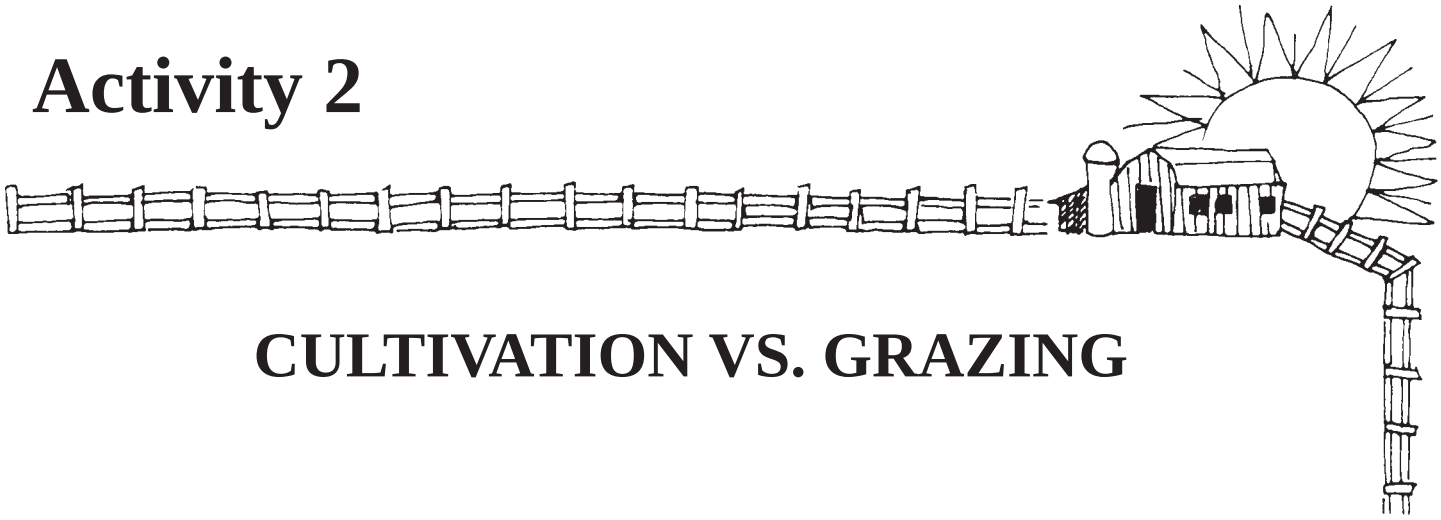
Activity 2



CULTIVATION VS. GRAZING

STUDY QUESTION:

When I look around Alberta I notice that we use the land for many different purposes. Who decides? and Why?

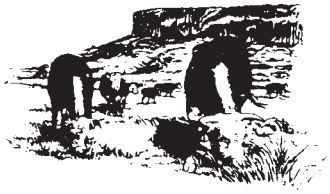
THE ACTIVITY:

Students evaluate selected agricultural land sites and recommend land use strategies.

CURRICULUM FIT:

SOCIAL STUDIES

- Topic A - Alberta: Its Geography and People.
- The effect of climate and geography on agricultural
- land use.



MAJOR CONCEPTS

- Natural resources, conservation, human needs, consumption.

LESSON CONCEPT

- Responsible management of Alberta's agricultural resources is essential in order to maintain the productivity of one of our greatest resources - the land.
- Grazing is a logical alternative to cultivation on poor quality or fragile land.

AGRICULTURE CONCEPTS:

Importance of Soil and Water
Economic Importance

PURPOSE:

- To introduce students to the concepts of conservation of natural resources while meeting human needs.
- To give students an opportunity to explore issues of land use related to Alberta's food industry.

MATERIALS REQUIRED:

Supplied in this lesson.

TIME REQUIRED:

1-2 class periods.

BACKGROUND - For the Teacher

When the pioneers came to Alberta, good land seemed to be unlimited. Prairies, parklands and boreal forests formed endless expanses of vegetation. Settlers soon discovered the best farming regions and began to till the land in order to grow crops and food for themselves, their livestock, and export.

Not all settlers were fortunate enough to select the best soils. Some agricultural production limitations were visible from a quick look at the property, while others remained to be discovered. Farmers identified good crop land by looking at such things as terrain, soil types, and weather patterns. This may have led to rather hasty decisions, based on the very sketchy information of a hundred years ago. Today, most of Alberta has been surveyed; the soil types and their related agricultural capabilities have been determined.

It is the modern farmer's responsibility to gather as much of the available data together and make a decision as to what is the best possible land use for a particular piece of property.

This is not a new idea. As long as man has been cultivating the soil, good land use has been a concern. The amount of good, arable land is limited. Our farming practices must be efficient and conservationally sound so that we maximize production while maintaining or improving the capabilities of the land.

In this lesson we will take a look at two major agricultural land uses. We will examine what determines the farmer's choice of farming practices.

The two major land use choices to be considered in this exercise are grain cropping or pasture. This may not appear to be a very serious issue on the surface; however, you will find that many things influence the final decision as to the best land use for any area.

PROCEDURE

Part 1
Introduction

1. Discuss land use - What is it?
   In this lesson we will look at two ways that land can be used for food production.
   a) cultivation
   b) grazing or pasture
2. Review the "Key Words" resource with students.

Part 2
Evaluating

3. Alberta has a variety of land types. Review the student resource "Factors Related To Agricultural Land Use."
4. Pass out the worksheet "How Would You Use This Land?" and see if the students can select the best land use for the three farms.

Part 3
Researching

Alberta can be generally classified into ecoregions. These large areas are constant in many ways such as soil, terrain, and weather conditions. For example, the Grasslands are flat to rolling, have dark brown and brown soils and have limited rainfall. These conditions favour grass as a native vegetation.

5. Review the ecoregion map and the general characteristics of each of the regions (from the information supplied in this lesson).
6. Have the students find their location on the ecoregion map. What region are they in?
7. Ask students to complete the worksheet "Getting To Know Your Region."
8. Make a list of possible consequences of poor use of agricultural land.

Part 4

Conclusion

We all recognize that it is important for our agricultural land to be as productive as possible. The demand for food is ever increasing. The supply of farm land is ever decreasing.

Ideas

Misuse of the land may result in some serious problems. Non-use of useable land can result in a shortage of food.

We have looked at the best use for the land types given on the worksheet. Now let us consider what might be the consequences of misuse. First, what are some of the other agricultural uses for lands described in this exercise?

FOR DISCUSSION

1. What is a result of the expansion of urbanization into prime farm land?
2. Should this be subject to control?
3. Are there any regulations regarding this issue in Alberta?
4. What ecoregion do you live in?
5. What do some of the farms in your area produce?
6. What are some of the topographical features of your area?
7. How are the agricultural products related to the land features?
8. How does the land change as you move out of your area?

North West South East

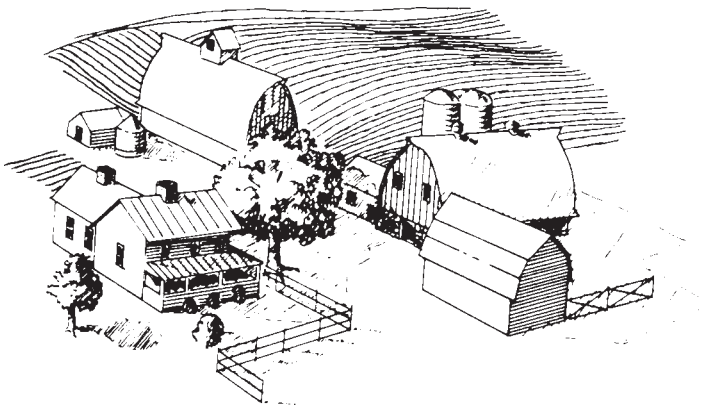
RELATED ACTIVITIES

1. Do a survey of agricultural land use in your area. What fraction of the land is used as pasture?
2. Stage a debate.

The Ranchers **vs.** **The Farmers**
(Grazing) (Cultivation)

OPTIONAL RESOURCE MATERIAL

1. View the film, “The Sun Changers” available from Alberta Agriculture, Food and Rural Development.



Worksheet

How Would You Use This Land?

A

Topography	Gently rolling.
Soil Type	Brown, some alkali.
Native Vegetation	Short grass.
Weather Conditions	Very little precipitation, chinooks in winter, strong winds.

A

Circle what you think would be the **BEST** land use.

Cultivation **Grazing**

B

Topography	Quite flat.
Soil Type	Rich, black.
Native Vegetation	Fescue grass and some aspen trees.
Weather Conditions	Moderate rainfall, light winds, fairly long frost-free season.

B

Circle what you think would be the **BEST** land use.

Cultivation **Grazing**

C

Topography	Hilly terrain with sloughs in the low areas. Many stones on the surface.
Soil Type	Grey wooded.
Native Vegetation	Wooded - aspens and spruce, some meadows. Water plants in the wet areas.
Weather Conditions	Heavy rainfall, moderate winds, medium length frost-free season.

C

Circle what you think would be the **BEST** land use.

Cultivation **Grazing**

Worksheet

Getting to Know Your Region

1. What ecoregion do you live in?

2. Write the general description that is given for your area.

- Climate	- Topography or terrain	- Natural vegetation

3. Look on the soil map to see what kind of soil is common in your area. Write down the characteristics of the soil.

4. How is the land used around your community?

5. Is the land around your area best for grazing or cultivation?

Why?

STUDENT RESOURCE

Fact Sheet --
Factors Related to Agricultural Land Use

There are many factors which determine whether land is more suitable for cultivated crops or grazing.

Factors to consider:

1. Potential yields of cultivated crops - high or low?
   This will determine whether you can operate your farm at a profit.

2. Cost of production. Some things to consider are:
   a) Soil fertility - Will a lot of chemical fertilizer be needed?
   b) Rainfall - Will there be enough moisture to grow crops?
   c) Irrigation potential - Is water available for irrigation?
   d) Rocks - These are a nuisance and should be removed.
   e) Topography - Flat or hilly? Which is better for farming?

3. Land conservation - Forage crops or native vegetation is available for grazing and helps to prevent soil erosion.

<u>Factors Favouring Cultivation</u>

1 - level terrain
2 - good surface and parent soil material
3 - favourable weather conditions (good moisture, long growing season)
4 - extensive areas of land suitable to cultivation (not split by natural barriers)
5 - fertile lands require less fertilization using costly chemical fertilizers

***** A farmer would probably choose to use land with these characteristics for cultivation.

<u>Factors Discouraging Cultivation</u>

1 - hilly uneven terrain
2 - poor soil, alkali soils, stony parent soil material or soils which may erode easily, such as sand
3 - short growing season or too wet or dry conditions
4 - small choppy parcels of good land

***** A farmer would probably choose to use land with these characteristics for grazing.

STUDENT RESOURCE

Key Words

Topography — The physical features of a place or region which are described by words like flat, hilly, and rolling.

Soil Type — Characteristics of soil are described to help classification. Example: texture, colour, composition (sand, silt, clay, humus).

Native Vegetation — Plants that grow naturally in a given area.

Weather — Conditions of the atmosphere including temperature (warm or cold), moisture (wetness or dryness), air movement (calm or windy), and cloud cover (clearness or cloudiness).

Cultivation — Tilling (plowing) of the soil to prepare for seeding and raising crops.

Grazing — To feed livestock on grass or pasture.

Terrain — Surface features of a tract of land.

Ecoregion — A large area which has the same climate, landscape, vegetation, and wildlife. Because of the large size of these areas, they also include a variety of habitats which reflect local conditions.

Climate — The average weather conditions for a place over a period of years.

Urbanization — The development of cities or towns.

Conservation — Planned management for the preservation of natural resources.

STUDENT RESOURCE

Ecoregions of Alberta

Lands in Alberta can be generally classified into ecoregions. These are large areas which have relatively constant conditions such as soil, terrain, and weather patterns. Various combinations of these factors favour certain types of vegetation. Agriculture is dependent on the vegetation which can be produced on any plot of land. Within the ecoregions and even within the space of one mile in any direction, land features can change significantly enough to favour a whole range of vegetation not typical of the larger land mass.

For example, a flat plain, suitable for crop farming, may be intersected by a coulee or creek bed. Thus, the crop land may give way to a region of land which cannot be tilled. Most farmers would utilize this area as pasture land if it is sufficiently large and if water is available for the livestock.

The following pages summarize the characteristics and show locations of the major ecoregions of Alberta.

GRASSLAND

Climate:
Warmest and driest in the province. Cold winter, warm summers, chinooks, high wind velocity. Lack of rainfall limits plant growth at least half the time. Frost-free period is over 90 days (over 100 days in southeast corner).

Topography:
Gently to strongly rolling plains. Some level glacial lake beds.

Soil Type:
Dark Brown and Brown soils.

Natural Vegetation:
Short and mixed grasslands, nearly treeless.

Special features related to Agriculture:
Streambed coulees, badlands.

* Black area indicates Grassland Ecoregion.

Location

STUDENT RESOURCE

PARKLAND

Climate:

Moderate precipitation, temperature and winds. Peace River region - high precipitation, short summers. Foothills region (southwest corner) - strong winds and chinooks. Rainfall is adequate for plant growth. Frost-free period is 75-90 days in Peace River area, over 90 days in rest of region.

Topography:

Variable: level glacial lake beds, rolling hilly areas of hummocky moraine.

Soil Type:

Black and Dark Gray soils.

Natural Vegetation:

Fescue grass and aspen bluffs. Wetlands -marsh and meadow vegetation. Some alkali ponds contain only salt tolerant species.

Special features related to Agriculture:

Sand dunes, plains, and badlands in southern portion of region.

* Black area indicates Parkland Ecoregion.

BOREAL FOREST

Climate:

Variable: short summer, high precipitation, cold winter. Rainfall is adequate for plant growth. Frost-free period is 60-75 days.

Topography:

Broad low plains, discontinuous hills. Land is generally low and poorly drained.

Soil Type:

Gray Wooded soils.

Natural Vegetation:

Mostly forested with poplar, spruce, jack pine in sandy areas. Extensive wetlands contain bogs of peat moss.

* Black area indicates Boreal Forest Ecoregion.

STUDENT RESOURCE

FOOTHILLS

* Black area indicates Foothills Ecoregion.

Climate:

Variable: high precipitation, summers cool, winters moderate. Rainfall is adequate for plant growth. Frost-free period is less than 60 days.

Topography:

Folded bedrock, long wide valleys, steep inclines.

Soil Type:

Gray Wooded soils.

Natural Vegetation:

Forested with mixed woods - extensive stands of Lodgepole pine with limited understory vegetation. Black spruce in wet areas.

MOUNTAINS

Climate:

High wind velocity at higher elevations. High precipitation, much of it in the form of snow. Some chinook action. Frost-free period too short for growing crops (native grasses only).

Topography:

Rugged upthrust bedrock creating high elevations, deep gorges, wide valleys.

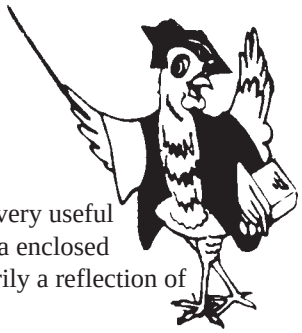
Soil Type:

Gray Wooded soils on lower mountain slopes, bare rock toward peaks.

Natural Vegetation:

- ***Montane areas*** - grasslands, Douglas fir, limber pine.
- ***Sub-alpine*** - Forests of fir and spruce which are stunted at higher elevations.
- ***Alpine*** - Above the tree line. Lush herb meadows.

* Black area indicates Mountain Ecoregion.



Soil Classification

Soils can be identified and classified in a similar manner to plants andanimals. In addition to identifying and describing the various types of soil, it is very useful to map these soils as to their geographic location. On the Soil Group Map of Alberta enclosed with this lesson, soils are classified on the basis of colour of topsoil, which is primarily a reflection of the vegetation and climate prevalent during soil formation.

Brown Soil Group

Brown soils occur in the semi-arid region of southeastern Alberta. Annual precipitation averages about 300 mm (12 in.) and native vegetation is short-grass prairie type. Lack of moisture has resulted in the development of soils with relatively thin profiles and lower levels of organic matter than the Dark Brown and Black soils to the north and west. Lack of rainfall is the main limitation to crop production in this area.

Dark Brown Soil Group

Dark Brown soils are similar to the Brown soils but have a greater accumulation of organic matter. The topsoil is darker coloured and usually thicker than in the Brown soil. Average precipitation is about 350 mm (14 in.). The boundary between the Dark Brown and the Brown soil groups is not sharply defined.

Black Soil Group

The Black soils have formed under grass and parkland. Annual precipitation averages between 375 and 500 mm (15 - 20 in.). The loss of moisture by evaporation from the soil in the Black soil group is generally less than that from soils in the Brown and Dark Brown soil groups. As you go deeper, the blackish coloured topsoil shades through the browns to a lighter coloured parent material. The moisture supply is adequate for abundant vegetation but has not caused excessive leaching. Because of the high organic matter content and higher precipitation in this zone, the productivity of Black soil is quite high.

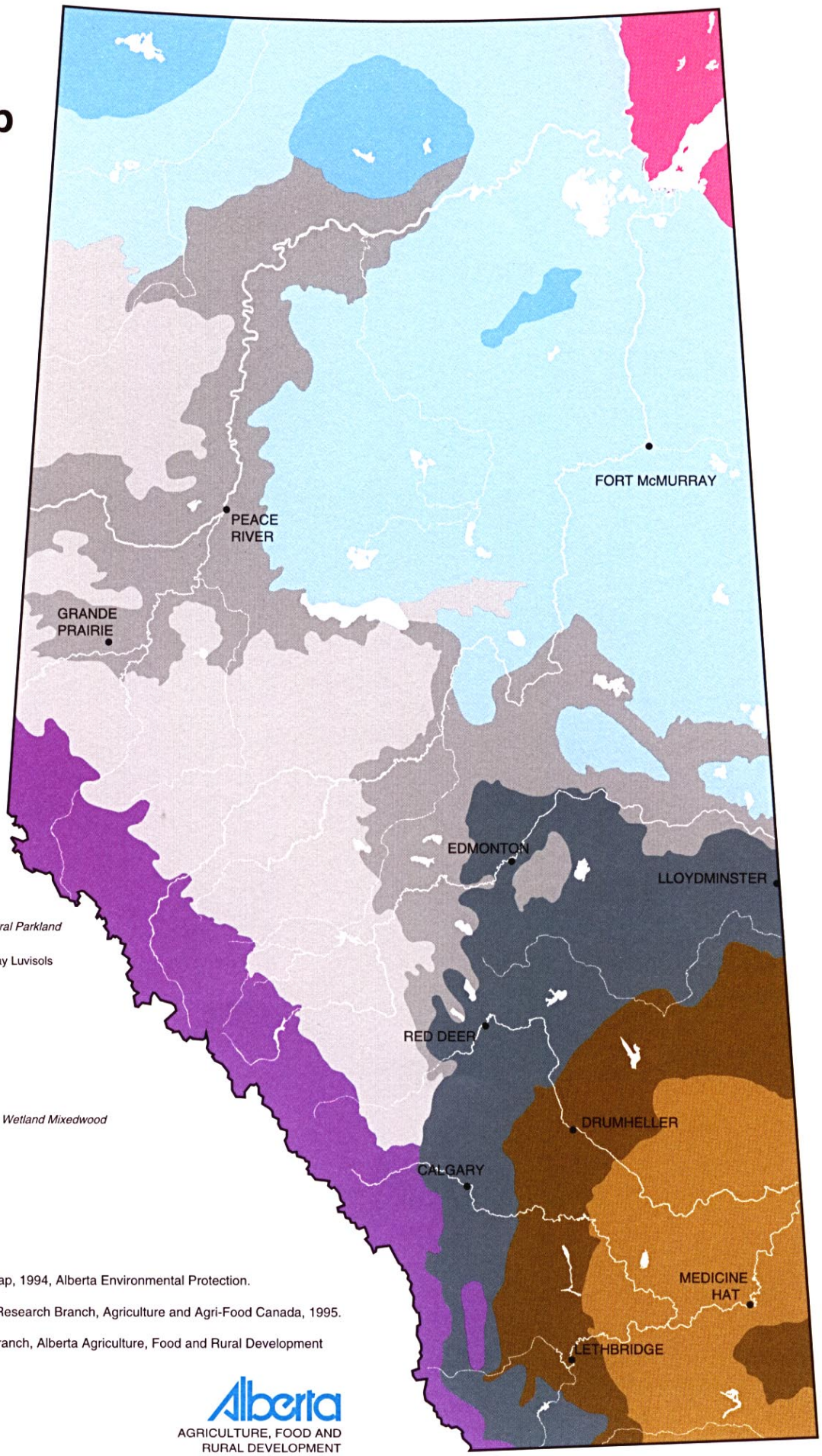
Dark Gray Soil Group

Dark Gray soils occur generally to the west and north of the Black soil group. This soil group represents a transition in climate, vegetation, and resultant soil colour from the Black to the Gray Wooded soil group. During development, these soils have been influenced alternately by grass and tree vegetation. Therefore, soil development has been affected by both calcification and acid leaching soil forming processes. The area is now primarily mixed woodlands, with the evergreens more common in the colder (higher) sections.

Gray Wooded Soil Group

The soil profile in the Gray Wooded (Luvisolic) group can be variable. Except in burnt over areas, a thin layer of partially decomposed acid organic material lies above a deeply leached surface soil ranging in colour from grey-brown to dark grey. This layer, in turn, breaks into a more compact finely textured sub-soil, often darker in colour. Acid leaching has been the dominant soil forming process. Soil microorganisms in this soil group tend to break down plant residues into water soluble forms. So although organic matter is often plentiful at the surface, many of the products of its decomposition are leached downward out of the surface soil. Consequently, the natural fertility of the Gray Wooded soils is relatively low.

Soil Group Map of Alberta



Scale

0 200 km

0 100 mi

1 : 5 million

Soil Groups*
Natural Subregions*

- Brown Chernozemics
  Dry Mixedgrass
- Dark Brown Chernozemics
  Mixedgrass, Northern Fescue
- Black Chernozemics
  Foothills Fescue, Foothills Parkland, Central Parkland
- Dark Gray Chernozemics, Dark Gray - Gray Luvisols
  Dry Mixedwood, Peace River Parkland
- Brunisols, Gray Luvisols
  Montane, Sub-alpine, Alpine
- Gray Luvisols
  Upper and Lower Foothills
- Gray Luvisols, Organics
  Peace River Lowlands, Boreal Highlands, Wetland Mixedwood
- Organic Cryosols, Gray Luvisols
  Sub-arctic
- Brunisols
  Athabasca Plain, Kazan Upland

*Alberta Soil Survey information.

**Natural Regions and Subregions of Alberta Map, 1994, Alberta Environmental Protection.

Map compiled by Alberta Land Resource Unit, Research Branch, Agriculture and Agri-Food Canada, 1995.

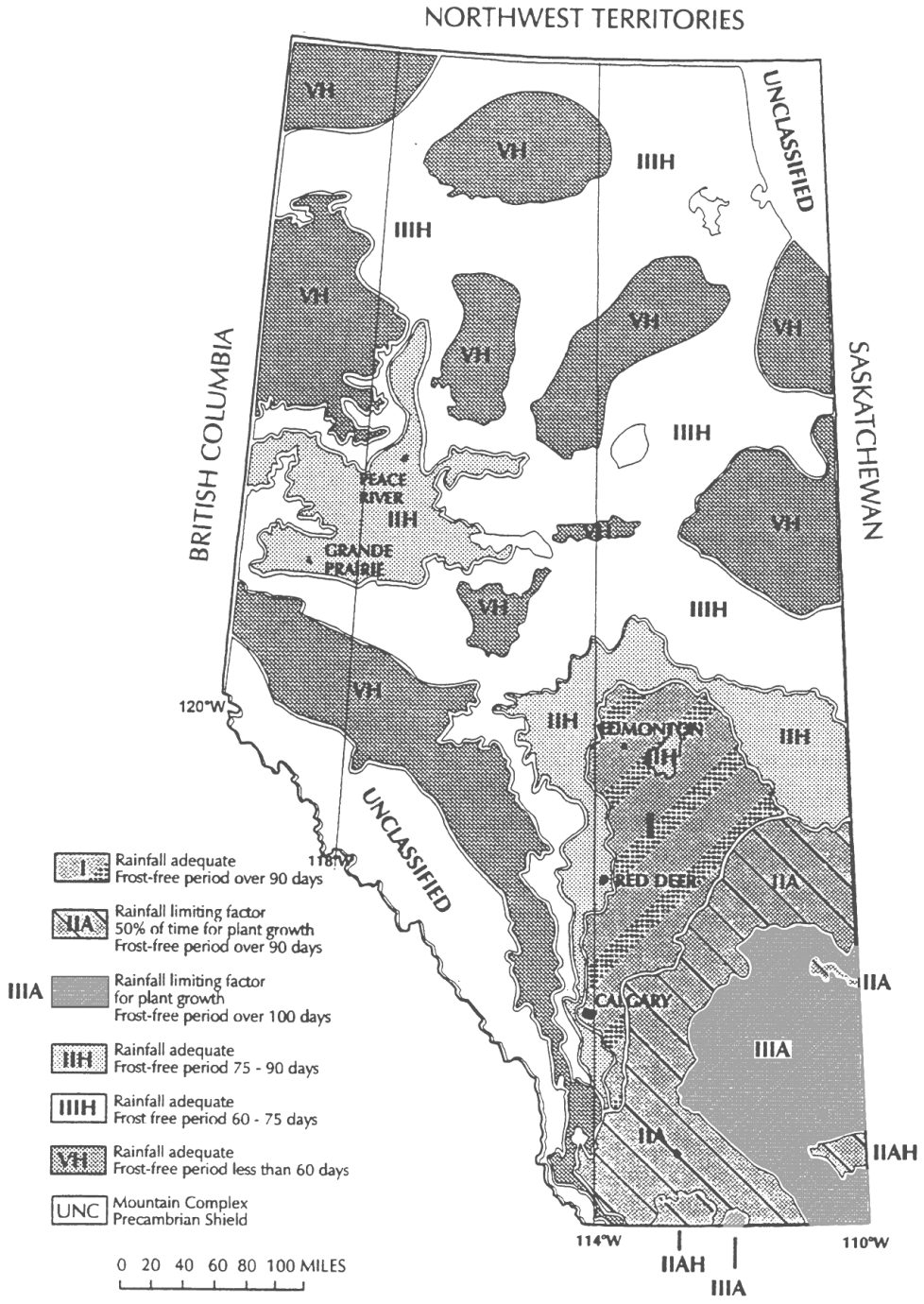
Produced by Conservation and Development Branch, Alberta Agriculture, Food and Rural Development

Agriculture and Agri-Food Canada

Alberta
AGRICULTURE, FOOD AND RURAL DEVELOPMENT

TEACHER RESOURCE

Agro-climatic Areas of Alberta



TEACHER RESOURCE

History of Legislation Affecting Land Use in Alberta

The first instance of assigning land to a particular use in Alberta was the granting in 1670 to the Hudson Bay Company the exclusive right to all the land in western Canada for the purpose of fur trading. Title to these lands was only transferred back to Canada in 1870, after Confederation. The Government of Canada then made grants of land in western Canada to railway companies as an inducement to build the transcontinental railroads, and large areas of the western provinces were made available for colonization under the Homestead Act.

The policy of both the federal and provincial governments after 1905 was to get the land in the West populated as quickly as possible, and little attention was paid to the quality of the land made available. That some of the land was unsuitable became clear when more and more settlers were forced to abandon their homesteads. To prevent future cancellations, a system of agricultural leases was instituted, followed by a system under which land was inspected before it was made available for settlement. Alberta was among the first jurisdictions to establish criteria for land alienation.

In 1905, land ownership in the province of Alberta carried with it most of the rights to use the land as the owner wished. The government retained the right of taxation, mineral rights, and limited rights of eminent domain.

The rapid growth of villages and towns in Alberta made the passing of a planning act necessary to effect orderly development. A brief history of planning in the province is taken from the Land Use Forum Technical Report No. 9:

> "In Alberta, planning legislation began in 1913, and new acts were passed in 1922 and 1928, with zoning beginning in 1929 when the Town Planning Act was passed."
>
> "The crises of the 1930's led to rural land-use planning and during this period the Prairie Farm Rehabilitation Act was passed in 1935, the Special Areas Act of Alberta in 1938, and the Agricultural Service Board Act in 1945. Numerous amendments of the "Town Planning Act" were made in the thirties until a major revision took place in 1942. The radical change, however,
> occurred in the amended act of 1950, when interim development control was introduced, as well as provisions for the formation of District Planning Commissions. Thus a clear recognition was made that land use planning was not something which could be confined within a local municipality, but was rather interrelated with outside areas and development."

From the above, it will be seen that common law, borrowed by Canada from the British, is basic to the development of planning in Alberta. Under common law, land which is owned by individuals may be used only within the constraints laid down by legislation. The owner of the land is considered its custodian and his use of it must not

have a detrimental effect on the surrounding property or the community at large, and is subject to many restrictions. These restrictions may be municipal or provincial in origin. Amongst the provincial legislation which affect agriculture are the following:

The Coal Conservation Act gives authority to the Energy Resources Conservation Board to decide which deposits may be mined. This has special significance for agriculture as large deposits of coal are to be found throughout central Alberta. There is also a coal development policy for Alberta which sets out guidelines for coal development on agricultural land subject to appropriate environmental and reclamation controls.

The Land Surface Conservation and Reclamation Act outlines the terms under which approvals for mining operations are allowed, and designates responsibility for cleaning up after explorations and development, and returning the land to productivity. This is of importance to agriculture in cases where land may be adversely affected by extractive operations.

The Oil and Gas Conservation Act gives the Energy Resources Conservation Board the authority to allow drilling for oil and gas and locating pipelines.

The Surface Rights Act stipulates the conditions which must be met before an exploration or development company may enter private land.

The Irrigation Act sets out the administrative machinery which deals with all aspects of irrigation in the province.

The Water Resources Act gives the Crown authority over the development of all water diversion and storage developments. The Act gives the minister power to make decisions on the location of dams and reservoirs for irrigation, power generation, recreation, etc.

The Public Lands Act regulates planning on public lands. The terms under which Crown lands may be used for pasture would be determined by this act.

In addition to these legislative and regulatory restrictions on development, there is a Local Authorities Board which acts as a quasi-judicial body enabled by legislation to make decisions on such matters as the annexation of a tract of land by a municipality. The municipality might then develop land for urban use. As the annexation of land for purposes of urban expansion, establishing airports, or public institutions, or the location of an industrial complex is often at the expense of agricultural land, or land deemed to have value for recreational purposes, conflicts have arisen. In order to make long-range plans, the province set up a Land Use Forum which, after hearing public opinion, reported in 1977. Subsequently the province passed a new planning act.

In general it can be said that key decisions as to the location of urban or industrial development are taken by the Cabinet, e.g., whether to proceed with an oil sands plant at Fort McMurray, a petrochemical development at Red Deer, or the de-centralizing of a government department. Communities can direct development which such decisions entail, by means of zoning which would be determined by the general plan. Local opinion is solicited and given consideration. Such a general plan must accord with a regional plan. Regional planning is designed to guide development of a number of communities. The regional plan establishes general land use classes for the region and designates the permissible uses and densities within each of these classes.

Since expansion for rural and urban residential purposes is responsible for the removal of most agricultural land from production, the subdivision process is governed by the Planning Act. A proposal for subdivision is put before the appropriate board or commission and it is reviewed to see if it conforms to existing plans for the site, taking all factors into consideration. If approved the plan is endorsed.

Subdivision of land for country residential purposes is restricted on class 1 - 3 land and industrial development is usually directed to class 3 land at best. {See page 2.18 for information on the classes of soils according to the Canada Land Inventory.} The province has also established restricted development areas around cities to provide space for utility lines, etc. In effect this may provide for the continuing use of this land for agricultural purposes.

There is a concern nevertheless at the amounts of land in each Canada Land Inventory class which have been taken out of agricultural production in Edmonton and Calgary.

In addition to losses due to urban expansion, agricultural land may be lost to production as a result of planning decisions which result in highway or freeway construction which facilitate an increase in country residential living along the route.

Within that part of Alberta which is farmed, there are areas more favourable to certain kinds of production than others, e.g., parts of south-central and southwestern Alberta have an advantage in row crop production; however, compared to British Columbia and Ontario, which have unique fruit growing areas, Alberta's crop potential is relatively limited.

Maintaining the productivity of good agricultural land is the responsibility of the provincial government which undertakes the planning necessary to reduce losses due to erosion or increasing salinity in the case of irrigated lands.

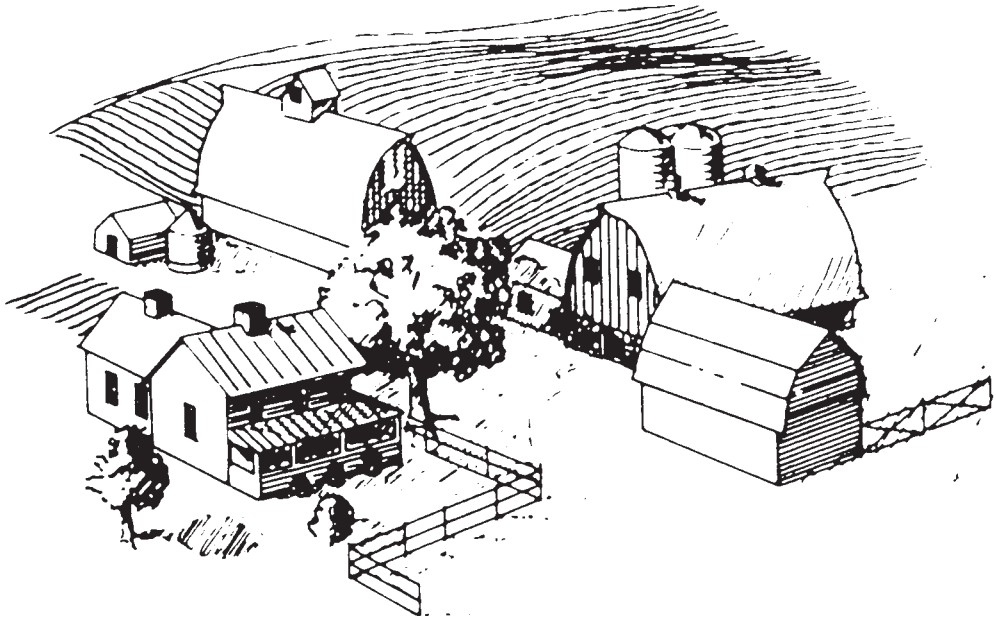
Having farm land available to young beginning farmers has been a concern of many rural organizations. Rising land costs, a significant factor in crop production, present a particular burden to the beginning farmer. In order to limit the competition for farm land from foreign buyers, the provincial government passed legislation in 1977 which restricts ownership of farm land to landed immigrants.

CANADIAN LAND RESOURCES:

A comprehensive inventory of land requirements in Canada is not yet completed. Such an inventory should include data on climate, geology, vegetation, soil, landform, water, wildlife, and current use of the land. The existing Canada Land Inventory rates the land capacity for agriculture, forestry, recreation or wildlife, but it covers only the settled areas of Canada, which are about 20 percent of the Canadian land area. Organic soils are not included, although they do have potential for production of certain crops. An Alberta Land Inventory is being prepared. It will deal with those areas not covered by the Canadian Land Inventory.

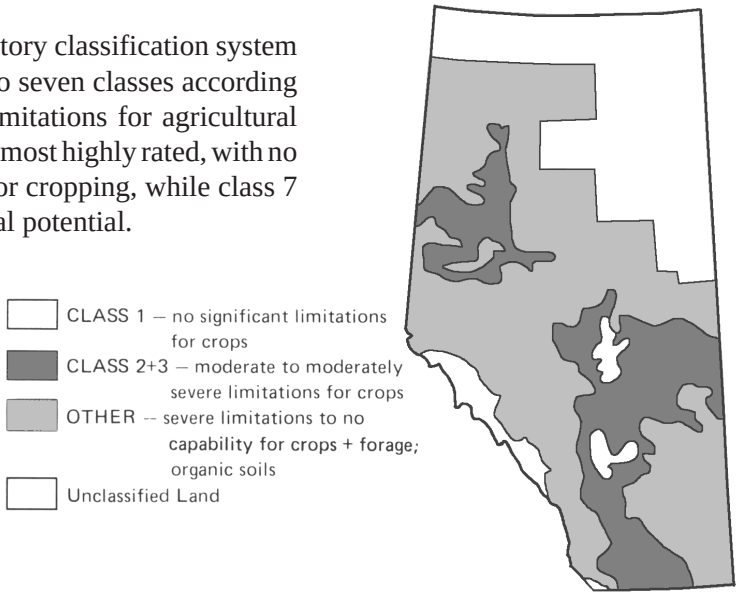
A national system of land evaluation is presently being prepared. According to CLI data, only seven percent of Canada's land is suitable for pasture. Most of the potential new farmland in Canada is in Alberta, but because of climatic factors, it would be only marginal for field crops. Bringing this land into production would be costly and the productivity per unit of energy consumed would be much lower than that of good soils in climatically favourable areas.

(This Land of Alberta - Alberta Agriculture, Food & Rural Development.)



Generalized Soil Capability

The Canada Land Inventory classification system groups mineral soils into seven classes according to their potential and limitations for agricultural use. Class 1 soils are the most highly rated, with no significant limitations for cropping, while class 7 soils have no agricultural potential.



Land Capability (Canada Land Inventory) for Agriculture in Alberta

CLI Class	Million Acres	Million Hectares	Percent of Province
1	2.0	0.8	1.2
2	10.0	4.0	6.1
3	15.9	6.4	9.7
Subtotal 1 - 3	27.9	11.2	17.0
4	24.5	9.8	15.0
Subtotal 1 - 4	52.4	21.0	32.0
Subtotal 5 - 7	49.4	19.8	30.2
Total	101.8	40.8	62.2
Other and Unclassified	61.6	24.6	37.8
Province	163.4	65.4	100.0