



THE CHANGING LANDSCAPE
of the SOUTHERN ALBERTA FOOTHILLS

Report of the
Southern Foothills Study
Business as Usual Scenario
and Public Survey

June 2007

Acknowledgements

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This report was written by Alan Gardner with editing assistance from Dr. Brad Stelfox.

Copies of the Business as Usual PowerPoint show and a DVD of Dr. Stelfox presenting the findings are available at the Calgary Public Library. They can also be bought for a nominal charge from the Southern Alberta Land Trust Society. Check the Southern Foothills Study website at www.salts-landtrust.org/sfs for more information.

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Executive Summary

BACKGROUND

The southern foothills region of Alberta is a land of spectacular scenery and the province's symbolic postcard. It provides important economic, ecological and social benefits far beyond its geographic boundary and, perhaps most importantly, it is a key watershed. It also harbours one of Alberta's richest diversity of plants and animals. These are assets from which all Albertans benefit.

A large part of this landscape is still ecologically intact and relatively unfragmented. This nearly pristine status, however, is changing rapidly due to significant development pressure from the energy and forest sectors, recreational users, intensive agricultural operations, and residential acreages. All of these uses provide benefits to the provincial economy, yet they also bring significant liabilities such as land and water disturbance, habitat fragmentation, and invasive weed infestations.

When we consider the development pressures on the foothills we come to a fundamental question: How do we respect and protect the essential qualities and existing valuable assets of this landscape while still allowing some acceptable levels and types of anthropogenic activity and change over time? We need to approach this land with the attitude that we are not so much entitled to use it for our own purposes, as we are responsible to steward it wisely for current and future generations.

In the fall of 2005 a group of landowners came together at Chain Lakes and agreed that to understand the issues, discuss the problem intelligently, and examine solutions, they would need a scientific approach. As a result they hired Dr. Brad Stelfox of Forem Technologies to conduct a cumulative effects study on three million acres of the southern East Slopes to determine the current state of the landscape today as well as to project landuse changes fifty years into the future. This became known as the Southern Foothills Study.

STUDY TRENDS

The key trends revealed by the study under a Business as Usual scenario show a slow but steady loss of environmental health and ecological integrity. Specifically:

- Water quantity is reduced, and demand for it is increasing within the study area, while it is already fully allocated 'downstream'.
- Water quality is degrading.
- The native fescue grassland continues to be lost due to a variety of activities and disturbances including invasive alien plant species (invasive weeds).
- The landscape is becoming increasingly fragmented due to new roads, industrial development from the energy and forestry sectors, as well as new residential acreages.
- The quality of the habitat for selected wildlife, and thus the future prospects for many animal and bird species, (some already considered to be species at risk) is being reduced.

PUBLIC MEETINGS

The results of the study were presented to the public in seven meetings throughout the study area in the fall of 2006. Over 600 people attended these meetings at which Dr. Stelfox presented the study's findings. There was good public participation with discussion of the issues, comments, and many questions to Dr. Stelfox.

Copies of invasive weed posters were available for pickup by attendees, as well as a 2007 calendar featuring invasive problem weeds.



SURVEY

People who attended the public meetings were asked to fill out a 2-page written survey of which 344 were returned. In addition, a Calgary company, Praxis Research, was hired to complete a random-sample telephone survey. This telephone survey included both urban and rural respondents and used similar questions to the written survey. Accuracy of the telephone survey was within 4.8% 19 times out of 20.

When the results from both surveys were tabulated it showed a strong correspondence, both between public meeting attendees and random respondents, as well as between rural and urban audiences. Protection of this geography from environmental degradation is a theme that resonates with Albertans whether they live in rural areas, local small towns, or cities such as Calgary and Lethbridge.

Watershed protection to ensure a high level of water quantity and quality was the primary concern of respondents. The study area essentially encompassed the headwaters of the Oldman River, Sheep River, Highwood River, Pekisko Creek, Willow Creek, and other local streams. This watershed feeds streams and rivers used as water sources by many communities, plus aquifers which provide well water both within the study area as well as eastward into the prairie. Mean scores, both urban and rural, indicate a high level of concern for any contamination of the water sources. Over 70% of respondents from the telephone survey said they were 'very concerned' about diminished water quality in wells, springs and aquifers resulting from chemical or bacterial contamination.

Respondents to the surveys also showed strong support for the inclusion of cumulative effects analysis in the approval process of new development in the study area. On a scale of 1 to 5, where 5 indicates strong agreement, mean scores were 4.39 (urban) 4.25 (rural) and 4.78 (written survey). This suggests that people have significant concerns about the current 'piecemeal' approval process for development which is a result of the lack of coordination between the various development approval agencies and boards, such as the EUB, cities, urban and rural municipalities, AENV, ASRD, and others.



KEY FINDINGS

The foothills of southwest Alberta, also known as the southern East Slopes, are experiencing a slow steady decline in environmental quality. This decline is due to increased human activity from the energy and forestry industries, intensive agriculture, recreation, residential acreages, and invasive alien plant species. The Business as Usual scenario projections from the ALCES® model suggest that this decline will continue or accelerate unless different planning and development approval strategies are adopted.

Feedback from both a written survey and a random-sample telephone survey indicate that this decline is of significant concern to people who live and work in southern Alberta. This feedback is reasonably consistent for both rural and urban dwellers. Their primary concern is water quality and quantity, suggesting that protection of the watershed should be a key planning priority.

There is broad support for a requirement that landuse planning take cumulative effects into account. Respondents to the surveys believe that government departments, agencies and boards tasked with development approvals should take cumulative effects into account when reviewing development projects.

While it is not the purpose of this report to draw specific conclusions or make recommendations, the study and survey results suggest the need for coordination and cooperation between all landuse development approval agencies to ensure that cumulative effects are taken into account. This also implies that, considering the importance of this watershed, some form of limit on the total degree of human footprint on the land may be necessary while still respecting the reasonable rights of private and public ownership. The question that the people of Alberta, and especially those living and working in southwest Alberta, must ask themselves is: “What level of acceptable environmental health and ecosystem integrity should we set as a lower limit to prevent irreparable harm to the ecological goods and services flowing from this landscape, and are we willing to set a limit on landscape disturbance and activity to maintain it?”

There is much evidence that people have long considered the southern East Slopes as an important natural area to be protected from excessive human activity in order to safeguard its abundant natural assets. Evidence also suggests that society is poor at dealing with incremental, non-crisis, resource management problems. Yet, if we don't find the will to do so, we may well lose the value of the assets and ecological goods and services provided by this landscape. And we will lose them not with a bang, but with a slow whimper.

Introduction and Background

The Southern Foothills region of Alberta is a land of spectacular scenery where rough hewn limestone outcrops and scraggly pines stand sentinel against a backdrop of rolling grasslands and blue-grey mountains. It is a land of stories and legends. Here people still come to live, to enjoy recreation opportunities, and to harvest the riches above and below the ground. But stand with your feet planted on a rocky hill and survey the native fescue prairie rolling out to the mountains in the distance, and you are faced with a conundrum. This is an environment with special values and iconic features that have sustained life and evolved over thousands of years, but it is also an environment that is fragile and has limited capacity to withstand landuse stress. How do we respect and protect the essential qualities and existing valuable assets of this landscape, while still allowing for an evolution of landuses?

It is this fundamental question that galvanized a group of local people into action. Their perception was that uncontrolled and uncoordinated development was taking place in the area without any overall landuse policy that would provide balance between those assets society should not lose, and those benefits that developers wish to gain. Participants believed that the current imbalance carried the potential to seriously damage a number of significant provincial assets, including a key watershed, important native fescue grasslands, wildlife habitat, a productive ranching economy, and the iconic 'Alberta Postcard' scenery. This group of people agreed on the need to establish a foundation of science and facts to guide future discussion and provide a base for proper landuse planning.

Project management of the study, now called the Southern Foothills Study (SFS) was undertaken by Alan Gardner of the Southern Alberta Land Trust Society (SALTS). SALTS is a locally-based, rancher-driven, non-profit organization dedicated to protecting the ecological, productive, scenic, and cultural values of Alberta's East Slopes, prairie, and foothill regions.

The methodology used on the project was the ALCES® landscape simulation model (www.alces.com) created by Dr. Brad Stelfox. Dr. Stelfox agreed to work with the group and create what is called a "base case", or Business as Usual scenario using ALCES®. Through previous work he was able to acquire key landuse and landscape data from the Alberta Government's Southern Alberta Landscape (SAL) Study. Future landuse trajectory information was acquired from Alberta Energy and various other governmental and industrial sources.

Once the data was acquired, Dr. Stelfox and the ALCES® team entered it into the ALCES® model, generated the output, and created a powerful presentation that illustrated a 100-year historical trajectory, as well as projections 50 years into the future. The presentation brought together multiple landuse trends into a sobering cumulative effects analysis. The presentation was then used to inform the public of the findings.

Seven public meetings were scheduled throughout the study area during October and November 2006. The format of each meeting was to have Dr. Stelfox present the results of the Business as Usual scenario, and then allow an hour for questions and discussion. At these meetings the participants were asked to fill out a written survey form. Total attendance at the meetings was just over 600 people. There were 344 survey forms completed and returned. Meetings were held in Nanton, Black Diamond, Cowley, Claresholm, Chain Lakes, Pincher Creek and High River. The level of attendance, the discussions, and the number and quality of survey forms returned indicated a high degree of interest and concern among the population about development pressures on the landscape.

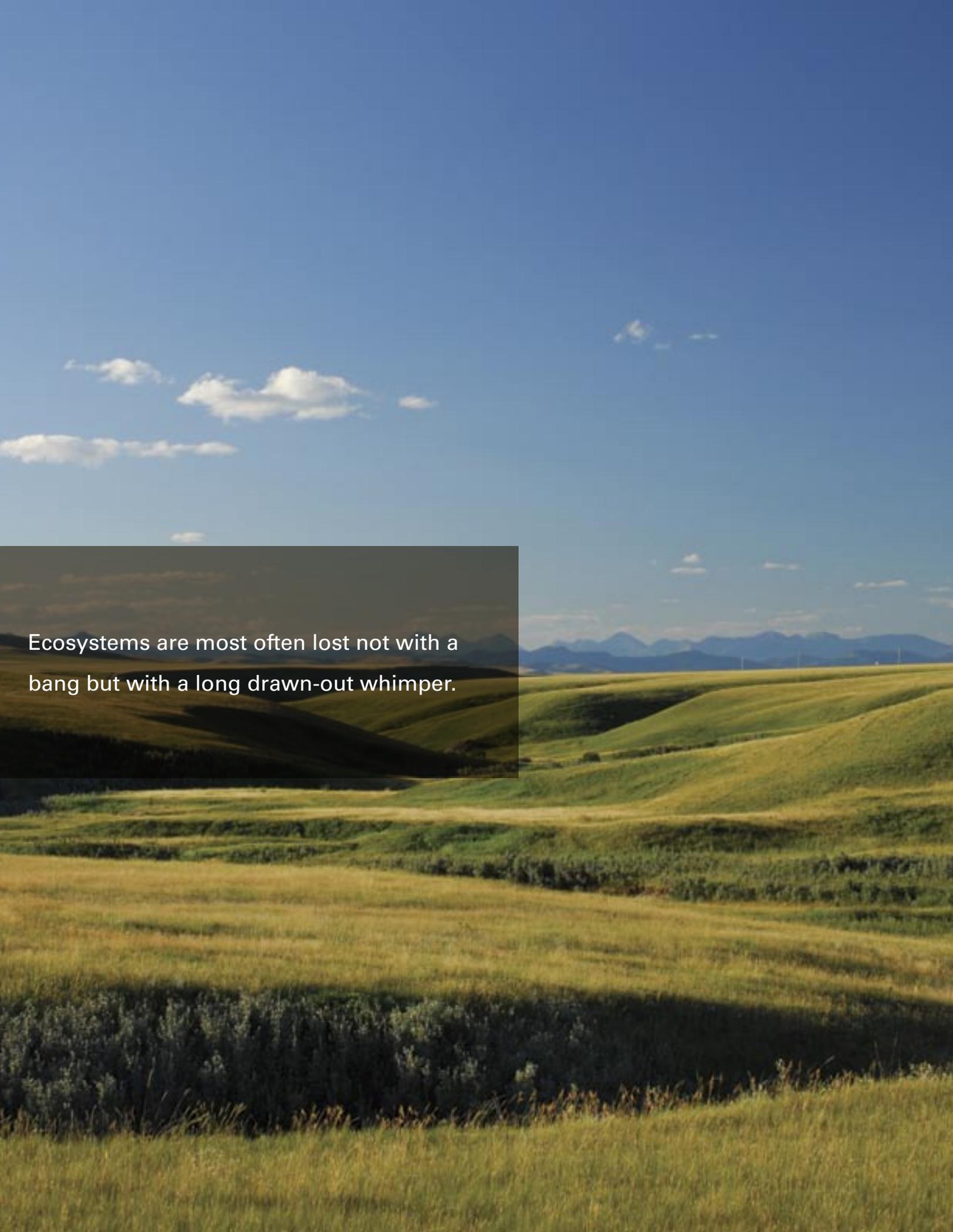
Praxis Research, a well-known survey company based in Calgary, assisted with the survey and was also hired to perform a separate random-sample telephone survey with similar questions. Currently some 40,000 people live within the study area, and over one million people live immediately adjacent to the Southern Foothills Landscape. The telephone survey gathered representative responses from the two major urban areas (Calgary and Lethbridge), as well as from more than 20 communities within and around the area.

The Southern Foothills Study was initiated with a simple structure and a minimum of administrative overhead. The basic rule was 'just get it done'. Nevertheless, participants agreed on some fundamental guidelines that were understood as important to the process. It was agreed that meetings were open, that decisions would be made as much as possible by consensus, and the results would be freely available to all members of the Advisory Group. The group also worked with Dr. Brad Stelfox to agree upon a set of key indicators which would be used in the study.

While there was no written formal Terms of Reference for Phase 1, there were certain principles to guide the overall process that were expressed in discussions. These principles included such things as inclusiveness, openness, clarity and balance. This was a cumulative effects study that would examine all natural and anthropogenic disturbances and activities on the landscape. No particular industry or activity would be singled out for special attention or treatment.

There was also a feeling of optimism and cooperation. Participants hoped that discussions based on science would avoid the ill-will and rancour that were increasingly characterizing landuse review processes.

Everyone in southern Alberta benefits from the hydrological, economic, visual, recreational, agricultural and ecological goods and services provided by this landscape. The wealth provided year after year cannot be described in fiscal terms alone. It speaks to the soul as well as to the wallet. To protect the source of this wealth we need, however, to take a broader, cumulative view. We hope that the findings of this study will encourage and provide a basis for good decisions in stewarding and protecting this source of wealth.



Ecosystems are most often lost not with a bang but with a long drawn-out whimper.

Cumulative Effects

The concept of cumulative effects with respect to landscape and environment simply means the sum total of all anthropogenic (man-made) and natural influences, both direct and indirect, that operate over time to change how a landscape and ecosystem looks and functions. While the concept is straightforward, the application of this to landscape-level planning is not.

People and companies working and living in Alberta, and particularly in rural areas, are accustomed to a regulatory framework that examines new development proposals in isolation from other developments in real time and space. For example, when the Alberta Energy and Utilities Board (AEUB) examines an application for a new gas well it may or may not take into account the effect of other past or future oil and gas development in the area. It has no mandate to examine that application from a cumulative effects standpoint in light of other dissimilar developments which may be taking place on the same landscape such as residential acreages, forest harvesting, road building, agricultural feedlots, and recreation. The Board has no reference on which to base such a decision process because there is no provincial landuse plan in place that sets clear landuse priorities, nor defines limits to landscape disturbance based on such priorities.

The concept of cumulative effects is a way of showing that, with increasing population pressure, we cannot maintain a healthy environment if everyone can do almost anything at any time, anywhere. How should we share the landscape when the area in question is a key watershed feeding rivers and aquifers for southern Alberta? In the area of the Southern Foothills Study the pressure on the landscape is exacerbated by being in close proximity to over a million people and two large urban centres. It is also underlain by hydrocarbon and mineral resources, as well as being an attractive area for recreation.

The Canadian Association of Petroleum Producers (CAPP) website defines cumulative effects as:

"...changes to the environment caused by an activity in combination with other past, present and reasonably foreseeable future human activities. Forestry, oil and natural gas development, mining, fisheries, hunting, recreation and human settlements may all contribute to cumulative effects."

This concept of cumulative effects attempts to come to grips with the challenge that ecosystems are most often lost not with a bang but a long drawn-out whimper. We recognize that the study area encompasses a valuable landscape. If each of us focuses only on meeting our own goals while ignoring all other demands on the same landscape, then we will individually and collectively do it irreparable harm.



How do we respect and protect the essential qualities and existing valuable assets of this landscape while still recognizing and allowing the continued evolution of landuses?

Protecting the Southern East Slopes

About a hundred and fifty years ago the Palliser expedition caught sight of the foothills and East Slopes of the Rocky Mountains. It must have seemed an amazing place after crossing the dry prairie. Here was water, game of all kinds, fescue-covered hills, forests, and the kind of scenery that few people in those times would have ever experienced.

The Dominion Lands Act of 1872 brought farmers who broke the prairie to the plough, but the foothills were too high and had too harsh a climate for farming. However, the fescue-covered hills and forest were recognized as an important watershed and a great place to raise cattle. The importance of the watershed to the new Province of Alberta, as well as to Canada, was recognized in the Dominion Forest Reserves Act of 1906, which was passed in order to “protect the resource for the purpose of maintaining a continuous supply of timber, to benefit water supply, and to protect the animals, fish and birds within the reserves.”

In the one hundred years that have passed since that time, much has been studied and discussed about how to protect the special qualities of this place. Again and again its special value has been recognized. For example, extensive hearings were carried out in the early 1970’s and the resulting report stated: “Development of the Eastern Slopes will adopt a Multiple-Use Policy as the basic concept. This will ensure that while some carefully selected projects will proceed in certain designated areas, vast tracts of land will be kept in natural and wilderness state. A conservative estimate is that a minimum of 70% of the Eastern Slopes Region will be maintained in present natural or wilderness areas.”

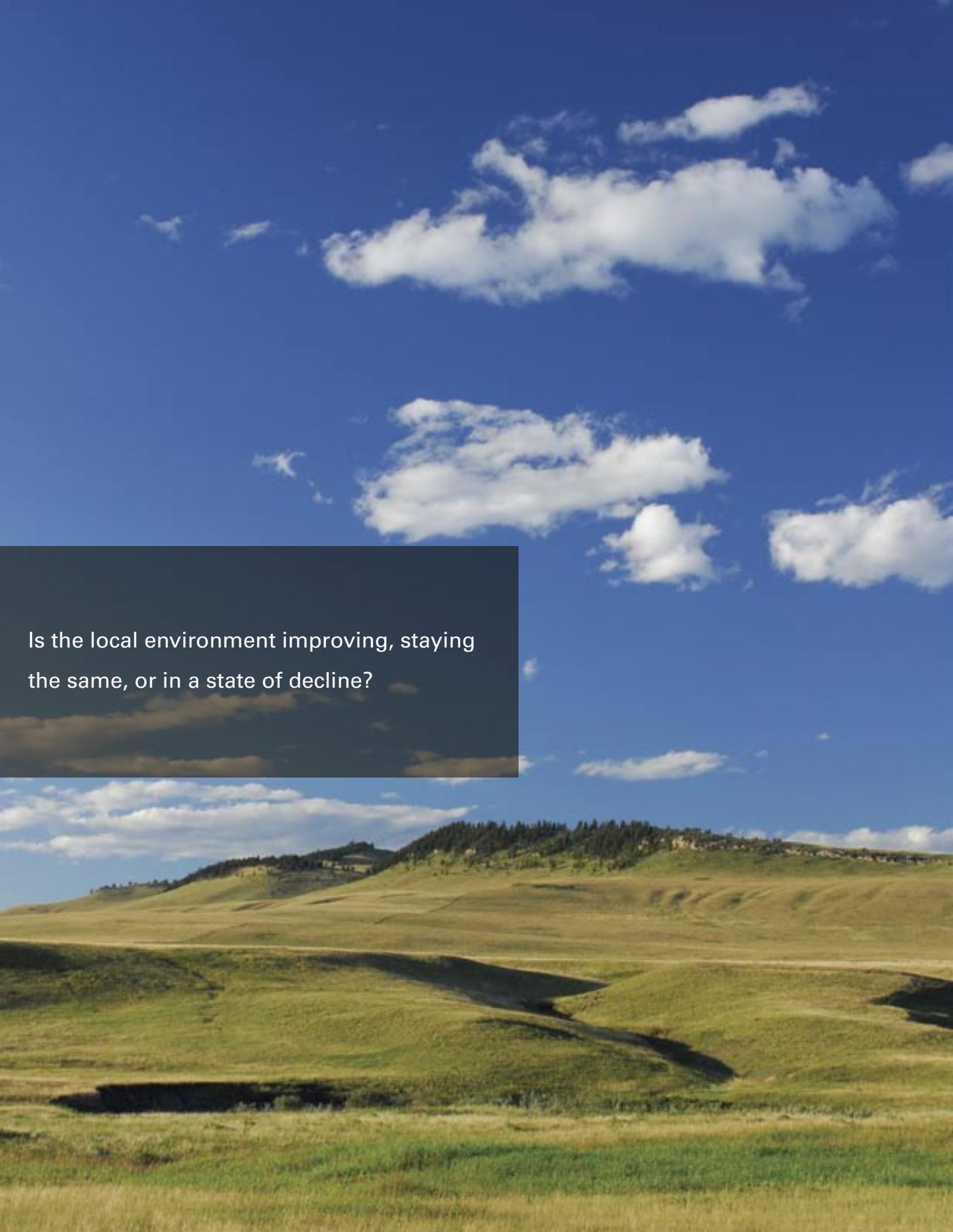
The 1970’s saw Integrated Resource Plans, the 1990’s saw Special Places 2000 and guidelines such as IL93-9 of the Alberta Energy and Utilities Board and, with the turn of the century, our government created the Water for Life Strategy. All the plans and Acts and strategies of the last century are witness to people with passion who spent much time and effort to understand why and how to protect this watershed, this forest and foothill landscape, this place of incredible beauty and wildlife diversity, this home to an enduring ranching culture.

Yet today its bountiful natural assets are even more threatened than they were in 1906. Why were all these plans, reports and strategies apparently so ineffectual? Unfortunately, the ‘Multiple-Use Policy’ has deteriorated into a situation that provides little in the way of coordinated planning or control to protect the watershed, the grasslands, or the wilderness areas.

In the end we come back to the essential question: “How do we respect and protect the essential qualities and existing valuable assets of this landscape while still recognizing and allowing the continued evolution of landscapes?”

A corollary question we must ask ourselves is: Will we continue to repeat the fruitless efforts of the past century while this landscape continues to be fragmented to residential and industrial development, or will we find a path to effective and long-lasting planning to protect that which nobody wants to lose?





Is the local environment improving, staying the same, or in a state of decline?

Results from the Study

The individuals and groups that supported the Southern Foothills Study wanted a comprehensive picture of what was happening, and what was projected to occur, in the local environment. Essentially, they wanted to know if the local environment was improving, staying the same, or in a state of decline. To understand this, we acquired the data for environmental trends over the past 100 years and then, using current known business plans, projected these environmental trends 50 years into the future. That is, we wanted to know what this landscape would look like when our grandchildren were grown.

Several key meaningful indicators of environmental health and ecological integrity were chosen at the beginning of the study. These indicators were:

Water quality

Water supply and demand

Health and quantity of native fescue grasslands

Environmental fragmentation

Population status of grizzly bears

The data on landuse trends, or drivers, affecting the performance of these indicators was gathered from multiple sources with the key consideration being the quality of the data for input to the ALCES® model. Two important decisions were made at the early stages: to be conservative on growth trajectories (to select growth rates at the low range of expectation), and to select an optimistic landscape reclamation rate (which has not been the case historically). With this in mind, we have confidence that the following results of the study are conservative.

We must recognize that landscapes change. Since the retreat of the last ice age, the southern foothills landscape has been shaped and altered by natural disturbance regimes such as erosion, fire, insects, plant invasions, and herbivores such as the bison. The resulting ecosystem has evolved to be highly adapted to the climate. As a result it continues to produce an abundance of natural goods and services such as clean water, wildlife and fish habitat, grazing for domestic animals, timber, and recreational opportunities. Economists are starting to recognize that the value of these services to the economy and to Alberta is considerable.

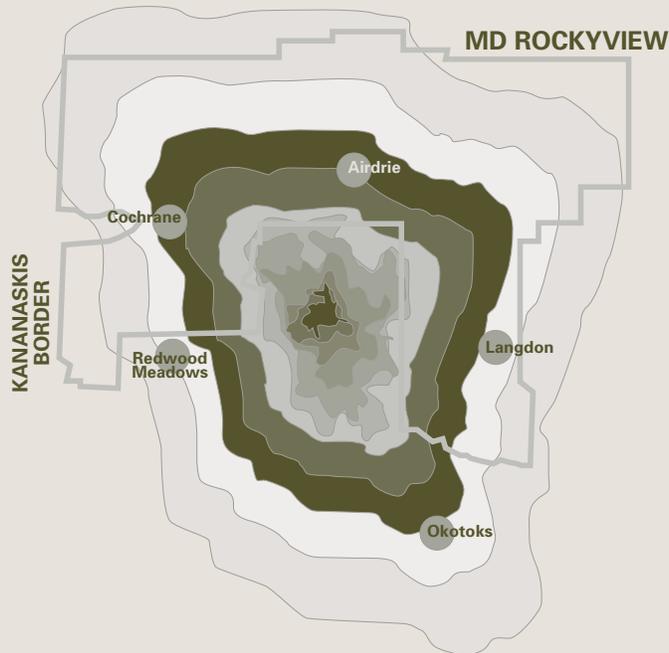
Please note that the data on which the hydrocarbon well projections are based was provided by Alberta Energy. The projected number of Coalbed Methane (CBM) wells in particular is based on a very limited amount of well data in the area and thus is more speculative than normal with respect to number of wells and timing. Projections from any mathematical model are based on the best data currently available about future business plans. Changing circumstances may result in more or less landscape activity than what the projections indicate.

Results from the Study

The projected trends which are driving the indicators are summarized below.

Human Population

Today there are approximately 40,000 people residing within the study area, but this number is projected to grow to approximately 95,000 by 2055. Population trends include the towns within, and on the edge of, the study area. While this growth is significant, it is also important to recognize the influence of Calgary, which has passed the one-million mark, as well as the city of Lethbridge. Both of these cities are experiencing rapid growth, and both are a short distance from the study area. In particular, Calgary, which is currently in a record building boom, is on track to extend its limits and grow beyond the surrounding towns of Cochrane, Airdrie, Redwood Meadows, Langdon and Okotoks. The ALCES® model suggests that at a continuing area growth rate of 3% these towns will be suburbs within the city limits of Calgary within 50 years.



City Of Calgary 50Year Projected Growth



The population will more than double from today's level.

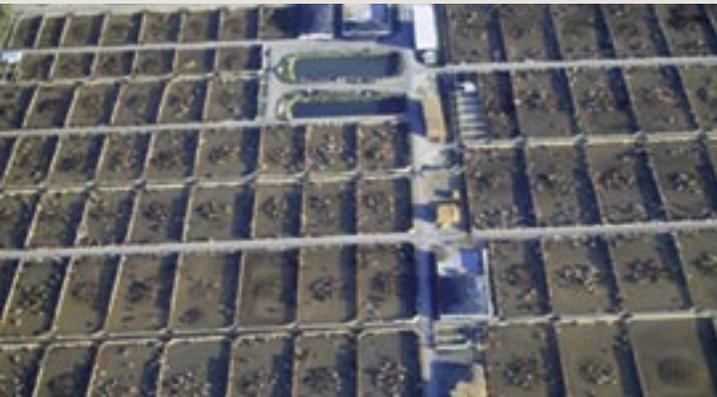
This urban expansion will increase demand for rural residential acreages, recreation, water and energy. Within the study area ALCES® suggests that the number of residential acreages will almost triple from 500 to 1400 by 2055.

Recreation is an important element of today's lifestyle. Calgary with its young and affluent population will generate a large demand for both foot-powered and off-highway-vehicle (OHV) recreational activities. Many of these activities will require human modifications to the landscape, whether that modification is resort development, ski hills, hiking trails, or golf courses. The demand for these facilities within driving distance of Calgary will increase pressure for landscape change within the SFS area, and increase the demand for water.

Agriculture

ALCES® indicates that most of the original human modifications to the landscape of Alberta resulted from farming. This trend is continuing, albeit at a slower rate than earlier in the twentieth century. The total surface area in cropland peaked in about 1985 and has since slightly declined. This decline is occurring despite cropland continuing to encroach on grassland and forest, and is due to the amount of prime farmland being taken over for residential subdivision, and an increasing number of access roads. Cultivated land in the SFS area in 2005 was approximately 250,295 ha. The Business as Usual scenario suggests that native fescue grassland will continue to be replaced by cultivated crops as the demand for crops and forage increases.

The number of cattle will increase by approximately 56%.



The number of cows in the study area is projected to increase significantly. The current herd of 205,000 head is projected to increase to 320,000 head over the next fifty years. Some of this increase will be from more cattle grazing on native and tame pasture, but much will be from the expansion of feedlots. This increase in feedlots will increase water demand and manure production.

The amount of irrigated land in Alberta has increased by 16% between 1990 and 2000. There is irrigated land in the south part of the study area and it is projected to increase depending upon water availability. Limits on new water allocations may effectively prevent expansion.

Results from the Study

The projected trends which are driving the indicators are summarized below.

The cutblock edge will increase from 2,500 km to 6,500 km.

Forestry

Forestry is a major landuse in the SFS area. There is a Forest Management Agreement (FMA) in the northern portion, and the C5 FMU in the southern portion, including the Porcupine Hills. The landscape is currently experiencing significant logging. FMA holders are required to harvest the net merchantable area at least every 100 years. Clearcutting is the preferential harvest method. The Business as Usual scenario projects that the industry will minimally log 1,000 ha annually for the next fifty years. The total cutblock edge is projected to increase from a recent 2,500 km to over 6,500 km by 2055.



One of the important effects of logging is the construction of cutblock access roads. Unfortunately, an unintended result is the access provided for off-highway-vehicles allowing them to reach otherwise inaccessible areas as a form of recreation. Once access is established it is legally very difficult to deny that access in future. This also allows for the introduction of invasive alien plants into areas where control is difficult.

Energy Sector

Most of Alberta, and all of the SFS area, is underlain by the Western Canada Sedimentary Basin. The Kootenay and Horseshoe Canyon formations are a potential source of natural gas from deep deposits, tight shales and Coalbed Methane (CBM). A number of resource companies are currently exploring and drilling in the area. The hydrocarbon sector can create a significant disturbance on the landscape when activities including seismic cutlines, trails, access roads, drilling pads, processing plants, and pipelines is taken into account.

The model projects that, even with aggressive reclamation (which is not now the case), the amount of cutlines will rise from the current of 6,930 km and peak at over 14,600 km in 2040, before starting to decline. Seismic lines will be added at the rate of 300 - 500 km per year.

The number of wells will increase by approximately 25 times.

²Please note that the data on which the hydrocarbon well projections are based was provided by Alberta Energy. The projected number of Coalbed Methane (CBM) wells in particular is based on a very limited amount of well data in the area and thus is more speculative than normal with respect to number of wells and timing.



There are currently 44 conventional oil wells, 160 conventional gas wells (many with significant H₂S content), and no (producing) Coalbed Methane (CBM) wells. The average number of new annual producing wells in the SFS area is projected to be 18 conventional gas, 7-8 conventional oil, and 35 CBM. The model projects that the total cumulative producing wells by 2055 will be 1,104 conventional gas, 378 conventional oil, 1,972 CBM, and an additional 1,500 other wells (delineation, dry). This suggests that there will be an average of one well drilled per section in the SFS area by 2055. The CBM well projection has a larger degree of uncertainty because this hydrocarbon play is in its infancy.

Pipelines are needed to bring the gas and oil to market. The model projects that some 6,300 km of pipelines will need to be built over the next fifty years in the SFS area.

When all of this activity is aggregated, the model projects that the energy sector footprint in the study area will increase from 4,092 ha in 2005 to a total of 11,460 ha by 2055. Edge will increase from 6,000 km to 23,000 km in the same period. This footprint represents a significant amount of activity and disturbance on the landscape.

¹Edge is a linear border of some feature. It is used to measure the impact of various disturbances on a landscape. For example, a one kilometer stretch of road has two sides, or edges, and thus represents two km of edge. The edge of a forestry cutblock would be the length of the perimeter.

Results from the Study

The projected trends which are driving the indicators are summarized below.

Wind Energy and Infrastructure

Southern Alberta is well known for its strong winds, a fact not lost on people promoting 'green' wind-generated electrical energy. As a result several wind farms have been built in the southern portion of the study area, and more are planned. Wind patterns determine that most electrical generation turbines will be built south of a latitude running east-west through Claresholm. A current limiting factor is infrastructure capacity including transmission lines and the ability of the grid to accept more of this type of power.



The number of electrical wind turbines will continue to increase.

While harvesting the wind for electrical energy is advantageous for generating power with no carbon emissions (except for the original manufacturing), it has a significant impact on the landscape.

Any time that the native grass is ploughed it exposes the soil to sun, wind and air, and allows the accumulated carbon in the soil to oxidize. It also exposes the landscape to the invasion of non-native plant species which replace the native fescue grass. This compromises the ability of the fescue grass to sequester and hold carbon in the soil.

Mining

Sand and gravel, or aggregate, is a fundamental requirement for the construction of roads, buildings, and industrial operations. Concrete, for example, is essentially aggregate held together by cement. The pace of growth and construction in Alberta today requires a large quantity of aggregate, which results in an increasing number of sand and gravel pits (or borrow pits).

The southern foothills have also gained the attention of other mining interests which are currently exploring the potential for various metal and mineral extraction and processing operations including uranium. Significant portions of the area have been staked with mineral claims.

The largest mining operation in Alberta is to extract sand and gravel.



The length of roads will increase from 7,000 km to 16,000 km.

Transportation Network

Landuse activity on the landscape almost invariably leads to a greater number of roads. Today, most roads being built in Alberta are to facilitate energy development, to access forestry cutblocks, and for access to rural residential acreages. Road length in the study area is projected to increase from some 7,136 km in 2005 to greater than 16,200 km in 2055. Every kilometre of road represents an opportunity for opportunistic alien weeds to invade the native prairie grassland.

Roads are a significant source of fragmentation. They are a good measure of the amount of industrial activity and disturbance to the landscape over time.

Trends - The Indicators

Collectively, the landuse trends described above affect the performance of the chosen indicators for the Southern Foothills Study. The model output from the Business as Usual scenario graphically illustrates the results of these trends using social, economic and environmental parameters. Several key indicators were used to measure the effect of these trends on the health of the environment.

The indicators all show a slow but steady loss of environmental health and ecological integrity. Specifically:

Water quality is degrading;

Water quantity is reduced due to increased demand within the study area, while at the same time it is already fully allocated 'downstream';

The native fescue grassland continues to be lost and degraded due to a variety of activities and effects including invasion by alien opportunistic plant species;

The landscape is being increasingly fragmented, especially due to new roads, industrial development from the energy and forest sectors, and an increasing number of residential acreages;

The quality of habitat for selected wildlife species is being reduced.

The Business as Usual scenario projections from the ALCES® model suggest that decline in indicator performance will continue unless different planning and development approval strategies are adopted. This does not suggest that we are at a crisis point, or that a crisis will occur in the near future.

The question that the people of Alberta, and especially those living in southwest Alberta, must ask themselves is: "What level of acceptable environmental health and ecosystem integrity should we set as a lower limit to prevent irreparable harm to the ecological goods and services flowing from this landscape, and are we willing to set a limit on landscape disturbance and activity to maintain it?"

There is an increasing awareness in society, government, and the economic and environmental communities that the value of the ecological goods and services (EGS) provided by an intact and healthy environment is considerable. Without effective landuse planning processes based on cumulative effects and protecting natural capital, we may well lose the value of these assets, and the ecological goods and services provided by this landscape. Once lost, or irreparably damaged, neither we nor future generations will have their benefit. And we will lose them not with a bang, but with a slow whimper.

The Public Survey

The results of the Business as Usual scenario were presented to the public at seven meetings around the study area in October and November of 2006. The meetings consisted of a one-hour presentation by Dr. Brad Stelfox, plus another hour for participants to ask questions and make comments. Attendance at these meetings totalled just over 600 participants. Meetings were held at Nanton, Cowley, Black Diamond, Claresholm, Pincher Creek and High River.

At these meetings, attendees were asked to fill out a two-page survey and leave it with the organizers. There were 344 responses, many of them with detailed comments. The degree and quality of response indicates a high level of interest on the part of the participants. The survey form was designed by Praxis Research with assistance from the Southern Alberta Land Trust Society.

While over 600 people took part in the workshops, almost 40,000 people live within the study area, and over 1 million people live immediately adjacent to the Southern Foothills Landscape. To gauge the perceptions and understanding of the broader public, a random sample telephone survey was conducted by Praxis in November and December, 2006. Representative responses were gathered from the two major urban areas (Calgary and Lethbridge), as well as more than 20 communities within or directly adjacent to the study area. The telephone survey included a sample of 800 respondents and had an accuracy of 4.8% 19 times out of 20.

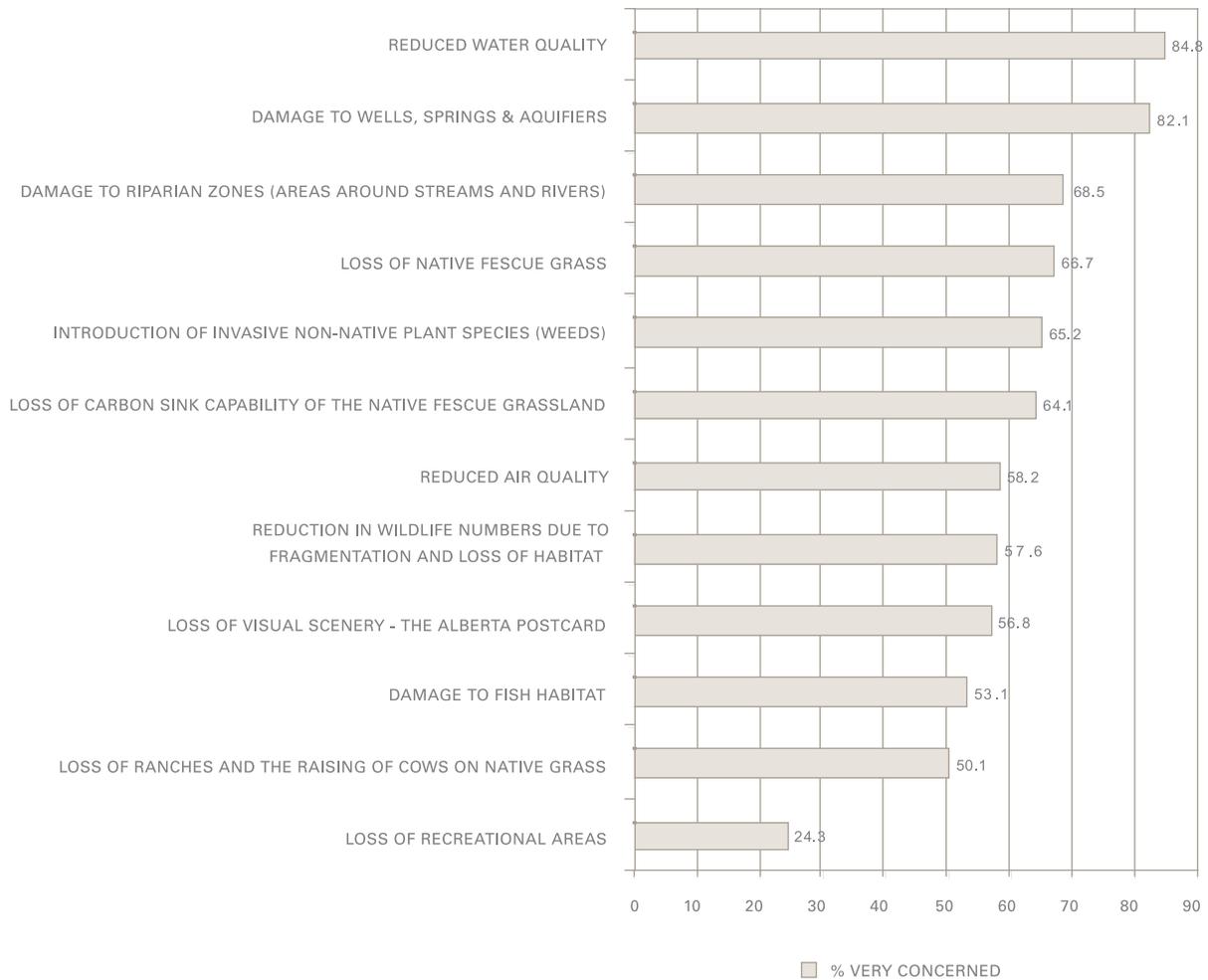
The survey analyses were prepared by Praxis. The following information is a summary of the key points from the analyses. Full versions can be downloaded from the Southern Foothills Study website at www.salts-landtrust.org/sfs.



Summary Results from the Public Survey

The public survey outcomes are summarized below.

FIGURE 1 - AREAS OF GREATEST CONCERN



HIGHEST CONCERN WAS ABOUT WATER QUALITY AND QUANTITY

The respondents to the written survey were primarily concerned about water supply and quality, and least concerned about the loss of recreational uses. Respondents were asked to rate their level of concern for 12 attributes where 1 denoted not at all concerned and 4 denoted very concerned. The loss of recreational areas received the lowest mean score (2.86 out of 4.0) while reduced water quality (3.84 out of 4.0) and damage to wells, springs, and aquifers (3.79 out of 4.0) received mean scores indicating the highest concern.

When you look at issues where people indicated they were very concerned, 85% indicated being very concerned about reduced water quality. The table includes the response for all issues.

Respondents were invited to provide comments on the written survey and 181 did so. The main themes included concerns about:

- water quantity / quality
- urban sprawl
- lack of government involvement in growth management
- lack of concern by the public
- amount of ATV usage
- coal bed methane
- damage to protected areas

The public survey outcomes are summarized below.

FIGURE 2 - IMPORTANCE OF MAINTAINING ECOSYSTEM



Respondents to the random sample telephone survey also indicated that protection of water sources was their primary concern. Respondents were asked to rate their level of concern for 9 attributes where 1 denoted not at all important and 5 denoted very important. The loss of the ranching community was rated of lowest importance but still received a high score (3.97 urban, 4.18 rural, out of 5.0) while maintaining high quality standards for water in rivers and streams rated of highest importance (4.81 urban, 4.84 rural, out of 5.0).

RIPARIAN ZONES

One of the similarities between both urban and rural respondents was the concern about protecting habitat around rivers and streams (riparian zones). The mean score from the paper survey was 3.67 out of 4.0 where 4.0 indicated "very concerned". The mean score from the telephone survey was 4.7 (urban) and 4.88 (rural) out of 5.0 where 5.0 indicated "very important".

Summary Results from the Public Survey

The public survey outcomes are summarized below.

FIGURE 3 - CUMULATIVE EFFECTS AND ENVIRONMENTAL HEALTH

The results of the study show that the indicators of environmental health in the study area have declined over the past decades and will continue to decline if past and current trends continue. This is not necessarily due to any one activity, but the cumulative effect of all activities on the landscape. With this in mind, please indicate your level of agreement or disagreement with the following statements: [Scale - strongly disagree (1) to strongly agree (5)	Mean	N total = 344	
		Valid	Missing
Cumulative effects on the ecosystem should be taken into account by planning and regulatory agencies when reviewing new development applications.	4.78	334	10
I would be willing to restrict or limit my own activity on the landscape in order to ensure the health of the overall ecosystem.	4.55	334	10
I would be willing to restrict or limit my own activity on the landscape in order to ensure the supply of water.	4.64	332	12
Planning and regulatory agencies should require new developments in the southern foothills watersheds to show beyond a reasonable doubt that their activity will not pose a risk to the supply of clean water to southern Alberta.	4.70	333	11

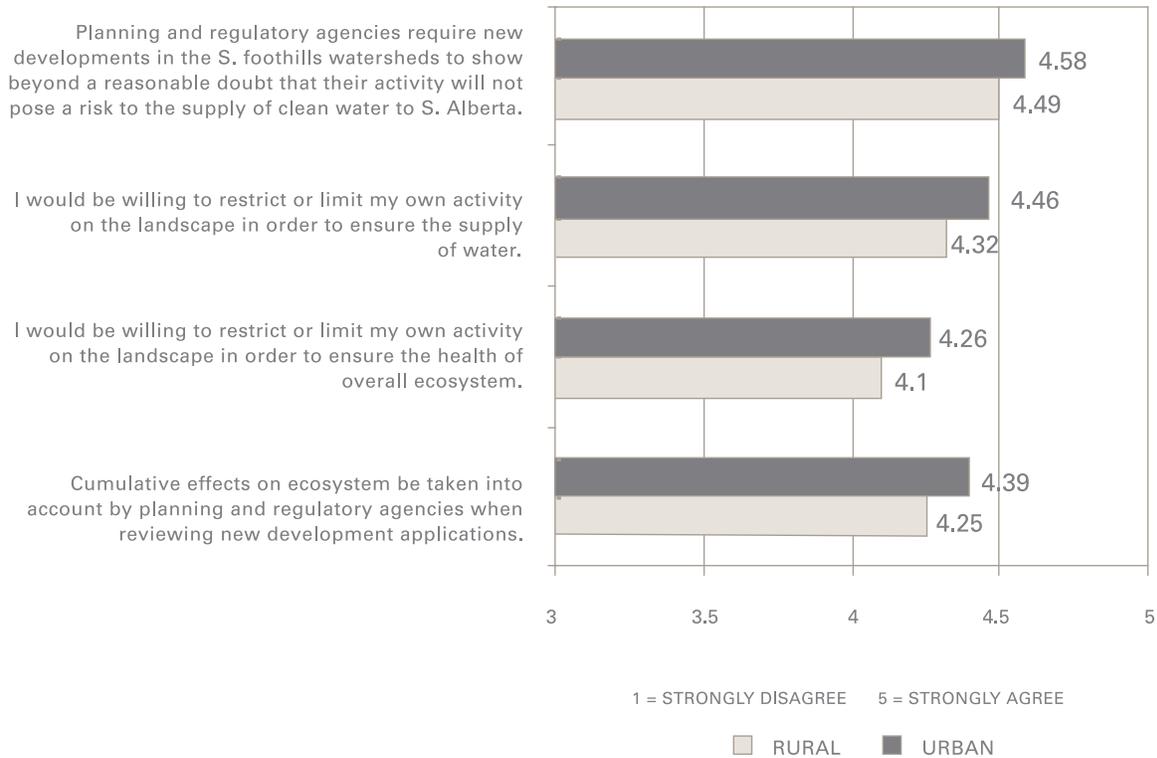
SUPPORT FOR CONSIDERING CUMULATIVE EFFECTS IN DEVELOPMENT APPLICATIONS

Another key aspect of the study was focused on the question of cumulative effects and regulatory approvals for new developments in the study area. Responses from the written survey showed very strong support for a requirement that cumulative effects should be taken into account by regulatory agencies when reviewing any new development applications in the study area. On a scale of 1 to 5 where 1 denoted strong disagreement and 5 denoted strong agreement, the mean score for the written survey on the question of whether cumulative effects should be taken into account for new development applications was 4.78 (maximum 5.0). A similar question focused on water scored a mean of 4.70.

Respondents to the telephone survey also indicated a high level of support for requiring regulatory agencies to take cumulative effects into account when reviewing new development proposals (urban 4.39, rural 4.25, out of 5.0). When speaking of protecting water and requiring new developments to show beyond a reasonable doubt that their activity will not pose a risk to the supply of clean water the mean values were even higher (urban 4.58, rural 4.49, out of 5.0).

The public survey outcomes are summarized below.

FIGURE 4 - MANAGING CUMULATIVE EFFECTS



THINGS THE LANDSCAPE CAN OR CANNOT AFFORD TO LOSE

Respondents to the written survey were asked what about the landscape, in either a visual or productive sense, they thought society COULD NOT afford to lose over the next few decades. The most mentioned theme was water. Of the total of 344 survey forms received, 296 respondents provided comments. Many participants provided more than one response. The main themes mentioned first were:

- water
- visual landscape / scenery
- grasslands / fescue grass
- wide open spaces

On the opposite side of the question, people were asked what society COULD afford to lose over the next few decades. There were 259 responses. Many participants provided more than one response. The main themes mentioned first were:

- nothing
- oil and gas
- recreational usage
- ATV / OHV usage
- urban sprawl
- feedlots
- economic development

Summary Results from the Public Survey

The public survey outcomes are summarized below.

COUNTRY AND URBAN PEOPLE ARE SIMILAR IN ENVIRONMENTAL ATTITUDES

Of great interest from the survey findings is the very small difference between urban and rural attitudes toward the issues raised by the survey. When it comes to water and the environment there is a great commonality of interest and attitudes between these two constituencies.

Based on analysis of variance (ANOVA) there were some statistically significant differences. For example:

Rural residents place higher importance on preventing loss of the ranching community than urban residents. Urban residents place higher importance on preserving recreational areas than rural residents.

Urban respondents are more concerned about over-use of water due to agricultural and industrial uses than rural respondents, and they are also more concerned about loss of wildlife habitat.

In managing cumulative effects, All the differences between rural and urban respondents are statistically significant, with urban being higher in agreement in all cases. However, the means scores show strong support for all the measures, regardless of location. (see table)

While these statistically significant differences between urban and rural attitudes are important, the similarity in responses shown in the above graphs is even more important. The concern for the ecological integrity of this landscape is evidently shared by all Albertans whether they live in a city or a rural area.

CONCERN FOR THE ENVIRONMENT SHARED BY DIFFERENT OCCUPATIONS

Another commonality in the data is the concern for the environment shared by people who work in different occupations. Again, all groups share the highest importance, which is maintaining high water quality standards. When the respondents were asked about the importance of other environmental issues, it is evident that regardless of the industry activity in which the household participate, the ecological attributes measured remain important.

FIGURE 5 - IMPORTANCE OF ECOSYSTEM BY MAJOR INDUSTRY ACTIVITY

	agriculture	oil and gas industry	forestry	mining and gravel extraction	wind energy production
maintaining high quality standards for water in rivers and streams	4.84	4.79	4.82	4.76	4.79
preserving recreational areas	4.16	4.36	4.03	4.29	4.21
maintaining the wide-open grasslands and viewscapes that are Alberta's postcard	4.34	4.26	4.33	4.24	4.26
protecting the area against invasive plants that are not native to this area	4.48	4.28	4.03	4.19	4.11
protecting wildlife habitat	4.58	4.57	4.58	4.57	4.53
maintaining high standards for air quality	4.71	4.68	4.67	4.48	4.84
protecting the habitat around rivers and streams	4.68	4.62	4.48	4.52	4.63
damage to fish habitat	4.36	4.34	4.06	4.33	4.37
loss of the ranching community	4.46	4.17	4.06	4.29	4.11

NUMBERS REPRESENT MEAN SCORES
1 = NOT AT ALL IMPORTANT 5 = VERY IMPORTANT

Key Public Survey Observations

TOP CONCERN IS WATER QUALITY AND QUANTITY

While it is not the purpose of this report to draw conclusions or make recommendations, it is nevertheless interesting to note a few results from the survey. The main one is fairly evident and that is the concern for water quality and quantity (and thus protection of our watersheds) that is reflected by people of all ages, place of residence, and occupation.

DEVELOPMENT APPROVALS SHOULD CONSIDER CUMULATIVE EFFECTS

A more interesting observation is the support by respondents for a requirement of regulatory agencies to take cumulative effects into account when reviewing new development proposals in the study area. Support for this was high in rural areas, but was even higher in urban populations. On a range of 1 to 5, where 5 indicates strong agreement, the mean scores were 4.25 (rural) and 4.39 urban.

PEOPLE ARE WILLING TO MODIFY THEIR ACTIONS TO PROTECT THIS ENVIRONMENT

It is evident from the survey data that people are concerned about the health and ecological integrity of the foothills area and are at least partially willing to limit and restrict their own activities to maintain a quality environment. Concomitant to this is the finding that rural and urban dwellers share a similar level of concern.

Albertans are united in
their desire to protect
the environmental assets
of the southern Alberta
foothills region.

The ALCES® Model

ALCES® (A Landscape Cumulative Effects Simulator) is a user-friendly landscape simulator that enables resource managers, industry, society, and the scientific community to explore and quantify dynamic landscapes affected by single or multiple human landuse practices, as well as by various natural disturbance regimes such as fire, herbivory, and flooding. ALCES® has already been used in multiple studies around Alberta as well as other parts of Canada and the USA. It is a proven model which can graphically illustrate the impact of multiple development scenarios within a study area using social, economic and environmental parameters.

This fast, powerful and user-friendly landscape simulator was developed by Dr. Brad Stelfox of Forem Technologies as a strategic-level simulation tool intended for use by resource managers, the scientific community, industrial landusers, and the general public. Its primary purpose is to facilitate “Integrated Resource Management”, which has been defined by Alberta Environment (June 2000) as:

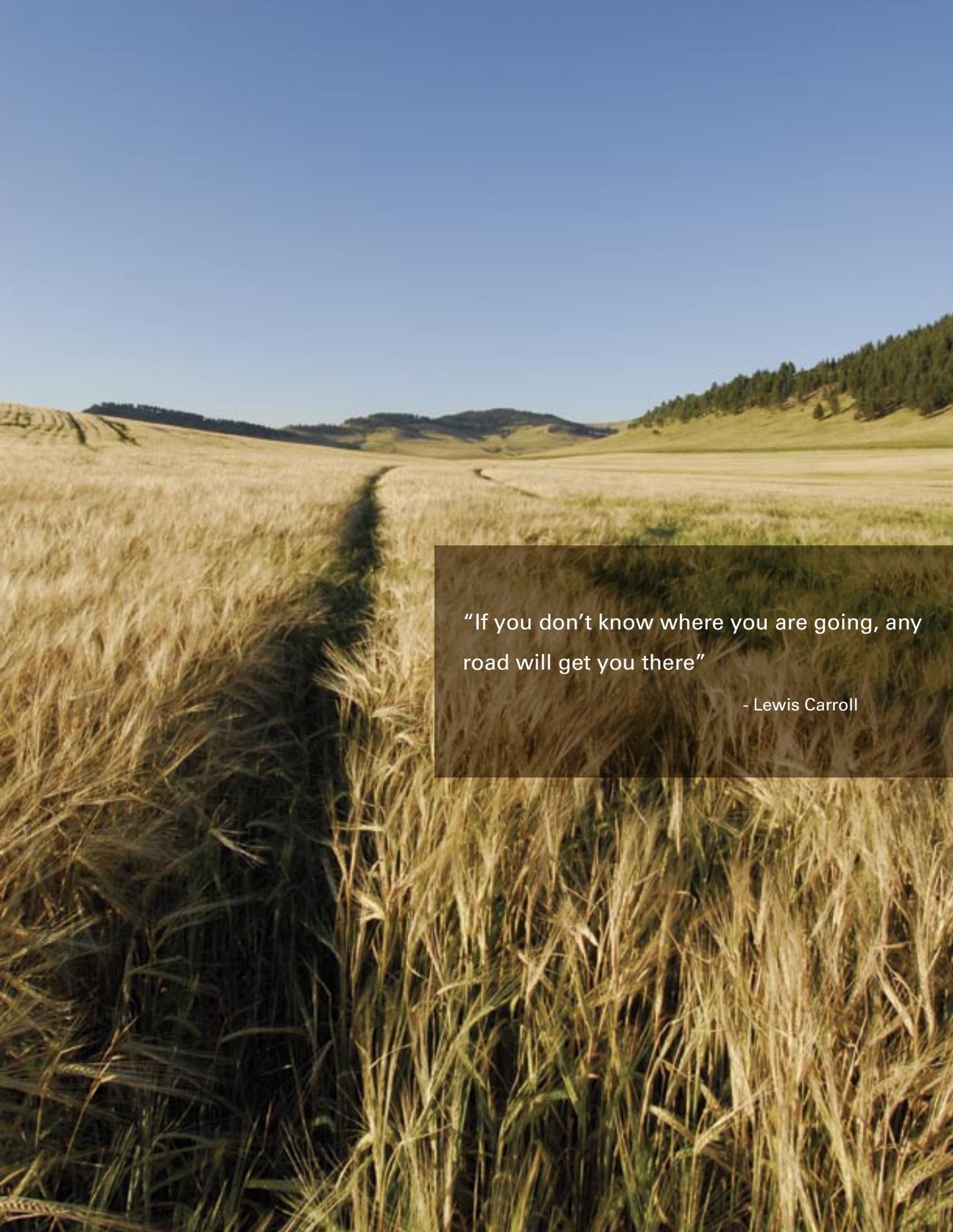
“An interdisciplinary and comprehensive approach to decision-making for natural resource management. This approach integrates decisions, legislation, policies, programs and activities across sectors to gain the best overall long-term benefits for society and to minimize conflicts. It recognizes that the use of a resource for one purpose can affect both the use of that resource for other purposes and the management and use of other resources”.

An important objective of ALCES® is to allow diverse stakeholders to gather together and explore the economic, ecological, and social consequences of different landuse trajectories on defined landscapes. These simulations need to run quickly and must be accurate at a strategic level. As stakeholders run ALCES® into the future (a 100 year run takes ~100 seconds) they can appreciate the range of socio-economic and ecological outcomes of different landuse options and move toward a suite of landuse practices that optimize societal goals.

Specific examples of requirements of ALCES® include:

- Forecast transformations of landscapes subjected to single or multiple human landuse practices and to various natural disturbance regimes.
- Track flows of natural resources (water, wood fiber, hydrocarbons, wildlife, livestock, carbon, agricultural products) and identify issues relating to sustainability of natural resources.
- Track employment, expenditures, royalties and indirect economic benefits associated with landuse resources (timber, hydrocarbon, water, electricity, etc) occurring on landscapes.
- Define trade-offs that exist between landuse practices and environmental resources.
- Seek mitigation strategies that minimize adverse risk to ecological and economic goals.

ALCES® is an excellent tool for investigative studies such as the Southern Foothills Study. It has provided base historical data and projections within the study area and will be used to investigate various possible mitigation strategies for the future. Without this type of model it would be difficult, if not impossible, for landowner-driven initiatives such as the current Southern Foothills Study to be carried out.



“If you don’t know where you are going, any road will get you there”

- Lewis Carroll



Southern Alberta
LAND TRUST SOCIETY

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