

Evaluation and Measurement of the California Annual Type

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The California annual-grass type is truly annual except for scattered individuals of a number of species of broad-leaved herbaceous plants. In very rare instances where grazing has been light or in occasional relic areas perennial grasses are found in a thin stand. A few grasslands along the coast have considerable amounts of perennial grasses.

The annual type is found in a wide variety of environmental conditions. Average precipitation may be as low as 5 inches per year in the southern end of the San Joaquin Valley or it may be as high as 80 inches along the California coast near the Oregon border. Regardless of yearly average, less than five percent occurs in the four months of June through September. Temperatures below freezing may occur any time between November and March but temperatures below zero are extremely rare. Average July temperatures may be below 60° F. along the coast to above 90° F. in the interior valley.

Soils occupied by the annual grass type are correspondingly varied. Some are prairie-like in that they are dark, slightly acid and have a high organic matter content. These are near the coast. Another group has the dark color and moderate organic matter content but with neutral surface and calcareous subsoil. These are similar to the Chernozems. A few Rendzina soils occur in the southern coast range. In the foothills and uncultivated portions of the Interior Valley the soils are usually of the noncalcic brown and desert types. Some grassland soils are deep, meditim textured, friable, and support excellent forage crops while others are shallow, extremely

heavy or light and low in productivity.

Characteristics of the California Annual Type

Many of the most abundant grasses such as species of *Aira*, *Avena*, *Briza*, *Bromus*, and *Gastridium* are introduced. Two of the annual fescues (*F. myuros* and *F. dertonensis*) are also alien while the most abundant species of this genus are considered native. The species of annual broadleaved plants among the aliens include *Spergula*, *Brassica*, *Medicago*, *Erodium*, *Centaurea*, *Hypochoeris* and many others. Some of the common native broadleaved plants include species of *Trifolium*, *Lotus*, *Amsinckia*, *Plagiobothrys*, *Madia* and *Orthocarpus*. In most areas of the annual

type the introduced species contribute 80 percent or more of the floral composition.

Seed production in the annual type is tremendous. The average number of seeds which will germinate from one square inch of soil collected in August varies from about 20 to nearly 100. Some seeds are dormant and do not germinate for several years. A seed crop may be light due to unfavorable weather but very seldom is it too low to produce a big crop of seedlings the next year. One principle in proper management of the annual range is to graze off the seed crop before maturity of the early maturing undesirable annuals. This practice coupled with deferment in the late growing season permits the better forage plants to produce seed and thereby the range condition improves.

Seeding into the annual range is not done because of the competition from the resident annuals. When seeding is done on the better lands, a combination of cultivation ahead of seeding, and grazing afterwards, must be used to lessen the competi-



FIGURE 1. A desirable combination of soft chess, bur clover and broadleaved filaree in the California annual type. The few plants of rigput are undesirable because of their coarse awns. Photo taken April 27, 1955, about three weeks before plant maturity.

tion. Seeding of burns is ordinarily not successful if the annuals are already present.

As one would expect from the above description the density is very high. Foliar cover on the basis of estimates and the point analyser often is 60 to 80 percent. Production frequently is above 2,000 pounds per acre. The carrying capacity of excellent annual type ranges, where the soil is good, is usually between 0.5 and 1 acre per animal unit month. With fertilization it is much higher.

Forage conditions for three seasonal periods may be considered separately. From germination in October to March green forage is present but scarce and animals are often given some hay or dry forage. During the spring ample green nutritious forage is available. Beginning in May or June the plants mature and livestock are usually supplemented with concentrates or placed on irrigated pastures.

This brief resume of the California annual type would be incomplete without mentioning the variability associated with weather and location. The crop may fail some years in the southern end of the San Joaquin Valley and be very lush other years. Along the north coast there is much less variation in yearly production. There are tremendous changes or differences in floral composition locally from one site to another, during the growing season, and from one year to the next. Californians speak of the variation in production and composition when they say, "This is a good clover year"; or "This is a good grass year."

Patterns of Vegetational Change

Three patterns or types of vegetational changes must be recognized before proper evaluation of the annual type range can be made. The first occurs through the growing season and may be illustrated by numbers of plants by species in square-inch plots. Data are from the Hopland Field Station in Mendocino County. From December of

1952 to June of 1953 soft chess (*Bromus mollis*) increased from 16 to 43 percent of the composition. At the same time the broadleaved plants decreased from 52 percent to 37 percent. Both soft chess and the broadleaved plants decreased in numbers but the decrease in soft chess was much the least. A similar pattern has existed for three years on three different sites.

The second source of change in floral composition is from one year to the next. On one set of plots where there was no grazing the variation in soft chess was from 38 to 63 percent in three years. Where there was moderate grazing the variation was from 40 to 38 percent. Generally, when soft chess was high the broadleaved plants were low and vice versa. The seasonal differences may be emphasized further by the average number of plants per square inch. On one site average numbers varied from 7 to 35 in different years. On all sites the greatest number was at least twice the lowest. However, in nearly all cases only approximately half the plants survived to produce seed. In terms of herbage production the seasonal variation was approximately 1,000 pounds per acre.

The third source of variation is directly related to the degree of grazing. This influence is exerted through the amount of plant residue present during the period from germination through the winter. Experimental plots with all residue removed have shown progressive deterioration in kinds of plants, rapidity of fall and winter growth and total herbage production. On the other hand, 700 to 1,000 pounds of residue per acre has allowed improvement in the floral composition and production on experimental plots that were in poor condition four years ago.

Evaluation of Range Condition

What does all this mean in the evaluation of range condition? First of all, if composition is the primary consideration, the exami-

nation should be near the end of the growing season when the full forage crop is present. Surveys earlier in the winter and later in the summer fail to find and give proper value to many species of broadleaved plants.

Second, composition is never the same in successive years. The exact reasons for this are not clear and only the most general relationships have been observed. Any system of range condition classification must be broad enough to include these variations.

The third point is that plant succession does occur in the annual type and therefore changes in floral composition can logically be used as a yardstick to aid in the designation of range condition. However, certain modifications in the system, as it is presently used in the Great Plains are needed. The terms "decreaser," "increaser" and "invader" do not necessarily apply because the whole flora is dominated by invaders and is likely to so remain. That is true if one considers the original climax to be perennial bunchgrass. But if the highest type of annual grassland, dominated by soft chess and ripgut, is considered "climax annual" then the principles expressed by the above three terms can be applied quite logically. When the group of commonly occurring dominants are so arranged the following listing is made.

Upper group

(Decreasers)

Soft chess
Ripgut
Wild oat
Slender oat
Annual rye grass
Cut-leaf filaree

Middle group

(Increasers)

Fescues (3 spp.)
Bur clover
Broadleaf filaree
Nit grass
Red brome

Lower group

(Invaders)

Hair grass
Quaking grass

Annual bluegrass
 Little barley
 Trifoliums
 Annual lupine
 Tarweed

Two points need to be made clear on this listing. Some species will be in different groups on different sites. Most of these species are present in all areas, and therefore the term "invader" may still not be precisely correct.

Certain inconsistencies between grazing value and successional tendencies of these species complicate the actual management of annual ranges. Ripgut is undesirable because of the very troublesome beard. Yet, succession toward the "climax" invariably allows it

to become dominant. The only answer so far is heavy late winter and early spring use and then deferment until the seeds have fallen. Judiciously done, this allows the decreasers to be dominant with small amounts of ripgut. Broadleaf filaree is often mentioned as a desirable plant. Perhaps it is for winter feed but it soon decreases with improvement of the grass stand. The resident trifoliums do not withstand competition from the grasses and only occur where the grass stand is poor. Yet, they are usually considered desirable. To manage annual range to favor filaree and the annual clovers usually means a sacrifice in total production.

Resume

Objectives of this paper have been to:

1. Direct attention to the varied nature of California annual-grass type.

2. To show that at least three patterns of vegetational changes exist on the same plot of ground.

3. To indicate that plant succession, measured by changes in floral composition, should be the basis of evaluating range condition.

4. To warn that evaluation of certain plants contrary to the natural successional tendencies often leads to requirements in range use incompatible with maximum production.