

Land Use in Alberta's Foothill Country

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Regional descriptions provide baseline data and other useful information of the physical and cultural features for particular areas. This paper on the Rocky Mountain Foothills provides background information of its natural features, human history, and the region's dominant land uses: ranching, forestry, coal mining, oil and gas extraction, and recreation and tourism. In addition, environmental issues and concerns related to these land uses are described and analyzed in the context of specific examples. An overview of the region's distinctive characteristics and option for future growth and development are also discussed.

Alberta's forested and grassland covered foothills country lies nestled between the agriculturally productive high plains and the physically formidable Rocky Mountains. For most people the region's quiet grandeur and natural resources encompass an area of transit. They use the Crowsnest, Trans-Canada, David Thompson, or Yellowhead highways from Calgary, Edmonton and other populated areas to reach the Rocky Mountains and other western destinations. Travelers from the west rush hastily through this noteworthy region to reach their destination beyond it. Except for those few people who live in the foothills and the recreation enthusiasts who visit the area, most Albertans have only a vague notion of the region's identity: its settlement, agriculture, coal mining, oil and gas extraction, forestry, recreation, hydroelectric power production, and other land uses; or its natural scenic splendor, wildlife, climate, and topography. The purpose of this paper is to provide background information on its natural features, human history, and dominant land uses, to analyze environmental issues related to these uses in the context of specific examples, to provide an overview of the region's distinctive characteristics, and to consider options for future growth and development.

Where are Canada's Rocky Mountain foothills? Generally speaking they are between the plains and the Rocky Mountains, but their detailed delineation is complex and varies somewhat among authorities. "Plains" is the geologically correct word as the commonly used Canadian term, "prairies," refers to a tract of grassland vegetation. The foothills western boundary is essentially the first Carbonate range of the Rocky Mountains, which lies along the Lewis thrust from the United States border to the Oldman River, curving westward to include part of the Crowsnest Pass area; the Livingston thrust from there to the Highwood River, and the McConnell thrust between the Highwood River and the Yellowhead Highway. The eastern delineation is more upon to judgment because it depends on the criterion used; whether one chooses the horizontally lying beds of the plains or where these beds begin to tilt, say 10° , to the west. Related questions involved in determining the boundary include selecting the erosion level and the subsurface structure. The boundary shown on the accompanying map gives the foothills their greatest extent—roughly 750 km northwest to southeast and anywhere between 30 and 50 km in width.

On a less technical level, the western or Rocky Mountain boundary is marked by the massive limestone cliff lineament of the front range, mostly devoid of vegetation. The eastern boundary can often be determined by noting the western end of the land survey and regular road grid characteristic of the plains and where the forested foothills give way to the grass vegetation of the prairies. Within the foothills, the Forestry Trunk Road (Highways 40 and 940), which already existed in some fashion before the 1930s and was completed during the 1940s, traverses its center, and Highway 22 north to Rocky Mountain House lies close to its eastern boundary.

This paper concentrates on the geologically delineated foothills and includes those small portions of the Rocky Mountains located between the foothills and the Alberta–British Columbia border and the Waterton, Banff, and Jasper National Park boundaries (Figure 1). It seemed reasonable to include these small mountain areas because they have the same land uses and are under the same administrative jurisdiction as the foothills, are undifferentiated in the mind of many users, and, with the exception of Kananaskis Country, the Bow Corridor, and some of the wilderness areas, are not discussed explicitly elsewhere (AWA, 1973; Kolar and Brawn, 1986; Kariel and Kariel, 1988; Kariel, 1991).

Natural Features

Geologically, the foothills are a belt of rugged hills characteristically consisting of northwesterly trending ridges with steep-sided valleys, the product of the erosion of folded and faulted Mesozoic sandstones and shales. The massive gray limestones of the Rocky Mountain are absent except for a few conspicuous mountain outliers: Moose Mountain west of Bragg Creek, the Brazeau Range near Nordegg, the Bighorn and Clearwater structures, and one or two more. To the east the sandstone ridges and the valleys between them become lower and less distinct and finally grade into the high west-ern plains.

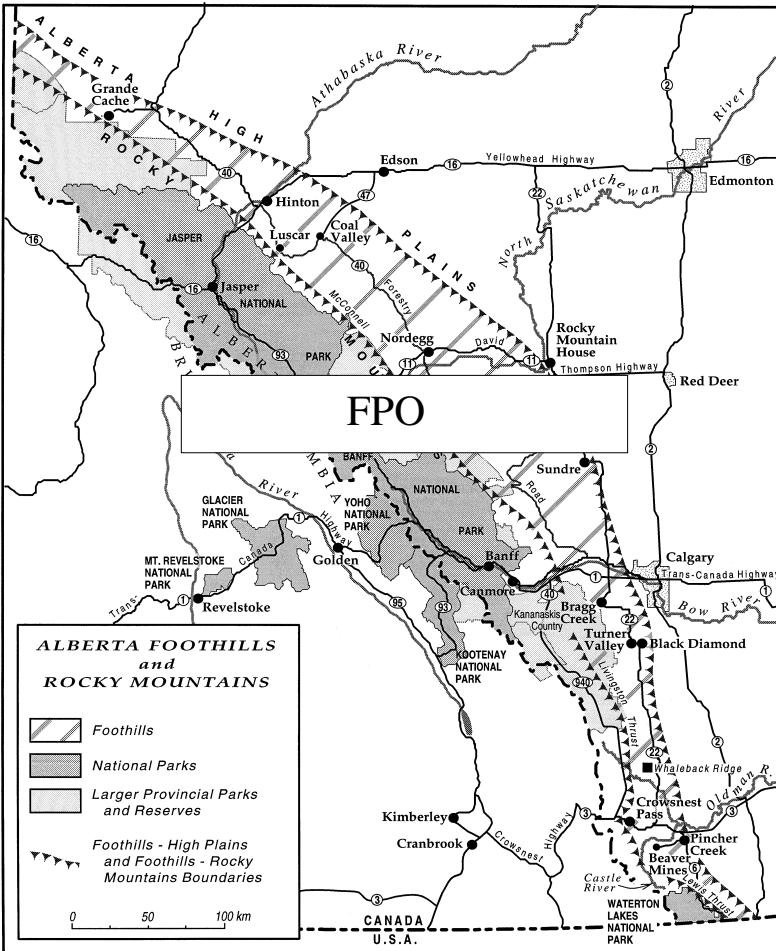


Figure 1

The foothills are chiefly a ridged, heavily forested area with scattered grasslands in the broader valleys and sparse trees along the highest crests. Large glacial erratics and small glacial boulders may be seen in many valleys and on upper slopes. Hard sandstones show through along sharp ridge tops and loose rock debris litters some of the slopes below. Low-lying areas are covered with glacial till, alluvium, or outwash material, either stemming from Cordilleran glaciers or deposited more recently. Frequently, the small streams in the valleys have cut down into dark Cretaceous shales or meander indistinctly over peaty and muskeg-covered flats.

Some three dozen rivers pass through the foothills. Those to the north drain via the Smoky, Peace, and Athabasca into the Arctic Ocean, while the others, including the Brazeau, Clearwater, Red Deer, Bow, and Oldman flow via the Saskatchewan River into Hudson Bay and the Atlantic. Many of these pass through the foothills in valleys widened and deepened by glaciers. These valleys are filled with sand and gravel; the broad flats of the Bow valley around Morley and of the Red Deer valley near Sundre are fitting examples. In some cases, rivers have sliced through tilted rocks leaving gorges; for example, the Athabasca at Entrance and the narrow canyons of the Smoky, Ram, Oldman, and Sheep. At places where hard sandstone ribs cross valleys spectacular falls have resulted, as on the Ram, Elbow, Livingstone, and the Sheep rivers.

Two forest regions are represented in the foothills, the subalpine and the montane. The climate of the subalpine is characterized by cold, snowy winters and cool, showery summers, with below freezing temperatures common in all months except July and August. Approximately half of the precipitation occurs during the winter months. Characteristic tree species of the subalpine region are Engelmann spruce (*Picea engelmannii*), subalpine fir (*Abies lasiocarpa*), subalpine larch (*Larix Lyalli*), lodgepole pine (*Pinus contorta*) and whitebark pine (*Pinus albicaulis*). The montane region occurs primarily in the vicinity of the Porcupine Hills, Crownsnest Pass and the foothills north of Waterton Lakes National Park. Its most notable feature is its association with major east-west mountain valleys which channel warm Pacific air (chinooks) during the winter months, thus lessening the effect of cold Arctic air from the north. Characteristic tree species are Douglas fir (*Pseudotsuga menziesii*) and limber pine (*Pinus flexilis*) while aspen (*Populus tremuloides*), lodgepole pine, and white spruce (*Picea glauca*) occupy moist cool sites, such as north-facing slopes. In both regions, more precipitation falls closer to the Rocky Mountains and at higher elevations, and average temperatures and length of growing season decrease from south to north and at higher elevations.

Early Human History

Early explorers and fur traders who traveled through the foothills included the North West Company's Duncan McGillivray (builder of Rocky Mountain House), David Thompson (geographer and map maker, especially of the Columbia River), Alexander McKenzie (founder of the Company in 1787), Simon Fraser (who continued McKenzie's work), and Alexander Henry the Younger. Anthony Henday, Sir George Simpson, and Peter Fidler (David Thompson's counterpart), worked for the Hudson's Bay Company, which had been founded in 1670. The two rival companies united in 1821. Missionaries such as Father Pierre-Jean DeSmet, explorers John Palliser and Thomas Blakiston, and wagon train leader James Sinclair were among numerous others who, often with the help of native wives, explored the passes, established the trade routes, and began making the area known to settlers and others who followed.

Our knowledge of the native peoples, in addition to that based on archeological evidence, is derived from explorers and fur traders. Even before Europeans had entered the foothills region their influence on the native population had been felt. The introduction of guns and metal tools and utensils to the Cree had a profound effect on them and their western neighbors. The acquisition of horses by various tribes led to the roaming of plains tribes and the migration of other tribes into the area. By the 1700s and the arrival of the first explorers, the region was inhabited by several native tribes. Their territories fluctuated as more aggressive or stronger tribes wrested land from weaker ones. The Stoney, for example, ended up settling in the foothills beyond the reach of the aggressive Blackfoot; the Cree, allied with the Stoney and formerly a plains tribe, adopted a woodland lifestyle; the Kootenays, once a plains tribe, were forced across the Rockies; the Blackfoot (Peigan, Blood, and Siksika) roamed as far west as the Rockies; and the Sarcee (Tsuu T'ina), members of the Blackfoot confederacy, settled in the southern part of the foothills.

The lure of white trade goods brought native people, such as the Kootenays, from near and far to the trading posts and meeting places, and resulted in their orientation to hunting and trapping for trade instead of food. Along with such trade goods as guns, axes, knives, and kettles, the whites also brought liquor and numerous diseases to which the natives had little immunity, both of which contributed significantly to their decline in number. The Canadian government recognized that if white settlements were to be established in the west, some accommodation must be made with the Indians regarding the division and ownership of land. Through a

series of seven treaties, native tribes, in exchange for certain rights and other benefits, relinquished claims to their territories from Lake Superior to the Rocky Mountain foothills except for certain specified land allotments. The treaties prepared the way for western settlement and railway construction with almost no confrontation between Indians and whites and finally led to the confinement of the native people to the reserves during the 1870s (Lower, 1983). Since the 1950s many native people began to live in urban areas in and beyond the foothills. There are several reserves in the foothills, containing a total population of about 3,500. These reserves vary economically from being quite poor to reasonably well off and, in education and level of health care, from very low to moderate.

Land Use

Major land uses in this region are ranching and agriculture, logging, oil and gas extraction, coal mining, and recreation and tourism. They contribute to Alberta's economy by providing considerable employment and, in the case of logging, coal mining and oil and gas extraction, royalty payments to the provincial government. They contribute different proportions to the economy of rural and urban communities, depending on the size of the individual operation and the nature of the industry.

Better than 80 per cent of the area is provincial Crown forested land, i.e. public rather than private, on which crop production and settlement are restricted. This land is administered by Alberta Land and Forest Service (LFS), but there is a complicated jurisdictional pattern for different land uses also involving Alberta Parks, Agriculture, and local municipalities. Although the forests are managed primarily for watershed protection and sustainable timber production, other uses and resources including coal mining, oil and gas extraction, fish and wildlife habitat, trapping, domestic grazing, recreation and tourism, and the landscape's visual quality are also considered. This multiple use framework is meant to apply to each region through an integrated resource planning approach (Alberta Energy and Natural Resources, 1984; Alberta Environmental Protection, 1994). In practice, however, it results in a checkered location of single use areas.

The region's land use and management are guided by the *Policy for Resource Management of the Eastern Slopes* (Alberta, 1984). The foothills are part of, but not conterminous with, the Eastern Slopes. Whereas the foothills are geologically delineated as discussed above (essentially the western part of the Eastern Slopes), the Eastern Slopes

are politically and administratively delineated, extending from the Alberta-British Columbia border and Waterton, Banff, and Jasper National Parks boundaries east to the settled area of the plains. There are eight land use zones: prime protection, critical wildlife, special use, general recreation, multiple use, agriculture, industrial, and facility, each of which is accorded different levels of protection, use intensities, development objectives and permitted activities. The current economically- and technocentrally-oriented policy supersedes an ecologically-oriented one (Alberta, 1977). In its critique of the new policy, the Alberta Wilderness Association pointed out that the new policy provides opportunities for stimulating economic growth at the expense of ecological considerations (AWA, n.d.). For example, it designates the development of tourism as a priority, encourages exploration and development of all mineral resources, decreases the protection for critical wildlife habitats, allows helicopter and motorized access and step-out drilling for oil and gas in the prime protection zone. The new policy redefines use categories: *permitted* has become compatible and *restricted* has become permitted. The policy is also "sufficiently flexible so that all future proposal for land use and development may be considered..[and]..no proposal will be categorically rejected." In the interest of encouraging development, if a proposed use or development is not compatible with the designated zoning and uses, a request is to be forwarded to the minister for his decision, thus making ministerial discretion an explicit part of the decision-making process.

Examples of resource use issues are presented in the following sections to illustrate disparate views held by individuals and the political reality faced by those in decision-making positions. Conflicts arise when individuals who hold different views and make different demands on the land and its resources compete for them. Issues and conflicts are exacerbated when activities result in land use patterns that are incompatible with traditional resource development and exploitation practices and which compete for areas that are becoming effectively ever smaller (O'Riordan 1981; Ives 1978). Prominent issues in the foothills include those centered around the Westcastle resort development proposal, construction of the Oldman River dam, proposed drilling for oil in the Whaleback area, subdivision of agricultural land west of Calgary, and increasing recreational pressures on the foothills. Each issue is complex and is presented here in simplified form and may therefore appear more clear-cut than it really is.

Settlement and Ranching

The earliest European settlement in Alberta took place during the latter half of the nineteenth century. At first most immigrants settled on the plains and their cattle grazed the natural grasslands. Later, potential economic advantage and suitable land and climate induced ranchers into the foothills, where they eagerly converted the forest lands into grain fields and regarded the forest reserves as extended grazing areas. In the years that followed, legislation would be required to ensure that the cattle complemented rather than competed with the forests and other land uses of the foothills (Breen, 1983; Evans, 1987).

Although the railway reached Calgary in 1883, bringing immigrants from many parts of Europe, it was not until after 1896 that large numbers of settlers arrived. The government and the CPR encouraged settlement and newspaper advertisements as well as the letters sent "back home" by earlier homesteaders beckoned potential settlers with promises of free 160-acre farms, abundant water and fuel, good grass for pasture and hay, a fertile soil and much rain (Francis, 1989). Not mentioned were the deep snow, below zero temperatures, mosquitoes, and untamed wilderness.

Cattle arrived slowly with the first breeding stock brought from Red River in 1860 to what is now Morley. During the 1870s more cattle, horses and even sheep were introduced, the latter much to the disgust of the cattlemen. During this period the first large herd of cattle was brought across the Montana border. By 1874, 41 stock-raising companies and sundry stockmen were engaged in cattle ranching along the base of the Rockies as far north as Calgary. Officials in Ottawa were eager to have a large-scale cattle industry firmly established in the western foothills because it would bring investment and settlement to a region too dry for cereal agriculture and meet Indian beef requirements as the last buffalo herds were disappearing from the northern plains. In order for the government to achieve the rapid expansion of the ranching frontier and fulfill the desires of eastern capitalists for profitable enterprises, an agreement on the manner of land tenure had to be reached. This meant that the original Act, which permitted unoccupied pasture to be leased only to bona fide homesteaders, was amended, in 1876, to permit leasing of grazing land to non-residents, individuals, or companies. The new lease structure helped to establish the cattle companies, made it more difficult for additional small stock-raisers to get started and subsequently eliminated the open range.

The careless use of fire for clearing land, the product of ignorance, negligence, and indifference, resulted in great conflagrations

which fanned out from settlements and burned vast stretches of forest. Some settlers deliberately set fires on their homesteads to burn the trees and, if the fires raced out of control, they tended toward indifference as they considered the forest as their enemy. Sometimes the fires turned direction and burned their buildings or those of their neighbors. Too late they learned that they had destroyed the humus essential for growth and with the slopes bare of trees, rain and melting snow carried topsoil downstream and much erosion ensued.

The range had been open and free with fences virtually unknown until 1889. Then, an Order-in-Council, the equivalent of a provincially legislated act, restricted the ranchers from grazing stock on public lands without consent of the Minister. By 1902 the day of the open range had passed as the land was divided into smaller parcels and wire fences appeared and multiplied. When the forest reserve was established in 1908, squatters were removed and the use of fire for clearing land was restricted.

The early ranching communities were composed predominantly of eastern Canadians and included a minority of American and Canadian frontiersmen. Between 1879 and 1881, they were joined by Englishmen who provided a certain English character. This complexion included "...the fox hunt, in which the lowly coyote was the unhappy substitute for the fox, a polo league, Chinese cooks, governesses, tutors and schools in the 'Old Country' and eastern Canada, and winters in Calgary, Victoria, or Great Britain, depending on financial status." (Breen, 1983, p.14)

Though stock raising was the major occupation, settlers tried a variety of agricultural pursuits and also involved themselves in saw mills and coal mines. They set out to make their holdings into homes and to ensure the comfort and welfare not only of their families, but also of their stock. They undertook the hard work involved in breaking the land and raising crops to supplement natural pastures. They milked cows, raised chickens, turkeys and sometimes geese and ducks, and took pride in their kitchen gardens, experimented with growing fruit, and went hunting and trapping. Women practiced old skills or learned new ones, e.g.: canning meat and game, churning butter, putting up fruit and vegetables from their gardens, and harvesting wild berries. Some settlers also tried irrigation to obtain a more reliable supply of water, but this was not worthwhile because of the high cost of labour involved; even in dry years there were enough showers to produce a modest hay crop. The settlers also built schools, churches, stores, hotels, gas stations, and other establishments which make up communities. They held dances, participated in sports, and squabbled intensively with owners of large ranches to carve out their niche on the land.

Since those early times, slowly and inexorably the land has been settled and partially cleared and roads built. At first these roads were dirt, then gravel, and eventually many were paved. Today, approximately 50,000 people live in the region's roughly 30-35,000 km². They are concentrated in the Bow Corridor as well as the communities and dispersed agricultural settlements throughout the region's eastern extent south of Rocky Mountain House, wherever farming and ranching can be undertaken economically. Larger communities, ranging in size from a few hundred to several thousand inhabitants, are located in this farming area along the eastern (plains) border, at resource extraction sites, and within commuting distance of Calgary; that is, at Grand Cache, Rocky Mountain House, Hinton, near Calgary around Bragg Creek and the Turner Valley and Black Diamond area, and south in the Crowsnest Pass and Pincher Creek areas. In the mountain section, only the Bow Corridor, a resource extraction and tourist locality, is settled intensively.

Perhaps the greatest land use change now taking place is urbanization of the rolling mixed forested, farming and ranching country west of Calgary. Some land owners subdivide their land, with the blessing of municipal councils, real estate developers and other like-minded business-oriented individuals, to provide building sites and homes for individuals who desire country living. Little may they realize or care that the beauty and serenity of the countryside, the very essence of what gives the foothills region its special attractive character, will thereby be destroyed and that taxes will inevitably rise to pay for additional services, upgrading of roads, construction of schools, and other amenities which will be demanded. The appearance of the landscape will change to an aesthetically less pleasing one more rapidly than most individuals recognize.

Oldman River dam

As settlement took place in the drier southeastern parts of Alberta, especially where evapotranspiration exceeds precipitation, a dependable water supply was needed by farmers for agricultural use and by municipalities for domestic and industrial uses. This desire resulted in construction of a dam on the Oldman River in the foothills. This and the other rivers are the source of water flowing across the plains. By inter-provincial agreement, half of the precipitation falling in Alberta's mountains and foothills must reach the Saskatchewan border. The Prairie Dry Belt (Jones 1987) in southeastern Alberta and southwestern Saskatchewan (part of the Palliser Triangle) receives a total of only 333mm of precipitation per year as opposed to 561mm in southwestern Alberta and the rivers flowing through it are at their lowest during summer and fall when the wa-

ter would be most needed for agricultural and municipal purposes (Kraenzel, 1955; Longley, 1972).

In 1974, the province first announced it was serious about building the Oldman River Dam, an idea that had been around for several decades among provincial and municipal politicians. The dam was to impound water for "water management, flood control, erosion control, flow regulation, conservation, and recreation." By 1984, the Alberta government decided to proceed with the dam, rather than consider off-stream storage or revegetating the upper Oldman River drainage basin. Canadians, on the whole, have held fast to traditional agricultural practices and irrigation whereas, with a different mind-set, Americans responded to the threat of drought by being flexible and relying on dry land farming methods rather than irrigation (Webb, 1931).

The debate concerning the dam has been intense, controversial, and incessant since the 1970s. It has pitted environmental, aesthetic, religious, economic, political, and other interests against each other. The conflict has been peppered by court battles, public demonstrations, a dam site protest concert attracting 18,000 people, and an armed standoff along the river with Peigan activists. Opponents claimed the project interferes with the normal flows of three rivers (Crownsnest, Castle, and Oldman), disrupts the regional ecosystem by interrupting normal fluctuation of the rivers, adversely affects the riparian cottonwood habitat, endangers up- and down-stream fisheries, forces people off farms that had been in their families for generations, negatively affects the Peigan who consider the rivers the foundation of their culture and religion, continues the philosophy of water squandering, makes a mockery of public consultation, and is entirely uneconomic even by governmental studies, along with many other complaints.

The decision to build the dam made a ridicule of the public consultation process, treated the Peigan unfairly, and precipitated a lengthy series of court battles against the \$450 million (estimated) dam started in 1987. A Federal Environmental Assessment Review, which the province obstructed, spurned, and tried to block, was started in 1991 while construction was still under way (the dam was completed in 1992). Its panel found the assertions of the dam's opponents to be valid and made 23 recommendations. Two key ones were 1) to decommission the dam by opening the low level diversion tunnels to allow unimpeded flow of the river, and 2) if decommissioning were not accepted and the dam operated, federal approval should be subject to the province's reaching an agreement with the Peigan Indians over their concerns and making a long-term commitment to mitigate the many environmental impacts of the

project (FEARO, 1992; Nikiforuk and Struzik, 1989; Rood and Jankunis, 1988).

Before and since then, a number of significant environmental mitigating measures have been taken; the dam, along with its fluctuating reservoir, is now in operation; while meetings held with the Peigan have so far been unsuccessful in resolving the problems. It has been recognized that it is important not only to monitor a project, but also to analyze and evaluate what is being monitored. Clearly, more arid parts of southeastern Alberta should never have been settled and used as intensively as it has, but people may have deluded themselves and perceived the area to be lush and as holding great promise. Being ever optimistic, once settled they do not wish to leave or admit that they may have erred, and they rationalize their staying and not cutting back the level of activity, even if there are indications to the contrary (Webb, 1931.) The political reality is that politicians wish to be reelected and governments perpetuate themselves, and their actions are thusly motivated. This saga reflects the determination of the Alberta government to complete construction of the dam, regardless of any costs involved. The legal counsel for the province reportedly was told to litigate until you die, to delay until construction is completed.

Forestry

The Dominion Forest Service was established in 1870 to administer and manage western Canada's forests. The Alberta Forest Service, now renamed Land and Forest Service (LFS), assumed this responsibility in 1930, when the land was transferred to the province. Its objectives relate to forest protection, timber harvesting and management, reclamation, and reforestation. Early logging and other activities in the foothills took place with fewer regulations than is the case now because there were fewer people, there was less competition for the land and its resources, and people were convinced that the land and its resources were unlimited. Over time, trails and then roads were built, fire lookouts constructed, more intensive fire suppression methods instigated, and through persuasion, regulations, and public and economic pressures, the present forest management program came about. Technological advances, such as the change from telephone to radio communication and from horse to helicopter use, also took place (Huth, 1990). Currently LFS is working toward ecosystem forest management in which naturally occurring phenomena, such as fires, are mimicked.

Logging is dispersed throughout the foothills. Saw logs are trucked to saw mills located at places such as Cochrane, Sundre,

Red Deer, and Crowsnest Pass, from which dimensional lumber can be shipped conveniently to Canadian, United States, and overseas markets. Numerous small sawmills also produce lumber, posts and poles, and shakes, which are sold locally. Although the northern foothills area provides some saw logs, trees are used primarily for pulp wood, which is processed into paper at a mill in Hinton. This mill, with a history of numerous water-polluting violations, is now cleaned up (Urquhart and Pratt, 1994). Reforestation is with pine as a mono-culture, which has roughly one-tenth the biodiversity of the original forest.

Timber companies bid for timber quotas, which give them the right to cut a certain volume per year in a specified block, according to specific ground rules (standards) and regulations, including stream set backs and reforestation. Virtually all Crown land available for commercial logging is currently committed because the allowable amount cut is regulated by the LFS on a sustained yield basis. The meaning and application of this and other concepts discussed in the rules and guidelines, such as *clearcut*, *reforestation* and *reclaiming* [roads] are, however, not entirely clear and differ between foresters and lay persons because of differences in education and indoctrination. Politicians can alter amounts of allowable cuts, sustained yield notwithstanding, if they decide that immediate job creation is more important than future forests. During boom times facilities are often expanded and companies argue that more timber is required to maintain employment. Because of technological advances, more modern machinery, and larger mills, however, the total number of jobs in the forest industry is decreasing, although unions and companies sometimes blame environmental groups and regulations for the decline.

As good as the LFS may be in supervising environmental aspects of logging and mill operations, the industry's Alberta Forest Products Association enforces its own more stringent requirements more consistently through its "Forest Care" initiative (AFPA, n.d.) Its code of practice, for example, states that signatory member companies *will* follow the requirements and that their operations will be monitored, evaluated, and reported to the public. The industry is concerned about its public image, whereas the LFS, as conscientious and capable as its civil servants are, needs to contend with political decision-makers and a reality dominated by close governmental and corporate connections and interests (Flaherty, 1988). Additionally, enforcing regulations can be difficult when an unscrupulous operator who disregard them goes out of business or changes its name. It has happened that a sawmill which was established with govern-

ment loans or grants declared bankruptcy and was later purchased by the previous owner at a lower price.

With trees treated as a crop and emphasis placed on the economics of timber production and logging, clear-cut areas are increasingly becoming a dominant landscape feature; and large portions of many watersheds have been logged, especially those in the central and southern part of the foothills. Perhaps a greater tragedy is timber cutting on private land outside the forest reserve, where there are no restrictions other than those related to environmental damage to fish, wildlife, and water. In response to high prices, Native people on Reserves and ranchers on their property and on Crown land, under range improvement plans, cut merchandisable aspen and spruce trees. This cutting changes the ecology and visual character of the land, converting it from a biodiverse and visually interesting landscape containing both coniferous and deciduous trees, to a treeless one or a relatively uniform one devoid of dark green spruce trees and a coniferous forest ecosystem. In attempts to counter unwise cutting, LFS tries to inform ranchers about the consequences of indiscriminate logging (Grundberg and Vanderwel, 1994).

Oil and Gas

Numerous oil and gas fields are dispersed in the fold-and-fault structure of the foothills at Moose Mountain, Turner Valley, Quirk Creek, Savannah Creek (Plateau Mountain), Pincher Creek, Waterton, Jumping Pound, Sarcee, and Edson. Oil and gas is found primarily in the Mississippian strata of this structure's series of imbricate thrust plates.

The first oil well in Western Canada was drilled in the Waterton Lakes area in 1902. In 1914 the first drilling took place on the large Turner Valley structure where seepages had been reported. This well produced a substantial flow of light gravity oil and large volumes of gas. The natural gas was flared at the wellhead, since it was not known that its uncontrolled release diminished the internal pressure which could ultimately assist in oil recovery. In 1924 deeper drilling encountered large volumes of wet gas, but it was not until 1932 that rigs capable of drilling to reach the oil in this formation were developed. The success caused a surge of drilling throughout the southern foothills and many surface structures were drilled, but with only minor success, as none reached the Mississippian reservoir rock. The lack of success was to a great extent due to the inability to determine structures involving the Mississippian carbonates. In about 1940, the use of seismic refraction methods resulted in the discovery of more gas fields and was the start of seismically initi-

ated and controlled gas recovery in the foothills. These methods involve detonating small explosions, measuring the time it takes for the shock waves to reflect and refract from different strata, and, thus, constructing geologic cross-sections (Hornford, 1968; Evers and Thorpe, 1975).

Increased demand for natural gas in the 1950s revived interest in exploration and several successful wildcat wells (those drilled speculatively by a small company) were drilled. Although seismic methods for locating thrust plates which include the Mississippian strata have proved extremely successful, even with good data many holes have been drilled which turned out to be dry (without gas or oil) as a result of errors in interpretation. Recently developed three-dimensional seismic technology provides more detailed information on subsurface geology and has resulted in considerable remapping. Compared with other parts of Alberta, where about 2000 wells are drilled per year, only 10–15 are drilled in the foothills. This difference relates to the much higher drilling cost because wells are deeper, up to 6,100m as compared with 120–150m; to compensate, however, the fields are larger and under greater pressure. The level of geophysical and drilling activity depends on the market situation.

The processed gas and oil is used within Alberta and sent via the main trunk distribution network to the United States and eastern Canada. Natural gas liquids—propane and butane—are refined in Edmonton and heavier hydrocarbons and by-products of natural gas are used in producing plastic goods. Sulfur recovered from sour gas is sold to domestic markets and world-wide, primarily to Pacific Rim countries, where it is used in manufacturing fertilizer and a wide variety of pharmaceutical and consumer products.

As a result of exploration activity, the foothills are literally criss-crossed with thousands of kilometers of seismic lines that run straight up and down steep forested slopes. These can erode quickly, especially when used by all terrain vehicles. These seismic lines, well sites, access roads, pipelines to transport gas from the well-head to processing plants and into the distribution network, and the processing plants themselves are visible features on a once relatively pristine landscape. Area residents, as well as the petroleum industry itself, have expressed several concerns related to dangers inherent in gas and oil production. These include the effects of poisonous sour gas, containing hydrogen sulfide (H_2S) which might escape and can kill even in low concentrations; the rupture of pipelines and the escaped oil or gas which can explode and burn. Although nearly 98% of the sulfur compounds present in the gas are recovered as elemental sulfur by burning or flaring, some are burned

and emerge from the stack as SO_2 , along with various oxides of nitrogen (NO_x) which can cause discomfort and illness in animals and humans. Because dangers from accidents are ever-present, elaborate safety precautions, including emergency shutdown valves, alarm systems, and evacuation plans for area residents, are in place. An additional concern is the noise emitted both during construction and drilling and by gas compressor plants, even though noise emission guidelines have been established. Nevertheless, residents living near these plants are impacted negatively because such sounds intrude into a quiet environment where nature-related sounds predominate. Encroachment of residences into the vicinity of existing operations can create health, safety, and annoyance concerns when tracts of agricultural and forested land are subdivided so that more people can live in the foothills as, for example, in the countryside west of Calgary.

Whaleback Ridge

Companies may wish to explore and drill for oil in environmentally sensitive areas which some individuals believe should be protected. Such was the case when Amoco Canada Petroleum Company wanted to drill an exploratory well in the Whaleback area of the southern foothills, an area of montane forest which has been nominated for preservation under the provincial Special Places 2000 program. The program is designed to protect areas representing each ecological zone in Alberta, of which the Whaleback is an excellent example of the under-represented montane ecosystem.

Hearings on the proposal were held in 1994 by the Energy Resources Conservation Board (now changed to Alberta Energy and Utilities Board) (ERCB, 1994). The company as applicant and several intervenors—local ranchers, outfitters, environmental groups, Alberta Fish and Game, the Peigan Nation, and other interested parties—expressed their views to the Board either supporting or opposing the project on technical and other grounds. Issues considered included information requirements (environmental data, drilling plans, etc.); need for the exploratory well; location of the well; potential future developments (if gas is found); public health, safety, and quality of life; adequacy of public consultation; and land use.

Although some local residents expressed support for Amoco's view that oil and gas development could be carried out in ways to preserve other land values, including ranching, hunting, recreation, and wildlife resources, most intervenors disagreed strongly with this view. They argued, for example, that the selected location is too risky and would damage wildlife and create environmental damage; that the use of the proposed drilling method and the proposed

ways of handling hydrogen sulfide are overly optimistic and overly simplistic for a sour gas well approximately 4000m deep and with up to 3000m of horizontal displacement; that the emergency response plan is inadequate; air quality and health might be affected negatively from emissions (of H₂S and SO₂) because of local weather patterns and topography; and that the well would be a potential risk to the Peigan Nation's traditional uses of the area. Since the Eastern Slopes policy (see above) placed a higher priority on protecting surface values of the area than on development of its subsurface values, oil and gas development did not need to proceed in all areas. Concerning the construction of a road, intervenors stated that Amoco would probably not have the ability to control access; and that increased access would result not only in wildlife impacts, including increased poaching, but also in cattle rustling and random or accidental shooting of cattle. They also expressed concern that constructing a road would represent the first step in a complex system of roads and well pads into an area fundamentally unchanged from the advent of ranching in the region which supports a unique lifestyle. They stressed that the lack of road development in the area had helped to preserve the region's wilderness, recreational, and ecological values, and more extensive access would represent a complete loss of the wilderness value and place the ecological integrity of the area at risk. In short, the qualities which make the area particularly attractive would be lost irrevocably by the drilling of the initial well and certainly with full-field development.

The ERCB considered carefully the evidence pertaining to the application, at times agreeing with the applicant and at times with the intervenors. The Board was not satisfied that the proposed well would be in the overall public interest of the province, considering its social and economic effects and its effects on the environment. In its landmark decision, the first time it turned down an application, the Board denied the application because it believed that the Whaleback area represents a unique and valuable Alberta ecosystem which is a primary candidate for protection under the Special Places 2000 program. Approving the application could affect the area's surface values significantly before the program has had an opportunity to evaluate the area's importance in a provincial context. The Board is prepared to consider a new application upon clarification of the area's land-use status and subject to the items believed to be deficient in the current application. At the moment the situation is in limbo because the government does not appear to be in any rush to reach a decision regarding the Special Places 2000 program.

Coal Mining

A crescent-shaped belt of coal deposits, laid down during the Cretaceous Period, lies along the Rocky Mountains and the foothills, extending eastward onto the plains. It varies in quality from high volatile bituminous thermal to medium volatile bituminous coking coal, all of low sulfur content. In the mountain section coal mining continued in the Kananaskis Valley and at Canmore from the turn of the century until the 1960s. In the foothills, mines were worked for local use for heating homes in places such as Bragg Creek, Sheep Creek and Black Diamond. Major mining activity centered at places such as Beaver Mines, Crowsnest Pass, Nordegg, the Coal Valley, and around Luscar Mountain southeast of Edson, where Alberta's largest collection of ghost towns is located. The Coal Branch, a railroad spur from the main CNR line, heads southeast from west of Edson to this collection of more than a dozen former company-owned coal mining camps in Coal Valley. Several were lusty, bustling towns with hotels, bars, bunk houses, stores, tennis courts, baseball diamonds, hockey rinks, churches, schools, and community halls. Mining operations were almost totally underground and experienced cave-ins, fires, and explosions. Most mining activity took place between about 1912 and 1955 when there was a demand for coal for the steam-powered railway. The mines closed with dieselization, the depletion of high-grade coal, and piping of natural gas to British Columbia, i.e. with cheaper and cleaner-burning fuel oil and natural gas (Fryer, 1976).

Although most communities have disappeared, Robb in Coal Valley still exists, its residents finding work in forestry, game guiding, local businesses, and in the operating strip mines near Luscar. Cadomin, another ghost town, is the vacation or permanent home of about 200 people who have bought cottages once owned by the mining company. Nordegg, which during its heyday was a town of 3500 people, is now a community of approximately 100 residents, some of whom wish to promote the town's tourism potential. The former minimum security prison inside the old town, whose inmates served their time working in the forest, is now closed. In the Crowsnest Pass area, where mining began in 1897 and ended in the 1950s, the half dozen former mining communities retain their own identity, while comprising a single municipality with a population of about 7600, and actively attempt to diversify the economy and attract tourists. In addition to the former mining operations, tourists are attracted to Frank, the site of the 1903 landslide from Turtle Mountain which buried the town and surrounding area under some 80 million tons of limestone in less than 100 seconds. These and other

mining communities have suffered from the social, personal, and economic problems of a boom-and-bust economy which stem from externally controlled prices and the depletion of deposits that can be mined economically. These ups and downs contribute to a lack of financial, personal, and community stability. At the same time, the workers and their families who were attracted to the area have formed considerable attachment to their communities and often wish to remain after the mine has closed in spite of having little hope of employment. With a decline in coal mining comes outmigration and the remaining "graying" population places additional pressure upon the municipal tax base and social services.

Current mining operations located at Grand Cache and the Coal Valley-Hinton area are primarily open-pit strip mines. Coal seams are fractured and some have been thickened by imbricate faulting. The coal is washed, rock and other impurities are removed, and most of the coal is then hauled to a Pacific coast port to supply Japanese and Korean steel industries while some is transported to Eastern Canadian markets. The majority of the employees in the Coal Valley mines live in Hinton, while others live in Robb.

The current objective of mine site reclamation is to return the land to conditions as similar as possible to what they were before mining. At one time the industry relied on natural processes, but with changing times and under public pressure and governmental regulations, environmental protection during mining and reclamation has become increasingly part of ongoing mining operations. Before mining, trees and topsoil are salvaged and overburden is transported to mined-out pits. In a few cases islands of original forest are left standing. Although it is not possible to restore the original rugged terrain, once mining is completed the land is graded to approach the contours of the surrounding topography and terraced to help stabilize slopes and prevent gully erosion. The meager topsoil is replaced in so far as possible and grasses, shrubs, and trees, planted in islands, are reintroduced. Where it is not possible to backfill pits, lakes are developed. In spite of difficulties, wildlife habitat and a landscape similar to the original have been reestablished in many instances.

Recreation and Tourism

Compared with the heavily-visited adjoining national parks, the foothills and neighboring Rocky Mountain wildland areas are relatively untrodden territory. The total number of visitor days is roughly 6 million (2 million in the foothills proper and 4 million in Kananaskis Country) compared with around 11 million per year in the parks.

Visitor use in both areas is concentrated during the summer and winter seasons. Visitor origin differs considerably with a much greater percentage of United States and international visitors going to the parks. With the possible exception of Kananaskis Country, which was widely publicized during the 1988 Winter Olympic Games, the area is used primarily by Albertans, that is by local and near-local individuals who come mainly from Calgary, Edmonton, Red Deer, and other nearby urban centers. On the whole, Calgaryans turn to the mountains for their recreational pursuits, while Edmontonians, who live further from the mountains, use both the mountains and nearby fresh water lakes, which are absent around Calgary. From both work and recreational points of view, the foothills country and even the national parks are traditionally horse and cowboy country, of which the Calgary Stampede is one expression.

Recreational land use in the foothills evolved with the road system and is concentrated at a few places but dispersed lightly throughout the remaining area. The amount of use relates to accessibility and attractiveness of the place; i.e. eighty to ninety percent of the visitors remain within one to two kilometers of a roadway and only two to five percent travel as far as two to ten kilometers. Most heavily used are places along and adjacent to the main roads and byways and at attractive sites, such as Elbow and Ram Falls, Moose Mountain, the provincial parks, and the many campgrounds along the Forestry Trunk Road. In addition, the campgrounds along the Yellowhead Highway west from Edmonton also receive many visitors. Generally, the most heavily used areas are west of Calgary, the southern portion receiving fewer visitors, and the northern area least. Those who seek out the foothills for recreation tend to pursue such traditional, non-mechanized forms of recreation as trail riding, hunting, fishing, river canoeing, camping, hiking, cross-country skiing, dog sledding, caving, and mountain scrambling. Mechanized and motorized forms, such as mountain biking, off-road vehicle driving (4x4s, four-wheelers, motor bikes), snowmobiling, hang-gliding, and down-hill skiing, are now also common. Because mechanized types of recreation are often incompatible with non-mechanized ones, there are frequently conflicts among users.

The most dramatic changes since the 1960s are an increase in use and the addition of mechanized and motorized forms of recreation. As a result, those who have used the area for many years to pursue non-mechanized types of recreational use have become accustomed to random camping with no or only minimal facilities, and often return to the same spot year after year without meeting other individuals. They are now displaced by and confronted with a multitude of visitors who have different ideas of camping and recreation.

In addition, increased use has led to paving roads and building campgrounds which can withstand heavier use and offer more elaborate facilities, such as RV dumping stations and bear-proof garbage containers. Management problems have increased not only with greater use and the desire for more facilities by the next generation of visitors, but also with accompanying vandalism, as when ranchers have their cattle harassed and sometimes shot, fences cut, gates left open, and are left to clean up after disrespectful recreationists.

Recreational use has also increased with the introduction of overnight backcountry fees in the national parks. The freedom associated with unregulated and unrestricted use of the foothills, where there are few people and a tremendous amount of solitude, serve as added attractions. With increased use, this freedom is waning. Favorite places are now overrun with other visitors and random camping is severely restricted.

Guest ranches, guiding services and similar tourism facilities are expanding on a modest scale. An unusual newcomer is a posh, high-end retreat for corporate executives on a 200ha. forested out-of-the-way site west of Millarville. This stylishly outfitted facility boasts log chalets for guests, a central lodge adorned with museum-quality native and ranching artifacts, and a tipi village, fort, and "historic" Western street modeled after Clint Eastwood's movies. The catering combines absolute local privacy and state-of-the-art communication technology with heli-hiking, heli-fishing, horseback riding, and other adventure activities in an idyllic setting; all for a price.

Canmore and the Bow Corridor

On a larger scale are various tourism proposals for the Bow Corridor and the proposed four-season resort in the West Castle River area, all designed with great expectations. In and around Canmore in the Bow Corridor, a former mining community and site of the 1988 Winter Olympic Games cross-country skiing events, there are numerous proposals aimed at constructing or expanding recreational vehicle parks, hotels, golf courses, tennis courts, condominiums, convention facilities, and various accoutrements turning the area into a world class destination resort (Kariel 1991). [Editor's note: See also McNicol article in this volume.] Additional projects and expansion of existing facilities are also slated for adjacent Kananaskis Country.

Reactions to the proposals vary: residents' reaction was mixed after the mines closed, but now a larger proportion appears to be in favor of tourism. Canmore's town council and the business community place their hopes for the future on tourism. Although they recognize the desirability of maintaining a quality environment to

attract tourists, they either fail to see or choose to ignore the paradox between building an urban landscape and preserving the area in a natural state. Recreation groups and environmental organizations generally oppose most proposals. They are concerned about retaining access to recreation areas and public lands, while maintaining critical wildlife habitats, water quality, and scenic environmental qualities. The provincial government has taken a pro-tourism stand and designated the area as a tourism growth center.

If all proposals come to fruition the entire valley will be transformed into an urban environment with a tremendously attractive mountain backdrop. Urbanization will also have negative impacts on the Bow Valley wildlife corridor. To look into the general controversy surrounding continued development and tourism growth of Banff National Park and the adjacent Bow Corridor, the Banff-Bow Valley study was struck by the federal minister responsible for Parks Canada. This broad-ranging task force is to come up with a Solomonic harmonious solution to ecological, economic, and social needs of the region.

Westcastle

The latest proposal for developing the existing Westcastle ski hill in the southwestern part of Alberta was made in 1993 with the objectives of enhancing a small marginal operation and bolstering the economy of the Pincher Creek area. In order to avoid bankruptcy, retain the ski hill, and provide employment for ranchers and other residents living near the area, the proponents want to develop a year-round resort complete with two 100-room hotels, condominiums, two golf courses with restaurants, lounges, and pro shop, and to expand the ski hill capacity by almost five times. The company is asking the government to pay costs of all infrastructure, such as roads, water, and sewer, and to provide 50 hectares of Crown land. Opponents reject the resort plan because it would destroy prime wildlife habitat, damage the Westcastle River's trout fishing and attract more hikers, hunters, and off-road vehicle users to sensitive land, which supports several rare plants. It would also decrease the size of the Crown of the Continent ecosystem, which includes Waterton-Glacier International Peace Park. Additionally, LFS personnel recognize that if the high-end resort proceeds, present outfitters, trail riders, and other users will feel the competition from additional visitors. Demands for mid-line facilities for today's recreationists, who expect such creature comforts as restaurants, convenience stores, mountain biking trails, riding stables, and campgrounds with flush toilets, showers, and sewage dump stations, will follow soon.

The operation was started in the early 1970s. In 1974 the provincial parks division recommended that the Westcastle-South Castle area become a provincial park but nothing was done. A 1975 government study concluded that a four-season resort did not make sense because of such factors as variable and unreliable snowfall, difficult terrain access, and low potential skier population. A 1985 ski industry consultant's report drew the same conclusion. The Integrated Resource Plan for the area stated that the Alberta cabinet had already given approval-in-principal to the proposal (Barnett 1993). In 1993 the Alberta Natural Resources Conservation Board (NRCB) held hearings and approved the project, subject to creation of a wildland recreation area in which non-conforming uses, such as grazing, motorized vehicle use, and timber harvesting, would not be permitted or would be severely restricted. The government gave provisional approval and established a consultation group representing diverse interests to recommend the creation of the wildland area. The group could not agree because all terrain vehicle users, hunters, and loggers believed establishing such an area would restrict their use of it. When the government withdrew the approval, after four of the board's twelve members resigned, most groups were upset because jobs would not be created for local communities, there would be no environmental protections, and the proponent would not build. Those who desire environmental protection continue to promote legal protection, while the proponent may reapply, without becoming subject to any further Environmental Assessment or NRCB hearings.

In the above examples as well as in other proposals, little if any attention is paid to the number and type of existing or proposed facilities and the really limited number of people who would be using them. Expanding existing or constructing new facilities often results simply in increased competition for existing clients and their redistribution.

The Foothills as a Region and Its Future

In spite of numbers and at times intensive land use activities in the foothills, the region is one where the natural scene—forests and grassland, hills and mountains, streams and rivers, and animals—still predominates. That is its charm. Its grassland, forest, mineral, and scenic resources are used principally by those living outside the region and they will determine its future. For them it is an area to pass through and to be used. The region is a microcosm of our world and differs only in particular elements. General principles of location theory, spatial interaction, and spatial diffusion, in conjunction with the concepts embodied in the technocentric value system,

can be applied to help account for what has taken place within the foothills. To understand this or any other region more fully it needs to be experienced directly.

The future of the region is uncertain. It lies in the hands of individuals in decision-making positions who live outside its confines and who will base their decisions on the values they embrace, whether ecocentric or technocentric and materialistic. It has been said that "It's the history of Alberta: Grandpa and Grandma homesteaded and fought against the forces of nature and won, and we're still fighting that battle." It may also be true that almost no one in a decision-making position talks or acts ecosystems, land aesthetics, or land ethics, when there are millions of dollars at stake. Hence, if present trends continue, the areas near Calgary and other urban centers and those readily accessible by road will be most strongly and rapidly metamorphosed into urban environments, undistinguishable from many others.

On the other hand, the scenario may differ dramatically as older ideas are questioned and newer ones begin to prevail. In the western world, faith in material progress has declined and the finite nature of the earth's resources is being increasingly recognized. The spiritual emptiness of our current life style is beginning to be realized. The idea that people should and can conquer as well as use nature for their own purposes with no regard for environmental considerations, has been increasingly, insistently, and compellingly questioned. The British economist James Robertson suggested that the new economic order for the 21st century must harmonize economy and ecology as the management and science of our earthly home. Considering people as part of the environment is becoming increasingly acceptable and ideas concerning the importance of nature is resurfacing. A restatement of our ancestors' conception of the wholeness of humanity and the world—identifying the earth as a vital being of which all organisms along with the air, water, and soils are dependent parts—is the Gaia Hypothesis by James Lovelock (Lovelock, 1988). The combined effect of the ascendancy of these ideas in a newmindedness constitute a revolution as profound as the Copernican one was in turning people away from an earth-centered universe.

Hence, it is just possible that the established dogma—economic considerations have priority over environmental protection—will be turned upside down as Albertans come to value and respect the natural environment more. The land will then not be enmeshed in the technological and economic might and imperial impetus of a rapidly expanding urban world. Public hearings, environmental impact assessments, government established task forces, and policy

guidelines will no longer be perfunctory performance; nor will it be required to enrich the region by the industry of people who can not predict the cumulative affect of separate, piecemeal decisions. It then may also be possible to retain the serenity and contentment of a rural setting where one can experience the quiet excitement of a glowing sunset, a storm's cessation, wildlife at play, flowering subalpine meadows, and other natural phenomena. Scenes conjured up by Beethoven's *Pastoral Symphony*, Schubert's *Trout Quintet*, or Borodin's *On the Steppes of Central Asia* can be preserved. A land ethic more akin to that proposed by Leopold in *A Sand County Almanac* and cherishing the beauty of nature as discussed by Rowe in *Home Place* may then prevail (Leopold, 1949; Rowe, 1990). The choice is ours, even if it is not always clearly understood and the path unknown and without road signs.

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