Composition of Two Disclimax Bluejoint Stands in Southcentral Alaska[1]

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Highlight

The composition of two disclimax bluejoint stands was determined prior to their being committed to grazing use in southcentral Alaska. The stands were essentially monotypic in their grass constituency with forbs and woody species comprising over 50% of the shoot density and well over 60% of the yield. Bluejoint was the only plant of grazing value found in quantity in the two communities.

Lush stands of bluejoint *(Calamagrostis canadensis)* prevail on mesic grassland sites and open areas of burned-over forest lands in southern and southcentral Alaska. On favorable sites bluejoint panicles often attain a height of 6 ft or more. These stands are particularly well developed and extensive in the coastal regions of southcentral Alaska. They become less extensive farther inland and northward.

Wunderlich (Rieger and Wunderlich, 1960) described some of these grasslands on Kodiak Island and estimated bluejoint volume from about 12 to 30% in the tall-grass stands. Hanson (1951) obtained relative density estimates of bluejoint ranging from about 35 to 75% in bluejoint communities throughout southcentral and central Alaska.

Few estimates of absolute weights of community fractions are available for Alaska grasslands. Klebesadel (Klebesadel and Laughlin, 1964) estimated dry matter yields in three bluejoint stands, which had developed as a result of mechanical clearing of forests in the Matanuska Valley, at about 2,800-4,150 lb/acre. In a study of managed bluejoint plots employing different fertilizer and clipping schedules, Klebesadel (1965) obtained yields of about 1.0-2.5 tons. Reports by farmers of hay production on native grasslands averaged 1,700 lb/acre in 1960 (Pownall and Tye, 1960).

The general area of the current study was toward the upper limits of the mixed evergreen-hardwood forest zone in the Chugach Mountains—dominated by *Betula papyrifera* (western paper birch) and *Picea glauca* (white spruce). It gives way to a zone dominated by *Alnus crispa* (green alder). The area was severely burned early in the century and now consists of scattered stands of trees, alder, and herbaceous communities. An assortment of herbaceous communities have developed in the open parks of these burned-over forest lands. Succession within the herbaceous communities on sufficiently deep soils appears to culminate, prior to ascendancy to a woody community, in a tall-grass bluejoint community (Fig. 1). These observations agree in general with those of Lutz (1956).

Two bluejoint stands of this disclimax type were analyzed for population density and one for

FIGURE 1. A bluejoint community bordered by birch and alder in the Chugach Mountains of southcentral Alaska. Bluejoint and fireweed dominate the tall, herbaceous growth. Oak fern and wood horsetail are most abundant in the understory.

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yield. The stands were scheduled to be grazed by cattle but prior to analysis had been undisturbed by man or his livestock. Original compositional and yield information have not been obtained on grasslands currently in grazing use in the region. These findings are intended to serve as a reference for future quantitative studies to assess the effects of grazing on this type of grassland.

Procedures

The field research was conducted from August 13-18, 1964, after the bluejoint was fully headed. The study area was in the Wolverine drainage north of the Wolverine Creek about 6.5 miles east of Palmer. The point-centered quarter method was employed to obtain estimates of shoot density and frequency (Cottam and Curtis, 1956; Dix, 1961). A slender rod with 4 short cross pieces attached at right angles near the base was placed 50 times at 5-pace intervals along a 250-pace transect. The distance from the center of the rod to the nearest shoot in each quarter was measured in centimeters and tallied by species. A species was considered amply sampled if encountered about 30 times (Cottam and Curtis, 1956; Dix, 1961).

Weight estimates were obtained by use of the clip-plot method. Nine 3.1-ft^2 quadrats were placed at regular intervals along the transect sampled for density and the plants, clipped at ground level, sacked according to species. The oven-dry weights were determined in grams and the yield in lb/acre calculated therefrom.

An estimate of bluejoint height was obtained by taking 40 measurements of non-heading culms at regular intervals along the transect. Measurements were taken from the ground level with the leaves extended along the tape. Dwarfed and very young plants in the understory were not included.

Taylor (1963), Anderson (1959), and Taylor and Little (1950) were employed for nomenclature.

Results

The two stands analyzed in the study differed in altitude and topography. Stand A occurred on level ground at about 1,150 ft altitude and Stand B on a generally southwest facing, 19% slope at about 1,400 ft. The soil mantle consisted of a silt loam, generally 18-20 inches deep over rock and gravel. Stand A was analyzed for yield as well as for density.

Density and yield figures are presented in Table 1. Bluejoint far exceeded any of the other species in shoot density but was surpassed in yield by the tall growing fireweed. Oak fern, a fragile sciophyte of the understory, was second to bluejoint in density but very low in yield. Fireweed and wood horsetail, another understory plant, were third and fourth in density, and the latter was fourth in yield. The above-ground-biennial shrub American red raspberry was very low in density but third in yield. All other species were low in both yield and density. The four species contributing the bulk of the cover in the community are all rhizomatous.

Production of a little over 2 tons/acre of dry matter was indicated for the stand with fireweed and bluejoint contributing about 1,600 lb and 1,400 lb respectively, i.e., almost 75% of the total yield. Red raspberry and horsetail comprised about 20% of the production. Thus 4 species accounted for over 95% of the total production of herbs and small shrubs. The infrequent overstory plants of paper birch, alder, and red elder *(Sambucus racemosa)* are not included in the production.

The two stands were very similar in composition, as indicated by the closeness of the relative frequencies of the four major species tallied in the analyses. The stands differed mainly in their representation of minor species. The difference recorded in the two stands for starflower (Table 1) was not a true difference, since starflower was so badly deteriorated in Stand A that it was not tallied in the analysis though it was encountered. Species noted to be present but not encountered in either analysis were cow parsnip *(Heracleum lanatum)*, prickly rose *(Rosa acicularis)*, red elder, and green alder.

Height measurements of 40 non-flowering culms of bluejoint averaged 108.9 cm (SE = 2.0) in Stand A and 105.9 cm (SE = 2.3) in Stand B. A volume index was derived by multiplying density in shoots/m^2 x height and dividing by 100. The two indices, which follow, differ only about 1.8%.

Stand A: $129.3 \times 108.9 \div 100 = 140.8$.

Stand B: $135.4 \times 105.9 \div 100 = 143.4$.

Discussion

The two disclimax tall-grass bluejoint stands analyzed in this study are essentially monotypic in their grass constituency. The bluegrasses encountered in Stand B only occurred in local disturbances (e.g., in moose bedding ground and around old fallen trees) and in microhabitats with thin soils. They were excluded from the undisturbed, well developed portions of both stands.

Bluejoint and the tall growing fireweed dominate the aspect of the community. Spiny woodfern is a vigorous clump former and dominates locally in its scattered occurrences, as do the infrequent red raspberry and other woody species. Except for the relatively few plants of tall lungwort and cow parsnip all other plants in the community are small plants of the understory—negligible in yield and forage value. The paucity of species in the community is due, in part at least, to the accumulation of dry and decomposing mulch, generally from 4 to 8 inches thick, and to the shading effects of the tall herbaceous growth.

Forbs and shrubs comprise the majority over grasses in both density and yield. The results are counter to that determined

Table 1. Composition and yield data on two disclimax bluejoint stands in southcentral Alaska. Density and frequency obtained by point-centered quarter method, yield by clip-plots.

Species	Stand A					Stand B		
	Rel. freq.	Rel. dens.	No./sq. meter	Yield Rel. wt.	Yield lb/acre	Rel. freq.	Rel. dens.	No./sq. meter
Grasses								
Bluejoint *(Calamagrostis canadensis)*	35.1	44.5	129.3	35.3	1,466	33.1	42.0	135.4
Bluegrasses *(Poa* spp.)						4.2	4.5	14.5
Forbs, shrubs, and trees								
Oak fern *(Gymnocarpium dryopteris)*	21.9	21.5	62.4	2.4	102	21.2	22.0	70.9
Fireweed *(Epilobium angustifolium)*	15.8	11.5	33.4	38.9	1,615	13.6	11.0	35.4
Wood horsetail *(Equisetum sylvaticum)*	12.3	11.5	33.4	7.8	324	11.9	8.5	27.4
Spiny woodfern *(Dryopteris austriaca)*	2.6	2.0	5.8	2.5	106	1.7	1.5	4.8
American red raspberry *(Rubus strigosus)*	1.8	1.0	2.9	12.5	519	0.8	0.5	1.6
Other species	—	—	—	0.5	21			
Starflower *(Trientalis europaea)*						8.5	6.5	20.9
Dogwood *(Cornus suecica)*	6.1	3.5	10.2			2.5	1.5	4.8
Chickweed *(Stellaria calycantha)*	2.6	1.5	4.4			0.8	0.5	1.6
Tall lungwort *(Mertensia paniculata)*						0.8	1.5	3.2
Western paper birch *(Betula papyrifera)*	0.9	2.0	5.8					
Highbush cranberry *(Viburnum edule)*	0.9	1.0	2.9					
Alaska bramble *(Rubus alaskensis)*						0.8	0.5	1.6
Totals			290.5		4,153*			322.1

*SE sample plots $= 3.2\ (.008\ \bar{x})$

by Penfound (1963) employing the same method in a density analysis of a tall-grass community in Oklahoma. Grasses constituted about 70% of the relative density in the southern tallgrass community as compared to about 46% in the subarctic bluejoint community. The differences in relative yields were even greater with grasses comprising about 87% of the yield in the Oklahoma community and about 35% of the yield in the Alaskan community.

The grazing potential of the bluejoint-fireweed disclimax community is limited since bluejoint is the only species present in any abundance that is normally sought by cattle. Fireweed may serve as forage when fed in silage or in a chopped form, but it is generally avoided by cattle in the field. The intolerance of bluejoint to intensive cropping (Piper, 1905; Rieger and Wunderlich, 1960; Klebesadel and Laughlin, 1964; Klebesadel, 1965) further limits the grazing value of the community. Visual estimates of native pastures that have been grazed indicate large reductions in the yield of bluejoint and important increases and incursions of other species.

Summary

Population density was determined in two disclimax tallgrass bluejoint stands on burned-over forest land in southcentral Alaska. Yield data were obtained on one of the stands. *Calamagrostis canadensis* (bluejoint) constituted about 42 to 45% of the relative density of the two stands. Occurrences of *Poa* spp. (bluegrasses), the only other grasses present, were minor and negligible as to yield. Twelve different forbs and woody species encountered in the analyses comprised the majority of the relative shoot density. Three other

species were noted to be present but not encountered.

Total dry matter production was estimated at 4,150 lb/acre with bluejoint yielding about 1,500 lb. *Epilobium angustifolium* (fireweed) exceeded bluejoint in yield at about 1,600 lb/acre, though registering only about one-fourth the shoot density of bluejoint. Fireweed and the other forbs and shrubs accounted for about 65% of the yield. Bluejoint constituted the only plant of grazing value occurring in any abundance in the community.

The analyses were conducted to obtain quantitative information on original composition of the stands prior to their being committed to grazing use. A volume index (absolute shoot density x height) was derived of bluejoint in both stands to abet future analyses for assessing vegetational changes.

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