

Condition Classes on Mountain Range in Southwestern Alberta

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FOUR range-condition classes have been set up for the bunchgrass mountain range of the Rocky Mountain Forest Reserve in Alberta. The classes are based upon vegetative composition, soil condition, plant vigor and to a lesser degree upon plant density. The condition classes are used to measure attainment of the aims of the management plans and as a guide to further adjustment in stocking rates and practices.

DESCRIPTION OF AREA

The forest lands in Alberta which are used as livestock range lie mainly on the east slope of the Rockies, north from the International boundary to the Bow River exclusive of Banff and Waterton Lakes National Parks. The Forest Reserves of the area include the foothills and mountains roughly above 5,000 feet, west to the British Columbia boundary. About 25,000 cattle and 2,500 sheep are grazed during the summer months. Four of the main tributaries of the Saskatchewan River rise in the region and furnish water for domestic use, livestock, and irrigation for many prosperous communities in the Prairie Provinces. Small saw-mills cutting lodgepole pine (*Pinus contorta* var. *latifolia*), spruce (*Picea* spp.) and Douglas fir (*Pseudotsuga taxifolia* var. *glauca*) are scattered along the mountains. Big game, trout streams and scenery offer attractions. This region is, therefore, an important watershed with grazing, lumbering and recreation as important adjuncts.

Seven range types comprise the vegetal cover: conifer, grass, meadow, broadleaf,

browse, waste and barren. The conifer type is the most widespread but the grassland supplies more of the forage than any other type. The grassland surveyed has an average forage acre factor of 0.160 while the lodgepole pine subtype has a factor of 0.037.

The grass type is the most important in the management of the range because it occupies a critical position as well as supplying much forage. It is usually the first to take abuse because of the palatability of the component plants and its accessibility. The grassland areas occupy open hillsides and valley bottoms. All the major grasses and some of the forbs have a fairly high preference. If steps are taken to insure good conditions on this type it may be assumed safely that the major part of the entire range is in satisfactory condition.

Because of the strategic position occupied by the grassland, it was selected for special study during the range survey conducted in 1949 under the direction of the Eastern Rockies Forest Conservation Board. A system of classifying range conditions was worked out for use in future management.

METHOD

Sites were located where range condition varied from good on the less used land to depleted where concentration of livestock occurred. Most of the range was in fair or better condition and the amount which could be considered depleted was too limited to be significant. Vegetative composition, plant vigor, plant density and soil conditions were observed and

recorded for 50 bunchgrass sites in varying condition classes. Ocular estimate was used for vegetal analysis on these sites. More precise analysis was made of the vegetation on 3 sites by the personnel of the Dominion Experimental Station using the vertical point method (Clark et al., 1942). The 3 sites extended on both sides of a fence separating a heavily used horse pasture classified as poor (class 3) from lightly used range classified as good (class 1). Some of the results appear in Figure 1.

could be estimated in the field were selected. Litter and plant cover were selected as indicators of soil protection, trailing and trampling as indicators of degree of soil depletion. If there was no evidence of surface runoff it was assumed that the soil was satisfactorily permeable.

Although infiltration tests were run, the method was not considered practical for field survey. The method of using two concentric cylinders driven into the soil and filled with water gave data which are useful only as relative indices rather

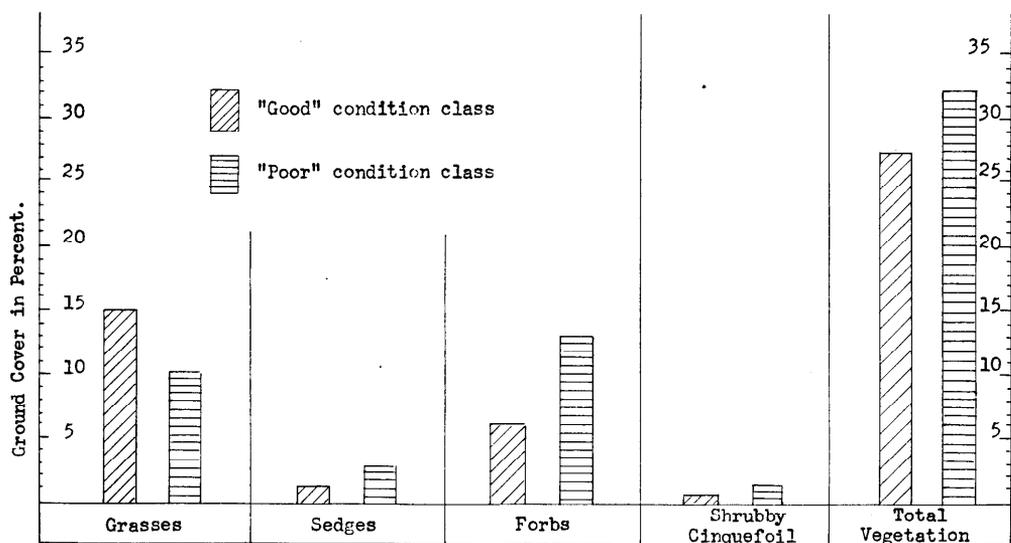


FIGURE 1. Components of the vegetation in percent of ground cover taken by the vertical point method on range in good and in poor condition.

Standards of soil condition were based upon stability and permeability. Soil showing capability of absorbing precipitation at the normal rate of fall for the site and in no way in danger of erosion losses was considered in top condition. Where retrogressive plant succession was severe and soil losses had reached the point where the plant community was adversely affected, the site was classified as depleted (class 4). The range of conditions was divided, arbitrarily into 4 classes and standards for judging that

than as actual infiltration rates. Soil disturbance, absence of rain drop action, and the short period of time involved account for the excessive rates obtained. The data did bear out the conclusion that the critical point in range deterioration is where conditions of soil and plant cover are such that infiltration is far enough below the rate of precipitation and snow melt that runoff becomes excessive. Infiltration indices were on the average five times as great on range in good condition (class 1) as they were on

range in poor condition (class 3); all runs made on similar soil and terrain on opposite sides of a fence.

TREND

The climax condition of soil and vegetal cover was considered to be the ideal aimed at and successional trend was observed as a helpful criterion. A discussion of trend may help in the interpretation of the condition classes.

The grassland of the foothills and mountains is mainly a bunchgrass type (Moss and Campbell, 1947). Rough fescue (*Festuca scabrella*) still dominates large tracts but is reputed to have formed a sea of waving grass in the early days on many ranges where it is now scarce or absent. A fairly long list of secondary grasses include Parry's oatgrass (*Danthonia parryi*), intermediate oatgrass (*D. intermedia*), Idaho fescue (*Festuca idahoensis*), June grass (*Koeleria cristata*), wheatgrasses (*Agropyron spp.*), speargrasses (*Stipa spp.*) and dryland sedges (*Carex spp.*). Forbs in the association include lupines (*Lupinus spp.*), asters (*Aster spp.*), alum root (*Heuchera spp.*), loco weeds (*Oxytropis spp.*), milk vetches (*Astragalus spp.*), three flowered avens (*Sieversia triflora*), yarrow (*Achillea lanulosa*), pasque flower (*Pulsatilla ludoviciana*) and goldenrods (*Solidago spp.*) (Budd 1949). The most common shrub is shrubby cinquefoil (*Potentilla fruticosa*). Juniper (*Juniperus spp.*) and bearberry (*Arctostaphylos uva-ursi*) appear on primitive soils. Oatgrasses sometimes appear as co-dominants along with rough fescue, and in a few places dominate the shallower and gravelly soils. Bluebunch wheatgrass (*Agropyron spicatum var. inermis*) replaces rough fescue as the dominant on drier steep slopes. Forbs often form an important part of the cover with the flowers making quite a show in summer.

There exists a delicate balance in this

bunchgrass association and any appreciable amount of use causes retrogressive changes. Rough fescue grows in large tussocks when protected from fire and grazing, with other grasses and forbs occupying the intervening spaces. The first evidence of use is the breaking up of the large tussocks into smaller, less dense bunches (Moss and Campbell, 1947). Increased intensity of use results in a further decrease in bunch size. In the early stages of downward trend the dominant is replaced by sub- or co-dominants. Oatgrasses, June grass, speargrasses and wheatgrasses increase, with the result that total density often remains about the same. Of the secondary grasses intermediate oatgrass is the least palatable and as heavy use continues it becomes increasingly prevalent to the exclusion of rough fescue, Idaho fescue, Richardson's speargrass, June grass, and wheatgrass, somewhat in that order. In moister areas blue grasses (*Poa compressa* and *P. pratensis*) become the most prevalent.

When use becomes very heavy the grasses thin out and are replaced by forbs. On the sites studied by the verticle point method, weedy plants had increased on overused pasture to more than double the amount on the lightly used range. The increase in forbs was so great that total ground cover actually increased with overuse (Figure 1). Much of the increase was contributed by plants of low palatability; three flowered avens, penstemon (*Penstemon spp.*), pasqueflower, and pussy toes (*Antennaria rosea*). Pussy toes formed dense mats. Little club moss (*Selaginella densa*) which appeared only on drier knolls of the little used range was quite common in overused pastures and formed mats, making re-establishment of other species difficult.

Exotics such as Canada thistle (*Cir-*

sium arvense) and downy brome (*Bromus tectorum*) were found to be invading where depletion had advanced far enough that the native perennials were thinning out.

There was little opportunity to observe upward trend from a depleted condition but a few changes were noted. Rough hairgrass (*Agrostis scabra*) was taking over bare ground in thinned stands when protected. Timothy (*Phleum pratense*) followed rough hairgrass and soon became an important component. When rhizomatous wheatgrasses were present they had quickly established themselves and on some abandoned roads had formed pure stands.

RANGE-CONDITION CLASSES

Four range-condition classes are presented here and these will be used on ranges of the Rocky Mountain Forest Reserve. The classes are based upon principles similar to those used by Ellison and Croft (1944) and Pickford and Reid (1946). They are called good, fair, poor and depleted. Standards of judging each of the conditions are outlined below:—

Soil conditions.

Class 1, good. Sufficient litter to protect the soil; 60 percent ground cover or better. Soil showing good structure and no evidence of compaction. No evidence of accelerated erosion.

Class 2, fair. Litter somewhat lacking or poorly distributed; 40 to 60 percent cover. Soil showing sufficient compaction in limited areas to slightly retard maximum infiltration rate.

Class 3, poor. Litter scarce or poorly distributed showing bare soil in patches. Soil compacted and infiltration rate insufficient to absorb the precipitation at the prevailing rate as evidenced by sheet erosion and incipient gully ero-

sion in the form of rills and alluvial, soil deposits or occasional advanced gullies. Plant crowns becoming exposed.

Class 4, depleted. Very little litter. Soil obviously compacted, trails numerous. Sheet and gully erosion advanced and active (Figure 2D). Plant crowns exposed and possibly roots showing, erosion pavement on stony or gravelly soil.

Plant composition.

Class 1. Rough fescue the dominant except on thin gravelly soil and steep dry southern exposures where oatgrasses or bluebunch wheatgrass may dominate (Figure 2A). Various species of grasses and sedges such as oatgrass, Idaho fescue, speargrass, June grass, wheatgrass and carex forming part of cover. Shrubby cinquefoil if present in small bunches with grass crowding into clumps. Forbs scattered lightly through the plant cover; lupines and balsamroot included.

Class 2. Rough fescue bunches definitely reduced in size. Secondary grasses forming a higher proportion of plant cover (Figure 2B). Shrubby cinquefoil bunches showing increase in size.

Class 3. Rough fescue absent or present only in the protection of unpalatable plants (Figure 2C). Idaho fescue and Richardson's speargrass scarce and bunches small. Intermediate oatgrass possibly still abundant. Three flowered avens and alum root increased in amount and size, lupines and balsamroot scarce or absent. Sedges may be fairly abundant. Pussy toes in noticeable mats. Little club moss matted between clumps of grass.

Class 4. Idaho fescue, June grass, Richardson's speargrass absent or present only as relics. Oatgrass, bluegrass

and sedges making up most of grass cover. Three flowered avens, alum root and other weeds forming as much as half the plant cover. Pussy toes and little club moss in large dense mats. Shrubby cinquefoil bunches large except where grazed by livestock or where soil losses are far advanced. Downy brome, Canada thistle or other invaders appearing where seed source exists.

Class 3. Rough fescue bunches if present very small and lacking vigor. Seed crop poor or none except on intermediate oatgrass and wheat-grasses. Color of grasses yellowish. Shrubby cinquefoil clumps vigorous.

Class 4. All palatable plants including intermediate oatgrass making poor growth. Few or no seedstalks. Shrubby cinquefoil losing vigor among invaders.

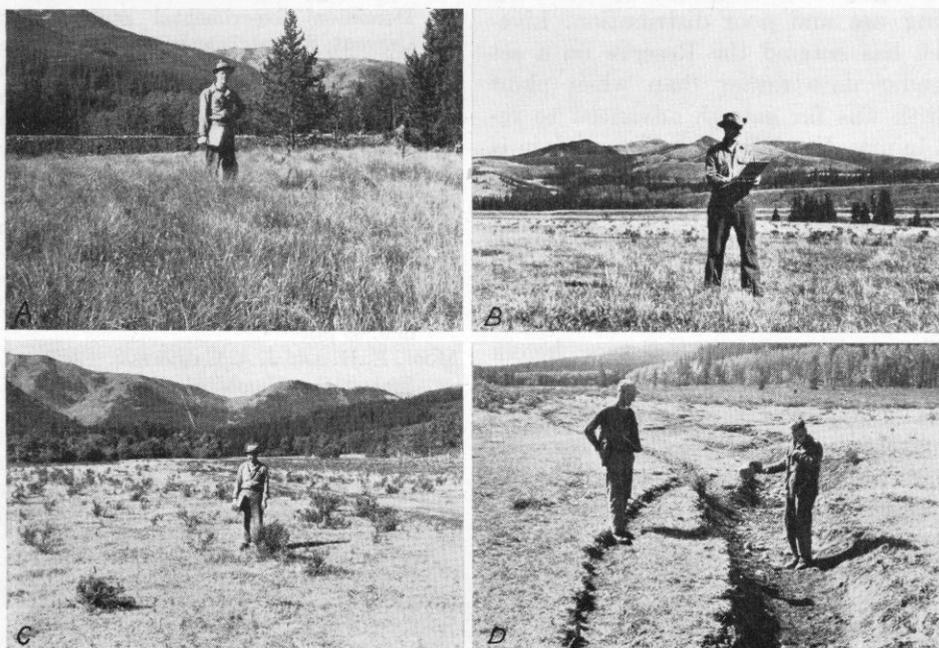


FIGURE 2. Range condition classes. A. Class 1, Good. Vigorous grass stand dominated by rough fescue. B. Class 2, Fair. Numerous heads of intermediate oatgrass indicate replacement of palatable grasses by less palatable ones. C. Class 3, Poor. The more palatable grasses remain only as relics in bunches of shrubby cinquefoil. D. Class 4, Depleted. Livestock concentration and trailing have caused soil compaction, runoff and gullying.

Plant vigor.

Class 1. Seed crop and forage production normal or almost as good as on protected areas. Fescues growing in large bunches. Leafage of palatable grasses robust and bright green.

Class 2. Bunches of fescues and speargrass small. Bunches of rough fescue dying in the center. Leaves narrower and drying up early.

Plant density.

Density varied so greatly from site to site within the bunchgrass type that no set boundaries were established for any class. Density was found to range above .30 for classes 1 and 2 except on very steep slopes and dry ridges.

Density did not decrease appreciably with deterioration down to class 3 on the sites studied. Groundcover measured

by the vertical point method increased on sites reported in Figure 1. As range condition reached class 4 where serious soil loss had begun, density did decrease considerably.

MANAGEMENT AND CONDITION CLASSES

Observations of present management in relation to range condition make it quite obvious that downward trend is due largely to two practices; too early spring use and poor distribution. Live-stock has entered the Reserve on a set calendar date rather than when plant growth was far enough advanced to resist injury. In most cases the set date is too advanced even in early seasons. Stocking rates are generally not too high providing proper distribution is attained.

APPLICATION

The range condition classes herein reported will be used to measure attainment of the aims of the prepared range management plans. A check of condition classes will be made periodically over the grassland types and adjustments in

stocking and management practices recommended as required. Utilization checks and range readiness studies will accompany the condition class survey. Enclosures of 2 acres or more have been fenced at strategic points; these will be observed to give a comparison of conditions under grazing and protection.

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