

Range Resources and Their Management in British Columbia

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THE production of range livestock is one of the important but lesser-known industries of British Columbia, a province better known for such products as timber, minerals and fish. In the interior section of the province, ranching constitutes a major form of land use and permits stable settlement of large areas which cannot support more intensive forms of agriculture. The population of beef cattle and sheep, most of them on the range areas, was 272,000 and 106,000 respectively in 1952. This livestock population constitutes an important source of livestock products, but does not meet the total needs of the province, and considerable amounts are imported annually from the Canadian plains region.

Description of the Area

Most of the range lands of British Columbia are situated between the Rocky Mountain System on the east and the Coast Range on the west. The southern portion of this region, extending from the United States border about 250 miles north to the vicinity of Lat. 53° contains the bulk of the grazing lands, although an appreciable area occurs farther north and east in the Peace River section (Fig. 1). The grazing resource consists of about 3 million acres of native grasslands, and an area of forested range estimated at 10 to 12 million acres. The major grassland areas are found in the Chilcotin, Fraser,

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Thompson, Nicola and Okanagan Valleys. The timber ranges occur at higher elevations throughout the region. Smaller areas of alpine range occur on some of the interior mountains.

Topographically, the main range area is situated in the southern portion of the Interior Plateau. This formation originally was comparable to the Columbia Plateau of eastern Washington and Oregon. Subsequent uplift and erosion have produced a topography marked by a series of irregular plateaus separated by broad, deep valleys and interspersed in places by mountain ranges. The general plateau level varies from about 5,000 feet above sea level in the southern portion to 3,000 feet near the northern boundary of the range area. The valley bottoms range from 600 to slightly over 2,000 feet in elevation. Drainage is mainly to the west, through the Fraser River and its tributaries.

The climate is determined to a large extent by the presence of a mountain barrier to the west and by the rugged topography of the region itself. The whole area is relatively dry because of the "rain shadow" effect of the Coast Mountains. In addition, local climate is strongly affected by differences in elevation and exposure. The valleys are dry and relatively warm considering their latitude, while at higher elevations there are marked increases in precipitation and decreases in temperatures. About half the annual precipitation occurs in the late fall and winter months, while a second maximum occurs in

May and June. The frost-free season is relatively long in the valleys of the southern portion, but becomes a limiting factor in the more northerly valleys and at higher elevations throughout the region. Climatic data for representative stations are presented in Table 1. The data give some idea of the variation of climatic conditions occurring within the region, but few records are available for the higher elevations.

The soils have been formed mainly from glacial materials, as the whole area was covered by the Pleistocene ice sheet. The soils commonly contain a high proportion of the native rock, and rock outcrops are common. Over most of the region, however, the soil mantle is relatively deep and well developed. Textures vary widely, with sandy loams most common.

The grasslands soils fall into three main zonal groups, namely, Chernozems, Chestnut and Brown. These soil groups differ considerably in depth to the lime layer and in the organic matter content of the A horizon. The forest soils also include several zonal groups, but these have not been fully classified. The lightly-leached soils of the more open forests which support a vigorous undercover of herbaceous and shrubby species are most productive from the range standpoint. At high elevations in the spruce-fir openings and on the alpine ranges, the soils are of the "mountain meadow" type, high in humus.

Native Vegetation and Range Types

Most of the vegetation can be classified into a few major zones which correspond to the soil zonal groups. Due to the rugged topography, much of the vegetation occurs in a series of elevational bands.

Grassland Ranges

The grasslands, although limited in extent, are of vital importance in the range industry as sources of spring, fall and winter grazing.

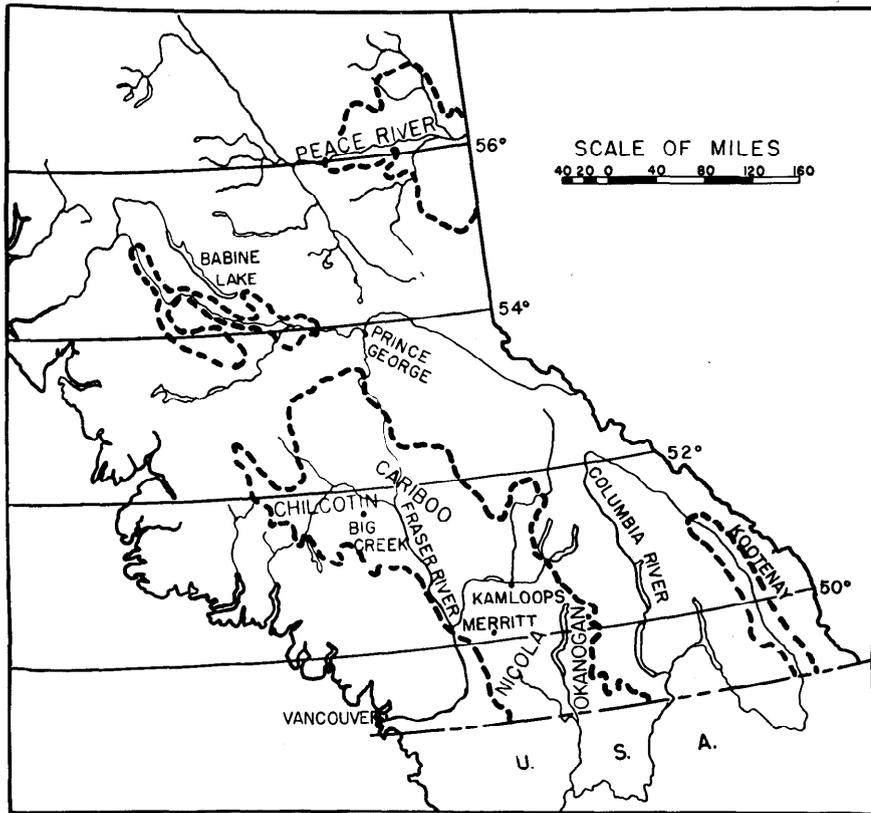


FIGURE 1. Outline map showing location of major range areas (inside broken line) in British Columbia.

The grasslands belong to the bunchgrass type of the Pacific Northwest. Three distinct zones are recognized, differing in botanical composition, forage yield, season of use and reaction to grazing. Bluebunch wheatgrass (*Agropyron spicatum*), the principal grass of the region is a dominant in all three zones but the associated species differ considerably.

The wheatgrass-sagebrush (Lower Grassland) zone occurs in the valleys at elevations up to 2,000 feet

approximately, and has the driest and warmest climate in the region. The brown soils support a relatively sparse vegetation of bluebunch wheatgrass and other bunchgrasses and big sagebrush (*Artemisia tridentata*). This range type is well suited for early spring and late fall grazing, and where sufficient acreage is available, for winter use as well. With overuse sagebrush increases at the expense of the bunchgrasses and grazing capacity declines greatly. In depleted areas,

sagebrush may comprise almost the entire cover, while destruction of this species by fire leads to dominance by cheatgrass (*Bromus tectorum*). This introduced annual supplies spring range, but for a shorter season and less reliably than do the perennial grasses.

The wheatgrass-bluegrass zone occurs at elevations of about 2,000 to 2,700 feet, and is slightly cooler and moister than the wheatgrass-sagebrush type. The vegetation, where not altered by misuse, consists mainly of bluebunch wheatgrass, Sandberg bluegrass (*Poa secunda*) and a number of forbs. Sagebrush is absent or rare and the only common shrub is rubber rabbitbrush (*Chrysothamnus nauseosus*). This zone is suitable for spring-fall grazing. With heavy use, the wheatgrass is often replaced by needlegrass (*Stipa comata*). Continued overgrazing results in a cover consisting mainly of cheatgrass and weedy forbs.

The wheatgrass-fescue (Upper Grassland) zone occurs at elevations of 2,700 to 3,300 feet or more and represents the most highly developed and productive of the grassland types. The principal climax species are bluebunch wheatgrass and rough fescue (*Festuca scabrella*). In addition, there is an abundance of forbs including yarrow (*Achillea*), fleabane (*Erigeron*), lupines (*Lupinus*) and balsamorhiza (*Balsamorhiza*). This type is best used as late spring and early fall range. The first change resulting from heavy use usually is replacement of wheatgrass and fescue by other perennial grasses, especially Columbia needlegrass (*Stipa columbiana*) and Kentucky bluegrass (*Poa pratensis*). Continued overuse results in a weedy cover dominated by unpalatable perennial forbs and a number of annuals including cheatgrass.

A summary of forage yield and grazing capacity data for the three

Table 1. Climatic data for stations in interior British Columbia

Station	Range Type	Lat.	Elev.	Av. Annual Precip.		Mean Temp.		Frost-free Season
				Total	Apr.-Sept.	Jan.	July	
		(degrees)	(feet)	(inches)	(inches)	(deg. F.)		(days)
McCulloch	Spruce-fir	50	4100	26.1	11.4	4	55	—
Knouff Lake	Douglasfir	51	3750	14.8	7.7	—	—	—
Big Creek	Douglasfir	52	3100	12.0	7.1	13	60	51
Merritt	Grassland	50	1940	8.9	3.6	22	64	121
Kamloops	Grassland	51	1260	10.2	5.5	22	70	170
Keremeos	Grassland	49	1165	9.8	4.9	25	71	184

grassland types is contained in Table 2.

Forest Ranges

The forest grazing types occupy a much greater area than the grasslands. In portions of the region the livestock populations do not fully utilize the available acreages of forest range. The forest ranges fall naturally into three zones, namely, ponderosa pine, Douglasfir and spruce-fir.

The ponderosa pine zone is limited in extent, occurring mainly as a fringe along the lower edge of the forested lands. Often the transition between the ponderosa pine and Douglasfir types is as extensive as the pine zone itself. The well-developed undercover vegetation resembles that of the grasslands. The principal species include bluebunch wheatgrass, Junegrass (*Koeleria cristata*), rough fescue, rubber rabbitbrush and several perennial forbs. This type is valuable for late spring and fall use. It has a grazing capacity, when in good condition, of about 2.5 acres per A.U.M. (animal unit month).

The extensive Douglasfir zone supplies most of the forest grazing. Soil moisture is usually adequate for growth throughout the summer months but temperatures limit the growing season to 3 months or less. The soil is a yellowish-brown podsollic type, neither highly leached nor strongly acid.

The climax tree cover consists mainly of Douglasfir (*Pseudotsuga taxifolia*) but, due to widespread fires, a large part of the zone is now occupied by lodgepole pine (*Pinus contorta* var. *latifolia*) and aspen (*Populus tremuloides*). Disturbance by fire has had a marked influence on grazing values. Areas dominated by aspen usually possess a better forage cover than those with conifers, while sites occupied by dense young stands of either pine or Douglasfir produce almost no forage.



FIGURE 2. Bunchgrass range in the Nicola Valley, with ponderosa pine scattered along the draws.

Over much of the zone the tree stand is relatively open, and there is a well-developed undercover of herbs and shrubs. The principal grass is pinegrass (*Calamagrostis rubescens*), while many broadleaved plants, including vetch (*Vicia*), peavine (*Lathyrus*), aster (*Aster*), wild rose (*Rosa*) and willow (*Salix*) provide valuable forage. Because of the shortness of the frost-free season and the rapid deterioration of forage in the early fall, the season of use in this zone is from mid-June to the end of September. Grazing capacity of good condition range averages about 4 acres per A.U.M. With too heavy use there is a marked decline in the more palatable species, especially among the forbs.

The third forest zone is the

spruce-fir, situated above the Douglasfir zone in a climate that is cool and relatively moist with a short growing season. The spruce-fir type is extensive but grazing is limited largely to meadows and openings. The tree cover is relatively dense, and the soils are acid and highly leached. The undercover is sparse and consists mainly of low shrubs such as blueberry (*Vaccinium*) along with mosses and lichens. The production of forage species is usually too low to warrant grazing use. In the meadows the cover consists of sedges and, in the drier openings, intermediate oatgrass (*Danthonia intermedia*). Herbage production is high with an average grazing capacity estimated at 1 acre per A.U.M.

Alpine ranges occur at elevations

Table 2. Soil zonation, forage production and grazing capacity of range in good condition within the principal grassland zones of interior British Columbia

Vegetational Zone	Soil Zone	Ave. Forage Yield	Estimated Grazing Capacity
		(lbs./acre)	(acres/A.U.M.)
Wheatgrass-sagebrush.....	Brown	400	3
Wheatgrass-bluegrass.....	Chestnut	600	2.3
Wheatgrass-fescue.....	Black (Chernozem)	1200	1.1



FIGURE 3. Yearling steers on timber range in Douglasfir zone, Tranquille range near Kamloops, B. C.

above 6,500 feet and are characterized by an extremely short growing season. The vegetation of alpine grasses, sedges and forbs has received little detailed study. Grazing use is mainly by sheep during a short summer period.

Nutritive Value and Palatability of the Range Forage

To date, evaluations of the quality of range forage in British Columbia have been confined to chemical analyses. While such methods fall short of revealing true nutritive value, they furnish comparative ratings for different species.

Analyses of the principal species of the grassland ranges show a high nutrient content in the early growth stages. The average for 6 major grasses in the leaf stage was found to be 16 percent crude protein, 0.24 percent phosphorus and 0.47 percent calcium. Marked changes occur as the plants mature, and the cured grass available for fall and winter use is low in protein and phosphorus. In many parts of Interior British Columbia, phosphorus supplementation during the winter months has proved beneficial. There is some evidence that

deficiencies of vitamin A may also occur in areas where cured forage is the only feed available for long periods.

On the forest ranges, the nutritional situation is strongly affected by season of use. Since these ranges are grazed in the summer, the forage species are taken mainly in early growth stages when nutrient content is high. Grazing during this period, coupled with the occurrence of many high quality forb and browse species, offset the poor quality of pinegrass forage. Pinegrass in this region averages 11 percent crude protein and 30 percent crude fiber in the leaf stage.

No detailed data are available for the gains of livestock on the grasslands, but weights of animals off grass indicate nutritive value comparable to that of Great Plains ranges. On timber ranges, studies at the Kamloops Experiment Station from 1938 to 1940 show gains of 2 pounds per head per day for 2-year old steers and heifers during late June, July and August. Gains dropped off sharply in September, with curing of the forage.

Although ratings of livestock preference have not been worked out

for all species, considerable information exists concerning the principal plants. On the grasslands, most of the grasses including the wheatgrasses, fescues and needlegrasses are eaten readily, especially by cattle. Sandberg bluegrass and cheatgrass are highly palatable when young and green, but not when cured. Most of the forbs are low in palatability for cattle, but are used to a greater extent by sheep. Rubber rabbitbrush is browsed lightly in winter, while big sagebrush is eaten little at any time.

On the timber ranges, the highly-preferred species are principally forbs such as peavine, vetch and asters. Several shrubs, including rose and willow are also grazed readily. Pinegrass has only a moderate palatability rating. Stock take this species in increasing amounts late in the grazing season, as the supply of more palatable forage becomes depleted.

The Ranching Industry

History

The range livestock industry in British Columbia owes its start to the discovery of gold in the Cariboo area in 1858. The demands of the miners were met first by trailing cattle in from the United States. Soon ranches were established in the area itself, and the livestock industry continued to develop after gold mining activity declined in the late 1860's. Growth was further stimulated by the completion of the transcontinental railroad in the early 1880's. After heavy losses of livestock had occurred in severe winters between 1879 and 1897, the growing of winter feed became general practice and helped to stabilize the industry.

In the early years, the grasslands alone provided abundant feed for the livestock population, but by 1900 all readily available ranges were being grazed, and many were already under fence. At this time

virtually no use was made of the timber ranges. The effects of overstocking and season-long grazing soon began to show in the form of lowered grazing capacity and increase of weedy species. Cheatgrass entered the region about 1915 and spread over large areas.

The shortage of grassland range has led to an increasing use and development of timber ranges for summer grazing in recent years.

Administration

A large portion of the open grassland range is in private ownership or is held under renewable 21-year leases. The grazing leases are issued by the Lands Service of the Department of Lands and Forests. Some of the holdings are of large size, the largest being the approximately 150,000 acres owned by the Douglas Lake Cattle Company. Most were acquired in the early days of settlement.

Some of the grassland and most of the forested ranges remain as unalienated Crown lands. These lands are administered by the Forest Service of the Department of Lands and Forests. Grazing use is on a permit basis. The area of these lands is divided into grazing districts for administrative purposes and further subdivided into stock ranges and grazing units. Permitted on each stock range are encouraged to form livestock associations which act in an advisory capacity on grazing use and problems. Actual administration is in the hands of the District Foresters and their range management personnel. Grazing fees are based on a sliding scale in relation to livestock prices and take the form of a monthly charge per head of livestock. The rates for 1953 were 18 cents per head per month for cattle, 22½ cents for horses, and 3¼ cents for sheep. Half of all grazing fees is used for range improvements such as trails, fences, development of watering places and reseeded.

An extensive grazing survey is being carried on by the grazing staff of the Forest Service. Approximately 600,000 acres are surveyed annually. Adjustments in rate of stocking and in livestock distribution are made in accordance with the findings of these surveys.

Livestock Management and Grazing Practices

In the average ranch operation, the grasslands are grazed in spring and fall, the timber ranges in summer and a combination of meadow and range grazing with supplementary feeding provides winter forage.

Spring turn-out time varies with local conditions. In the Kamloops district, the grazing season starts about mid-April when the lower ranges are ready for use. The animals move upward into the higher grassland zones as the forage develops and usually reach the wheat-grass-fescue zone near the end of May. The timber range is ready for use by mid-June and supplies good forage until the end of September. Even on the forested ranges the grazing period varies with altitude, and the livestock are generally drifted up to higher elevations during the summer as the feed becomes dried out or depleted in the lower areas.

Cattle graze mainly in the Douglasfir zone and the meadows of the spruce-fir. Sheep are grazed on the open forest and meadows of the spruce-fir and alpine zones, reaching the latter about mid-July. All livestock are usually brought back to grassland ranges by late September or early October because of danger from storms at the higher elevations, and the seasonal decline in quality of forage on the timbered areas. The stock are then shifted to the winter ranges and meadows until feeding becomes necessary due to forage depletion or heavy snows. In the early ranching days in this area, stock usually grazed out

all winter and did well. Now many ranches lack adequate winter range. This deficiency in winter forage combined with the practice of selling fat beef on the summer market result in a feeding period which averages 4 months (December through March) in the southern part of the region and about 2 weeks longer in the northern portion.

In districts containing major valleys, the livestock are wintered on the benches and meadows, where climatic conditions are favorable and feed supplies handy. This situation prevails over most of the southern part of the ranching area. Further north, in the Cariboo and Chilcotin districts, favorable wintering spots are less common and many livestock are wintered on native meadows above the 3,500 foot level. In these areas, the hay is cut and cattle graze on the aftermath until snow depth makes feeding necessary.

Range Problems

The diversity of climate, soils, topography and vegetation in the region results in a number of problems facing the range user and the range technician. Only a few of the outstanding problems are discussed here.

On the grasslands poor range condition and the consequent reduction in grazing capacity are major problems. Some grassland ranges are in good condition but other areas have been reduced to a cover of perennial or annual weedy species. The reduction in grazing capacity on these ranges is particularly serious since the grasslands are usually the limiting factor in the yearlong ranch operation. The restoration of depleted grasslands by natural renovation or by artificial revegetation is a major management objective in the region.

The major problems of the timber ranges are not those of overgrazing, but of accessibility and usability.

Large areas have been rendered inaccessible due to deadfall conditions, produced mainly by the killing of stands of lodgepole pine by bark beetles (*Dendroctonus*) or by fire. Not only are such areas spoiled for grazing, but often they hinder movement of stock to better ranges. Another problem is that caused by the encroachment of tree or shrub cover on areas formerly dominated by herbaceous species. In many cases this encroachment appears to be the result of normal plant succession in areas where the woody plant cover had been previously removed by fire. The utilization of insect-killed forest areas and the maintenance of grazing capacity on ranges of increasing tree and shrub growth are becoming acute problems in parts of the region.

Poisonous plants are a definite problem. They cause an estimated 14 percent of all cattle losses. On grassland ranges, low larkspur (*Delphinium bicolor*) and death camas (*Zygadenus venenosus*) are the principal offenders. The larkspur menace can usually be met by deferred use of areas with heavy infestations and sometimes by herding the cattle during critical periods. The period when the plant is attractive to stock is a short one, but comes during the spring grazing period on the upper grassland ranges. Death camas is a problem only to sheep outfits. Recognition and avoidance of large patches, and care in trailing and bedding can do much to cut losses. Plants of low-lying areas that cause occasional losses include poison hemlock (*Cicuta douglasii*) and arrowgrass (*Triglochin maritima*).

The most serious poisonous plant of the area is timber poisonvetch (*Astragalus serotinus*). This native herb occurs in the wheatgrass-fescue, ponderosa pine, and Douglas-fir zones. In grasslands, this plant rarely causes trouble except on areas where good forage is lacking.

On timber ranges, the plant is eaten readily during the early part of the grazing season but becomes unpalatable at maturity. Various forms of paralysis and respiratory disturbances are shown by affected animals. Emaciation is common, and in severe cases death may occur. The handling and control of livestock on the rugged ranges of Interior British Columbia present problems absent in areas of more gentle topography. Management of breeding stock is difficult since many breeding herds are on forest ranges for at least part of the breeding season. No doubt this partly accounts for the relatively low calf crop, which was found to average only 55 percent in a study made during the period 1933-1940. On many ranches the calf crop has since been increased much above this figure by good management practices, including careful selection and proper distribution of bulls and the use of breeding pastures. In the Tranquille herd used for range studies by the Kamloops Station from 1935 to 1939, the calf crop was increased from 50 to 90 percent by application of the above measures.

Other problems assume major importance in certain districts or in particular years. The paralysis tick (*Dermacentor andersoni*) is common on grassland ranges in some of the southern districts. These ticks cause occasional losses of livestock and when abundant may delay spring grazing.

Grasshoppers have reached epidemic proportions on the grassland ranges several times since ranching began in the region. The increase of species which cause the most damage is favored by overgrazing, while the insects themselves show much the same forage preferences as do livestock.

Range Research

Research on range problems in British Columbia is carried on

principally by the Federal Government, through the Canada Range Experiment Station at Kamloops. Close cooperation is maintained with provincial agencies, including the University of British Columbia. The research program was started in 1935 when a range experimental sub-station was established at Kamloops. The work was set up on a cooperative basis with the provincial government. Cattle of the Tranquille Sanatorium near Kamloops were used as the experimental herd. The disbanding of this herd in 1940 and war-time economy moves by the federal government resulted in closing of the sub-station. In 1946, steps were taken which led to the re-establishment of research facilities and in 1947, the Canada Range Experiment Station was established at Kamloops. A full program of research on problems of the range livestock industry is underway.

Summary

The range resources of British Columbia include 3 million acres of grassland and 10 to 12 million acres of forested range. The main range area is located in the southern interior section of the province. The area is one of rugged topography, with great variation in climate, soils and vegetation. The grassland ranges belong to the bunchgrass type and include three well-defined zones differing in plant cover and grazing capacity. The timber range is mainly in the Douglasfir zone, much of which is now occupied by lodgepole pine or aspen.

The forage of the grassland ranges consists mainly of a few species of grasses. On the timber ranges, forbs and browse supplement the pinegrass which makes up much of the forage cover. The range vegetation is high in nutritional value and the principal known deficiency is that of phosphorus in cured forage. Good gains are made by stock on

the grassland ranges in spring, and on timber ranges from June through August.

The grassland ranges supply the spring-fall and some winter grazing, while the timber ranges are used for summer range. Stock are wintered mainly on valley ranges and on cultivated or native meadows.

Most of the grasslands are privately owned, but the forest ranges are largely on public lands, administered by the Provincial Department of Lands and Forests. Grazing is on a permit basis and half the fees are used for range improvement.

Current problems include the poor condition of large areas of grassland and the decrease of forage on timber ranges due to deadfall and/or thickening of the tree and shrub cover. Poisonous plants are of importance over much of the area. Research on these and other range problems is under way at the Canada Range Experiment Station located near Kamloops.

The demands of the increasing human population of British Co-

lumbia exceed the current supply of livestock products and present an excellent market for increased production. Any appreciable increase must come from more intensive use of existing range areas and a greater emphasis on pounds of meat rather than on numbers as an index of livestock production.

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STRENGTHENING AMERICAN AGRICULTURE THROUGH RESOURCE CONSERVATION

The resource conservation program outlined by Secretary Benson on December 4, 1953 listed three principal objectives for immediate attention by the Department of Agriculture:

1. Accelerate both research and education so that improvements in agricultural resources are obtained and quickly passed on to those who can use them.
2. Improve technical aid to landowners and operators and help speed up the survey of soil resources and the planning and application of needed conservation measures on the farm, ranch and forest lands of this country—acre by acre and watershed by watershed.
3. Encourage local leadership such as is provided by soil conservation districts, watershed organizations, and other community and neighborhood teams of people.

Conservation means putting into use on the land combinations of good practices—combinations fitted to the soil and water resources of each piece of land, and to the human resources and capabilities of each

landowner or operator. Modern resource conservation means the planning and treatment of entire watersheds. In watershed protection programs, local people and organizations must team up with local, state and federal governments to share the cost and work out improvements to benefit all.

The final responsibility for carrying out a sound, vigorous program of conservation rests with the people who own and operate the land. Soil conservation districts and other groups, locally organized and directed, provide effective mechanisms for the management of these programs to fit local needs.

The overall responsibility of the United States Department of Agriculture is to make fullest and most economical use of basic technical data and knowledge for the Nation and for its varied resource areas by integrating technical assistance, cost sharing and such other phases of conservation as may be in the national interest. (Excerpts from the U. S. Dept. of Agriculture booklet "*Strengthening American Agriculture through Resource Conservation*", published December, 1953.