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RANGE, ITS NATURE AND USE

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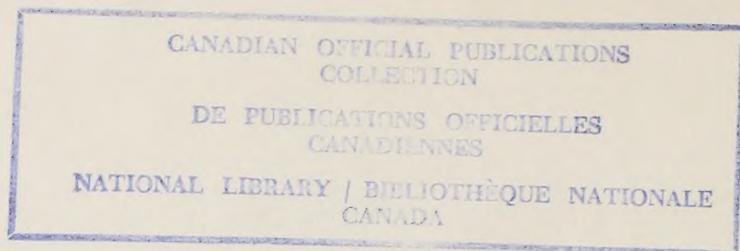
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HON. N. A. WILLMORE, Minister

HON. L. C. HALMRAST, Minister

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FOREWORD

This booklet, published by the Lands Branch, and the Extension Branch of the Alberta Departments of Lands and Forests and Agriculture respectively, was first prepared by the American Society of Range Management. The International Mountain Section of the Society, which has about half of its membership in Alberta has encouraged the revision and publication. The aim of the organization is to foster advancement in the science and art of grazing land management. This booklet is meant to assist in accomplishing the aim by increasing the understanding of the nature and use of grazing lands. The basic principles of range management are stressed. Some plants and situations referred to may not occur in all localities and it will be necessary for each reader to apply it to his own locality.

The editors trust that this booklet will be of use to those in Alberta who have a "steak" in our great grazing lands.

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RANGE, ITS NATURE AND USE

I. RANGE—TO HAVE AND USE

WHAT IS RANGE?

Range is an extensive land area, usually not adapted to cultivation, covered with native grasses and other forage plants best suited for

grazing of domestic and wild animals. Range may be privately or publicly owned, fenced or unfenced, and supporting a native or reseeded vegetation.

DOES IT CONCERN ME?



We All Have a "Steak" in the Range

Yes, each of us has a "steak" in the range, since it is the major source of our meat supply. It is also highly important in wool production, as a source of water, wildlife, and many forms of recreation. It is just as important for the non-user of rangelands to promote its conservation and maintenance for future use, as it is for the person operating and living on the range.

Way Back When

Our range resource is one of the most valuable of our natural resources and has played a major

role in the settlement and prosperity of Western Canada.

No history of the range is complete without a review of the livestock industry, which is a product of the range.

The first cattle and sheep were brought into what is now Western Canada by fur traders of the Hudson Bay Company. These animals came in via Fort Churchill starting around 1700. Because of the unfavorable climate with a long cold winter livestock numbers did not increase very much but by 1812

were present on trading posts in what is now southern Manitoba and eastern Saskatchewan. Fifty years later small numbers of livestock had reached the Edmonton and Calgary areas. Horses had been acquired by the Indians of the northern plains around 1730 and increased rapidly during the following century.

Ranching, as we know it, got its start when Fred Kanouse of Fort Macleod turned 21 cows and a bull loose in the fall of 1877 and picked them up in surprisingly good condition the next spring. These animals, and many of those which followed, were brought in from Montana. The big herds started moving into southern Alberta in the eighties. The Cochrane ranch bought 4,000 head from Poindexter and Orr of Dillon, Montana in 1882 and moved them to the headquarters west of Calgary. Some 3,400 head were brought in by the Oxley ranch about a year later.

Many difficulties had to be faced by these early ranchers including drought, falling prices, and disease. The severe winters of 1886-87 and 1906-07 were particularly hard on the range herds. Forty per cent of the cattle on the range perished during each of the two periods—a harsh lesson, but one which taught the cattleman a lot about the importance of feed reserves.

The period 1900-25 was one of rapid settlement during which much land, suited only for grazing, was broken for grain production. Some of this land was abandoned soon after it was plowed up but abandon-

ment did not become general until the dry years of the thirties. During this period native pastures were overgrazed, and became seriously depleted and covered with weeds. Feed shortages made it necessary to sell off much of the livestock and the outlook was bleak, indeed.

With better moisture, extensive reseeding of abandoned lands was undertaken. Submarginal lands were taken out of grain production and converted to community pastures. Fewer livestock for a time meant that the range had a chance to rest and the better plants to increase. This has all been of lasting benefit to the livestock industry.

At present land uses other than livestock production are becoming important in the range areas. The lumbering industry is a factor in some localities. Recreational use and the production of water are becoming more and more important as the population increases and irrigated acreages are extended. Industrial development and reservations of various sorts are cutting into the range area.

The many uses of range have come into a high degree of competition due to the increase in population. People have more leisure time for recreation. Water for irrigation, home use, industry, and power is far more important now. At the same time there is greater demand for meat and other animal products. These things have brought about the need for a closer look at our range resources. The private stockman, as well as the

public at large, has a real opportunity to plan co-operatively for range use.

The poor condition of some of our ranges has contributed to flooding. Much valuable water and soil has been lost. While these factors are serious, there is much to be optimistic about. Many ranchers know how to take care of their range—and do take care of it. Government agencies have managed to keep most of the Crown rangeland in good, healthy condition.

Many thousands of acres of private rangeland are being reseeded. Native meadows and irrigated pastures are being made to produce two to three times more hay.

Yes, we all have a “steak” in our range resource. It is becoming nationally recognized. The livestock grower is likewise aware of his position and now has the knowledge and desire to do something about it.

How Much Range Do We have?

The Province of Alberta is 255,285 square miles or 163,382,400 acres in extent. Of this area 6,457 square miles or 4,132,480 acres are fresh water. The amount of land considered suitable for agricultural purposes is estimated at 68 million acres, with 30 million acres classed as good to fair arable and 10 million acres as fair to poor arable. The grazing lands of the Province are largely confined to the latter class with about 4 million acres of Crown land held under long-term grazing lease and grazing permit. This does not include grazing lands within the forest reserves where some 25,000

head of cattle are grazed during the summer months.

The largest blocks of grazing land are located in the dry treeless plains of the south and eastern portions of the Province. This area of grazing land is considered to be part of the Great Plains Area extending through North America from the Gulf of Mexico into the so-called Prairie Provinces of Western Canada. The value of these lands for grazing was recognized prior to the Palliser Expedition of 1857 and they have been grazed since and are increasing in demand with the increasing population.

At the present time, the only Crown grazing land available for leasing are several million acres of poplar and willow covered land in the more northerly portions of the Province. In its native condition this land is not very productive, so that clearing, breaking, and seeding of introduced forage crops is necessary to increase productivity for the economic maintenance of livestock. Clearing and breaking can be expensive with figures at \$30 or more per acre plus the additional cost of seed and seeding operations. It should be realized too, that in Northern Alberta, summers are short making it necessary to provide for a possible winter feeding period of seven months.

Anyone desiring to commence ranching in the grassland regions of Alberta at the present time would of necessity be required to purchase deeded land or secure the transfer of Crown lands held under long-term lease or permit.

WHAT ARE THE OPPORTUNITIES IN RANGE MANAGEMENT?

The day has passed when a man could take a horse, rope, and a branding iron and start in the livestock ranching business. In spite of the large amount of capital required to get to be a ranch owner-operator, such an objective can still be accomplished. First step is to get prepared—increase your knowledge and experience.

II. WHAT IS RANGE MANAGEMENT?

Range management is the care and use of rangeland to get the highest continuous yield of animal products without endangering the range soil and water resources and other important uses of the land. This is in keeping with conservation of the range. Animal products of the range are meat, wool and hides. Other important range products are water, wildlife and recreation.

For those young men who are primarily interested in a profession which takes them out of doors much of the time; who like to work with natural subjects, the field of range management and its related fields offer the most satisfying opportunities. There are those in plant and animal research, wildlife research, recreational research, and the various technical and educational services in the Provinces and with other government agencies.

Have you noticed when stockmen sell their products, they are paid for the **pounds** and not for the number of head sold? Pounds of products is the measure of a range management plan.

The goals of range management are:

1. Keep our range covered with good forage plants.
2. Maintain a range feed reserve.



It's pounds that count.

3. Increase livestock and wildlife products.
4. Increase the water-holding capacity and even out the flow of water from the range.
5. Control soil erosion on the range watersheds.

You can keep the range healthy and productive by knowing the plants and animals that live there and how to properly manage them. The plants and animals live together as a "community". Cattle, sheep, deer, antelope and other animals

III. KNOW YOUR RANGE

To be a successful range manager, you need to know a great deal about the range. The things that make up the range are soils, water and plants. A practical knowledge of each is essential for knowing your range.

Range Site

A part of a range area with similar soil, slope and moisture is called a range "site". These factors help determine the kind of plants that grow on a given range site.

THE SOIL

There are many kinds of soils, differing in depth, slope and texture. These are called physical features. Let's consider **soil depths**. Soil depth is the amount of soil above the parent material. It takes millions of years for bare rock to be turned into rich, fertile soil that will support plants and animals. Soil is made in layers, with the dark topsoil the most important to the range manager. It takes about 500 years to build one inch of soil

that feed upon range plants make up the animal community.

If we are going to keep our range cover, wildlife and livestock on a continuous basis, then, grazing animal equivalents have to be considered. If we increase one kind of stock on a range, we may need to reduce another kind to keep within the stocking rate of the pasture. "Animal equivalents" listed in Section IV are useful in adjusting animal number on range.

from bedrock. When the topsoil is bare of plants, water and wind erosion take place. The washing and blowing wastes the fertile topsoil.

Texture is the size of the various soil particles within each soil layer. Bedrock first breaks down into large rocks, then into gravel pebbles. As weathering takes place, the gravel is broken up into smaller particles until we have a fine textured soil. Usually, the richer the soil, the finer the texture. Soil particles have the following names based upon their size: gravel, sand, silt and clay.

Usually our soils are a mixture of the different sized soil particles. The name given the soil is based on the size particle most abundant. For example, a very fine sandy loam would mean that the texture was made up mostly of very fine sand particles with some silt and clay particles. The soil particles are grouped together like "grains" of a popcorn ball. Texture sometimes can be determined by "feel-

ing" the soil. The color of the soil is also used in classifying soil.

Slope of Soil

The slopes of land are extremely variable from slightly rolling to steep hills and mountains. The slopes usually make a difference in the type of range plants that can grow on the soil. Soils on southern slopes usually warm up sooner than soils on northern slopes. Also, different kinds of plants grow on each slope. Generally, the steeper the slope, the more rapidly erosion may occur. Steeper slopes have thinner soil.

Plant Matter

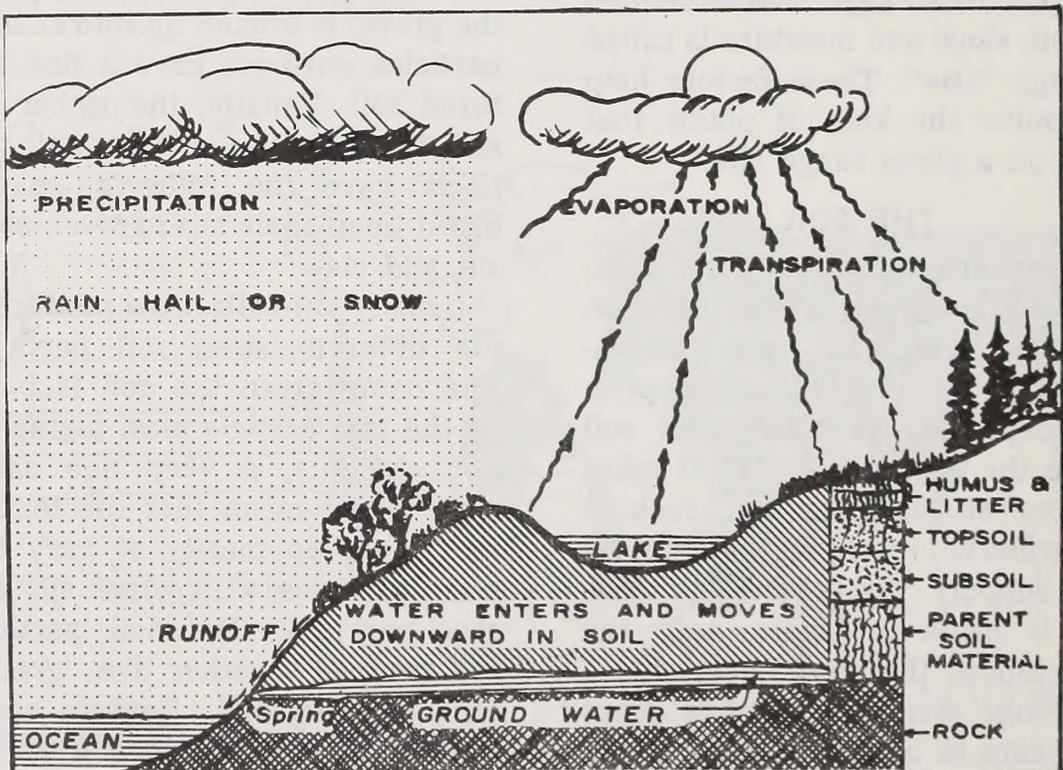
Range plants may become a part of the range soils. Leaves dry and drop to the soil, protecting the surface. Roots die and furnish food for millions of little living plants and animals called soil organisms. These organisms are constantly

breaking the coarse soil particles down into a form which range plants can use. The more organisms in the topsoil, usually, the better will be the grasses on our range.

The soils of most of Alberta have been surveyed and are described in bulletins. You may obtain one for your locality through your district agriculturist.

To keep the range soils productive for years to come, we have to return something to the soil to keep it fertile. At the end of the grazing season, some dry vegetation should be left on the range. This is known as carry over and should be 45 to 50 per cent of the current year's growth.

This remaining vegetation also helps reduce erosion and increase water penetration. When grazing animals remove too much of the vegetation, expensive soil conserva-



tion practices such as terraces, pitting, furrows, dams and reseeding native grasses are needed to hold the soils in place.

Water For Plants

Water is the factor which most commonly limits production on rangeland. Water is needed by plants for growth. When range plants receive enough water, they grow rapidly, producing plenty of forage for animals. When there is a shortage of water, all plant and animal life suffers.

Have you heard about the natural water cycle? It begins at the ocean, goes to the sky, to the land and back to the ocean.

Water evaporates from the surface of the ocean into the atmosphere as moisture. The moisture is lifted by air currents. Clouds form, causing precipitation to fall back to the earth as rain or snow.

We are most interested in receiving and holding rain and snow on the range. As rain falls or snow melts part of it goes into the soil and part runs off. Of the part that enters the soil some is used up by plants or evaporates but some moves through the soil and comes out as springs to replenish the streams. Water that runs off too fast may carry the valuable top soil with it as well as leaving the range plants without moisture.

Let's compare a raindrop that hits the bare soil with one that falls on grass. The downward racing raindrop smashes against the bare soil with great force, packing the surface soil together. Little of the

water goes into the soil. On the other hand, when a raindrop hits a range plant, its force is broken and it trickles into the soil.

Range plants, particularly grasses, are the better type of plants for catching and holding moisture on the range. Tall, deep-rooted grasses can best "manage" the moisture that falls on the range.

Nature "fits" the plants to the range. Grasses have deep root systems. A part of the grass root system dies each year and the dead part is replaced by new roots. When the root dies, it leaves a small channel for water to run into the soil. Also, the dead root furnishes food for soil organisms.

If there is not enough underground food for soil organisms, many die. This changes the soil and plant relationship.

PLANTS

As a range manager, you will need to know range plants by their standard common names. Plants tell you what kind of range you have. Each plant helps to tell the story. The presence or absence of certain plants on the range tells how the range has been used and what should be done to improve or to maintain it.

There are hundreds of different plants found on a range. You do not need to know all the plants. You only need to know the most important ones which furnish the most livestock forage. As a general rule, there will be about 15 to 30 plants in any one range area that will be of outstanding importance.

You need to know all details of managing them so they can be made to produce the most livestock and livestock products. Plants have different life spans.

Annual plants live only one season. They do not come up a second year from roots or crown.

Biennial plants live two years.

Perennial plants live over from year to year, producing leaves and stems for more than two years from the same crown.

Plants may not all have the same origin. Not all are native. Some are introduced. Also, they grow by the seasons.

Native plants are those which have not been introduced from outside North America.

Introduced plants are those which have been brought in from outside North America.

Cool season plants make their principal growth during the cool weather in the spring and late fall.

Warm season plants generally make their principal growth during the frost-free period and develop seed in the summer or early fall. They wait for warm weather.

Kind of Plants

Plants on the range are so numerous and so different in their forms and growth habits that they should be grouped for convenience. There are four main kinds of plants: Grasses, grasslike plants, forbs and shrubs.

Following is a description of the four kinds of common range plants:

Grasses. Plants with jointed

stems. Stems are generally hollow. Leaves are in two rows on the stem. Veins in the leaves are parallel. These are "true grasses" and the most important kind of range plants. Examples are:

Western wheatgrass (perennial with creeping underground stems or rhizomes)

Rough fescue (perennial bunchgrass)

Cheatgrass brome (an annual grass).

Grasslike Plants. These look like grasses but have solid (not hollow) stems which are often triangular and have no joints. Veins are parallel in the leaves. These are sedges and rushes. Examples are:

Threadleaf sedge (black fibrous roots)

Baltic rush (creeping rhizomes).

Forbs. A forb is a non-grasslike plant with annual stems (tops) and net-like veins in the leaves (weeds and range flowers). We use the term "forb" instead of "weed" because weeds are usually thought of as pests. Many of this group of plants on range are not pests for they are valuable as forage especially for sheep. Broadleafed herbs are forbs. Examples are:

Yarrow (has perennial creeping rhizomes)

Lupine (has perennial roots)

Golden Aster (yellow flowered).

Shrubs. A shrub is a woody plant with stems which live over the winter and branch from near the base. (A tree is like the shrub in growth form but has a definite trunk with branches well above the ground.)

Examples of shrubs are:

Shrubby cinquefoil

Hoary sage bush.

There are many individual plants within each group and, although you do not need to know all of them, the names of the important ones should be known.

The botanist uses a plant key to identify each one but most people have trouble using one. For most of you it will be more practical to take the plants to a range technician, teacher or district agriculturist. Some books with good pictures can be obtained.

The drawings on the next two pages will help to recognize the four groups of plants and to understand what you hear and read about grasses.

HOW PLANTS LIVE AND PRODUCE

Range plants are living organisms which require food, air, water and light to live and grow. If any one of these elements is cut off, the range plant will die. Most of all our range plants produce seed each year which may sprout and grow into mature plants.

A green grass plant is nature's automatically powered food factory. For power, it uses energy from the sun. Water, air and minerals are the raw materials used in its manufacturing. Some finished products are sugar (an energy food) and protein (needed for growth). Its waste products are oxygen, carbon dioxide and water. Let's follow, step by step, the elements used by the world's greatest and most valuable plant, "grass".

Water

Water makes up about 70 to 90 per cent of the weight of green grass and from 8 to 25 per cent of dry grass. Some of it is used directly by the plant to "keep cool". Much of the water serves as a food and mineral carrier within the plant's body.

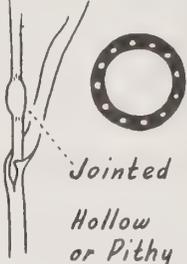
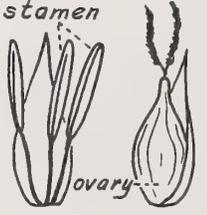
Most of the water is absorbed through the roots, although a small amount is taken in by the leaves. The young, tender leaves contain more water and nutrients than any other part of the plant. Grasses, like other plants, need large amounts of water to produce a pound of dry forage. In the semi-arid areas, range grasses need from 300 to 1,000 pounds of water to produce one pound of dry forage, while shrubs and trees need 1,700 to 2,400 pounds to produce a pound of twigs, bark and leaves.

Air

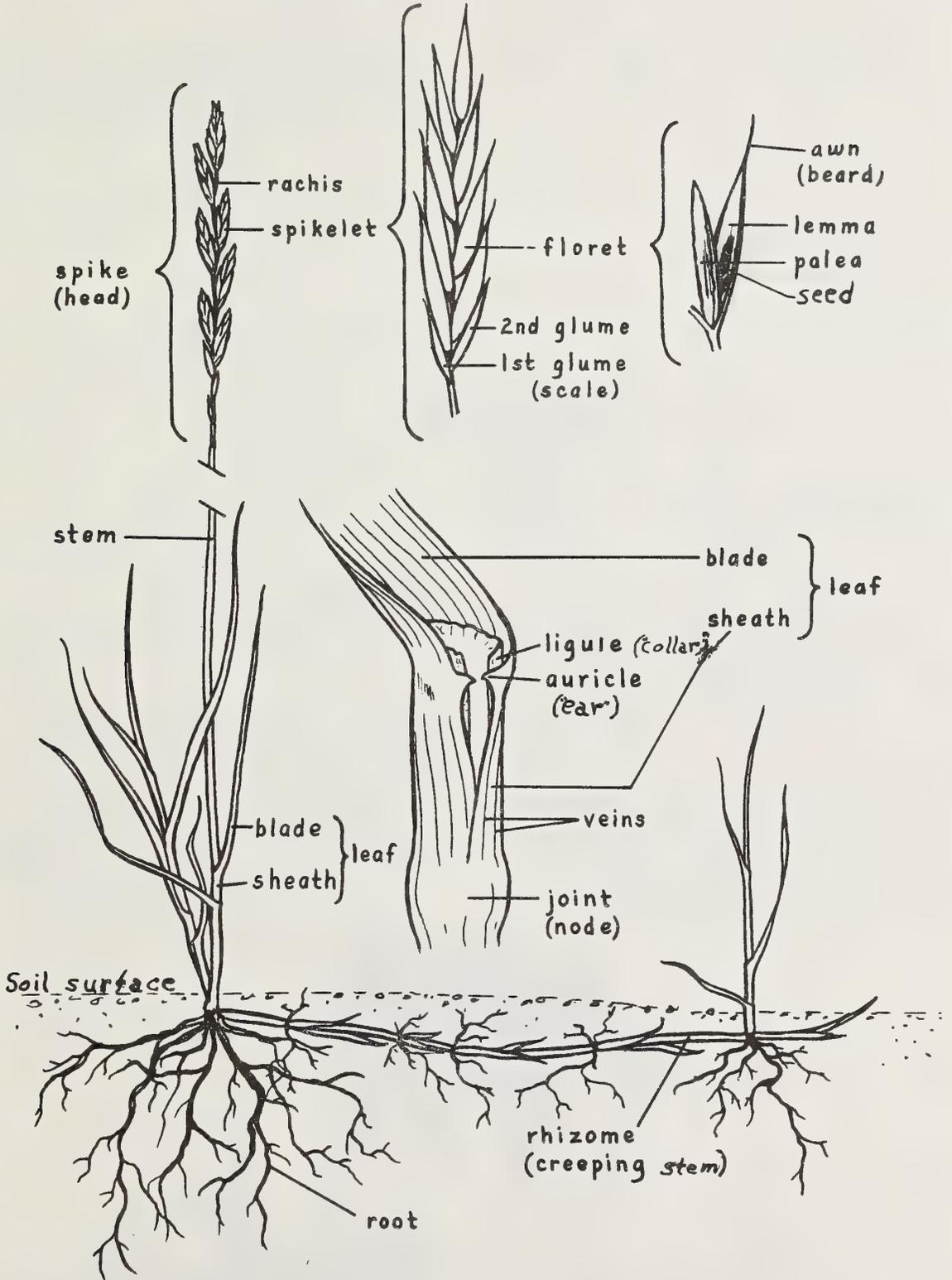
Carbon dioxide taken from the air is the next most important element needed for grass growth. The plant breathes the carbon dioxide through stomata (microscopic pores) on the under side of the grass leaves.

Inside the plant cells, the carbon dioxide, together with other raw materials, is made into starches, sugars, fats and protein that animals need. When the plant is full grown and green it manufactures more food and building material than it needs and this is stored in the stems, crowns, and roots, to carry the plant over winter and for re-growth the next spring.

IMPORTANT RANGE PLANT GROUPS

	<u>GRASSES</u>	<u>GRASSLIKE</u>		<u>FORBS</u>	<u>SHRUBS</u>
		Sedges	Rushes		
S T E M S	 <p style="text-align: center;"><i>Jointed</i> <i>Hollow</i> <i>or Pithy</i></p>	 <p style="text-align: center;"><i>Solid</i> <i>Not Jointed</i></p>	 <p style="text-align: center;"><i>Solid</i></p>	 <p style="text-align: center;"><i>Solid</i></p>	 <p style="text-align: center;"><i>growth rings</i> <i>Solid</i></p>
L E A V E S	 <p style="text-align: center;"><i>Parallel Veins</i></p>			 <p style="text-align: center;"><i>"Veins" are netlike</i></p>	
	 <p style="text-align: center;"><i>Leaves on</i> <i>2 sides of stem</i></p>	 <p style="text-align: center;"><i>Leaves on</i> <i>3 sides of stem</i></p>	 <p style="text-align: center;"><i>Leaves on 2 sides</i> <i>of stem; rounded</i></p>		
F L O W E R S	 <p style="text-align: center;"><i>(floret)</i></p>	 <p style="text-align: center;"><i>stamen</i> <i>ovary</i> <i>male female</i> <i>(may be combined)</i></p>		 <p style="text-align: center;"><i>Usually showy</i></p>	
E X A M P L E	 <p style="text-align: center;"><i>Western Wheatgrass</i></p>	 <p style="text-align: center;"><i>Threadleaf Sedge</i></p>	 <p style="text-align: center;"><i>Wire Rush</i></p>	 <p style="text-align: center;"><i>Yarrow</i></p>	 <p style="text-align: center;"><i>Big Sagebrush</i> <i>(twig)</i></p>

PARTS of GRASS PLANTS



Nitrogen is another element taken from the air. While in the air, nitrogen is in a free state and cannot be used by grass plants until it is combined with other elements. Most of the nitrogen for plants comes from the soil.

Minerals

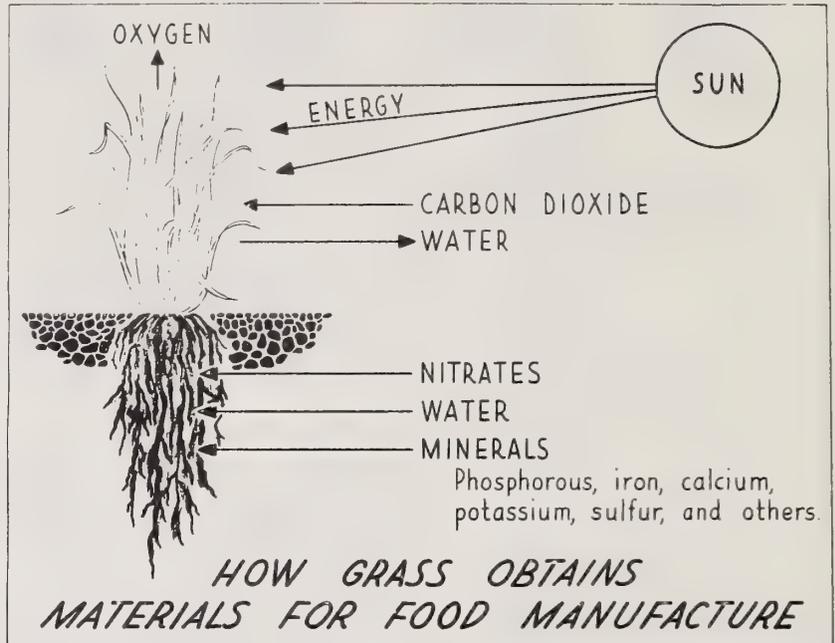
As many as 36 minerals have been found in plants. It is not known if all 36 are required for grass growth, but it is known that 10 of the important essential minerals are used. These are calcium, nitrogen, phosphorus, potassium, iron, sulphur, magnesium, silicon, manganese, aluminum and chlorine. Each of these minerals has a definite place in the life cycle of a grass plant.

Remember now, the green tops or herbage of plants are the manufacturing machinery. This is where the food is manufactured and the

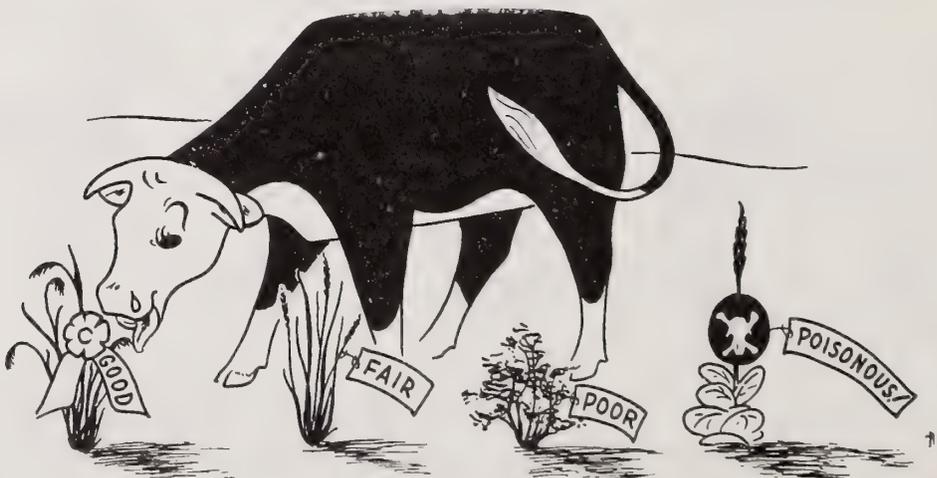
building materials for the roots and tops are made. If the tops of the plants are eaten off it cannot manufacture food.

Collecting Range Plants

Collecting, mounting and naming



them is the best way to learn plants. This is an excellent project for a 4H Club or a person who wishes to become proficient in range management. The 4H Club leader, teacher or range technician can show you how to make a collection.



Forage Values

Forage values for each species can be determined on the basis of palatability (how well they are liked by livestock), nutritive content and dependability as a forage supply. This is a relative factor which may vary, depending upon the kind of livestock using the plants, the soil fertility and the season. Forage value classes are GOOD, FAIR, and POOR.

Cattle, especially, like to graze grass that is high enough that they can "wrap their tongues around it" and get a big bite. Early in the spring, the taller grasses are soft and the livestock like them. Cattle can fill up quickly if they have taller growing grasses to graze. If they are forced to eat the short grasses, they get less to eat and gain less. Cattle also eat some forbs and shrubs.

Sheep are browsers. They like fine grasses, forbs and shrubs. Sheep like forbs and shrubs better than cattle do. By knowing the kinds of plants on your range, you will know what kind of livestock to run on it.

Poisonous and Injurious Plants

Poisonous range plants that kill livestock often reduce ranchers' income. Diseases and other troubles

of livestock are often caused by poisonous plants. Some range plants are poisonous only at certain stages of growth and seasons, while at other times they provide good forage. A knowledge of these plants is essential to the rancher.

The following plants have been known to cause death on Alberta pastures and ranges.

1. Tall larkspur—tall plants (3-6 ft.) with showy spikes of blue spurred flowers found in the foothills, mountains and northern forests—sheep rarely affected but very poisonous to cattle.
2. Low larkspur — 6 inches to 2 feet tall with showy dark blue spurred flowers — found in Cypress Hills, Milk River ridge, foothills and high prairie country — less poisonous than tall larkspur.
3. Death camas — leaves and bulb similar to onion but with cluster of cream-colored flowers — draws, moist hillsides and edges of grassy sloughs throughout foothills and prairies — poisonous to both sheep and cattle.
4. Arrowgrass — looks like grass but has spongy leaves which are round on one side — wet saline soils and marshes throughout the prairies. Poisoning is caused by hydrocyanic acid and it acts very fast but death seldom occurs unless animal has eaten considerable.
5. Water hemlock — often confused with water parsnip but can be identified by cross partitions in hollow stem base — springs and fresh marshes — poisonous to cattle and sheep.

Here are some aids in preventing stock poisoning:

1. Know poisonous plants and know their characteristics.
2. Do not overuse the range forage. Most poisonous plants are shunned by well-fed grazing ani-



mals. Overuse often kills good forage plants, but promotes poisonous plants.

3. Graze only in the proper season. Poisonous plants develop earlier than nutritious forage plants. Too early grazing use may result in poisoning. It is also sometimes possible to prevent poisoning by grazing before periods of toxicity or by delaying use until after poisonous plants are no longer dangerous.
4. Be careful with **hungry** animals. They are more likely to graze poisonous plants during trailing, bedding or after long truck hauls. Poison-free feed should be supplied before hungry animals are turned out on ranges where there are poisonous plants.
5. Provide ample salt and supplement any minerals known to be deficient in the native forage. Animals sometimes eat poisonous plants which they will not graze if they have the right kind of minerals.
6. If possible, use a class of stock not poisoned by the plant present. Cattle can sometimes safely graze ranges containing plants which would prevent sheep use, and vice versa.

There are many range plants that are mechanically injurious to animals at various times of the year. The cactus family causes injury to grazing animals when the spines stick to the skin. Needlegrasses injure sheep when the seed is mature and begins to shed. Once the needlegrass seed gets a hold in the wool it continues to work through the skin. This damages the flesh for edible food and makes the hide useless for leather. At all other times the needlegrasses furnish

good quality forage to grazing animals.

PLANT COMMUNITIES

Plants of various kinds "group" into separate but related communities somewhat as people do. You have seen how the mixture of plants on a north slope differ from those on a south slope. They are two plant communities. Either community might change.

Plant Community Change

The plant community is never stable but is always changing for better or worse. Let us consider one of the best, a tall grass community, and see what changes take place during long drouth and continued heavy use.

Tall grasses are usually deeper rooted and require more water to live than the short grasses. They will keep the short grasses out. During a long drouth and heavy grazing, the short grasses are "better off" because they escape grazing. The tall grasses are weakened by heavy grazing. Part of the plant dies. That leaves an opening for more short grasses to move in. If drouth and heavy use continue, the short grass is in turn replaced by forbs and unpalatable shrubs. The better, hard working range plants are thus replaced by lazy, "gold-bricking" plants that produce little livestock feed. Such poor condition range is a poor home for grazing animals.

The grass community is a desirable community to have on range. Grasses are good conservers of water and soil. Grasses are good

forage producers. A few short grasses mixed in with tall grasses are what "Mother Nature" puts on prairie range — if she is not "disturbed" Top condition range, or

climax range, is range where there is a natural set of plants that are balanced with environment. It is the most "healthy" range.

If a plant is grazed and then



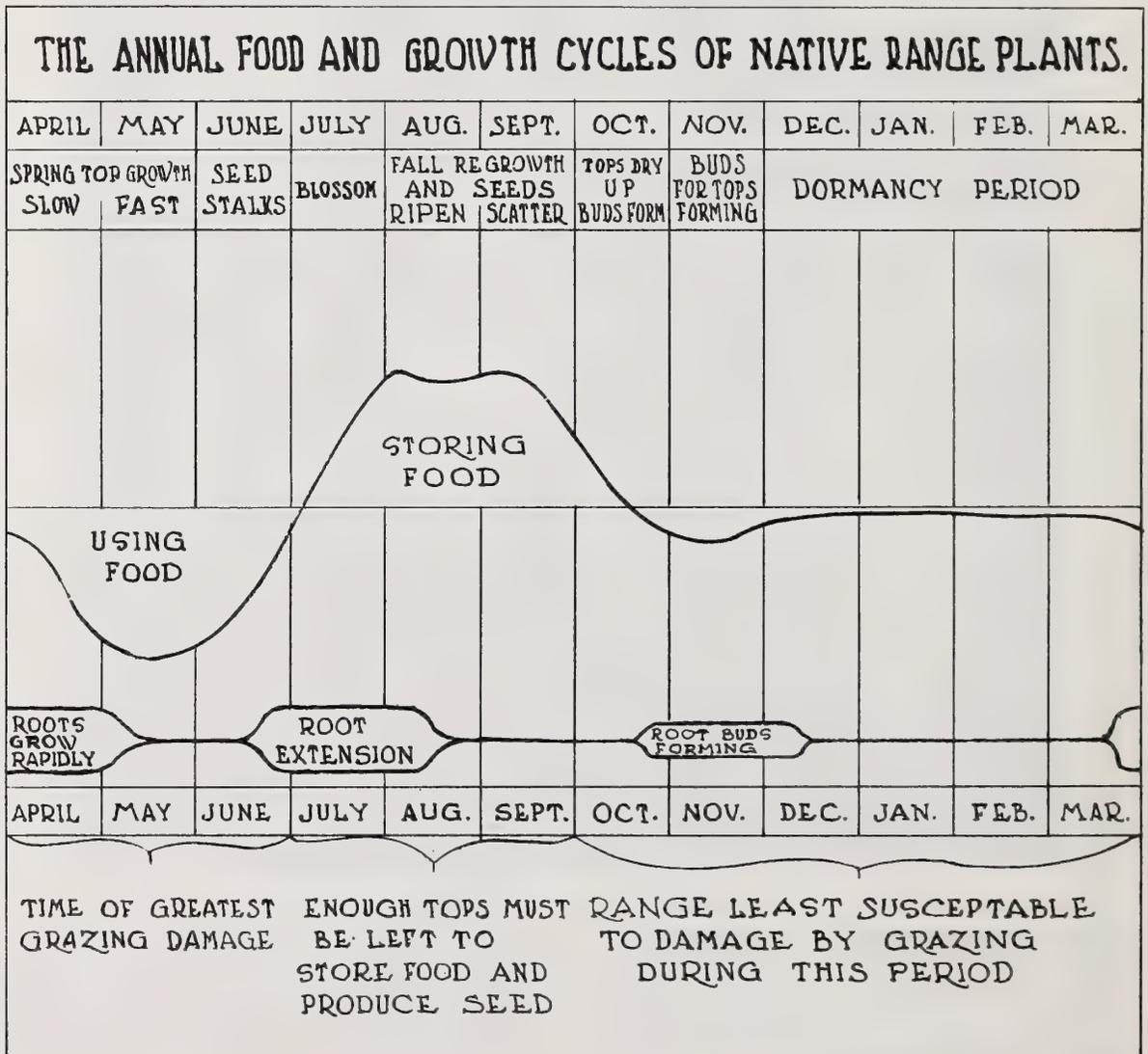
Fat Grass — Thin Grass

The above plants were grown from sod pieces cut from three adjoining pastures — same kind of grass, same soil, but grazed differently. In six weeks the lightly grazed plant at the left had produced 16 times as much top and 14 times as much root as the heavily grazed one at the right. The moderately grazed plant in the center produced 6 times as much top and 5 times as much root. Moderate grazing usually pays off the best. Overgrazing never pays.

allowed to make top growth again, it won't be seriously hurt. But if the shoots are **kept grazed** close to the surface of the ground, the plant suffers. Where the shoots are **kept down, the roots are shortened**. This makes the grass plant less able to compete for moisture and nutrients with the thrifty, ungrazed, non-palatable plants around it.

If all plants are grazed to the same height, the short ones also will have the advantage over the tall ones. Let's look at a tall and a short grass growing side by side. Now,

if these were grazed down to the same height, say 2 inches, what fraction of the tops of each would be lost to the plant? In the case of short grass, grazing it to the height of 2 inches would remove only one-fourth of its top. However, in the case of tall grass, the 2-inch grazing height would result in over three-fourths of the top growth being removed. It is easy to see that the tall grass would be crowded out because its food-making machinery is reduced too much to work well. The tall plants become weak and



may even die out. Usually, less palatable plants, or shorter ones, take their place.

To have good range management, enough of the shoots should be left each year so that the grass can manufacture food for the plant's use and build materials to make strong roots. Food is stored in the roots for early growth next spring, but only after the grass plant makes a seed head.

HOW DOES TOP CONDITION COME ABOUT?

It takes thousands of years for fertile soil and a productive grass community to develop. When the plant cover is such that it makes the best use of the soil nutrients, the soil moisture and the sun's energy, it is called the "climax" plant community. The climax is the best or highest form that nature can produce. In the foothills, a stand of rough fescue with a mixture of shorter species, a few forbs and a very few shrubs make up a "climax" stand. Range in "top" condition is in the climax or near climax stage. Overgrazing causes it to deteriorate into a "sub-climax" stand.

READING THE STORY ON RANGE

Every person thinks of the same thing when he sees the different **colors of traffic signals**. Everybody thinks the same thing when they see the green light, the yellow light, and the red light.

Now, let us apply these same colors and their meanings, to range plants. We shall call them the "green group", the "yellow group", and the "red group".

The Green Group plants are the most desirable ones. They are the plants that livestock like best. They are usually the most tender plants. When you see the green group plants in abundance in the range you know that your grazing program is going well. The green group plants which are plentiful in "climax" range are the first ones to **decrease** as grazing becomes too heavy. You find less of these as you go from "excellent" range down to "poor" range. Range in the poorest condition has very few green group plants in it.

The Yellow Group plants are also native plants that are in "climax" range, but are less attractive to livestock. Many are short stemmed. They escape grazing because they are short, or, because they are less tasty to livestock. Yellow group plants are the ones to watch with "caution". They **increase** in numbers as grazing becomes heavy. They replace the green group plants when they are weakened by overgrazing.

The manager uses caution when he sees the number of yellow group plants changing in his range. He is safe if they are decreasing **and** the green group plants are increasing. That means that the range is improving. If the yellow group plants begin to weaken and die out, the operator carefully checks his grazing program to see what needs to be done to strengthen yellow and green plants.

The Red Group plants really don't need any explanation. They simply mean "DANGER" in the range, so

far as production is concerned. These plants usually have come in from other areas and occupy the range as **invaders**. Invader plants seldom, if ever, take as good care of the soil and water resources as the native plants do. Soil and water losses cause nature's plant and soil

development process to go in reverse. The range becomes less healthy and less productive.

We need to learn to judge range health and know how to keep range healthy. (See Section IV.) (See appendix, list of green, yellow and red group plants.)

IV. JUDGING RANGE CONDITION AND PROPER STOCKING RATES

Range condition is range "health". We judge range condition by the amount of native climax plants that are on that range. The greater the proportion of forage furnished by the climax grasses and other plants, the better the range condition.

By knowing range condition classes you will know how to manage your range better. Range condition tells what has taken place in the past.

All range sites are not in the same condition, so we separate them into classes. Standard classes are: **excellent**, **good**, **fair** and **poor** condition.

Let's consider what it takes to make up each range condition class:

Excellent. Range where 100-75 per cent of forage yield is from climax (green and yellow group) plants. Heavy mulch. Rain soaks in rapidly. No erosion.

Good. Range where 75-50 per cent of forage yield is from climax plants. Ground is covered. Plants vigorous. Slight erosion.

Fair. Range where 50-25 per cent of forage yield comes from climax plants. Sub-climax plants produce most of forage. Climax grasses are

in a weakened condition. Perennial forbs and shrubs, some **annual** grasses and forbs (weeds) have greatly increased. Less ground cover. Low production. Large amount of water runoff. Poor water penetration. Soil fertility lowered.

Poor. Range where only 25 to 0 per cent of forage yield is from climax plants. Large amounts of annual grasses, forbs and shrubs become more abundant and vigorous. Soil is poorly protected. Climax plants are weak or lacking. Much loss of water from runoff. Soil fertility lowered. Top soil hard and dry.

The kinds of plants on the range can tell the story of the various influences such as amount of water, amount of grazing, and time of grazing, better than any mechanical device. Plant growth is the best sign post to tell the condition of the soil and the way the range is grazed.

There are certain things to look for when you are judging range condition. Judge range on the basis of how well it fits your idea of perfection. "Excellent" range condition is the ideal. The further a

piece of range departs from the ideal, the lower you place it in the scale of "excellent", "good", "fair" and "poor".

"Excellent" range is best able to use and conserve the available **moisture**, the **soil fertility** and the available **sunlight**. It is the most productive set of plants that you can have upon a piece of range.

Guides to assist in judging range condition have been prepared for some localities. If you are interested in going further with this you might enquire of the Forage and Range Division, Research Station, Lethbridge.

On the next pages are photos showing four condition classes typical of the southeastern part of Alberta.

RANGE SITES

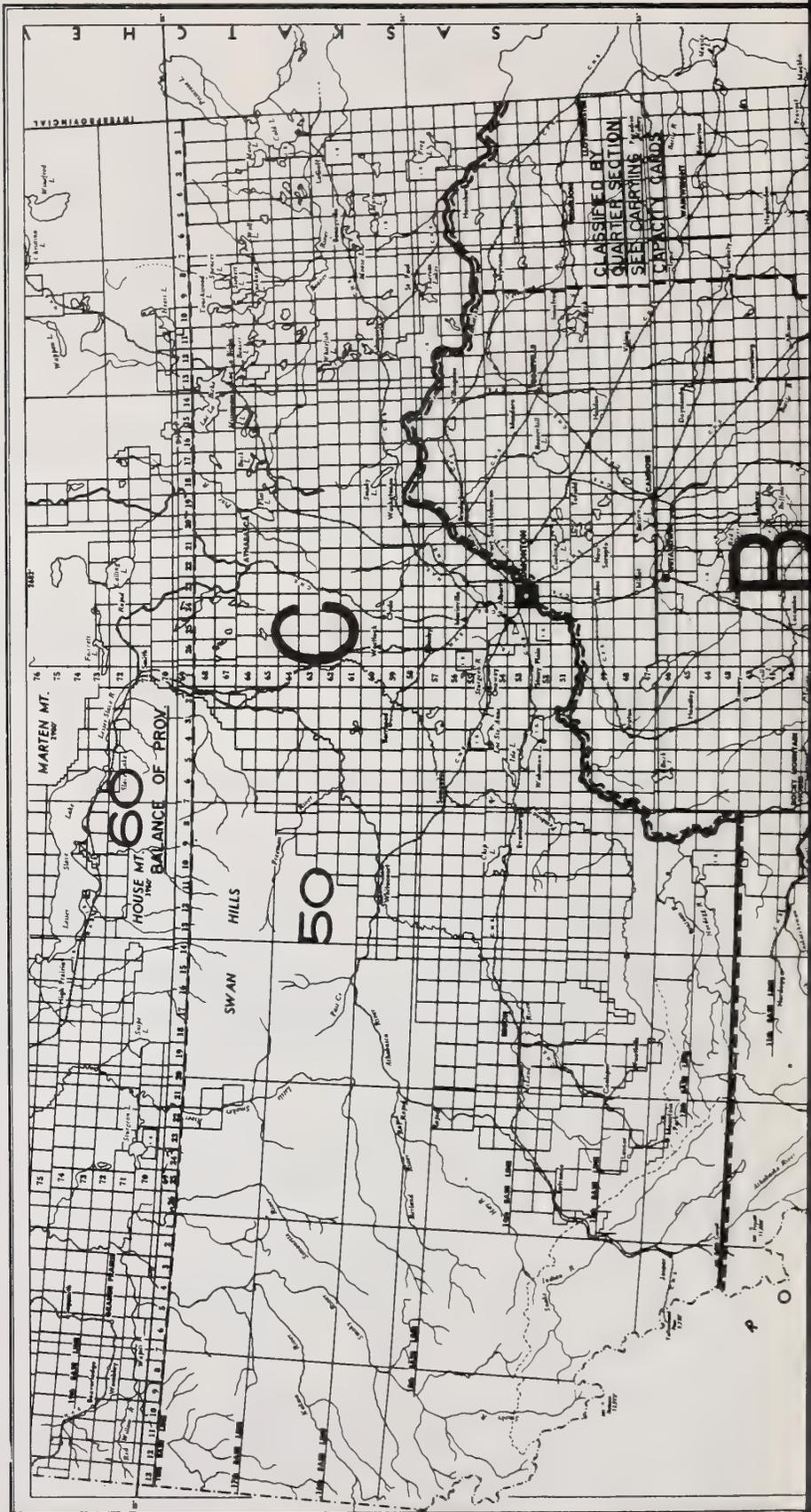
All areas of range are not the same as to soil and climatic conditions. Clay flats are different from steep, rocky slopes. So we wouldn't expect to find the same set of climax plants in both sites. Each range site is a special combination of soil type, slope and climate.

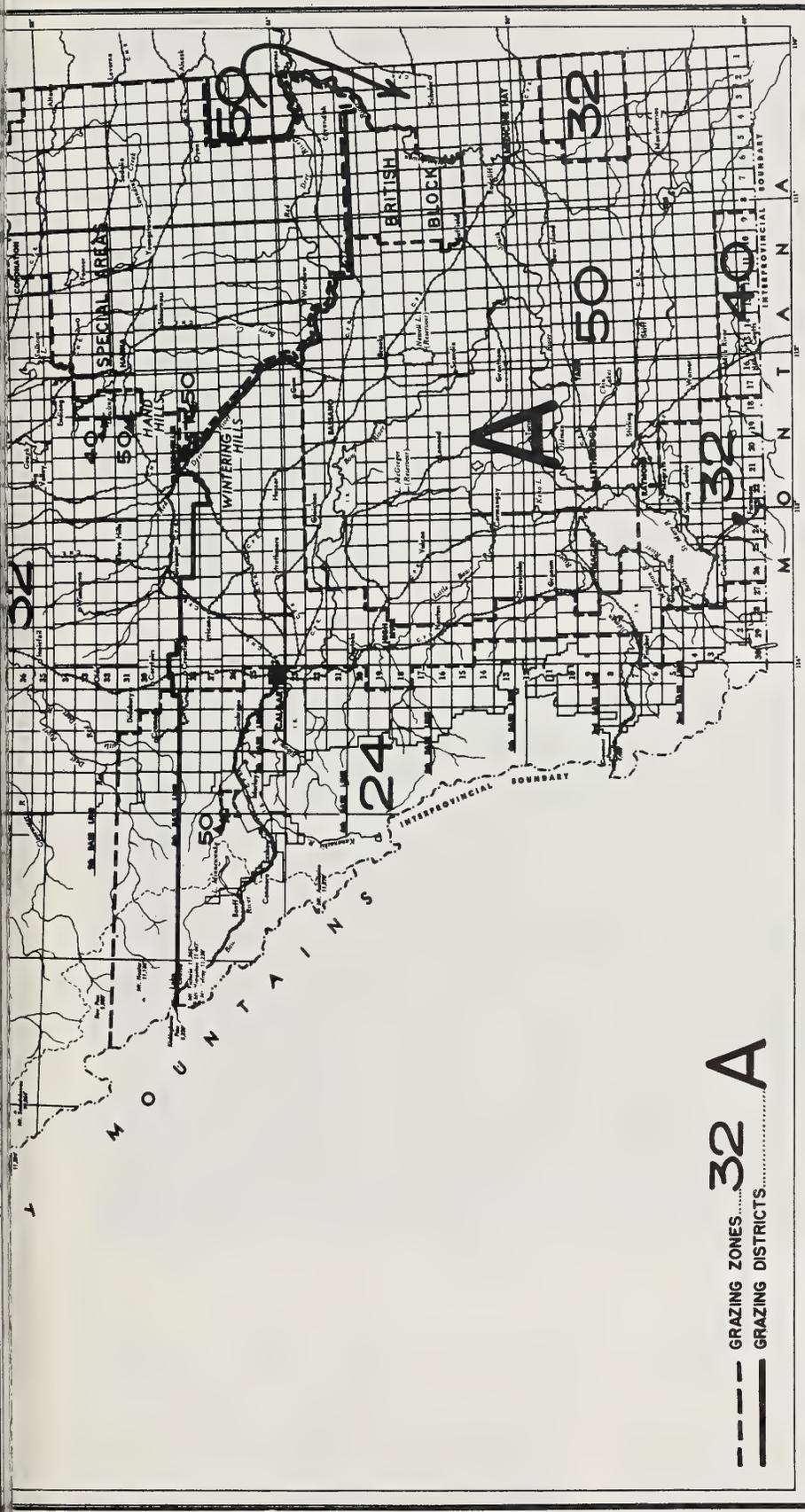
The climax for each site is different. So we judge each site separately. Suggested stocking rate of each site in a pasture is figured separately (and added together) to get the proper stocking rate for the pasture.

The following photographs taken at the Stavely Range Research Station show "excellent", "good" and "fair" condition range.



"Excellent" Range Condition





--- GRAZING ZONES.....32 A
 ——— GRAZING DISTRICTS.....



"Good" Range Condition



"Fair" Range Condition

GRAZING CAPACITY AND STOCKING RATES

It is very important that a rancher or a manager of public range land makes a good estimate of the grazing capacity and then stocks the

land at the proper rate. Understocking fails to make full use of the resource and may make an uneconomical operation, but overstocking will damage the resource. Although overstocking for a few

years may bring in a little extra money, the range will be damaged so that the production will be low for many years to come, and if top soil has been lost, the land will not return to its original productivity in your lifetime.

If land has been abused so that the condition has deteriorated, it must be stocked lightly to allow it to improve. Stocking rates must also be reduced for such unfavorable conditions as drought, late spring or grasshopper damage.

There are several terms which apply to grazing capacity. The following terms and equivalents are used in this booklet:

Animal Unit (A.U.) — a 1,000 pound cow or its equivalent; usually the calf is not calculated.

Animal Unit Month — the grazing required to support an animal unit (1 cow) for 1 month.

- 1 cow and calf
under 6 months = 1 A.U.
- 1 bull _____ = 1½ A.U.
- 1 horse _____ = 1½ A.U.
- 5 ewes _____ = 1 A.U.
- 6 deer _____ = 1 A.U.
- 1 yearling, steer
or heifer _____ = ⅔ to ¾ A.U.

The Lands Branch of the Alberta Department of Lands and Forests rates public grazing land on the basis of the number of acres required to support an animal unit (1 cow) for a year. For calculating grazing capacity on a ranch, it is more convenient to use a figure which gives the fraction of an animal unit month which each acre will produce. Then the number of acres can be multiplied by the fraction to get total grazing capacity.

The grazing map of Alberta shows five grazing capacity zones. The zones are indicated by the figures which show the number of acres needed to support an animal unit for one year. The figures vary from 24 acres per animal unit in the foothills to 60 acres in the bush country in the north.

The table below shows the Alberta grazing zones and also the conversion from acres required for one animal, to animal unit months (A.U.M.) per acre, (e.g.—24 acres per animal unit for a year is converted in line 3 to 0.5 animal unit months per acre).

	ALBERTA GRAZING CAPACITY ZONES				
	Zone (1) 24 ac./A.U.	Zone (2) 32 ac./A.U.	Zone (3) 40 ac./A.U.	Zone (4) 50 ac./A.U.	Zone (5) 60 ac./A.U.
Equivalent in A.U.M. per acre	0.5 AUM/Ac.	0.4 AUM/Ac.	0.3 AUM/Ac.	0.24 AUM/Ac.	0.2 AUM/Ac.
Range Condition Class	A.U.M.'s per acre	A.U.M.'s per acre	A.U.M.'s per acre	A.U.M.'s per acre	A.U.M.'s per acre
Excellent	0.8 -1.0	0.6 -0.8	0.45 -0.6	0.3 -0.4	0.25 -0.3
Good	0.6 -0.8	0.4 -0.6	0.35 -0.45	0.25 -0.3	0.2 -0.25
Fair	0.4 -0.6	0.3 -0.4	0.25 -0.35	0.15 -0.25	0.1 -0.2
Poor	0.25 -0.4	0.2 -0.3	0.15 -0.25	0.1 -0.15	0.05 -0.1

It must be kept in mind that the figures for the Alberta grazing zones apply to average quality sites in average condition. There is considerable variation within each zone depending upon the soil and slope as well as the range condition.

How to Use the Table

The above table can be used as a rough guide in estimating the grazing capacity of your range. Let us take a specific example and follow it through the table.

Suppose your land is in the foothills (zone 1) and a careful examination indicates that it is above average site quality because of deep soil and gentle topography and that it is in the "good" condition class described earlier. Suppose also that it is used for 5 months in summer.

Then in the column in the table for zone 1, follow down to the line for "good" condition (0.6 to 0.8 animal unit months per acre). Since the land in question was considered to be above average quality you would select the higher figure or 0.8 A.U. per acre. This figure is the index for grazing capacity. If you have 1,000 acres of this range you would multiply the acreage by 0.8 to get the capacity in animal unit months ($1,000 \times 0.8 = 800$ A.U.M.).

To get the number of animals which you can safely graze (stocking rate) divide the carrying capacity by the number of months ($800 \div 5 = 160$ animal units for the season. If yearlings are grazed the figure should be increased proportionately.

MECHANICAL MEASUREMENT OF RANGE FORAGE PRODUCTION

Another method used to estimate stocking rate is based upon direct measurement of the forage produced. This method might be a good **demonstration** project for a club tour or meeting.

Mark off a circle with a 20-inch piece of string with a large nail in each end. Clip the forage within this circle at ground level and weigh it. The forage weight will be in pounds. Multiply the weight by 5,000 as there are 5,000 of these areas in one acre. For example, if you had $\frac{1}{4}$ pound, you would have 1,250 pounds of forage per acre — ($\frac{1}{4} \times 5,000 = 1,250$).

To find out how long a cow could graze one acre that had 1,250 pounds of forage, multiply by $\frac{1}{2}$, which would be 625 pounds. (Grazing one-half and leaving one-half is proper use of grass.) Let's say that the cow needs 30 pounds of grass a day, then divide 30 into 625, giving 21, the number of days to let one cow graze on one acre. Stocking on a year-long basis, the cow would need 17.3 acres (365 days divided by 21 equals 17.3 acres). On the same basis as the table each acre would yield 0.7 animal unit months.

After all is said and done, the most accurate method of determining the stocking rate is to stock the range according to your best estimate and see what effect this has on the vegetation of the key range areas. This method takes a long

time. The estimate is usually based on one of the previously described methods. Then, after stocking at the estimated rate, the "green" and "yellow" range plants are carefully watched to see how they react. Further adjustments are made from time to time until the greatest use is being made without permanent damage to the important plants. This is the "range condition" method.

If you wish to be sure about your judgment, it is best to set up **permanent** markers in the range. These permanent markers should be checked every year or two to determine accurately whether the range is improving or going down in condition. This might require the help of a range technician. He would be happy to talk with you about this.

V. JUDGING RANGE UTILIZATION AND ADJUSTING THE NUMBER OF ANIMALS

Utilization of all kinds of range plants by grazing animals is not the same. Each grass, forb and shrub has a certain amount that can be grazed without harmful effects to its productiveness.

Range utilization is, therefore, the amount of forage removed from a range area by grazing animals. Utilization can be classed into three categories:

1. **Heavy use** leads to a decrease in forage production and range condition. Heavy use is extremely harmful to plants, soil and animals. With heavy use, grasses are grazed short with no seed heads being produced and roots are decreased in size and length, causing plants to

die during a drouth. Heavy use results in unprofitable returns, trampling and speeded up water and wind erosion. Grasses that are kept grazed short require 3 to 6 weeks top growth before root growth begins.

2. **Light use** means not grazing the area enough. It is not economical. Valuable range products are not used. When grasses are left ungrazed too long, fire hazards develop. Grazing animals help to condition the soil.
3. **Moderate use** (proper use) insures protection of the soil and forage and gives highest productivity. "Proper use" for most grasses mean that about 50 per cent of the total weight of the above ground parts of the plant should be left at the

A RANGE MAP

With some knowledge of forage plants, how they grow and produce forage, range condition and grazing capacity, the various parts can be fitted together into management. The first step is to find out what you have obtained by way of range resource — make an inventory. This can best be done by making a **range map**. On it show all the essentials used in managing grazing land — fences, watering places, salt stations, streams, buildings, different range types, etc. Section VII, Rounding Up Your Range Plan, tells how to make a range map.

close of the growing season. Properly used grasses furnish green feed one or two weeks earlier in the spring.

To determine proper use or the amount of stubble to leave, follow these steps:

1. Wrap mature ungrazed plant with string.
2. Cut off plant at crown (ground level).
3. Place wrapped plant across index finger. When plant balances, measure with ruler from bottom of plant to point of balance. This gives proper height use for that particular grass.
4. To check yourself, cut the plant at point of balance and weigh both parts. They should be equal.

A properly used range should have 50 per cent of palatable plants utilized. The other 50 per cent is not wasted. It is left as a necessary litter and for maintenance of the

plants and the site.

The grazing load on the range should be adjusted according to weather. Grazing management should be aimed at proper use of the whole area. Adjust stocking load by making utilization checks on climax plants. Keep the live-stock operation flexible to withstand any and all adverse weather.

The livestock operation can be kept flexible by (1) grazing 75 per cent of year-long recommended stocking rate with breeding animals. (Doesn't apply to steer ranches.) This allows the range to make feed reserves. (2) Buying dry animals or keeping offspring when there is range forage that cannot be properly utilized. (3) Building feed and cash reserves during good years to withstand drouthy years.

VI. RANGE IMPROVEMENT PRACTICES

Good range practices increase the amount of usable range forage, replace poor producing plants with good ones, conserve soil and water and increase the value of our range.

STOCK WATERING PLACES

On most western ranges the water supply is not sufficient for the number of stock the range will carry. Even though there is plenty of forage, livestock must have all the water they can drink. They should not have to travel long distances for water. They will graze an area close to water again and again, rather than move a long distance to better forage. The result is poor use of range forage and poor gains on the stock.

Additional watering places encourage better distribution of grazing animals and make better live-stock gains. If there is already plenty of water on the range and the feed is used evenly all over the range, new water developments are not necessary.

The amount of water needed by stock differs with the kind of range, the amount of salt consumed, the climate, the season and the kind of stock. The average amount of water needed per day is ten gallons for cattle and one gallon for sheep.

Cattle like to drink daily during the hot summer period. They normally will drink every two days in the winter.

Sheep can go without water for three or four days, or longer, depending upon the temperature and the frequency of showers and dew.

Watering places require different spacing in mountainous country than in a plains region. In the steep mountain country, cattle should not have to travel more than one-half of a mile for water and sheep not more than two miles. In the plains country, cattle can travel two miles and sheep four or five miles. **Shorter travel is better.** There should be one watering place per section for cattle for best distribution of grazing.

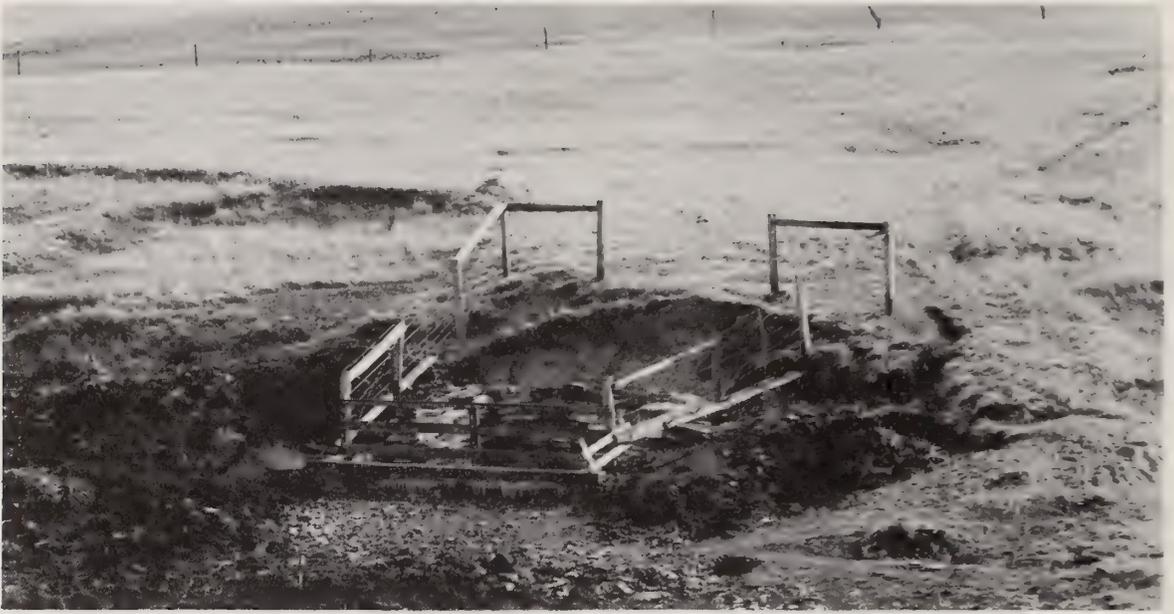
Development of needed additional stock water is a good project and is profitable. You may get more

pounds of beef or lamb per section. Develop springs and seeps which you are sure will furnish a dependable supply of clean, wholesome water throughout the grazing season. Try to make watering places from dangerous bog holes.

To develop a good watering place from a spring, clean the soil away from the spring down to bedrock, if practical. Build a concrete or masonry box around the source of the water with an outlet pipe several inches above the bottom. A close fitting wooden or rock lid keeps out the dirt.

Run the outlet pipe to a trough or tank. The tank should have an overflow which will deliver the extra





water far enough away from the trough to prevent mud holes or ice sheets from forming near the tank. Unused tanks may be drained in winter.

Wells and windmills are used where natural springs or good reservoir sites are not available. Well drilling is usually contracted to experienced persons with good reputations and good equipment for the work.

Advantages of wells for stock water:

1. Can be drilled near the forage supply
2. Furnishes a more dependable water supply in dry seasons and in winter
3. Safer place for livestock to get water in winter.

The depth of livestock water troughs at wells and windmills should be about 16 inches for cattle and 8 to 10 inches for sheep. Place the windmill and the tank on a well-drained place and as near a dependable forage supply as possible.

Tanks and reservoirs may provide the cheapest supply of water. Build where there is good drainage. Talk with P.F.R.A. engineer and district agriculturist regarding possible locations and design for your reservoirs. The soil type is important. Reservoirs built on sandy soil are of little value. They often cannot be made to hold water. Treating reservoir bottoms with bentonite clay, salt or plastic liners, may help to seal leaks.

Check carefully regarding the legal specifications and water rights with the Water Resources Branch, Alberta Department of Agriculture, Edmonton.

The design of the spillway is especially important. A good rule is to make the spillway low enough so that water will flow through when it gets within 3 or 4 feet of the top of the dam. Have the spillway wide enough and level enough to allow the water to pass through it in a thin, solid sheet that will not erode the soil.



FENCING

There are five good reasons why you should have good fences on the range:

1. Fences help prevent trespass by stray stock.
2. Fences help to distribute livestock and prevent drifting. Livestock tend to graze too much in some spots and too little in others.
3. Fences make deferred and rotated grazing possible.
4. Fences make possible fencing-out problem areas, such as poisonous plant areas and **reseeded areas**.
5. Fences make it possible to separate different classes of stock for better management.

Barbed wire became popular about 1880. It is still the most common fencing material. Four wire fences with wooden posts are widely used for cattle and horses, while woven wire is usually required for sheep.

Space posts as needed to make a fence sturdy.

Electric fences of one single barbed wire, on widely separated posts make a good temporary fence, although not considered effective for sheep. Fence building is an odd time job.

Homestead fences were built on ownership boundaries. They may have to be moved to get the best use of the range.

Build cross-fences to follow natural land features or the "lay" of the land. Cross-fences should be planned so that all pastures have about the same potential stocking rates. When pastures are large and contain different range sites, livestock normally concentrate on the most desirable sites first. When the forage on these sites is depleted, livestock move to the next most desirable ones. A valley site is capable of producing several times more forage than shallow upland or ridgeland. Study the movement of livestock in a pasture for about a year before you actually build the cross or drift fences. Do not build fences where they will cause stock to walk farther to feed and water. Stock like to move "on the level" and in all directions from water. Let them do it.

SALTING PLACES

Grazing animals need more salt (sodium chloride) than they can get from plants. Lack of salt causes

animals to lose their appetites, lose weight, their eyes become dull and their coats rough. They don't grow as they should.

Salt distribution may offer an excellent means of getting an even use of range forage in a pasture. Salt attracts livestock. They will often travel a long way to find it. Watch the cattle to see if they find the salt when it is moved to a new, accessible place. They might need help.

Salt is usually placed in troughs to protect it from wind and rain. Hollowed out logs are used in the mountains. On the plains, oil barrels are used with a part of the side cut out and folded back to make an awning over the opening. The hole in the barrel must be large enough for a bull with horns to easily get his head in and out.

As a general rule, place salt boxes where grazing has been lightest. Move as often as necessary. Salt boxes should be located on knolls, benches, openings in timber and gentle slopes on under-used sites.

Salting Suggestions

1. Allow 2 pounds per cow per month — ½ pound per head per month for sheep.
2. Place salt about one-half to one mile from water where forage is plentiful. Move the salt with the livestock.
3. Have one saltground for each 40 or 50 head of cattle.
4. The best kind is crushed salt containing stabilized iodine. Trace minerals are good, also. Hard block salt forces the animals to lick the salt too long to get enough for body use. They should be resting

and chewing their cuds instead of licking salt blocks.

If your range soils are short on **phosphorus**, the range forage will be low in phosphorus. Bone chewing, unthriftiness, dull hair and poor calf crops are signs of phosphorus deficiency. Check with your district agriculturist on this.

5. Have a salt plan for each range. A 50-50 mixture of mono-sodium phosphate or steamed bone meal and salt, fed in one end of the saltfeeder, is suggested. Add bran mix to keep it from hardening. Stock will generally take it if they need it, particularly if the mineral feed is of good quality.

RESEEDING RANGELAND

An important part of any grazing program is the job of "rounding out" the year-long forage supply. Native range furnishes excellent forage for livestock during the growing season. Native range, especially if it has palatable shrubs on it, is often used in winter. Cured range grasses may lack some of the important livestock nutrients. Livestock miss green grass in their diets in late fall and winter. The green grass season can be lengthened by seeding crop land to high producing grasses and legumes.

By now, you may have selected varieties which you have seen in a grass and legume nursery, or elsewhere. A good goal to shoot for is **six months of live grass**.

Seed bed preparation is the first "hurdle" to get over in reseeding. Seedling plants are weak. They cannot stand competition of large established plants. Therefore, remove all undesirable, moisture-robbing plants from the site to be reseeded.

You know that seeded grasses do much better in clean ground, free of other plants.

Shallow tillage should be done just before seeding, to kill weeds. A **clean** grain stubble is an excellent seedbed, if there is enough moisture available. No tillage is then needed. The seedbed should be **very firm**. Loose soil is not a good pasture seedbed.

A **drill** with depth regulators is the best tool for seeding. Small grass seeds, planted too deep, will never make it to the surface. They "smother". Neither should they be planted too shallow. Moisture is necessary to germinate the seeds. Therefore, plant where seed will have moisture and shallow enough so they can emerge. Plant the **smallest seeds one-fourth inch deep**, the **larger seeds**, one inch. Plant slightly deeper in sandy soils and shallower in heavy clay or silt soils.

Broadcasting seed is generally **not** a good practice. The seeds are not covered uniformly. In rough country, however, it may be the only reseeding practice that can be used.

Time of seeding is important in reseeding work. Late summer or fall seeding is probably a little better than spring seeding, depending on where you are planting the grass. Spring seeding is best in the middle and high elevations of mountains when there is sufficient moisture. Moisture is the most important factor while the seedlings are getting established. Twelve inches of reserve moisture in the topsoil is

considered sufficient for seeding. For time of seeding, **more depends upon the rancher** than upon a rule.

What to Seed

Here again, much depends upon the conditions in your local area. Plant grasses which are suitable to your local area. Some grasses do better on heavy, clay soil. Others do better on sandy soil, while in the mountains, another grass is best suited. Ask your district agriculturist what to plant.

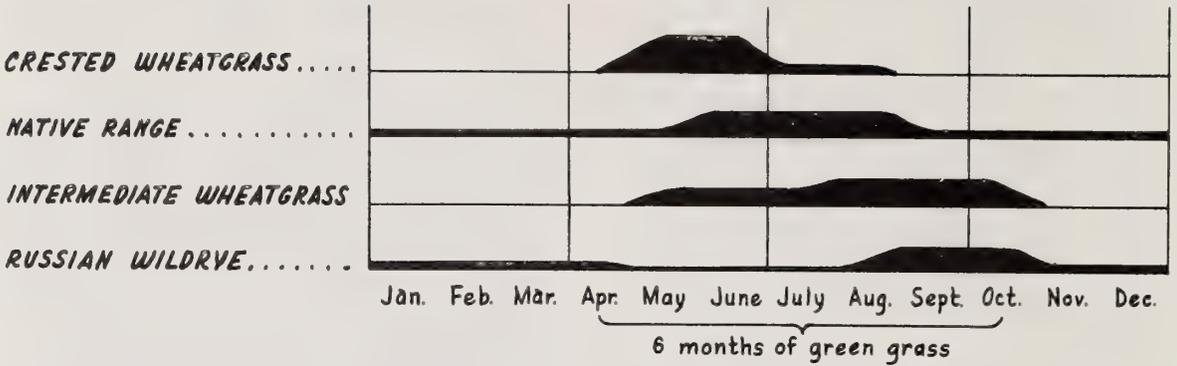
Have a legume in every planting. Only a very small amount of pure live seed is needed, $\frac{1}{4}$ to $\frac{1}{2}$ pound per acre is enough.

Managing Reseeded Range

While the new seedlings are getting established, it is best not to graze them. They may be pulled up by the roots, if grazed too soon, especially if the soil is wet. It takes about a year for the seedlings to become firmly rooted. Even during the second spring, grazing should be moderate. If weeds seem to be getting ahead of the young grass during the first year, they should be clipped. The fallen weeds make good mulch which helps hold the moisture near the surface of the soil. If the seeded area is too rough to mow and the weeds are considerably taller than the grasses, they might be grazed off, provided the livestock will graze them.

Let's see how the different pastures might be seeded to make "six months of green grass". (Adapt grazing calendar and kinds of grass to **your area**.)

GRAZING CALENDAR



CONTROL OF UNDESIRABLE PLANTS

Useless shrubs or brush on the range cause lowered production of native grasses (and livestock). The brush plants use about four times more water for growth processes than native grass. Removing brush plants from the range can increase forage production and stocking rates. Brush on ranges can be controlled.

Several methods of control can be used to reduce brush. These methods include chemical, mechanical, fire, and good management. The chemicals are usually liquid materials that are sprayed on the brush leaves by airplanes and ground machines. Common chemicals include 2,4-D, 2,4,5-T and amates. Soil sterilants, such as sodium chlorate and borax, are used on small weed patches on land of high value.

Mechanical methods include mowing, bulldozing, chaining, pitting and others. Mechanical methods are more controllable than some others.

Fire is a good method, but conditions need to be just right for best results. Things to consider be-

fore burning are: know fire laws and get needed permits; know when, where and how to burn; do not burn too much in one day and have plenty of help to control the fire.

Any area that has had brush control measures should be deferred from grazing the first growing season so native grasses can become established.

CONTROL OF POISONOUS PLANTS IN THE RANGE

Chemical control of the important poisonous range plants with 2,4-D, and 2,4,5-T have proved more or less effective. Some species have been controlled where conditions are right and where spraying has been properly done. Other species are not killed easily with 2,4-D or other chemicals. Be sure you are not killing desirable plants.

Apply 2,4-D at the rate of about one pound of the ester form per acre when plants are growing rapidly. Use water as a carrier in ground sprayers at about 10 to 20 gallons per acre.

If the weed-killer is applied by plane, use oil and water emulsion. Three gallons of water and one

gallon of diesel fuel per acre are commonly used to dissolve and spread the 2,4-D.

Chlorate weed-killers are effective on practically all weeds but the cost is generally high.

Certain poisonous plants can be controlled by grazing of livestock.

Make sure good plants take the place of those killed. Reseed and defer grazing as necessary.

Some poisonous species start growing earlier in the spring than good range plants. On such range, deferred grazing is a good practice.

GRAZING PLANS

Rotation and deferred grazing systems may have some advantages and some disadvantages.

Rotation grazing means grazing one unit or pasture; then another, and so on, until back to the first. This applies best on irrigated tame pastures.

Deferred grazing generally means waiting to graze an area until after the most important forage plants have made seed. This is a good practice to improve heavily grazed rangelands that are in low condition. "Rest" is the best medicine for a "sick" range.

Winter grazing is less harmful to the plants than summer grazing.

Whatever the grazing system, it should fit the range unit. Ranchers can get help on plans for a good grazing system from their district agriculturist or a range technician.

VII. ROUNDING-UP YOUR RANGE PLAN

Every good range operator knows the resource with which he is working. Maps are used to "inventory" that resource. They are more accurate than memory. We don't always notice gradual changes.

Have you observed that folks who see a youngster only once or twice a year notice that he has grown, while those who are with him every day don't notice it?

Range grazed by livestock may **change so gradually** that you may not notice the change. These changes may effect your income from the range before you really know they have happened. The changes may mean financial profit or loss. They may also mean loss of valuable soil and water—which no one wants.

A map is the most important part of your range plan. It gives you a picture of what you have to work with and what you intend to do with it. It should show each range site and its condition, fences, trails, watering places, salting places, natural features such as coulees, streams and cutbanks, buildings and anything else which may affect the handling of the livestock.

A map like the sample shown over the page can be made up on a grid showing the sections, quarters and possibly the "forties". If aerial photos are available the information can be transferred from them. A little practice and the use of a stereoscope will make you proficient in interpreting the features from aerial photos.

If large scale photos (4 miles = 1 inch or larger) are available they can be used as the map. Several can be spliced together into a "mosaic". The same kind of information shown on the sample map can be inked onto the mosaic. These make excellent maps with very little work.

Aerial photos for most of Alberta can be obtained from the Technical Division of the Department of Lands and Forests, Edmonton. When you enquire about photos give the legal description of your land.

Management practices are based upon what the map shows as to range condition and forage use in the different areas of each pasture. It also shows you the changes needed to get the best production from the range. For instance, a pasture which is in "poor" condition in one end and in "excellent" condition in another part, might indicate the need of cross-fencing; or, additional watering places nearer the good forage. Possibly a change in the salting places is needed to attract stock to areas of excellent forage. Maybe those five steers that died were all found near a poisonous plant infestation! It should be controlled or fenced out.

Improvement and changes can be shown on transparent mapping material laid over the detailed map of the range made earlier. These are called "overlays". Overlays can be used on aerial photos, too. Show the fences to be moved or new ones to be built on the overlay. The same

can be done for new water developments and new saltgrounds.

Mark problem areas to be treated on the overlay. Abandoned farm land to be reseeded, poisonous plants or shrubs to be controlled can be marked on the overlay. Show the year during which each of the practices is to be carried out, either on the overlay or the written plan, or both.

On the next page, you will see how an "overlay" is used in planning for range improvement. It shows the following proposed range improvement practices, north (top) to south:

1. Four new pieces of fence built and one piece removed to give better **pasture arrangement** (pasture "C" is added).
2. Better calving pasture and fall pastures to be seeded.
3. Four possible new stock water developments to get more uniform grazing of forage.
4. Two stock salt stations moved and two new ones to attract stock to the lightly-used range areas.
5. Poisonous plants fenced out.

If you are just starting your range map, you will save time by obtaining plat book sheets from the book store or municipal office. Ordinary, heavy paper will do very well, if it is tough and light colored. It will need to have grid lines to represent quarter-sections, sections and townships.

Aerial photographs may help you locate important features on your maps. It will be practical to use tracing paper to transfer informa-

tion to your maps from photos, **if** the aerial photos are on the **same scale** as your maps.

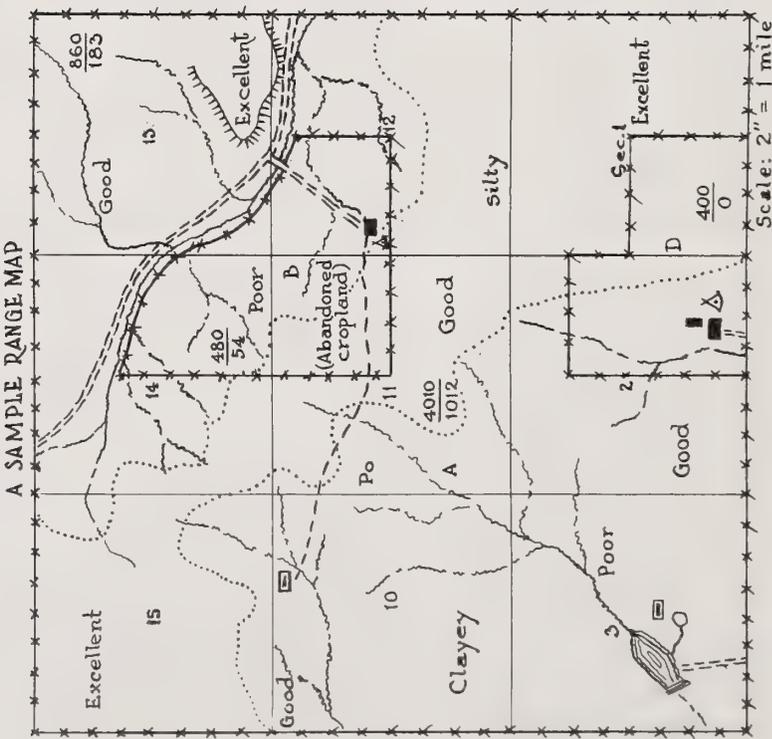
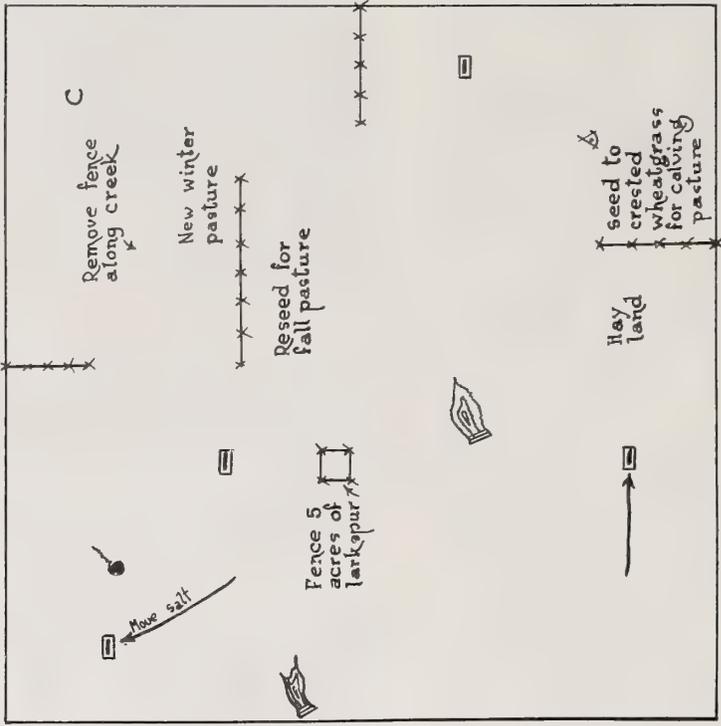
If you are fortunate enough to have aerial photos for use in your range project, overlays can be used

on the photos.

For further information on range management, see your local district agriculturist. He will tell you where you can get additional technical help.

AN "OVERLAY"

This shows how to "map" your plans for the following:
 Fencing
 Stock water development
 Trail building
 Saling places
 Range reseeding



- Building
- Salt trough
- △ Windmill
- Natural spring
- Spring developed
- *** Fence
- D Pasture or field number
- 860 Usable acres
- 193 Animal unit months
- Po Poisonous plants
- == Public road
- Private road
- - - Trail
- - - Permanent stream
- - - Intermittent stream
- mmm Cliffs
- ⊖ Stock water or reservoir
- Excellent, Good, Fair, or Poor = Range condition
- Site boundaries

APPENDIX

FACTS ABOUT RANGE PLANTS FOR PLANT JUDGING AND IDENTIFICATION

Grasses included in this list are selected on the basis of their importance, distribution and forage contribution for the range areas of Alberta.

Common names on the list are standardized plant names.

Annual plants live only one season. They do not come up a second year from roots or crown.

Perennial plants live over from year to year, producing leaves and stems for more than two years from the same crown. (The list includes two biennials which are marked.)

Grasses are plants which have hollow, jointed stems and leaves in two rows on the stems. The seeds are borne between two scales.

Forbs are non-grasslike plants with annual tops and net-like veins in the leaves (range weeds and flowers).

Native plants are those which have not been introduced from outside North America.

Introduced plants are those which have been brought in from outside North America.

Cool season plants make their principal growth in the spring and late fall.

Warm season plants generally make their principal growth during the frost-free period and develop seed

in the summer or early fall (wait for warm weather).

Grazing response is the way the amount of the various plants in the range change when they are grazed. Range plants are grouped as follows:

Green group plants are usually the most desirable, original native ones. They are the first to "decrease" in the range as they are weakened by grazing, or other causes. An abundance of green group plants indicates the grazing program is "going well".

Yellow group plants are also native plants but they "increase" and take the place of green group plants which have weakened or gone out of the range, due to over-grazing or other range abuse. The yellow group plants are normally shorter, less palatable to livestock. Yellow, means "caution" or in many cases, lowered production per acre.

Red group plants are the plants which invade and replace the plants which have been removed or seriously weakened. They are not good, dependable producers of range feed. Red group plants invading the range endanger production and the valuable soil and water resources. These plants are the danger signal.

Forage values for each species were determined on the basis of palatability, nutritive content and dependability as a forage supply. This is a relative factor which may vary, depending on the kind of livestock using the plants, the soil conditions and the season.

RANGE PLANT JUDGING AND IDENTIFICATION

NAME OF PLANT	Type of Plant			Life Span		Origin of Plant		Season of Growth		Grazing Response			Forage Value			Poisonous
	Grass	Shrub	Forb	Annual	Perennial	Native	Introduced	Cool	Warm	Decreases	Increases	Invades	Good	Fair	Poor	
Arrowleaf balsamroot			X		X	X		X		X	X			X		
Arrowgrass			X		X	X		X		X	X				X	X
Baltic rush	RUSH				X	X		X		X	X				X	
Bearded wheatgrass	X				X	X		X		X			X			
Blue grama	X				X	X			X	X	X		X			
Canby bluegrass	X				X	X		X		X			X			
Canada bluegrass	X				X		X	X		X		X	X			
Canada reedgrass	X				X	X			X	X				X		
Canada wildrye	X				X	X		X		X			X			
Cheatgrass brome	X			X			X	X		X		X		X ^{to} X		
Common chokecherry		X			X	X			X	X	X			X		X
Curlycup gumweed			X	Biennial	X				X	X		X			X	
Dandelion			X		X		X	X		X		X	X			
Death Camas			X		X	X		X		X	X					X
Fringed sage		X			X	X		X		X				X		
Foxtail barley	X				X	X		X		X		X		X ^{to} X		
Giant wildrye	X				X	X		X		X				X		
Green Needlegrass	X				X	X		X		X			X			
Geranium (sticky)			X		X	X		X		X				X		
Goatsbeard			X	Biennial			X	X		X		X			X	
Greasewood		X			X	X			X	X			X			

RANGE PLANT JUDGING AND IDENTIFICATION

NAME OF PLANT	Type of Plant			Life Span		Origin of Plant		Season of Growth		Grazing Response			Forage Value			Poisonous
	Grass	Shrub	Forb	Annual	Perennial	Native	Introduced	Cool	Warm	Decreases	Increases	Invades	Good	Fair	Poor	
Hairy wildrye	X				X	X			X	X				X		
Hooker's oatgrass	X				X	X			X	X				X		
Idaho fescue	X				X	X		X		X			X			
Indian ricegrass	X				X	X		X		X				X		
Junegrass	X				X	X		X		X			X			
Kentucky bluegrass	X				X		X	X				X	X			
Little bluestem	X				X	X			X	X			X ^{to} X			
Loco			X		X	X		X			X				X	X
Larkspur — tall			X		X	X		X			X			X		X
Lupine			X		X	X		X			X				X	X
Mountain brome	X				X	X		X		X			X			
Narrowleaf milkvetch			X		X	X		X			X				X	
Needle-and-thread	X				X	X		X		X ^{or} X			X			
Nuttall's saltbush		X			X	X			X	X			X			
Parry's oatgrass	X				X	X		X		X			X			
Peavine			X		X	X			X	X			X			
Phlox			X		X	X		X			X				X	
Pine reed grass	X				X	X		X		X				X ^{to} X		
Plains muhly	X				X	X		X			X			X ^{to} X		
Porcupine Grass	X				X	X			X	X			X			
Prairie sandreed grass	X				X	X			X	X				X ^{to} X		

RANGE PLANT JUDGING AND IDENTIFICATION

NAME OF PLANT	Type of Plant			Life Span		Origin of Plant		Season of Growth		Grazing Response			Forage Value			
	Grass	Shrub	Forb	Annual	Perennial	Native	Introduced	Cool	Warm	Decreases	Increases	Invades	Good	Fair	Poor	Poisonous
Red three-awn	X				X	X			X			X				X
Richardson's needlegrass	X				X	X			X	X			X			
Rough fescue	X				X	X		X		X			X			
Sandberg bluegrass	X				X	X		X			X		X			
Sand dropseed	X				X	X			X	X				X		
Saskatoon		X			X	X		X		X				X		
Shadscale		X			X	X			X	X			X			
Shrubby cinquefoil		X			X	X		X		X					X	
Silver sagebrush		X			X	X			X	X				X		
Slender wheatgrass	X				X	X		X		X			X			
Slough grass (sedge)	Sedge			X		X			X	X				X		
Snowberry		X			X	X		X		X					X	
Streambank wheatgrass	X				X	X		X		X			X			
Thickspike wheatgrass	X				X	X		X		X			X			
Threadleaf sedge	Sedge (Grasslike)				X	X		X		X	X		X			
Timber oatgrass	X				X	X		X		X			X			
Tufted hairgrass	X				X	X		X		X			X			
Two grooved loco			X		X	X		X		X	X					X
Vetch			X		X	X			X	X			X			
Western wheatgrass	X				X	X		X		X	X		X			
Wild onion			X		X	X		X		X	X				X	
Winterfat		X			X	X		X		X			X			
Yarrow			X		X	X		X		X	X				X	

N.L.C. - B.N.C.



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