive processes of climate, topography, soils, and natural disturbance. The Aberdeen study area grasslands, similar to the surrounding landscape, are characterized by drumlins and hummocky terrain, a topography well suited to the formation of depressions for ponds and wetlands, which are both highly valued habitats. Many of the ponds in the study area have mineral soils and are therefore alkaline: as a result, many play host to a unique community of specially adapted plants. Natural disturbance from fire is important in maintaining grassland communities, though fire suppression over most of the last century has allowed trees—in Aberdeen it is particularly Douglas-fir—to grow into sites that would have traditionally been grassland.

[1] Because of the presence and sometimes partial dominance of shrubs, in particular big sage and rabbit-brush, the term shrub-steppe is often used to describe grasslands that dominate semi-arid portions of the Pacific Northwest, including in Washington State (e.g., Daubenmire 1970).

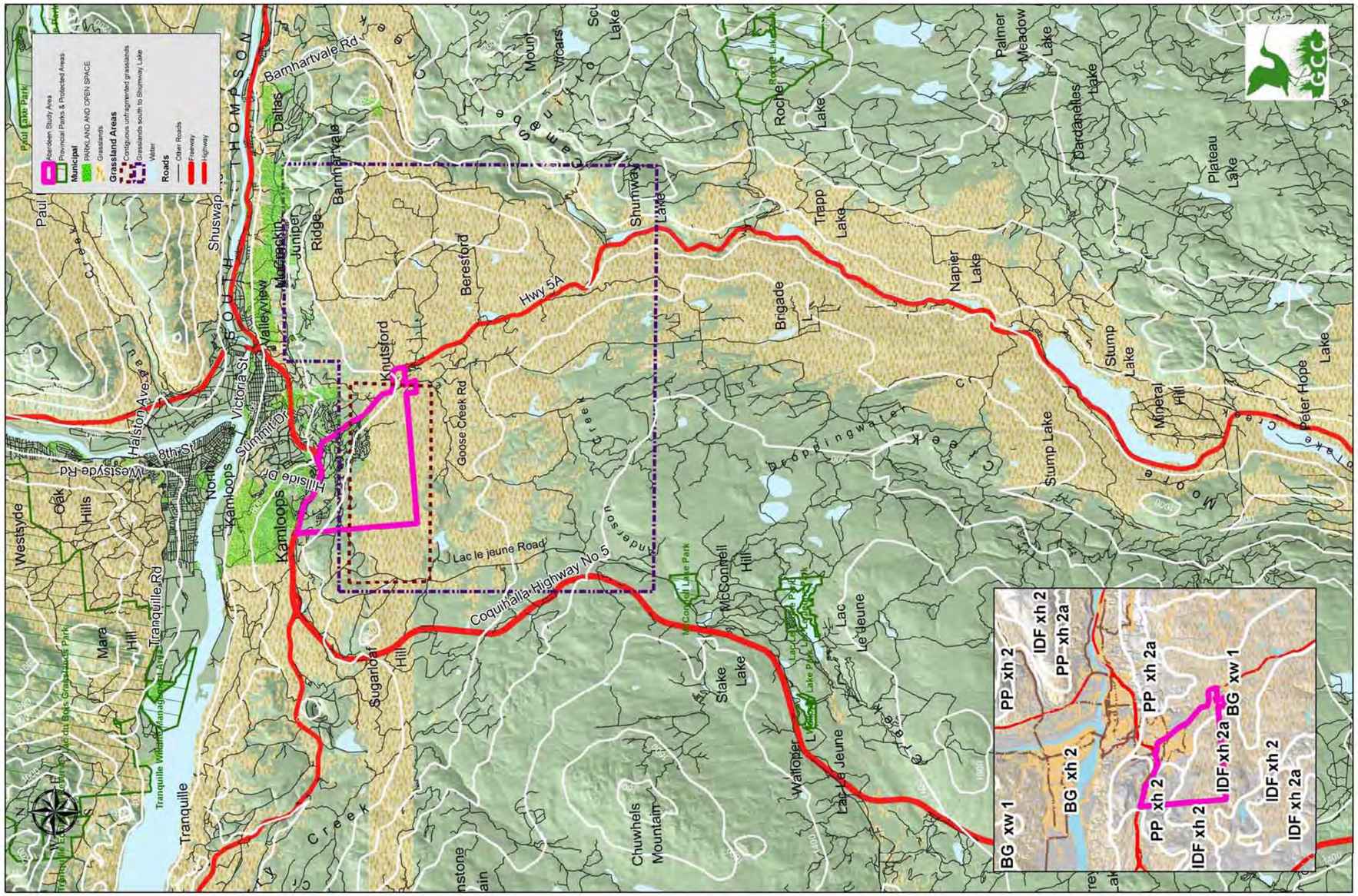


**Figure 2: Map showing the Aberdeen study area in the context of the surrounding landscape, including sections of the Thompson and Nicola Basins**

In the Kamloops area, the majority of natural grasslands are characterized by the following general biotic groups:

1. Bunchgrasses: in particular bluebunch wheatgrass, the most widespread species, but also Sandberg bluegrass and rough fescue. Other locally dominant grasses include Idaho fescue, species of needlegrass, and the rhizomatous species, Kentucky bluegrass.
2. Shrubs: big sage (warmer sites) and rabbit-brush (cooler sites) are the most common species, but other species are also characteristic.
3. Herbaceous species: a wide variety of herbaceous species, in particular forbs but also grasses, dominate the vegetation within and around the larger bunchgrasses and shrubs. Some of the most diverse assemblages of these plants are found in these grasslands.
4. Biological soil crusts: critical components of healthy grassland ecosystems. Comprised of complex associations of organisms that include lichens, bryophytes (including mosses and a few species of liverworts), single-celled algae, cyanobacteria, and fungal hyphae intermixed with plant roots, litter, and soil (Belnap *et al.* 2001, Belnap 2003). Soil crusts perform a number of ecological functions that contribute to the integrity and health of grassland ecosystems, including binding soil surfaces, increasing soil stability, (Belnap 2003), protecting soil from wind erosion (Neuman and Maxwell 1999), and increasing water infiltration rates (Eldridge 1993).
5. Trees: all grasslands in the Kamloops area form a mosaic of grasslands and forest with a forest edge of Douglas-fir or Ponderosa pine, or in topographically favorable areas, such as in draws, gullies and on cool aspects, an interface with Trembling aspen. Over hundreds of years, the grassland/forest interface has changed following climatic shifts and, often, some very large trees – often veterans or vets – survive within the grassland mosaic. They are mostly unaffected by fire and other disturbances, and usually benefit from periodic fire (e.g. by eliminating litter from around their bases). Once the fire regime is altered, such as with fire suppression, the seeds that these veteran trees produce become the source for much of the forest ingrowth into grasslands. Under natural conditions, these veteran trees play an important role in helping to maintain the diversity of wildlife, especially birds and insects.
6. Wildlife: Numerous animals depend on healthy and functioning grassland ecosystems for at least part of the year. Although birds and large mammals are usually evident on these landscapes, small mammals, reptiles, amphibians and large numbers of insects are dependent on them as well.

The study area can be described using the provincial Biogeoclimatic Ecosystem Classification (BEC) system, the British Columbia Ministry of Forests and

Range's method to classify and manage sites on an ecosystem-specific basis. This system is widely employed by biologists and other professionals to communicate various characteristics of any given habitat within a broad-based ecological context. Communications with Ted Lea (Ministry of Environment, Victoria) and Mike Ryan (Ministry of Forests and Range, Kamloops) have confirmed that the Aberdeen study area is both geographically and climatologically complex, and as a result, three BEC subzones have been mapped for the area: PPxh2 (Thompson Very Dry Hot Ponderosa Pine Variant), BGxw1 (Nicola Very Dry Warm Bunchgrass Variant), and IDFxh2a (Grassland Phase of the Very Dry Hot Interior Douglas-fir Variant) (Lloyd *et al.* 1990).

### 1.3 Objectives

The main objectives of this project are to:

1. Provide baseline information on the natural features; including wildlife, plants and lichens, as well as the distinct habitats or Ecological Communities (EC) in the Aberdeen Area Plan study area;
2. Complete an ecological assessment of the Aberdeen Area Plan study area, including flora, fauna and Ecological Communities;
3. Prioritize ecologically-based areas into Priority Ecological Zones: Conservation Areas, Sustainable Development Areas, and Development Areas; and
4. Provide guidance and recommendations to the City of Kamloops on conservation measures and future steps.

### 1.4 Limitations

The data, analyses and results presented in this report are based on the best available information and knowledge obtained from late season (October/November) surveys. The following are limitations to the data and results:

1. The timing of the field work was not ideal, especially for the observation of rare plant species (many of which are spring or summer-growing species and are very difficult to observe after mid-September), nor for the observation of most wildlife (especially birds and insects, with the exception of raptors);
2. For several of the Ecological Communities described in this report ,the identification is tentative due to many plants being dormant (or still in seed) at this time of the year, and follow-up work is required to gather more details;
3. The lack of previous detailed ecological or wildlife surveys in the study area required initial reconnaissance surveys that took away time from more detail surveys;

4. The results of the analysis and ecological assessment had limited review by the scientific community at large; and
5. Some vegetation units encountered in the study area were not given ecological status due to limited field time.

## 2. METHODOLOGY

This section summarizes the methodology used for the ecological assessment of the Aberdeen study area. The methodology included: a literature review, field surveys, consultation with experts, field work analysis, and priority ecosystem mapping and analysis. A much more detailed account of this methodology is described in Appendix B.

### 2.1 Literature Review

Numerous sources were reviewed in the development of this report. Much of the accessed documents and databases, especially government resources such as ecological report and species at risk data, are housed in repositories on the Internet. Table B1 in Appendix B provides a list of information sources consulted.

### 2.2 Field Surveys and Analysis

Field surveys were conducted in October and November 2007 for a total of nine person-days. The field work comprised of visual assessments and ground inspections based on the BC Conservation Data Centre's (CDC) draft Conservation Assessment Procedure for Element Occurrences of Ecological Communities (MOE 2007).

Visual assessments formed the basis for establishing the study area's Ecological Communities and the eight representative vegetation plot locations. Due to the limited late season field work, a number of local and provincial experts familiar with the study area were consulted to supplement the information gathered (Appendix C).

The field data gathered were not only compiled into species lists (Appendix D and E), but helped form the basis for defining and delineating Ecological Communities. Each Ecological Community is evaluated for its ecological and conservation value. Conservation evaluations – a descriptive summary of the Ecological Community – provide a standard way of comparing Ecological Communities. The content of the conservation evaluations is derived from information in Ministry of Environment (MOE) documents (2007, 2006a, 2006b, 2007c, and 2007d).

### 2.3 Priority Mapping and Analysis

Priority mapping and analysis consists of Terrestrial Ecosystem Mapping, community element occurrence designation, priority ecosystem analysis, species

at risk mapping and habitat potential modelling, priority category and level assignment, and priority ecological zoning.

The field survey data, in combination with a Terrestrial Ecosystem Mapping (TEM) (Resources Inventory Committee (RIC) 1998b) related GIS analysis, was used to map bioterrain units. The bioterrain unit polygons represent a combination of key topographic, abiotic and vegetative features in the study area that together form a cohesive unit relative to their landscape and ecological function. To delineate these bioterrain units, digital elevation models (DEM) and Topographical Ruggedness Index (TRI) grids are used in coordination with ortho-photograph interpretation and field data. Other GIS datasets used as mapping aids include: bedrock geology, hydrology (i.e. streams, ponds and wetlands), BC's Ministry of Forests and Range Vegetation Resource Inventory (VRI) and BEC subzones, and GCC's grasslands occurrence layer.

Once the bioterrain units were mapped, they were grouped into community element occurrences, assigned a landscape distribution pattern category (i.e. matrix, large patch, small patch and linear ecosystems) and then grouped into either base polygons or smaller encompassed polygons in preparation for the priority ecosystems analysis (See Appendix B for details).

The priority ecosystem analysis methodology used in this assessment was developed by the GCC and its partners—including experts from various disciplines—to guide a process for identifying and delineating high priority grasslands and associated ecosystems (GCC 2007). The stages of the priority ecosystem analysis applied to this assessment are described in great detail in Table B3 in Appendix B.

In the initial stages of the priority ecosystem analysis, the bioterrain base polygons were assigned a category label and ranked based on what grassland values they encompass. The primary values included: important ecosystems, species at risk, wildlife habitat, recreation and spring forage. Labels are assigned, in part, to provide an efficient way of recognizing what values a bioterrain unit contains and provides an efficient means for the subsequent priority ecological zoning assignment.

The final stage of the priority ecosystem analysis was the assignment of Priority Ecological Zones to the base polygons. This zoning method resulted in representing the study area by three distinct classes, which represent the following recommendations for land use planning:

1) **Class 1: "Green zone" – Development Area**
   There are no specific ecological concerns and the area is highly fragmented. It does not play an important role in contiguity of the highest priority areas, but where possible, specific community elements should be considered for conservation.

2) **Class 2: "Amber zone" – Sustainable Development Area**
   Development should proceed with caution and special attention should be paid to conserving small patch community elements with high priority ranking and/or connectivity value. A clear vision and plan is required to protect ecosystem values and ensure that development does not compromise core ecological values.

3) **Class 3: "Red zone" – Conservation Area**
   This area is defined by a large concentration of high and moderate ecosystem values, including important and highly suitable habitat for species at risk, as well as rare ecosystems. This area is the highest priority for conservation, and activities should be primarily directed towards maintaining ecological, wildlife habitat and agricultural values.

# 3. RESULTS

The following section provides the results of the Ecological Communities identification, plant and wildlife surveys, and the Priority Mapping and Analysis, including the integration of the literature review and outcomes of discussions with experts.

## 3.1 Ecological Communities

Of the ten Ecological Communities identified for the Aberdeen study area during field surveys, two are grassland associated, four are shallow-soiled or rock outcrop, two are forest dominated, and two are wetlands (Table 1). Because of the limited field work, some of these Ecological Communities may be divided or possibly combined in future when further studies are conducted.

**Table 1: Ecological Communities in the Aberdeen Study Area**

| Ecological Community | Estimated proportion of study area |
|---|---|
| **Grasslands** | |
| **1.** Bluebunch wheatgrass-dominated Ecological Community | 70% |
| **2.** Bluebunch wheatgrass-Rough fescue Ecological Community | <2% |
| **Shallow Soil and Outcrop** | |
| **3.** Bluebunch wheatgrass-dominated Ecological Community on thin soils | <10% |
| **4.** Bluebunch wheatgrass-dominated Ecological Community on talus slopes | <6% |

| | |
|---|---|
| **5.** Compact selaginella-dominated Ecological Community | <1% |
| **6**. Outcrop | <1% |
| **Forests** | |
| **7.** Douglas-fir-dominated | 25% |
| **8**. Aspen-dominated | <10% |
| **Wetlands** | |
| **9.** Alkaline pond complex | <2% |
| **10.** Alkaline seepage slope | <01% |

### 3.2 Plant and Wildlife Surveys

The field surveys identified 110 plant species despite the late season survey period (Appendix D). These include: three trees, nine shrubs, 57 forbs, 27 graminoids (grasses, rushes, and sedges), and 14 mosses. One of the plant species, the alkaline wing-nerved moss, is listed as Threatened on Schedule 1 on the federal Species at Risk Act (SARA) and is Red Listed by the CDC. It was found along the edges of two of the alkaline ponds in the Aberdeen study area (located in the south east and south west of the study area). This species is scattered across the drier landscapes through British Columbia and is rarely very common at any site; however, one of the Aberdeen populations of this species appears to be one of the largest in British Columbia.

The inventory of the plants (including bryophytes) and lichens in the study area is preliminary. Although the vascular plant flora is probably about 85% complete, the bryophytes and lichens are still mostly unknown; more complete spring and summer surveys should be conducted to obtain a better representation of current plant communities and the presence of rare species. It is expected that other rare species will be observed during future surveys, especially adjacent to alkaline ponds or in terrain seeps.

A list of the animals that were observed during field work is included in Appendix E. Seven hundred and thirty-three observations of 45 bird species were made, and observations or evidence of five mammals utilizing the area were also noted (Appendix F).

Based on field surveys, personal communication and compiled information from the literature review, a total of one Red Listed bird (Lewis' woodpecker), two Blue Listed birds (Sandhill crane and Sharp-tailed grouse), one Threatened bird (Common nighthawk), one Blue Listed mammal (American badger), and one Red Listed/Threatened non-vascular plant (Alkaline wing-nerved moss) have been identified in the study area.

Discussions with experts lead to the establishment of a list of potential species at risk in the study area (Table F2 of Appendix F). In addition to the confirmed

species noted above, a total of four likely and 27 possible Species at Risk may occur within the study area, and requires further investigation.

### 3.3 Priority Mapping and Analysis

The study area is comprised of approximately 1,960 hectares (19.6 $km^2$): 1,448 hectares (14.5 $km^2$) being intact habitat (15% forest, 59% grasslands) and the remaining 512 hectares (5.1 $km^2$) being developed urban areas.

Appendix F provides a series of important maps that lead to the resulting priority ecological zoning map, including Terrestrial Ecosystem Maps, badger habitat potential model, Sharp-tailed grouse habitat potential model, Great Basin spadefoot habitat potential model, priority categories and priority ecological level "ranks".

Figure 3 shows the study area stratified into three priority ecological zones: Conservation Area (Red zone), Sustainable Development Area (Amber zone) and Development Area (Green zone).

The red zone is defined by a large concentration of high and moderate ecosystem values, including important and highly suitable habitat for species at risk and rare ecosystems as defined by the CDC, and is the highest priority for conservation. The amber zone is defined by moderate ecosystem values on the broader landscape level with specific high priority sensitive ecosystems, such as wetlands. The green zone overall has lower priority values but specific community elements within this zone may have higher ecological values.

Figure 4 represents the priority ecological zoning, but showcases the special features within the amber and green zones that need to be considered in developing these areas.

Table 2 breaks down the total hectares and the number of occurrences of each zone within the study area, and Table 3 shows the same breakdown for the combination of the study area and the adjacent special development area (LU134). Special development areas are areas identified as potential for future development in the Aberdeen Area Plan Background Report (True Consulting Group 2005).

Figure 5 shows the percentages of each zone within the study area, including the area where no zone was designated because the land is already developed. Figure 6 shows the same thing for the combination of the study area and the adjacent special development area (LU134).

For each development area in the study area, and for one development area adjacent to the study area, the percentage of each zone of the Ecological Zoning Analysis is graphed as a bar (Figure 7). The Conservation, Sustainable Development, and Development percentages for each do not add up to 100% due to slight discrepancies in the zone boundary lines within the GIS environment.

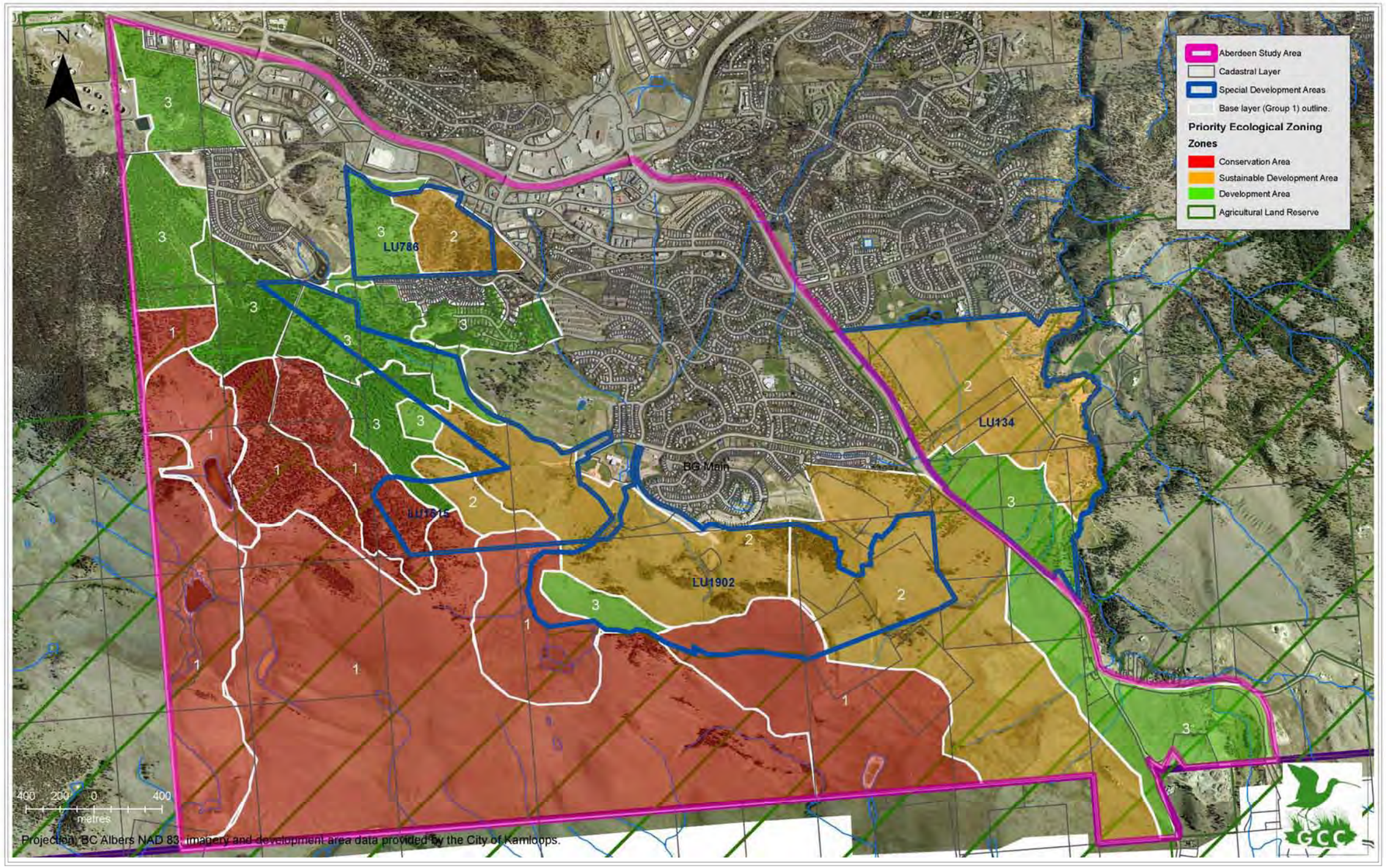


**Figure 3: Map of Priority Ecological Zoning for the Aberdeen Study Area**

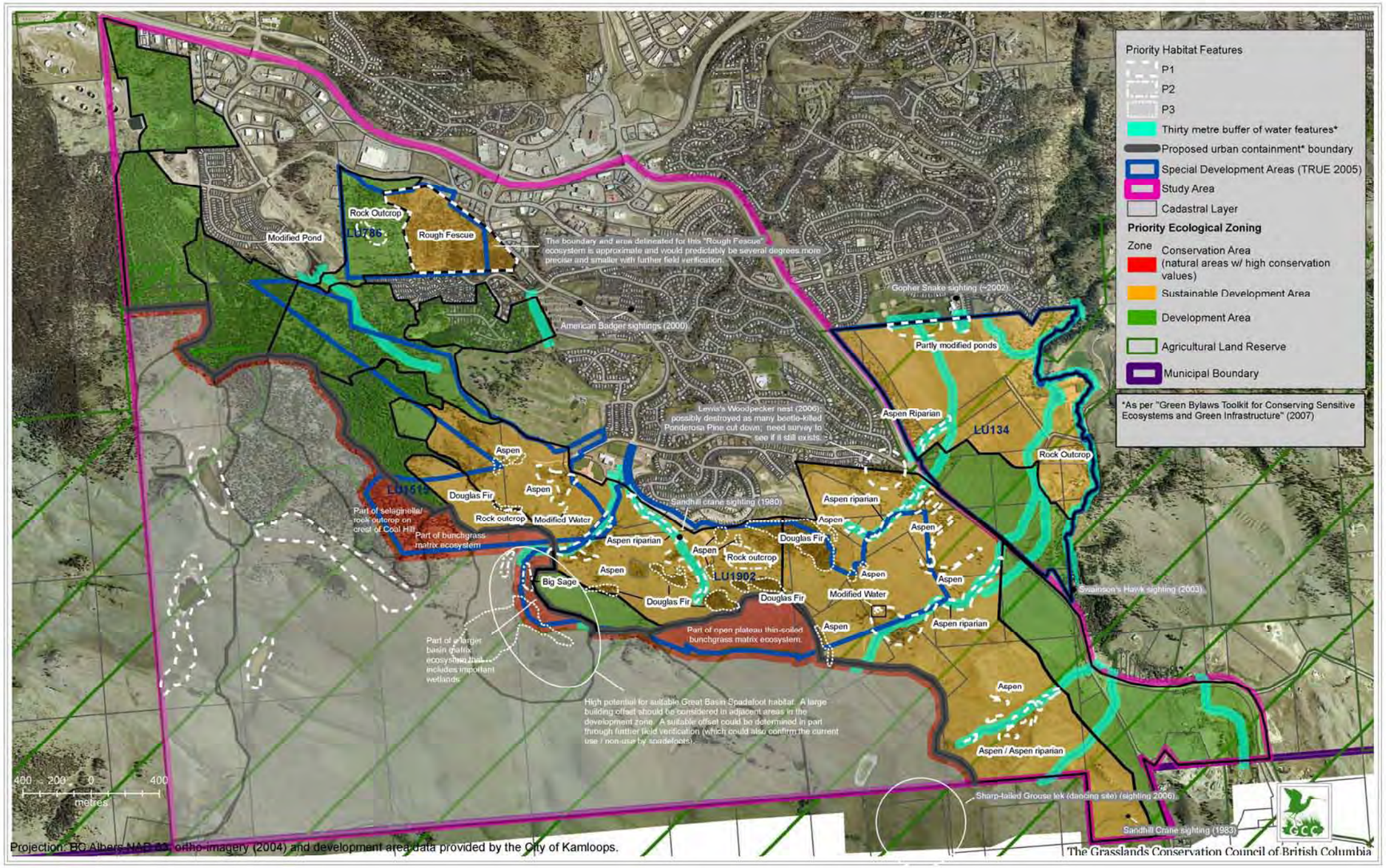


**Figure 4: Map of important habitat features in the Aberdeen Study area in the context of Ecological Zoning and Special Development Areas**

**Table 2: Total area covered by each Ecological Zone in the Study Area.**

| Zone | Number of Occurrences | Hectares |
|---|---|---|
| Conservation | 7 | 788 |
| Sustainable Development | 4 | 347 |
| Development | 11 | 312 |

**Table 3: Total area covered by each Ecological Zone in the Study Area and in the adjacent Development Area (LU134).**

| Zone | Number of Occurrences | Hectares |
|---|---|---|
| Conservation | 7 | 790 |
| Sustainable Development | 5 | 447 |
| Development | 12 | 347 |

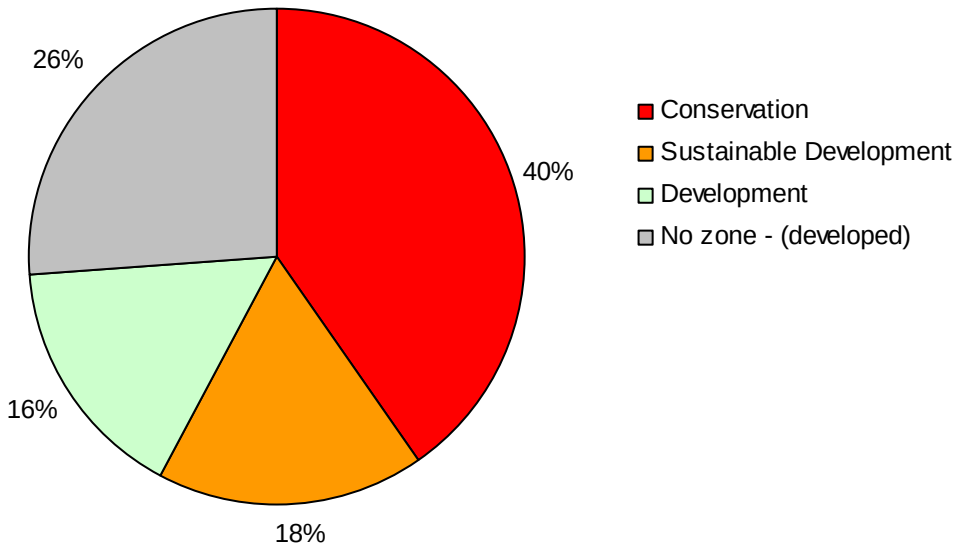


**Figure 5: Percentage of study area covered by each Ecological Zone**

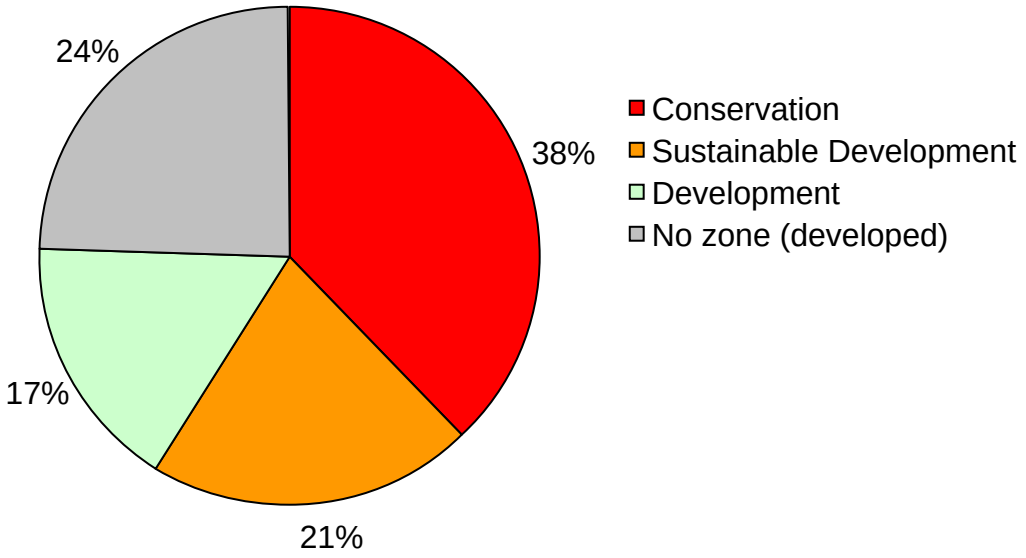


**Figure 6: Percentage of study area and adjacent Development Area (LU134) covered by each Ecological Zone**

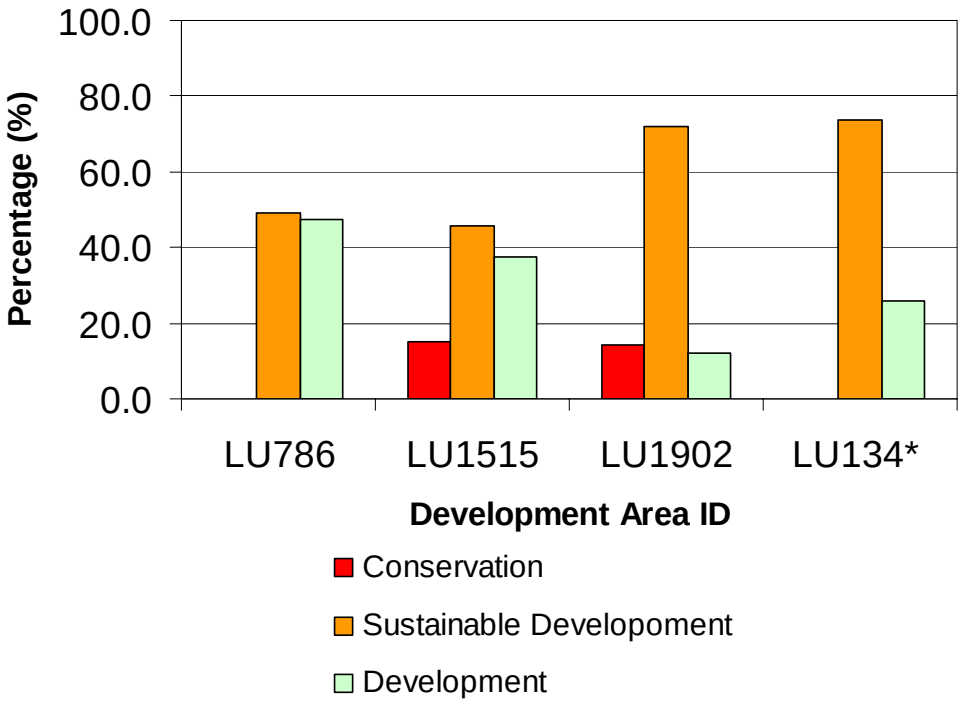


**Figure 7: Percentage of Ecological Zone type in each of the four Special Development Areas**

# 4. PLANNING FOR CONSERVATION AREAS

In 2004, the City of Kamloops developed KAMPLAN, the *Official Community Plan* for the City of Kamloops. This plan recognizes:

- New urbanism that supports preservation of agricultural lands and environmentally sensitive areas through compact development;
- Protection of parkland and open spaces for their contribution to the quality of the Aberdeen neighborhood; and
- The importance of natural habitats within city boundaries, in particular grasslands and wetland habitats, which are highly sensitive to disturbance.

As the city of Kamloops grapples with significant growth pressure over the next few decades, conservation of natural ecosystems within urban areas is becoming a leading concern. It is increasingly recognized that conservation of natural lands not only provide wildlife habitat, but they contribute to the quality of urban life, human experience and a healthy community.

## 4.1 Proposed Ranking of Study Area

Building on the results of the analysis where ecosystems were ranked using a Priority Ecological Zoning analysis, the study area was stratified into three areas:

1. Conservation Area (Red Zone) – This zone is defined by a large concentration of high and moderate ecosystem values including important and highly suitable habitat for species at risk, and rare ecosystems as defined by the CDC. The Red Zone is the highest priority for conservation and include natural areas with high conservation values. Activities should be primarily directed towards maintaining ecological and wildlife habitat values in this area, as well as agricultural values. A working agricultural landscape managed in a sustainable way may be consistent with conservation objectives.

2. Sustainable Development Area (Amber Zone) – this zone is defined by moderate ecosystem values on the broader landscape level with specific high priority sensitive ecosystems delineated. Figure 4 illustrates priorities for conservation within this zone. A clear vision and plan is required to protect ecosystem values and ensure that development does not compromise core values. High priority features within this zone should be zoned for environmental consideration as park, environmentally sensitive areas, or protected with other conservation tools.

3. Development Area (Green Zone) – this zone is defined as having lower conservation value. There are specific community elements within this

zone that have ecological value that could be considered for urban green space or parks.

Due to the high values found within the Red Zone, this area is proposed as a conservation area where no development should be considered. Land use should be primarily directed towards maintaining ecological, wildlife and agricultural values. In the Amber Zone, or sustainable development area, development will need to be carefully planned and ecologically sensitive areas will need to be buffered from potential adverse effects of adjacent development or other land uses.

### 4.2 Buffers

Sensitive ecosystems and conservation areas need to be buffered from potential adverse effects of adjacent land uses (Iverson *et al.* 2006). We recommend that the City of Kamloops consider similar buffers as presented in the Vernon Commonage Sensitive Ecosystem Inventory:

> "It is generally acknowledged that terrestrial buffers or riparian strips (30 to 60 meters) wide will effectively protect water resources. However, terrestrial habitats surrounding wetlands are important to more than just the protection of water resources. They are also essential to the conservation and management of semi-aquatic species... data clearly indicates that buffers of 15-30 meters, used to protect wetland species in many states, are inadequate for amphibians and reptiles. We propose…three terrestrial zones of protection... an aquatic buffer 30-60 meters; a core habitat (which includes the aquatic buffer): 142 to 289 meters; and an additional terrestrial buffer of 50 meters. We propose…three terrestrial zones adjacent to core aquatic and wetland habitats (1) a first terrestrial zone immediately adjacent to the aquatic habitat, which is restricted from use and designed to buffer the core aquatic habitat and protect water resources (30 to 60 meters); (2) starting again from the wetland edge and overlapping with the first zone, a second terrestrial zone that encompasses the core terrestrial habitat defined by semi-aquatic focal-group use (e.g., amphibians 159 – 290m); and (3) a third zone, outside the second zone, that serves to buffer the core terrestrial habitat from edge effects from surrounding land use (e.g. 50 meters)" (Iverson *et al.* 2006).

### 4.3 Wildlife Corridors

While wildlife corridors are not specifically addressed in this report, potential habitat areas suitable for wildlife corridors were assessed and integrated with the process that was used to establish the three priority ecological zones. Wildlife corridors are important as they provide animals with the ability to move freely between habitats and ecosystem types. Movement of wildlife is important to provide genetic links between populations and compensate for temporary

population declines in one habitat patch. Corridors typically include riparian draws with adjacent warm aspect grasslands and ridges, as these features are most commonly used for travel between habitats.

A more detailed analysis should be included in future land use planning exercises and constitutes a limitation in this report.

## 5. RECOMMENDATIONS

The GCC recommends that:

1. Additional field work be completed to verify Ecological Community assessments and ranking of ecosystems;
2. Red Zone area should be a focus for conservation/parkland acquisition, and a more detailed analysis should be completed to determine appropriate park boundaries and land uses. The City of Kamloops should determine other potential means of land acquisition and other conservation options such as conservation covenants;
3. The City of Kamloops establish an urban containment boundary as defined in Figure 4, encompassing all of the Red Zone (see Figure 3 for delineation of Red Zone). For more details on urban containment, please refer to the *Green Bylaws Toolkit* (www.greenbylaws.ca).
4. Amber Zone area should be a focus for sustainable development, and a more detailed analysis should be completed to determine boundaries for key conservation areas (Environmentally Sensitive Areas) within this zone, as well as appropriate buffers and wildlife corridors;
5. More detailed ecosystem descriptions must be provided as part of the next phase of this process, including wetland, riparian, forest (i.e. old, mature, coniferous), grassland and broadleaf woodland (e.g. aspen);
6. The City of Kamloops should complete a comprehensive ecosystem plan as part of the Aberdeen Area Plan;
7. The City of Kamloops should consider the following as part of a conservation strategy:
    - Designate Red Zone areas and special features in the Amber Zone areas as Environmentally Sensitive Areas (ESA);
    - Designate Amber Zone areas as Development Permit Areas (DPAs) and ensure that only developments and other activities compatible with the preservation, protection, restoration and enhancement of sensitive Ecological Communities occur in DPAs;
    - Provide and maintain appropriate buffers—determined by qualified professionals—around sensitive Ecological Communities. The buffer

widths and designs should be developed to reflect the specific ecosystem and wildlife habitat values;

- Provide connectivity corridors between sensitive and important Ecological Communities and conservation areas. Details for corridor widths must be determined based on scientific and ecological data;
- Protect wetlands by not allowing the in-filling of these vital areas;
- Leave dead trees for Lewis' woodpeckers and other cavity nesting birds;
- Provide greater incentives, such as density bonuses in developments in exchange for the retention of sensitive Ecological Communities;
- Eliminate large lot zoning designations in favour of cluster development zones;
- Reduce minimum lot size to permit cluster development if more than 20% natural area is retained and is not disturbed. Consider the development of cluster housing as a zoning designation;
- Design initial road and utility layouts at a landscape scale to minimize impacts to sensitive and other important Ecological Communities;
- Plan and manage recreational access to minimize impacts to sensitive Ecological Communities;
- Develop and implement a weed management strategy to minimize the spread and introduction of invasive plant species;
- Use other protection techniques such as restrictive covenants, purchase of development rights and financial incentives to leave sensitive sites intact; and
- Adopts the Green Bylaws Toolkit (http://www.greenbylaws.ca) for use in all future land-use planning exercises.