FUMARIACEAE, The Fumitory Family

Corydalis Medicus, The Corydalises

Corydalis aurea Willdenow; boreal; montane-submontane; Dry Lake, B&S 18a-62; Slumgullion Gulch, B 56-61; Crested Butte, B 10-55; Cochetopa Park, B 93c-55. A perfectly native plant, and widespread both in dry and in moist open places in the Gunnison Basin, the golden corydalis is one of the principal pioneers in gravelly roadcuts. Here its chief competitor is that other native plant, Oenothera caespitosa, which was discussed in the Introduction.*

Corydalis Caseana Gray; cordilleran; subalpine-montane; Lake Irwin, L 588 (1949) COLO; Gothic, B 125-52; Oh-be-Joyful Creek, S 64-90. This, the only other corydalis in the Basin, could hardly be more different from the golden corydalis. In the first place, it seems to be restricted to the ten miles (by airline) between Gothic and Kebler Pass. In the second place, it is a large, lush plant of moist places only, with long racemes of pink to purple flowers. It is easily one of the handsomest plants in the Gunnison Basin, and of great interest to botanists who have not seen it before.

GENTIANACEAE, The Gentian Family

Frasera Walter, The Green Gentians

Frasera speciosa Douglas [Swertia radiata (Kellogg) Kuntze]; cordilleran; montane; Ohio Creek Valley, K 582 (1947) DBG; Meridian Lake, S 65-57; Gothic, Ke 7/2/49 WS. I think that this biennial herb, reaching as it does a height of six feet, is probably the most spectacular plant in the Gunnison Basin. The contrast between first-year basal leaves and second-year flowering stalk is frequently noteworthy in a biennial plant. But in F. speciosa, or the monument plant as it is called,

* See above, p. 22.

the whole upper half of the second-year stalk can be in flower at one time, and the blossoms are large, four-petaled, and white. In fact, when seen, a hundred on a hillside at once, the plants do seem like monuments, and are visible at a great distance.

It is well known that various Asian perennial bamboos bloom simultaneously over large territories at mysterious intervals of time. The flowering cycle of this American biennial seems almost as mysterious. In 1952, when the vegetation at Gothic was particularly lush, F. speciosa was so rare that a single plant on a meadowy bench above the Rocky Mountain Biological Laboratory had a sign to one side, saying, "Do not collect; save for photographers." Yet in June 1961, in a season almost equally verdant, the meadowy hillsides around Gothic were covered with the plant. True, the conditions for the flowering of a biennial are established the year before, and I did ascertain that the rainfall of 1951 was twice that of 1960. Perhaps the first-year plants of F. speciosa require a season of average rather than of heavy rain. But I doubt if the answer is as simple as this.

Gentiana L., The Gentians

The perennial gentians

Gentiana affinis Grisebach; cordilleran; subalpine-submontane; Baxter Basin, Li 8/13/37 COCO; Cement Creek Valley, S 65-204 RMBL; Parlin, E 7/89 COLO. To me, the most striking thing about this gentian is the narrow, cylindrical corolla. Conceivably, it could be confused with G. calycosa; but the corolla of G. calycosa is barrel-shaped, and its similarly paired leaves are wider. The Gunnison Basin race of G. affinis is curiously different from the race that inhabits the mesas and foothills of the Front Range. Its corolla is of a deeper blue, its leaves are not so long and narrow, and it inhabits moister places.

Gentiana calycosa Grisebach [G. Parryi Engelmann];

cordilleran; alpine-montane; Gothic, L 73 (1948) CS; Powderhorn Park, B 224-65; Queen Basin, B 68c-54. G. calycosa is as widespread and frequent in the Gunnison Basin as G. affinis is rare and infrequent, and the remarks under G. affinis should be enough to differentiate it. On the rich, open, herbaceous, subalpine floor of Powderhorn Park, G. calycosa grows with G. Amarella, Penstemon Rydbergii, Haploppapus Clementis, Agoseris aurantiaca, Hymenoxys grandiflora, and Geum triflorum in about equal frequency. In midsummer, it is a sight to see.

Gentiana Romanzovii Ledebour; cordilleran; alpine-subalpine; North Italian Mtn., B 73-54; Cottonwood Pass, B 252-60; Rough Creek Meadows, B&S 589-62. Along with Hymenoxys grandiflora, this dwarf but large-flowered white gentian is one of the most memorable alpine plants of the region. The linear leaves are all basal; but the flowers are elevated on short stems to just above the height of the basal leaves. The plant is unmistakable.

The annual gentians

Gentiana Amarella L. [G. strictiflora Nelson, G. plebeia Chamisso]; boreal; alpine-subalpine; Rough Creek Cirque, B&S 590-62; Wolverine Basin, B 304-61; Gothic Natural Area, B 138-59; Fish Creek, B&S 366-62; Cochetopa Park, B&S 182-66; Gunnison, B 287-61. With white, blue, or lavender blossoms, and with diminutive or tall, multi-branched or perfectly strict stems, this is the universal gentian of the Gunnison Basin, found in the remotest of alpine cirques, in the ash deposits of Cochetopa Park, and in an old field outside of Gunnison. It blooms both terminally and axilly, and cannot be missed.

Gentiana tenella Rottboell; boreal; alpine; North Italian Mtn., B 78-54; Rough Creek Pass, B&S 619-62. This is one of the rarest and smallest of the Gunnison Basin alpines. I have collected it only twice within the Basin, and have seen no sheets from the Basin other

than my own. The plant ranges in height from a quarter of an inch to an inch and a half, and could be confused with G. Amarella. However, the Gunnison Basin plants are branched, if at all, close to the ground, and the flowers are borne solitarily at the ends of the branches, which often curve out from the base of the plant leaving the center hollow. The small blue blossoms are pointed before they open.

Gentiana barbellata Engelmann; cordilleran; alpine; Virginia Ridge, B 70i-54; Queen Basin, B 68-54; North Italian Mtn., B 79b-54. Although apparently restricted to the Elk Mountains district of the Basin, this alpine gentian is not so rare or so small as G. tenella; in fact it grows three or four inches high. Its blue petals are narrowly oblong with lacerate edges, and like those of no other gentian in the Basin.

Gentiana thermalis Kuntze; cordilleran; montane-alpine; Gothic, B 217-52; Peeler Basin, B 262-60; Mill Creek, B&S 565-62; Virginia Col, Sh 56-76 RMBL. G. thermalis is the Rocky Mountain counterpart of the fringed gentian of eastern North America, and those who know that plant will need no further identification. True, the stems of the western plant are not nearly so much branched, so that the flowers on their long pedicels appear to be solitary; while the fringed petals are of a much deeper blue. Yet in spite of these and other differences, there can be no question of the closeness of kin. G. thermalis grows in moist open places, and in the Gunnison Basin seems to favor the subalpine zone. It is less frequent in the montane zone, and least frequent in the alpine zone.

Gentiana prostrata Haenke; boreal; submontane-alpine; Gunnison, B&S 13-62; Cathedral, S 62-24 RMBL; Horse Park, B 32-65 RMBL; Mineral Mtn., B&S 535-62; Mesa Seco, B 95-64. The dispute over G. Fremontii and G. prostrata early attracted my attention. In 1951 particularly good drawings of the two species appeared side by side on page 361 of the third volume of Abrams's Illustrated Flora of the Pacific States; and in the Gunni-

son Basin, the distinction between the two species seemed even sharper than in the text or drawings of the Abrams volume. In the submontane and montane zones, G. Fremontii grows less than two inches high, is lost amid the grass in which it grows, and has green-ribbed, waxy white corollas that close upon collection. In the alpine zone, G. prostrata is twice as tall, has lavender-blue blossoms that are twice as long, and blunt divaricate leaves instead of acute appressed leaves. The case for the two species seemed complete (that is, to a field man), although the analytical botanists, largely on the basis of the indeterminacy of the capsule position, argued for a single species.

For me, as for all field men, the issue was settled, not by analysis, but by making the perfect transitional collection. This happened in a grassy park in the lower subalpine zone (thus bridging the gap altitudinally as well as morphologically), where a large population of the plant was growing with the vertical habit of G. Fremontii, with light-blue, green-ribbed corollas, and with height, foliage, and other details halfway between.

The whole experience affords further proof of the general claim of this flora that varieties in the Gunnison Basin are phenotypic only.* In fact it would seem as if the density of the associated grass might be a controlling factor. In the submontane and montane zones, the small, white-flowered plants might well have become responsive to the thickness of the grass in which they grow. In the subalpine park, the grass, although abundant and undoubtedly still causing the vertical habit of the plant, was far less dense, and the fact remains that the population was seen from horseback, something that would have been impossible in the lower zones. In the alpine zone, where bunchgrass is the rule and sod the exception, G. prostrata frequently escapes completely from its grass association and assumes a prostrate habit over the bare ground.

Gentiana heterosepala Engelmann; cordilleran; montane-subalpine; Cement Creek Valley, Ke 7/26/49 WS; Peanuts Lake, B 299-61; Gothic, Wi 10489 (1954); Rustler's Gulch, L 467-48 COLO. G. heterosepala is closely related to G. Amarella, and at the present moment when analytical botany is regnant is usually collapsed into G. Amarella. It is placed in this flora at the opposite end of the annual gentians to abjure this tendency. And it is not a question simply of the pair of gross sepals that have always been the hallmark of the species. The whole plant looks differently and behaves differently. For instance, in the Gunnison Basin, the plant seems to be restricted to the Elk Mountains and to an altitudinal range of not more than two thousand feet. Again, at least in the Basin, white-flowered and dwarf forms seem to be unknown. G. Amarella, on the other hand, whether in the neighborhood of Gunnison or in an alpine cirque, not only produces white-flowered populations but frequently blossoms at the height of an inch or two. In contrast, the average height of G. heterosepala must be around a foot, and I have seen no plant from the Basin shorter than six inches. Finally, the blossoms of G. heterosepala are always longer than half an inch, whereas those of G. Amarella do not exceed half an inch.

* See above, pp. 5-6 and 15-16.

Lomatogonium A. Brown, The Marsh Felworts

Lomatogonium differs from Gentiana chiefly in its five-petaled, disklike corolla (which is white in the Gunnison Basin plant), and in the absence of style, the two stigmas being attached directly to opposite sides of the ovary.

Lomatogonium rotatum (L.) Fries [Pleurogyne rotata (L.) Grisebach]; boreal; montane; Cathedral, B 697-62. This delightful plant, about eight inches high, has linear grassy leaves and linear grassy sepals; and since it grows in wet grassy places, it is almost impossible to perceive unless one happens to look just where it is growing. Its white blossoms are about the size of a dime, and tinged with blue underneath. The plant is an annual.

Swertia L., The Star Gentians

Swertia, with a five-petaled rotate, or disklike, corolla, is much like Lomatogonium. But the genus is composed of perennial plants, and there is a bit of a style with the result that the two abbreviated stigmas are not attached to the ovary itself.

Swertia perennis L.; cordilleran; montane-alpine; Gothic, L 236-48 COLO; Fish Creek Mesa, B&S 395-62; Schofield Pass, B 309-61; Alpine Pass, Fe (1905) COLO. The starlike blossoms of this species are a deep violet-blue, and since the plant grows commonly a foot and a half tall, there is little possibility of its not being seen and recognized. It is tolerant of partial shade, but it must have moisture.

GERANIACEAE, The Geranium Family

Geranium L., The Geraniums

Geranium atropurpureum Heller [G. caespitosum James]; southwestern; montane; Sherman, P 1554 (1940) COCO; Henson Creek Valley, B 35-61; Lake City, Ke 7/7/49 WS. With its strap-shaped, dark-purple, pendent petals, this large, red-stemmed geranium is one of the easiest in the Basin to identify. It is natural to associate it with that other southwestern plant, Leucampyx Newberryi, which occurs in a narrow fringe at the base of the Northeastern San Juans from Cochetopa Pass to the eastern base of Slumgullion Pass. G. atropurpureum picks up the fringe on the other side of Slumgullion Pass and carries it up Henson Creek and up the Lake Fork to Sherman, very nearly as far west in the Basin as one can get. Are these two species that occur on the southern margin of the Gunnison Basin migrants into the Basin since the last glaciation? Or are they the last stand of a Gunnison Basin distribution that was once much wider? Here, contrary to the likelihood in the case of Balsamorrhiza sagittata,* the balance of probabilities would seem to incline to the first alternative. But the question is by no means settled, and as usual, one would like to pursue the matter further.

Geranium Parryi (Engelmann) Heller; cordilleran; montane-alpine; Spring Creek Valley (south), B 147-65 RMBL; Cathedral, B 95-65; Rough Creek Valley, B&S 235a-62; Handies Peak, P 1539 (1940) COCO. It is natural to place G. Parryi after G. atropurpureum. Its range in the Gunnison Basin is only a little more extensive; and were it not for its occurrence in Wyoming, it also would have to be classified as a southwestern species. Again, it is a large (or fairly large) red-stemmed geranium. But morphologically, the plant is easy to separate from all the other geraniums in the Basin, its chief character being, of course, its glandular pubescence. Calyces, pedicels, petioles, and stems equally display it, and are on every plant the graveyard of innumerable insects and the repository of numberless bits of plant débris.

Geranium Cowenii Rydberg [G. Fremontii Cowenii (Rydberg) Harrington var.]; Coloradan; submontane-subalpine; Cochetopa Park, B&S 180-66; Cathedral, B 94-65; Rough Creek Valley, B&S 235-62; Mill Creek Valley, B 144-61. If it was natural for G. Parryi to follow G. atropurpureum, it is even more natural for G. Cowenii to follow G. Parryi; for the latter two species have been, and are, confused in most manuals and herbaria. They are, to be sure, much alike, and I have no doubt that G. Cowenii is a xeric derivative of G. Parryi. But such derivatives embracing changes in habitat, distribution, and form constitute the very meaning of the term species, especially when, as in the present case, there is also a loss of the ability to intergrade.

Naturally, the chief morphological difference is the total substitution of a short, sparse, white pubescence for the viscid pubescence of G. Parryi. The calyces,

* See above, pp. 96-97.

pedicels, petioles, and stems of G. Cowenii offer no graveyard to the insects, and the cleanness of the stems, if one can see below the leaves, is visible from eye-level without collection. The two species are also consistently different in leaf pattern. Now it is well known that most geranium leaves look hopelessly alike, and I am not going to attempt to put into words the subtle differences. Nevertheless, several times when I have come upon populations evenly composed of the two species, yet without a sign of intergradation, I have collected an individual plant of G. Cowenii, looked closely at the leaf configuration, and then gone through the population making further collections according to leaf pattern alone. In no instance did I collect G. Parryi by mistake. In the above series of citations for the two species, the Cathedral and Rough Creek Valley listings represent such mixed populations. The citations also bring out the difference between the two species with respect to habitat and distribution.

Geranium Fremontii Torry; cordilleran; submontane-montane; Big Mesa, B 187-65 RMBL; Sheep Gulch, B 70-61; Cabin Creek Cow Camp, B 146a-60; Crested Butte, B 85-59. Like G. Parryi, this geranium would have to be classified as southwestern were it not for the extension of its range into Wyoming. In other words, all the geraniums thus far listed are species of limited distribution. The remaining geraniums are plants of wider distribution, the last, in fact, being an adventive. As for G. Fremontii, it is a large, bushy geranium, a frequenter of roadsides and open places, although a perfectly native plant. It may be recognized from automobile by its peculiar habit of growth. Its leaves occur in two planes, or stories, the second elevated above the first. The first story is composed of the numerous basal leaves; the second of the involucral leaves which arise at the base of the much-branched panicle. In between the two stories is bare stem.

Geranium Richardsonii Fischer & Trautvetter; cordilleran; subalpine-submontane; Gothic, B 135-60 RMBL; Big Soap Park, B&S 65-81 RMBL; Cathedral, B&S 190-66, B 195-66; Fish Creek Mesa, B&S 206-62; Almont, Ke 6/22/49 WS. G. Richardsonii is the most frequent and widespread geranium in the Gunnison Basin because in the montane zone wherever there are trees it is at home. The soils may be thin or deep, the situation dry or moist, the shade light or dense, but there G. Richardsonii will stake out a claim, the size of the plant responding to the favorability or unfavorability of the habitat. In the submontane and subalpine zones the plant is much less common if not rare. Its petals range from white to lavender (although most are white), and the species may infallibly be recognized by the stalked purple glands of the sepals, pedicels, and upper stems.

Geranium nervosum Rydberg; cordilleran; montane; Granite Basin, L 188 (1949) COLO; Gothic, W 9134 (1955) COLO. In habit of growth and general appearance this species resembles G. Richardsonii; but it is a plant of open places (whether of sagebrush or of meadow), and much less frequent. The stalked purple glands of G. Richardsonii here become yellow, the petals are pink to rose-purple, and the lower stems appear glabrous but in reality are canescent with fine, appressed white hairs.

Geranium pusillum Burman filius; adventive; submontane; Gunnison, Sto (1953) WS. This decumbent annual is different from all the preceding perennial geraniums. For one thing, its inflorescence is largely axillary, the peduncles being two-flowered. The petals are pink to lavender, and the functioning stamens just five.

GRAMINEAE, The Grass Family

The first characters of the grass family were given on page 166 when the sedge family was distinguished from it, and the reader is asked to review those prefatory remarks. In the grass family, each floret has two protective scales, the inner or ventral one being called a palea, the outer or dorsal one a lemma, while the spikelet as a whole has another pair of scales called

glumes. In spite of these extra parts, the grasses are less difficult than the sedges. For one thing, they divide easily into a number of tribes, a classification that in the following account will be used in addition to that of genera. For another thing, there are some forty genera of grasses in the Gunnison Basin instead of one enormous genus and four little genera as in the sedge family. Finally, in one inexpensive and handy volume, the Hitchcock-Chase manual* offers both text and drawing for each and every one of the grasses, an advantage not now possessed, but soon, with the publication of F.J. Hermann's manual,** to be enjoyed by students of the Rocky Mountain carices.

Agrostideae, The Agrostid Grasses

This tribe of the grasses takes its main features from the genus that gives it its name. The spikelet, once multiflowered, has been reduced to a single floret, and in two genera, Agrostis and Alopecurus, some of the species show a loss also of the ventral scale or palea. Again, in some genera of the Agrostideae, the internode between the glumes and the lemma becomes specialized, being called a callus and assisting in seed dispersal. The inflorescence is always a panicle, although it may simulate a spike. On the other hand, it can be notably diffuse.

Agrostis L., The Bents

As suggested in the previous paragraph, the bents are characterized not only by spikelets that have been reduced to a single floret but often by spikelets in which the palea of the surviving floret has been lost, or almost lost. On the other hand, sometimes a rudiment of the former rachilla remains.

* Hitchcock, Albert S., Manual of the Grasses of the United States, second edition revised by Agnes Chase, Washington, D.C., 1950.

** See above, p. 51.

Agrostis borealis Hartman; boreal; alpine; Old Monarch Pass, B 151a-59 CS, RMBL, AGUW, B 159a-59 RMBL; Mesa Seco, B 76-64 RMBL. The absence of palea will distinguish this plant from any other alpine bunchgrass that might be confused with it. It occurs in both awned and awnless forms, and is a plant of dry to median situations.

Agrostis humilis Vasey; cordilleran; alpine; Devil's Lake, B&S 635-62 CS, RMBL, AGUW. This species is also an alpine bunchgrass. But it is a dweller in wet places, has a palea, and unlike A. borealis, never has awns. Hence these two agrostises can scarcely be confused.

Agrostis Thurberiana Hitchcock; cordilleran; subalpine-alpine; Peeler Basin, I 18890 (1961) RMBL; Cottonwood Pass, I 19141 (1961). Essentially a bog plant, this agrostis reaches up into the lower alpine zone. It may be told at once, not only by its palea, but by the hairy rudiment of a rachilla that is also present.

Agrostis alba L.; boreal; montane-submontane; Cathedral, B&S 651-62 CS, AGUW; Cebolla Hot Springs, B 70-64; Crested Butte, B 113-59 CS, RMBL, AGUW; Gold Basin Creek drainage, B 92b-57 RMBL. Possessing both rhizomes and a palea, surely the common redtop needs no identifying description. It is the least specialized of the Gunnison Basin agrostises, and appears to be thoroughly native, not seeking disturbed sites, but holding its own in moist open places amid a profusion of native plants. It is tolerant of alkaline soil.

Agrostis exarata Trinius; cordilleran; subalpine-submontane; Copper Creek Valley, B 97-57 CS; Gothic, B 106-59 CS, RMBL, AGUW; Gunnison, Ko 9/6/61 WS. It is well known that before and after anthesis the panicle of A. alba tends to be contracted, and when this is so, it resembles A. exarata. But there are many differences. Even in the open, A. exarata never develops the deep redness of A. alba, and it is always a more delicate plant, being frequently found in partial or in full shade,

a situation in which I have never encountered A. alba. Finally there is a major difference in the size of the anthers. Those of A. exarata are no more than a third of a millimeter in length; those of A. alba are a full millimeter in length.

Agrostis scabra Willdenow; boreal; subalpine-submontane; Schofield Park, B 116-57 CS, RMBL, AGUW; Cathedral, B&S 608-62 CS, AGUW; Gold Basin Creek drainage, B 92a-57 RMBL. This widespread species is the easiest of the Gunnison Basin agrostises to identify. Lacking both rhizomes and palea, it offers the combination of spikelets as small as two millimeters in length and a panicle as large as a foot in diameter. The small spikelets occur at the ends of the branchlets of the panicle, and give the plant a distinctive, filmy appearance. The first of the above stations, cited for altitude, is a mile north of the topographic Gunnison Basin, but well within the floristic Gunnison Basin.

Alopecurus L., The Foxtails

The name foxtail has popularly been applied to a number of grasses; hence it is interesting to note (since Alopecurus and foxtail mean the same thing) that Linnaeus chose this genus to bear the popular caption. No genus is more quickly recognized by a glance through a handlens. The awnless glumes are united toward the base, and consequently form a small cup with a slit down either side.

Alopecurus aequalis Sobolewski; boreal; montane; Grant Lake, B 180-59 CS, AGUW; Beaver Creek (south), B&S 633-62 RMBL, AGUW; Cathedral, B&S 350-62 CS, AGUW; Lake City, B 60-61; Old Agency Guard Station, B 50a-60 CS. Superficially, all three of the Gunnison Basin foxtails resemble species of timothy. But once this first impression has been corrected by a glance at the awnless glumes, the difference between the three species can be recognized by gross features. A. aequalis, a plant of moist to wet places, in the open or in partial shade, is by far the most frequent species,

and is the one that looks the least like a foxtail, the most like a timothy. Its glumes are the least ciliate of the three species, and the awns on its lemmas the least conspicuous. It also has the narrowest panicle; in fact the spikelets at the top frequently fail to mature, so that the last inch appears to be an inch of bare tail, or rachis.

Alopecurus alpinus Smith; boreal; submontane; Chavez Creek, N (1955) CS. This alopecurus resembles Phleum alpinum even to the inflated sheaths. Of the three species of Alopecurus, it has the shortest and widest panicle; and since the ciliation covers the glumes completely, it is the woolliest.

Alopecurus pratensis L.; adventive; montane; Crested Butte, Br 5300 (1957) RMBL. On the basis of this single collection, A. pratensis in the Gunnison Basin would appear to be a plant of dry to median, disturbed sites. It is the type species, that is, the species on which Linnaeus first conferred the name of Alopecurus. Since its panicle is wider than that of A. aequalis and longer than that of A. alpinus, and at the same time conspicuously ciliate (if not woolly), it is indeed a good example of the popular conception of a foxtail grass.

Aristida L., The Three-awns

A handlens is not necessary to identify this genus. The awn that emerges from the summit of the lemma divides into three parts, the lateral pair being more or less at right angles to the part that continues.

Aristida Fendleriana Steudel; cordilleran; submontane; Powderhorn, B 73-64 RMBL, AGUW. Since apparently this is the only member of the genus to occur in the Gunnison Basin, further words of identification are not necessary. It is a low bunchgrass of dry situations.

Blepharoneuron Nash, Pinegrass

The nerves both of lemma and of palea in this agrostid genus are heavy with a white pubescence which is both the

source of the name and an infallible guide to the identity of the genus.

Blepharoneuron tricholepis (Torrey) Nash; southwestern; montane-alpine; Cathedral, B 388-62 CS, AGUW; Copper Creek Valley, B 168-59 CS, RMBL, AGUW; Old Monarch Pass, B 154-59 CS, RMBL, AGUW. Even without the give-away of the white pubescent veins, this species is easy to recognize. Its leaves (nearly all basal) are of an ordinary shade of green. But the panicles are of a striking (and handsome) leaden green, and together with the small ellipsoidal spikelets, make this plant a distinct entity in the Gunnison Basin flora.

Calamagrostis Adanson, The Reedgrasses

Morphologically, the reedgrasses are at the opposite end of the agrostid spectrum from Agrostis and Alopecurus. In Agrostis and Alopecurus, the palea is lacking from some or all of the species of the genus, and a rudimentary rachilla is a rarity. In Calamagrostis, all the species possess both palea and rudimentary rachilla; and the callus, or internode between glumes and lemma, surrounds the floret with a girdle of hairs.

Calamagrostis canadensis (Michaux) Beauvois; boreal; montane-alpine; Gothic, B 123-59 CS; Fish Creek, B&S 407-62 CS, AGUW; Copper Creek Valley, B 143-59 RMBL; Engineer Pass, B 136a-64 AGUW. This vigorous grass is one of the handsomest in North America, and never more handsome than when the seeds have fallen and the empty glumes, becoming bronze at the tips, are displayed in contrast with the vivid green of the stems and leaves. Later, the nodding panicles become completely bronze as the color of stems and leaves begins to fade. In the Gunnison Basin, the plant not only frequents moist meadowy places but penetrates relatively dry openings in the spruce forest. The plant is markedly rhizomatous, and both callus hairs, rachilla, and toothed lemma are of about the same height. Only the awn is a bit longer. This, the common species in the Gunnison Basin and the one usually thought of when the

genus is mentioned, is the famous bluejoint about which Aldo Leopold has written so memorably.*

Calamagrostis inexpansa Gray; boreal; montane-submontane; Gothic, B 122-59 RMBL; Goose Creek, B 153-64 AGUW; Hot Springs Creek, B&S 119-66. This species is close to C. canadensis in size, rhizomes, and details of the spikelets. But in contrast to the open panicles of C. canadensis, the panicles of C. inexpansa are strikingly contracted. In August and September they fade to a light tan, and seem like so many spearheads above the stems and leaves still green below. The plant is a frequenter of creek banks and marshy places, and is tolerant of alkaline soil.

Calamagrostis Scribneri Beal; cordilleran; subalpine; Chavez Creek, N (1955) CS. This little-collected grass is confusable only with C. canadensis, and needs to be separated only from it. There are a couple of distinguishing characters. At the summit of the sheath, C. Scribneri has a band of pubescence not present in C. canadensis. Again, in C. canadensis, the rachilla is about the same height as the lemma; in C. Scribneri, it is less than half this height.

Calamagrostis neglecta (Ehrhart) Gaertner; boreal; montane; Crested Butte, St 107 (1959) RMBL. A small-flowered, delicate grass of wet places, this species must be determined largely on the basis of measurement. Its lemmas are scarcely more than two millimeters long, and the callus hairs and straight awns are shorter still.

Calamagrostis purpurascens R. Brown; boreal; montane-alpine; Cathedral, B&S 237-62 CS, RMBL, AGUW, B 157-64 AGUW; Cement Creek Valley, B 79-57 RMBL; Emerald Lake, I 18955a (1961); Blaine Basin, B 110b-57 RMBL, AGUW; Long Branch Baldy, B&S 115-66. In the manuals, this species is separated principally by its long geniculate awn. But in the Gunnison Basin, the species can occur without awns; and also with a very narrow

* Leopold, Aldo, A Sand County Almanac, New York, 1949, p. 99.

spicate panicle as well as with a relatively loose, open panicle. In the midst of this dilemma there is, however, a diagnostic that seems to be dependable. The callus hairs occur in two tufts either side of the rudimentary rachilla, with some shorter hairs between the tufts on the side opposite the rudiment. Once determined, the plant can be recognized by its general look, and the reddishness that usually tinges the spikelets.

Calamagrostis rubescens Buckley; cordilleran; alpine; Cumberland Pass, B 102-57 CS, RMBL. Frequently a pair of confusable grasses can be separated only by measurement of the spikelet. Such is the case with C. purpurascens and C. rubescens. For although they are distinguishable by rootstocks (those of C. rubescens being the more creeping of the two) and by callus hairs (see C. purpurascens), these characters on first acquaintance may not seem sharp enough. But in C. rubescens, the glumes are not longer than five millimeters; in C. purpurascens, not shorter than six millimeters. This makes for a significant difference, and in this way the two grasses can rather easily be separated. The awns of C. rubescens are bent so as to protrude from the side of the spikelet; those of C. purpurascens (when they occur) are bent so as to protrude from the top of the spikelet.

Calamagrostis scopulorum Jones; cordilleran; montane; Gothic, Wi 10233 (1954), Ka 771 (1964). This is a tall, green meadow grass, the spikelike panicles of which are occasionally tinged with purple. The panicles may seem to be awnless. But in reality, the awns are merely short and straight and included within the glumes. This is the best character for distinguishing the plant.

Cinna L., The Woodreeds

The woodreeds differ from the reedgrasses in a number of respects, the most conspicuous being the total lack of callus hairs.

Cinna latifolia (Treviranus) Grisebach; boreal; montane; Gothic, Wi 10526 (1954), W 9471 (1955) COLO. This also is a

tall, green, meadow grass, and at first glance it might be taken for Calamagrostis scopulorum. But in addition to the generic character given above, the leaves are far wider and the panicle far more open.

Muhlenbergia Schreber, The Muhlenbergias

In the Gunnison Basin muhlenbergias, or muhlies, as they are sometimes called, the lemmas are usually longer than the glumes, and are awnless, short-awned, or long-awned depending upon the species. With the exception of M. andina (which resembles a timothy), M. asperifolia (which seems like a panicum), and M. racemosa (which resembles only itself), the muhlenbergias have a certain look, which comes largely from a blotchiness of the spikelets. Sometimes this blotchiness is the result of dark anthers or stigmas. More often, it comes from a pigmentation of the lemmas, and even of the glumes.

Muhlenbergia andina (Nuttall) Hitchcock; cordilleran; montane; Fish Creek, B&S 559-62 CS, RMBL, AGUW. There is no other grass in the Gunnison Basin quite like this. It is true that it might be taken for a phleum. But the spikelike panicle is really too irregular, and it is gray and silky, with a tinge of purple. Again, its rhizomes, white between the nodes and curving, set it off not only from the phleums but from the other muhlenbergias of the Basin. The plant is a dweller in moist open places.

Muhlenbergia asperifolia (Nees & Meyen) Parodi; widespread North American; submontane; Gunnison, B 254-61; Cebolla Hot Springs, B&S 489-62 CS, RMBL, AGUW. As was pointed out in the generic description, this awnless muhlenbergia, with its spray of evenly distributed small spikelets, resembles a panicum, e.g., Panicum capillare. But a close look will reveal the characteristic glumes and lemma of an agrostid, not the ribbed second glume and sterile lemma of a panicum. The plant has light-colored, horizontal rhizomes, and seems to seek moist places in the open or in partial shade. It is tolerant of alkaline soil.

Muhlenbergia filiculmis Vasey; cordilleran; submontane-montane; Gold Basin Creek drainage, B 59-57 RMBL; Cochetopa Park, B&S 183-66; Powderhorn, B 151-64; Cathedral, B 687-62 CS, AGUW; Mineral Creek Valley, B&S 500-62 CS, RMBL. In the southern half of the Basin, this is not only the commonest muhlenbergia, but one of the commonest bunchgrasses. It ranges in height from six to fourteen inches, but always the spikelets are small. Including the awn they run to about five millimeters; excluding the awn, to about half of this. M. montana, which otherwise closely resembles M. filiculmis, has spikelets of about twice the length including the awn; but the spikelet proper is only a little longer. M. filiculmis is a plant of dry soils and open places, and is found growing with Agropyron Smithii, Stipa pinetorum, and Sporobolus cryptandrus.

Muhlenbergia filiformis (Thurber) Rydberg; cordilleran; subalpine; Lily Lake, B 212-60 RMBL; Leechmere, S 66-216. A plant of open, boggy places, this species is almost, but not quite, the smallest-flowered of the Gunnison Basin muhlenbergias. The plant with its threadlike panicles can be as low as an inch, as high as three inches, while the spikelets are about two millimeters in length. The awn at the summit of the lemma is very short.

Muhlenbergia minutissima (Steudel) Swallen; cordilleran; submontane; Gunnison, W&J 8560 (1953) COLO. This plant is amazing--a minute (but erect) M. asperifolia! It is quite the smallest-flowered muhlenbergia in the Basin, the spikelets being only about a millimeter in length while the culms run from about two to five inches in length. It is similar to the preceding species in being an annual, and in dwelling in open boggy places.

Muhlenbergia montana (Nuttall) Hitchcock; cordilleran; montane-submontane; Middle Farris Creek, L 1130 (1950) COLO; Cathedral, B&S 634-62 CS, RMBL, AGUW, B 684-62 CS, AGUW (two stations); Cochetopa Park, Jo (1959) CS. In the Gunnison Basin, this is principally a montane species, being especially at home in the open Douglas-fir or ponderosa-pine forests of the southern

half of the Basin. The species, in the Hitchcock-Chase manual, is separated from M. filiculmis chiefly by the longer, stouter stems. But in the Gunnison Basin the only practicable diagnostic is the difference in the length of the spikelets, which was given under M. filiculmis.

Muhlenbergia racemosa (Michaux) BSP.; widespread North American; submontane; Gunnison, Han 9/26/61 WS. This muhlenbergia of moist grasslands is different from the other muhlenbergias of the Gunnison Basin. It is taller than the rest, its spikelike panicle (although too broken to resemble a timothy) is denser than that of the typical muhlenbergia, and its glumes, longer than its lemmas, are conspicuously awned.

Muhlenbergia Richardsonis (Trinius) Rydberg; boreal; submontane-montane; Jack's Cabin, B 217-60 CS, RMBL; Quartz Creek Valley, S 65-106; Cebolla Hot Springs, B 110-64; Cathedral, B&S 432-62 CS, AGUW. In the sloughs of the submontane zone, this species is a meadow grass, its culms rising to more than a foot in height. In dry places, its system of rhizomes permits it to form mats, above which the culms rise to about half the meadow height. The spikelets are about three millimeters in length. Sometimes they may approach the two-millimeter length of M. filiformis. But the spikelets of M. Richardsonis nearly always will be found to be more heavily pigmented than those of M. filiformis; and besides, there is always the anther size to fall back on. The anthers of M. filiformis run from two- to three-tenths of a millimeter; those of M. Richardsonis from seven- to eight-tenths of a millimeter. This is an enormous difference in the world of the muhlenbergias, and quite decisive. The species is tolerant of alkaline soil.

Oryzopsis Michaux, The Ricegrasses

Most grasses are at their showiest in anthesis. Then the protective scales are spread apart, the feathery stigmas rise above them, and the anthers (often colored) dangle on either side. But this is not true of the genus Oryzopsis. The ricegrasses are at their showiest later

on, when the lemmas and paleas are swelling from the fruit inside, and a third or a half of the awns have fallen, snapping off at the joint between awn and lemma. These grasses look as if their seeds (still enveloped by the protective scales) should be good for human consumption. They seem as though they ought to be edible seedgrasses, which is why, indeed, they have been called ricegrasses.

Oryzopsis asperifolia Michaux; boreal; montane; Los Pinos Pass, B&S 164-62 CS, RMBL, AGUW. In the Gunnison Basin, this is a grass of rich aspen woods, the above collection coming from a north-facing slope just north of the given pass. The blades of the culm leaves are mere rudiments; but the blades of the evergreen basal leaves are long, wide, and tapered at both ends, their bases being purplish. The seedlike spikelets are large, being about a centimeter in length beneath the deciduous awns.

Oryzopsis hymenoides (Roemer & Schultes) Ricker; cordilleran; submontane-montane; Almont, B 33-59 CS, RMBL; Walrod Gulch, L 370 (1949) CS; Cathedral, B 56-62 CS, RMBL, AGUW. This is one of the few grasses that really can be recognized from a passing automobile. The panicles are divaricately and dichotomously branched, while the branchlets have additional crooks in them. The result is that the agrostid spikelets of this species seem to be displayed with a maximum of particularity and eccentricity. The two glumes of the spikelet are papery and swollen; from between them protrude the silky hairs of the lemma and the solitary awn which will fall from its joint when the fruit is mature.

Oryzopsis micrantha (Trinius & Ruprecht) Thurber; cordilleran; submontane-montane; The Palisades, B 62-57 CS, RMBL; Goose Creek Valley, B 100-65; Cement Creek Valley, W&L 9511 (1955) COLO; Cathedral, B 124-62 CS, RMBL, AGUW. The seedlike spikelets of this species are much like those of O. asperifolia--except that they are two millimeters long instead of one centimeter long! But the panicle branches are different. When mature, they have a tendency to reflex

stiffly from the central axis. The long leaves are filiform, and the plant likes some sort of shade, preferably that of rocks or cliffs, but also that of aspen groves. It is the most frequent ricegrass in the Basin.

Oryzopsis pungens (Torrey) Hitchcock; boreal; montane; Los Pinos Creek Valley, B 12-64 RMBL, AGUW. The above collection was made in a rich forest of lodgepole pine, aspen, and Colorado spruce; and in truth, this species resembles the preceding, not only in its slender leaves and small spikelets, but also in its liking for shade. There is a good diagnostic, however, and that lies in the awns. Whereas in O. micrantha these can be the better part of a centimeter in length, in O. pungens they have been reduced to a millimeter or so--a mere point, which thus provides the specific name of the species.

Phleum L., The Timothies

It would seem that any one consulting this flora would know a timothy if he saw one, that the only difficulty would be in deciding whether the supposed timothy belonged to the genus Phleum or to the genus Alopecurus. And it is a fact that both species show the same cuplike structure formed by a pair of glumes united at the base. Yet only in Phleum are the glumes awned, and furthermore these awned glumes are ciliate only on the keel.

Phleum alpinum L.; boreal; alpine-submontane; Slumgullion Mesa, B 258a-65; Mill Creek, B&S 299-62 CS, AGUW; Gothic, Wi 10069 (1954); Henson Creek, B&S 33-66; Powderhorn, B 71-64. As mentioned in the Introduction,* P. alpinum is one of the most widespread of grasses in the Gunnison Basin. Its spikelike panicles, shorter and thicker than those of P. pratense, always have a touch of magenta to them, and the sheaths will always be found in some degree to be inflated.

Phleum pratense L.; adventive; montane-submontane;

* See above, p. 23.

Gothic, B 284-61; Cathedral, B&S 352-62 CS, AGUW; Gunnison, B&S 305-62 RMBL. This species, if the need arises, may be told from P. alpinum by its long, narrow panicles, and by the uninflated sheaths. The general failure of the species to establish itself in the Basin was noted in the Introduction.* Curiously, the third collection cited above came from that same old field in which Spiranthes Romanzoffiana and Carex nebraskensis were collected, yet only after cattle had been let in to pasture.**

Sporobolus R. Brown, The Dropseeds

This genus of agrostid grasses, without awns or callus hairs, takes its popular name from the peculiarity of dropping its seeds free, not only of the glumes, but also of the lemma and palea.

Sporobolus cryptandrus (Torrey) Gray; widespread North American; montane-submontane; Powderhorn, B 144-64 RMBL, AGUW, B 149-64 RMBL (two stations); Gunnison, Ko 9/6/61 WS. This tallish bunchgrass of sandy places has a habit of growth that makes identification in the field relatively easy. The short, stiff branches of its panicle are held away from the stem at a characteristic upward angle varying from about 60° to 40°. The tufts of short white hairs at the junction of sheath and blade offer another identifying feature.

Stipa L., The Needlegrasses

The popular name of this last genus of agrostid grasses comes from the sharp-pointed base of the callus, useful in sinking the seed into the ground. The awns of the enveloping lemmas are twisted at the base, and when they untwist in response to moisture, they too help sink the seed into the ground.

Stipa columbiana Macoun; cordilleran; montane-subalpine; Gothic, B 50-57 RMBL, B 115a-59 CS, RMBL (two

* See above, p. 23. ** See above, pp. 23-25.

stations); West Pass, H 9006 (1959) CS; Capitol City, S 62-47. This is a tall bunchgrass of relatively open, dryish places, the doubly geniculate awns giving to the spike-like panicle an unkempt appearance.

Stipa Lettermanii Vasey; cordilleran; subalpine-montane; Brush Creek Valley, B&S 642-62 CS, RMBL, AGUW; Peeler Basin, I 18848 (1961); Gothic, Pe 7/30/55 RMBL. Occasionally, this grass and the preceding seem to be separable by gross characters; but many years of collecting have convinced me that the only dependable differentia is the length of the hairs at the top of the lemma. When these are of the same length as the hairs of the body of the lemma, then the species is S. columbiana; when they are noticeably longer, then the species is the generally smaller S. Lettermanii.

Stipa pinetorum Jones; cordilleran; submontane; Gunnison, W 9143 (1955) COLO; Powderhorn, B 150-64 RMBL, AGUW. As if the two preceding species were not hard enough to distinguish, S. pinetorum (at least as it grows in the Gunnison Basin and on the basis of gross characters) is quite indistinguishable from S. Lettermanii. But here, both the distribution of the latter and a fine character make the distinction quite possible. S. pinetorum has not been collected except in the submontane zone, nor S. columbiana and S. Lettermanii except in the montane and subalpine zones. Furthermore, at the summit of the lemma, on either side of the awn, S. pinetorum bears a distinct pair of hyaline teeth. It is interesting that the Hitchcock-Chase manual gives the habitat of S. pinetorum as "open pine woods at high altitudes."* In the Gunnison Basin it is found at low altitudes, in brushy, sandy places quite removed from any kind of woods.

Stipa comata Trinius & Ruprecht; cordilleran; submontane-montane; Almont, B 32-59 RMBL; Cochetopa Park, H 8976 (1959) CS; Cathedral, B&S 309-62 CS, RMBL, AGUW. Curiously (and happily), the last of the stipas thus far collected in the Gunnison Basin is easily and

* In the Manual as cited, p. 459.

quickly recognizable by gross characters. A tall bunchgrass of dry places in the lower zones, its doubly geniculate awns are three to four inches long and constitute the "thread" of its popular name, thread-and-needle grass.

Aveneae, The Oat Grasses

To one who knows the look of cultivated oats (Avena sativa), the recognition of this tribe of grasses should be relatively easy. The spikelets, whether reduced to a pair of florets or containing as many as seven or eight, are usually enclosed by the glumes, so that they look like miniature, tapered cigars. The panicle may be open and diffuse as in cultivated oats, or narrow and spikelike (as in Koeleria cristata), and anywhere between.

Arrhenatherum Beauvois, The False Oats

This genus of relatively tall grasses with narrow, but not compact, panicles is rather easy to determine. The lower floret of the spikelet is staminate, the upper perfect, and the conspicuous geniculate awn comes from the back of the lower floret.

Arrhenatherum elatius (L.) Presl; adventive; montane; Crested Butte, Br 5289 (1957) RMBL; Gothic, R 10737 (1959) CS. The only representative of its genus in the Gunnison Basin, this is a plant of open montane roadsides.

Danthonia Lam. & DC., The Danthonias

The danthonias have particularly large spikelets which is why, I suppose, they are often called wild oats. But the best diagnostic is the ribbonlike (but twisted), geniculate awn that emerges from between the two lobes at the summit of the lemma.

Danthonia intermedia Vasey; boreal; subalpine-montane; Copper Lake Basin, B 191-59 CS, RMBL, AGUW; Lily Lake Basin, B 210-60 CS, RMBL; Crested Butte,

E (1891) COLO. This danthonia can be distinguished by its panicle which is short and compact, often being no more than an inch long, and half an inch wide. It seeks open places, where its panicle becomes a reddish bronze, in whole or in part.

Danthonia Parryi Scribner; cordilleran; montane; Cochetopa Park, Jo (1959) CS; Cathedral, B 221-62 CS, RMBL, AGUW, B 229-62 CS, RMBL, AGUW (two stations); Cochetopa Pass, B&S 107-66. Apparently restricted to the southern half of the Basin, D. Parryi is found both in dry meadows and in forest openings. The panicle, composed of anywhere from four to a dozen large spikelets, is variously contracted, secund, or diffuse. Here occurs one of the few errors I have found in the Hitchcock-Chase manual. Both in the key and in the text, the length of the glumes is given as ranging from twenty to twenty-two millimeters.* Actually, the glumes run from fourteen or fifteen to twenty-two millimeters.

Danthonia californica Bolander; cordilleran; montane; East Beaver Creek, G 2811 (1964) WS. D. californica is very close to D. Parryi, all the more when one considers that the Gunnison Basin specimens of D. Parryi are not densely pillose on the backs of the lemmas, but very sparsely pillose. I think the best diagnostic comes from the lobes of the lemmas. In D. Parryi, the lobes slope so gradually to their summits that the awns of the latter are inconspicuous. In D. californica, the lobes slope so abruptly to their summits that the awns are conspicuous. In the Gunnison Basin, D. californica seems to favor slightly colder and moister sites.

Deschampsia Beauvois, The Hairgrasses

In the genus Deschampsia there is a return to a mere pair of florets in a spikelet; but here, as in the remaining Aveneae of the Gunnison Basin, all the florets are perfect. The lemmas are round-backed and bear their

* In the Manual as cited, pp. 307 and 311.

awn from the middle or lower part.

Deschampsia caespitosa (L.) Beauvois; boreal; alpine-submontane; Cumberland Pass, B 99d-57; Gothic Natural Area, B 279-61; Rough Creek, B&S 185-62 CS, AGUW; Powderhorn, B 104-64; Hot Springs Creek, B&S 117-66. Wherever there is moisture and not too much shade, this grass is found throughout the Basin. After one has become used to the plant (which varies in height from six inches to forty), it can be recognized by the contrast between the lower, darker parts of its glumes and lemmas, and the upper, pearly parts. More finely, it will be noted that the upper of the two florets slightly exceeds its neighboring glume, and that its awn slightly exceeds the floret.

Deschampsia atropurpurea (Wahlenberg) Scheele; boreal; subalpine; Gothic Natural Area, B 178-59 CS, RMBL, AGUW; Peeler Basin, I 18898 (1961) RMBL. Whereas D. caespitosa, although occasionally extending into the partial shade of the forest, is principally a plant of open places, D. atropurpurea is a forest plant, ranging (in the Gunnison Basin) from the deepest part of the spruce-fir forest to the partial shade of its edge. It has the wide, short leaves of a forest grass, and its glumes extend beyond the florets. The awns, being more bent than those of D. caespitosa, usually appear from the side of the spikelet.

Helictotrichon Besser, The Wild Oats

In Helictotrichon, the number of florets in a spikelet differs according to the species and within the species. The spikelet itself varies in length from a centimeter to a centimeter and a half, and is thus larger than the spikelet of Deschampsia, smaller than the spikelet of Danthonia. The two species of Helictotrichon in the Gunnison Basin are alpine bunchgrasses and can be separated by gross features.

Helictotrichon Mortonianum (Scribner) Henrard; southwestern; alpine; Cumberland Pass, B 100-57 CS, RMBL, AGUW; Baldy Chato, B&S 468-62 CS, RMBL, AGUW; Mesa Seco, B 94-64 RMBL. This bunchgrass of the alpine zone grows from four to eight inches high, the panicles being sometimes contained within the leaves, sometimes elevated above them. The spikelets are usually two-flowered, as may be told by the pairs of often unequal awns, which bend and twist at the summit of the spikelet in a thoroughly individual way.

Helictotrichon Hookeri (Scribner) Henrard; cordilleran; alpine; Cumberland Pass, G 2874 (1964) COLO. This collection was made, not in the same general area, but in exactly the same place as the first collection cited under the preceding species, and it is interesting to observe the same conditions bringing both species to about the same height of eight inches. Both species have spikelike panicles; but that of H. Hookeri is far denser to begin with, and also far woollier, on account of the presence of frequently three (instead of two) awns protruding from a spikelet. But most striking is the difference between the vegetative plants. H. Mortonianum has gray-green involute leaves of a piece with the gray-green culms, while the leaves of H. Hookeri are flat, and a bright meadow-green like that of the culms.

In fact we now come to the most interesting detail of these two collections. H. Hookeri, although in just about the same state of maturity as H. Mortonianum, was collected five weeks earlier, on July 23rd instead of August 28th! In other words, this is not merely another instance of our principle that when two species of a genus are found growing together they will differ in flowering season.* Here, apparently, there is also a difference in adaptation. For evidently the wider-ranging, cordilleran species has become accustomed to do its work as a plant during the rains and milder temperatures of midsummer. The narrower-ranging southwestern species has presumably adapted itself to the greater drought and lower temperatures of late summer and approaching autumn. However this may be, I am convinced that with

* See above, pp. 33 and 175.

sufficient study, every plant in the Gunnison Basin could be taken out of the abstract and static web of morphologic distinction and placed in a dynamic web of plant geography and plant history.

Koeleria Persoon, The Koelerias

In the remaining Gunnison Basin genera of the Aveneae, the spikelets similarly differ in number of florets either according to the species or within the species. Furthermore in this genus and the next (at least as they are represented in the Gunnison Basin), there are no awns.

Koeleria cristata (L.) Persoon; boreal; alpine-submontane; Old Monarch Pass, B 155-59 CS, RMBL, AGUW; Los Pinos Pass, B 163-64 AGUW; Rough Creek Valley, B&S 236-62 CS, AGUW; Copper Creek Valley, B 167-59 CS, RMBL, AGUW; Almont, B 120-59 CS, RMBL; Gunnison, B&S 305a-62. Although the panicle of K. cristata may occur with various irregularities, the commonest form is that of a spike rendered all the more narrow by the lack of awns. Frequently it gives a pearly, herringbone impression. This comes from the hyaline paleas of the commonly three florets, which are arranged in herringbone fashion. By way of oddity, the three lemmas are rough and pigmented as if they were glumes.

Sphenopholis Scribner, The Wedgescales

Once a lens is applied to a spikelet, the individuality of this genus can scarcely be a matter of doubt. Of the two glumes of each spikelet, the upper (or inner) one is large and wedgelike, the lower (and outer) one is slim and linear. As mentioned under Koeleria, the genus as represented in the Gunnison Basin is awnless.

Sphenopholis intermedia (Rydberg) Rydberg; boreal; montane; Fish Creek Valley, B&S 361-62 CS, RMBL, B&S 362-62 AGUW. Here, as in Koeleria cristata, the

panicle is long and often narrow; but even at its narrowest, it is so loose and wayward that it could not be described as spikelike. As a matter of fact, when it comes to field recognition, plants with narrow panicles will more readily be mistaken for Agrostis exarata than for K. cristata. Curiously, the two collections cited above represent two different clones of a single population, the first being three-flowered, the second two-flowered. In the first collection, the leaves are also wider and the whole plant more vigorous. Yet no one still possessed of his common sense would ever call the two collections two species.

Trisetum L., The Trisetums

Although Trisetum is represented in the Gunnison Basin by three species, two of the species are infrequent if not rare, while the species that is not infrequent, T. spicatum, is one of the commonest grasses in the Basin. As a result, the two infrequent species will always be known by way of contrast. The trisetous, or three-bristled, aspect of the genus (which not all the species possess) is derived from the two lateral awns of the lemma, which take up their position on either side of the awn that comes from above the middle of the back.

Trisetum spicatum (L.) Richter; boreal; alpine-montane; Baldy Chato, B&S 464-62 RMBL; Conundrum Pass, B 70k-55 RMBL; Slumgullion Gulch, B 97-59; Elk Basin, B 161-59 CS; Gothic, B 60a-57 RMBL; Big Soap Park, B&S 65-80. The dense, spikelike heads of this grass, ragged from the projecting awns, have a tendency to develop a deep color in the sun. In the field, this color can seem to be a chocolate brown; but when dried, the essential redness always comes out. However, when growing in the partial shade of forest openings, or at the edge of a patch of montane woods, the color does not develop, and the species can be confused with T. montanum, which the reader should consult.

Trisetum montanum Vasey; southwestern; montane;

Gothic, Wi 10084 (1954); Slate River Valley, B 102-60 CS, RMBL; Wager Gulch, B&S 270a-65 RMBL. Spikelet for spikelet, I should hate to be obliged to separate this species from the montane, partially shaded plants of T. spicatum. Both spikelets are prevailingly two-flowered, and both are so much alike in size that measurement cannot be used with any confidence. However, the panicle of T. montanum is always less dense than that of T. spicatum, and the culm immediately below the panicle is smooth, that of T. spicatum rough. I am obliged to W.A. Weber for pointing this latter distinction out to me. It is especially valuable in the field, since it needs only to be felt, and does not have to be seen.

Trisetum Wolfii Vasey; cordilleran; subalpine; Gothic Natural Area, B 179-59 CS, RMBL, AGUW; Cottonwood Pass, I 19048 (1961). Since the awns that give the name to the genus are lacking from T. Wolfii, this species is apt to offer difficulty in identification. True, the prevailingly two-flowered avenaceous spikelets are a help. But it seems to me that I have collected certain keeled, few-flowered poas that were very close to this grass. Fortunately, however, there is a character which I have always found dependable. If one really looks for it, there is a rudiment of an awn at least on some of the lemmas, which starts around the middle of the back but gives out before reaching the top.

Chlorideae, The Chlorid Grasses

The chlorids are conspicuous among the grasses for their groomed appearance. Their spikelets occur in two rows, which are brushed to one side of the rachis and thus form a one-sided spike. These spikes occur solitarily, or are aggregated into various sorts of inflorescence.

Beckmannia Host, Sloughgrass

In the single American species of this genus, the spikelets are one-flowered and circular, and seem to

have been plaited rather than brushed into their short, one-sided spikes. These latter are gathered together in an erect, racemose panicle unlike that of any other grass in the Basin.

Beckmannia syzigachne (Steudel) Fernald; boreal; montane-submontane; Gothic, W 9161 (1955) COLO; Cathedral, B&S 288-62 AGUW; Gunnison, W 9481 (1955) COLO. This plant is found both in moist meadows and along irrigation ditches, and ranges from the montane zone (where it seems to be most at home) to the floor of the Basin.

Bouteloua Lagasca, The Gramas

Here also the spikelets are one-flowered (although with conspicuous rudiments of former florets), and the brushing of the spikelets to one side of the rachis is even more pronounced. But there are many differences between the two genera. The spikelets of Bouteloua are anything but circular, are copiously awned, and are much more numerous along the one side of the short spike.

Bouteloua gracilis (HBK) Lagasca; relict of the plains; submontane-montane; Almont, B 355-61; Cochetopa Park, Pe 8/10/55 RMBL; Cebolla Hot Springs, B&S 491-62 CS, AGUW; Cathedral, S 62-65. This short grass has a distinctive habit with its sparse panicles composed of from one to three curved spikes at the summit of each vertical culm. The plant is a denizen of dry, open places, and is tolerant of alkaline soil.

Bouteloua simplex Lagasca; southwestern; submontane; Gunnison, Ko 8/20/61 WS. This annual species resembles B. gracilis, and is to B. gracilis as an annual is to a perennial, although its similarly curved spikes are always solitary at the ends of the culms, and do not appear in twos or threes. The plant is found in open, dry habitats similar to those of B. gracilis.

Buchloë Engelmann, Buffalograss

In this genus, known only by the following species, the spikelets are either pistillate or staminate, but not both. The one-flowered pistillate spikelets occur in small heads nestled among the leaves, and do not show the usual grooming of the chlorid grasses. The panicled, two-flowered, staminate spikelets, however, are groomed into one-sided spikes, and these are collected into two- or three-spiked panicles which show the closeness of the genus to Bouteloua.

Buchloë dactyloides (Nuttall) Engelmann; relict of the plains; submontane; Gunnison, Wi 10424 (1954). There would seem to be degrees among the relicts of the plains in the Gunnison Basin. For whereas Bouteloua gracilis does not seem to be especially rare, and even reaches the montane zone in one or two places, B. dactyloides is known only by the above collection, made a couple of miles north of Gunnison. Yet even here it was sending out its overground stolons to maintain its claim to part of the arid soil of the floor of the Basin.

Festuceae, The Festucous Grasses

The Festuceae can quickly and easily be separated both from the tribes that have preceded it and from those that are still to come. The spikelets, far from being reduced to a pair or even a single floret, have three or more florets--in fact so many that, contrary to the Aveneae, the glumes are unable to enclose the spikelet. Indeed, the glumes are unable to cover even the first floret.

Bromus L., The Bromes

The tribe takes its name from the genus Festuca; but the genus Bromus could have served as well. In both genera the spikelets are many-flowered and in both genera (with the exception, in the Gunnison Basin, of a single species in each), the lemmas are awned. One is,

in fact, hard pressed at the beginning to give characters that, without acquaintance, will separate the two genera. Of such characters probably the best is that in Bromus the awn comes from between two teeth at the apex of the lemma, that in Festuca it comes from the apex itself, which has no such teeth.

Bromus inermis Leysser; adventive; montane-submontane; Gothic, B 94-57 RMBL; Gunnison, B&S 306-62 CS. As mentioned in the Introduction,* most of the hayfields in the Gunnison Basin are composed of native grasses and are unsown. This is especially true of the meadows on the old floodplains that receive more subsoil irrigation than is usually supposed. But frequently, on the slopes just above the floodplains, B. inermis is sown, and does very well if watered for a year or two. Hence it is not surprising to find the grass as an escape here and there. It is a tall, vigorous, rhizomatous grass, especially noticeable in anthesis because of its large, bright-yellow anthers. The long, seven- to eight-flowered spikelets are usually pigmented on the backs of the lemmas, and in spite of the specific name of "unarmed," occasionally have slight, weak awns.

Bromus Pumpellianus Scribner; cordilleran; submontane; Gunnison, B 64-57 CS, RMBL; Sargents, R 10621 (1959) CS. B. Pumpellianus has been regarded as a variety of B. inermis, which is difficult to understand since the difference between the two species, at least in the Gunnison Basin, can be seen from a passing automobile. The habit of the two grasses is, in fact, quite different. Whereas the panicle of B. inermis tends to be symmetrically disposed on all sides of the axis, that of B. Pumpellianus is distinctly one-sided, or plumelike; and since it is fully twice as large, the plume is a flag to the passing botanist, if not to the passing tourist.

Bromus Porteri (Coulter) Nash [B. anomalus Ruprecht]; cordilleran; subalpine-submontane; Lower Powderhorn Lake, B 681-62 CS, RMBL, AGUW; Fish

* See above, pp. 25-27.

Creek Valley, B&S 344-62 CS; Gold Basin Creek drainage, B 93a-57; Gothic, B 60-57; Washington Gulch, B 273-61. Nearly all the morphological characters between this and the next species overlap, and separation of the two can be difficult if based upon these characters. Hence it is fortunate that there are a number of non-morphological characteristics. In the first place, there is a distinct difference in habitat. B. Porteri is a plant of dry places, B. Richardsonii of median to moist places. Again, B. Richardsonii is a much more luxuriant plant; B. Porteri seems thin and wiry in comparison. Finally, the panicle branches of B. Richardsonii arch over and droop quite evenly, as if they were carrying relatively heavy burdens, which in fact they are. The panicle branches of B. Porteri have quirks in them. They do not droop evenly at all. They can even reverse themselves and turn up.

Bromus Richardsonii Link [B. ciliatus L.]; cordilleran; alpine-montane; Blaine Basin, B 113-57 RMBL; Gothic, B 49-57 CS, RMBL; Fish Creek Valley, B&S 343-62 CS, AGUW; Capitol City, S 66-123. The differentiation of B. Richardsonii was given under the preceding species. It should be pointed out, however, that nearly every one (including the author), except when the plant is in full anthesis, has mistaken B. Richardsonii for B. polyanthus. The latter has been collected in the Black Canyon of the Gunnison River, just west of the Gunnison Basin, but to my knowledge has never been collected in the Basin itself.

Bromus tectorum L.; cordilleran; submontane; Almont, B 30-59 RMBL. This annual, otherwise known as "cheat," the destructivity of which has been graphically set forth by Aldo Leopold in his Sand County Almanac,* is fortunately not a range grass in the Gunnison Basin. On the contrary, it seems to be restricted to sandy roadsides on the floor of the Basin where it can harm neither range nor beast. It can even be attractive in its green, soft stage, with its nodding spikelets and

* In the work as cited, pp. 154-158.

awns longer than the lemmas.

Catabrosa Beauvois, Brookgrass

A boreal, Eurasian genus, Catabrosa is represented in North America by one species only. Nevertheless this one species is the sort of plant that any one can know accurately without close examination. Anchoring itself on the edges of brooks and pools, the grass sends out leafy stolons over the water which are remarkable for their bright-red sheaths and for the culms they bear that overtop the ones on land.

Catabrosa aquatica (L.) Beauvois; boreal; subalpine-submontane; Copper Creek Valley, B 145-59 CS; Cabin Creek Cow Camp, B 150-60; West Pass Creek Valley, H 9050 (1959) CS; Cathedral, B&S 87-62 CS, AGUW. Although fine examination is not necessary to determine this species, the collector should look at the strongly ribbed, truncate, and erose lemmas of the species. Nothing could be more distinctive. The glumes are small and inconspicuous.

Dactylis L., Orchardgrass

Like Catabrosa, this is a boreal, Eurasian genus with but one North American representative. Unlike Catabrosa, the single North American representative is not native but introduced, and indeed commonly planted as a hay or pasture grass.

Dactylis glomerata L.; adventive; montane-subalpine; Cement Creek Valley, S 65-59 RMBL; Cathedral, B&S 284-62 CS; West Pass, H 9000 (1959) CS. In the field, this grass can be recognized by the glomerules into which its spikelets are gathered. Sometimes these glomerules are simply arranged up and down the summit of the culm. Sometimes they are held off by means of a few stiff branches. The three- or four-flowered spikelets may be recognized by the ciliate keels and margins of the flattened, short-awned lemmas. In the Gunnison Basin,

except for these ciliations, the spikelets are largely glabrous.

Distichlis Rafinesque, Saltgrass

As the popular name indicates, this is a genus of saline soils, whether of the coast or of the interior, and curiously, is restricted to the two Americas, North and South. The plants are rhizomatous and dioecious, and the leaves are two-ranked--from which characteristic arises the name of the genus.

Distichlis stricta (Torrey) Rydberg; cordilleran; submontane; Cebolla Hot Springs, B&S 567-62 CS, RMBL, AGUW; Gunnison, Ko 9/31/61 WS. Since this is the only species known to occur in the Gunnison Basin (and indeed in the state of Colorado), no further words of identification are necessary. Apparently the grass can occur in soils that are merely dry, and not necessarily saline.

Eragrostis Beauvois, Stinkgrass

This genus, unknown in the Gunnison Basin save for one collection of an adventive species, is remarkable for its multiflowered, imbricated spikelets. There is no other genus of grasses quite so stylish; and indeed for the closest parallel, one would probably have to go to the genus Cyperus in the sedge family.

Eragrostis cilianensis (Allioni) Lutati; adventive; submontane; Gunnison, Ko 9/5/61 WS. If the above words are insufficient for identification of this annual, it will surely be recognized by its odor, which has given it the popular name of stinkgrass.

Festuca L., The Fescues

The fescues probably cover more land in the Gunnison Basin than any other genus of grasses, and this largely because of two species, F. arizonica and F. Thurberi, the first being an associate of sagebrush in the southern

(and larger) half of the Basin, the second in the northern half, although it also occurs in the southern half. In addition, these two grasses form grassland in their own right, F. Thurberi both in the upper montane zone below the spruce-fir forest and in the lower alpine zone above it. In general, the fescues may be regarded as a less robust kind of brome. Morphologically, they are frequently separated from the bromes by the lack of a pair of teeth on either side of the awn at the top of the lemma.

Festuca arizonica Vasey; southwestern; alpine-submontane; Carson Pass, B&S 65-183; Brush Creek Valley, B&S 641-62 CS, RMBL, AGUW; Fish Creek Valley, B&S 363-62 AGUW; Big Soap Park, B&S 65-82; Cochetopa Park, Pe 8/10/55 RMBL. Although F. arizonica is the ecological counterpart in the southern half of the Basin of F. Thurberi in the north, it is a wider-ranging species. It ranges from the floor of the Basin (where F. Thurberi is not found), through the forests of the montane and subalpine zones (where here and there it forms patches of grassland), to the crest of the Continental Divide where at 12,500 feet it may be mistaken for F. brachyphylla. Yet even at this altitude, the main features of the plant are still in evidence.

Its anthers, for instance, are two and a half to four millimeters long, those of F. brachyphylla not more than a millimeter long. In words this may not seem impressive; but under 20-power magnification it is striking. Furthermore the difference is constant. Again, in F. arizonica, the floret and awn are streamlined; one has the impression of gazing upon the backs of minute sea animals being led by their awns through the water. F. brachyphylla gives no such impression; its florets are shorter and stubbier. Finally, the panicles themselves differ. In F. brachyphylla it is usually possible to find one that is both one-sided and slightly curved; in F. arizonica both sides are about equally irregular. One should also note that in the Gunnison Basin F. arizonica has awns up to four millimeters in length, and that the character of virtual awnlessness simply doesn't work.

Festuca Thurberi Vasey; cordilleran; montane-alpine; Gothic, Wi 10443 (1954); Crested Butte, E (1891) COLO; Devil's Hole, B&S 287-62 CS, AGUW; Handies Peak, P 1540 (1940) COCO. This vigorous grass, which grows a yard high and frequently has six florets to a spikelet, is not found in truly dry habitats, which is why it is replaced by F. arizonica in much of the southern half of the Basin. Morphologically, it may be distinguished from the other fescues by its mucronate rather than awned lemmas. The mucros are not more than a millimeter in length, and are even lacking from some of the lemmas.

Festuca rubra L.; boreal montane-subalpine; Gothic, Wi 10083 (1954); Lake Irwin Basin, B 128-59 CS, AGUW. In the Gunnison Basin apparently an inhabitant of dry, rocky places, this is altogether a lesser plant than F. Thurberi. Its awns are longer than the mucros of F. Thurberi; but its lemmas are shorter (with fewer florets to the spikelet), and it grows to scarcely half the height. At the base of the plant, one can see the brown fibres of the old leaf-sheaths.

Festuca idahoensis Elmer; cordilleran; montane; Taylor Park, P 4509 (1955) CS; Gothic, B 164-60 CS, RMBL. This species, which is close to F. rubra, also springs from a brown, fibrillose base; but the stems rise vertically (or very nearly so) from a vertical root, instead of curving out, as in F. rubra, from a root that tends to grow sidewise. The panicle, too, is more open, the lemmas are firmer, and the awns are from two to four millimeters in length, not less than two millimeters, as in F. rubra. Finally, F. idahoensis seems to be a plant of open places where, unlike F. rubra, it fails to redden.

Festuca elatior L.; adventive; montane-submontane; Gothic, W 9478 (1955) COLO; Gunnison, Ko 9/6/61 WS. In size and in habit of growth this grass is much like F. Thurberi, which indeed was the principal grass in the meadow where the first of the above collections was made. But unlike F. Thurberi, this adventive grass is without even a mucro at the summit of its lemmas; nor

do the exposed backs of its lemmas show the tendency of F. Thurberi to redden in the sun.

Festuca brachyphylla Schultes [F. ovina L. var. brachyphylla (Schultes) Piper]; boreal; alpine; Conundrum Pass, B 70a-55 CS; Old Monarch Pass, B 159-59 CS; Rough Creek Pass, B&S 660-62 CS, AGUW; Slumgullion Mesa, B 211-65. For remarks about the individuality of this species the reader is asked to turn both to F. arizonica and to the following F. saximontana.

Festuca saximontana Rydberg [F. ovina L.]; boreal; submontane-montane; Gunnison, Ka 292 (1964); Big Soap Park, B&S 65-79; Johnson Gulch, B 96-66. Several years ago I came across Fernald's separation of this species from F. ovina and F. brachyphylla in the eighth edition of Gray's Manual.* The separation seemed so peculiarly reflective of the situation in the Gunnison Basin that during the next few years I gave especial attention to these three species, carefully measuring the anthers of all plants collected. I never found an anther beyond a millimeter and a half in length, and came to the conclusion that F. ovina does not grow in the Gunnison Basin. And with respect to F. saximontana, not only did I find the green, coriaceous, involute lemmas of Fernald's description, but I also noted an indubitable gap between the alpine habitat of F. brachyphylla and the submontane and lower montane zones where alone F. saximontana appears to grow. Yet in this lower region, F. saximontana shows the diversity of situation that is characteristic of many Gunnison Basin plants. For it is found both in the open and in partial shade, and in sandy soils as well as in woodsy loams. Its anthers vary in length from a millimeter to a millimeter and a half.

Glyceria R. Brown, The Mannagrasses

The lemmas of this genus make recognition unusually easy. They are strongly ribbed, and the ribs stay apart

* Fernald, Merritt L., Gray's Manual of Botany, eighth edition, N.Y., 1950, pp. 104-105.

until near the top. In fact, in many of the species, the lemmas seem like miniature sea dories.

Glyceria grandis Watson; boreal; submontane-montane; Gunnison, B 185-59 RMBL; Parlin, B&S 66-146; Fish Creek, B&S 575-62 CS. As its specific name implies, this is a large glyceria; in fact it is not only the largest of the Gunnison Basin glycerias but one of the largest grasses in the Basin. It grows to be well over five feet tall and is a worthy companion of the cattails with which it is frequently found, as was the case in the last of the cited collections.

Glyceria pauciflora Presl; cordilleran; montane-subalpine; Gothic, B 105-59 CS, RMBL, AGUW; Copper Lake, B 192-59 CS, RMBL, AGUW. Like G. grandis, this species seeks a shallow-water habitat in the sun, and also like G. grandis the individual plants are linked together by white rhizomes. But the rhizomes are slender, not stout, and the species, though vigorous, grows only to about two feet in height. The collector will further note that its lemmas have only five ribs instead of the seven of G. grandis, and that it has a tendency to develop red sheaths and stems, which contrast handsomely with the deep-green leaves.

Glyceria striata (Lamarck) Hitchcock; boreal; montane-submontane; Crested Butte, B 89-59 CS, RMBL; Cathedral, B&S 357-62 CS, AGUW; Lake Fork Canyon, B&S 503-62 CS, RMBL; Gunnison, B&S 193-62. This is by all odds the commonest glyceria in the Gunnison Basin; in fact the two other species are rather uncommon. By way of contrast, G. striata seeks moist soil rather than shallow water, and seems equally at home whether in dense shade or in the full blaze of the Colorado sun. Its lemmas have seven ribs, and it sends out short, brownish rhizomes to the side of the plant.

Melica L., The Oniongrasses

In this genus, many of the species (including the one in the Gunnison Basin) have an enlarged internode at the base of the stem which resembles the bulb of the onion and has given the genus its popular name.

Melica spectabilis Scribner; cordilleran; montane; Gothic, Br 5367 (1957) RMBL; Irwin, P 4567 (1955) COCO. The specific name of this plant means showy, and around Gothic and Irwin there is not a grass to which the name can be better applied. The attribute comes from the disproportionately large spikelets of the slender panicle, which are conspicuous for their purple tips. The "bulb" is at the base of the stem, resting on its node just under the ground, and beneath the node there is an unswollen half-inch of internode before the roots begin.

Poa L., The Bluegrasses

The poas are legendary for their difficulty. But this has finally worked to their advantage. For one thing, the divisions or subgenera of the poas have taken on a greater meaning than in any other genus of the grasses except Panicum, and will be used in the following account of them. For another thing, the very energy required to understand the poas usually produces an effect of overcompensation. At any rate it has produced this effect upon the author, and the species of Poa in the Gunnison Basin seem to him to stand forth with an especial clarity.

The poas certainly have a look of their own, so that one can usually recognize the genus even if he does not know the species. The spikelets are few-flowered and awnless, and the awnlessness of the spikelets seems part of the general glabrousness of the genus. The poas do not, as far as I know, form grassland anywhere in the Basin. Rather, they merge with the forbs of forest and meadow (and even of brushland), adding their blossoms to the general display. Take Poa alpina. On a sheltered, southwest-facing alpine slope I have seen the plant in full anthesis along with Swertia, Oxyria, Zygadenus, Erigeron, Penstemon, and Trifolium, and

in my opinion the plant with its yellow anthers protruding from the numerous hanging bells was the chief flower of them all.

Alpinae, The Alpine Bluegrasses

Since this division of the poas, like the others, is morphological only, and takes merely its name from Poa alpina, it does not follow that the members of the division will all be found in the alpine zone. Yet in the Gunnison Basin with one exception they all are, and this one exception, P. stenantha, known from a single station, was collected in a bare place above timberline which except for the altitude of 10,700 feet could be called alpine. Morphologically, the Alpinae seem to be without rhizomes and without the folded hairs at the base of the lemma usually spoken of as a web. The glumes are very much like the lemmas, except for some inconspicuous pubescence on the keels and margins of the latter, and both glumes and lemmas are inclined to color when exposed to the sun.

Poa alpina L.; boreal; alpine-montane; Mineral Mtn., B&S 525-62 CS, RMBL, AGUW; Engineer Pass, S 62-54; East Maroon Pass, B 186-59 CS, RMBL, AGUW; Gothic Natural Area, B 279a-61; Gothic, Wi 10068 (1954). In the cooler parts of the Basin, whether in the open or in partial shade, P. alpina is not uncommon. Of medium height, its panicles often take the form of an isosceles (even of an equilateral) triangle, and the spikelets frequently hang from the panicle branches. These are four- to five-flowered, and their bases are not acute, but rounded, like the top of a bell. In my opinion, this is the plant's most distinctive character.

Poa Pattersonii Vasey; cordilleran; alpine; Conundrum Pass, B 70b-55 RMBL, COLO; Cumberland Pass, G 2852 (1964) WS. There is no doubt, morphologically speaking, that P. Pattersonii is a member of the Alpinae. The second glume, for instance, is often larger than a lemma. But from the point of view of habit, the plant is

quite different from P. alpina. The panicle is compact and spikelike, and the elliptical spikelets all point up. Again, the plant is a bunchgrass (P. alpina grows individually), and the individuals of the bunch curve out from the base, with long papery sheaths, and then expand in vaselike fashion so distinctively that the plant can be told by its habit alone. Curiously, the lemmas show a trace of web.

Poa stenantha Trinius; cordilleran; subalpine; Lake Irwin Basin, B 130-59 CS, AGUW. By exception this poa, collected in a dry, open, south-facing gully above Lake Irwin, grows a yard tall. Its panicle branches (two or three at a node) extend outward for three or four inches, and display their narrowly elliptical spikelets at the ends. Actually, the plant may be recognized by its habit alone.

Poa glauca Vahl [P. rupicola Nash]; boreal; alpine-subalpine; Mt. Belleview, B 169-60 CS; Cumberland Pass, B 99-57 RMBL; Old Monarch Pass, B 158-59 RMBL; Mt. Ouray, B&S 126-66; Baldy Chato, B&S 463-62; Rough Creek Pass, B&S 625-62 AGUW; Slumgullion Gulch, B 96-59 RMBL. This is one of the most widely distributed alpine grasses in the Gunnison Basin, and amid the profusion of micro-habitats that exist in the alpine zone it shows an equally wide variation in form. At one extreme (represented by B&S 625-62 above), it is a replica of the European plant described and drawn on pages 156 and 157 of C.E. Hubbard's well-known Grasses.* At the other extreme (represented by B&S 463-62), it is typical of the grass described as P. rupicola in the Hitchcock-Chase manual. In general, the plant may be known by the stiffly erect clusters of culms and by the narrow, but relatively open, panicles. Frequently a cluster contains dried stalks and panicles from the year before. The three- to five-flowered spikelets are elliptical, and the glumes are ovate.

* Penguin Books, Harmondsworth, Middlesex, 1954.

Poa Fendleriana (Steudel) Vasey; cordilleran; alpine-submontane; Cumberland Pass, B 99c-57 CS, RMBL; Uncompahgre Peak, S 66-122; Cathedral, B 51-62 RMBL; Gothic, Wi 10084 (1954); Willow Creek Valley (north), B 11-65; Gold Basin Creek drainage, B 20-59 CS. If P. glauca is one of the most widely distributed grasses above timberline in the Basin, P. Fendleriana is one of the most widely distributed grasses in the Basin as a whole. It is also one of the easiest in the Basin to identify; for it is one of the few grasses that are dioecious, and it is certainly the first to flower, the fifth collection cited above (B 11-65) having been collected as early as May 28th. The upper third of the lemma is hyaline, and often as much of the glumes, and frequently this gives to the inflorescence a white, papery look that is recognizable from horseback. The plant seems to be most at home in the alpine zone, where it can be found growing a foot and a half tall; and this, I take it, is the reason that on the floor of the Basin it is the first grass (and one of the first plants) to bloom. I also suspect a condition of apomixis in the species since both staminate plants, and pistillate plants with a few stamens, are very rare, and there simply is not enough pollen to account for the abundance of purely pistillate plants.

Pratenses, The Rhizomatous Bluegrasses

This section of the poas takes its name from Poa pratensis, the grass that with its rhizomes saved Kentucky when the original cane lands were destroyed by the early settlers. Hence the presence of rhizomes is what distinguishes these poas from the rest. Yet it must be remembered, as mentioned in the Introduction,* that almost any plant in the Basin can be found with rhizomes, and also that few of the rhizomatous poas in the Gunnison Basin find conditions favorable for the development of sod.

* See above, p. 17.

Poa pratensis L.; boreal; subalpine-montane; Capitol City, S 62-47; Goose Creek Valley, B&S 107-65; Gunnison, B&S 192-62 CS. In the eighth edition of Gray's Manual, Fernald states that P. pratensis is "indigenous northward,"* and it must be said that the Gunnison Basin, which is the home of such northward plants as Erigeron grandiflorus and Hedysarum alpinum, qualifies in this respect. But what impels me most to regard this species as native in the Gunnison Basin is that in disturbed sites it does rather poorly; in a montane aspen grove, or among subalpine willows, very well. Its vigorous rhizomes are perhaps the first suggestion of its identity. After that, I find the lemmas most revealing. For each lemma has a conspicuous glabrous rib between the pubescent keel and pubescent margin. The species is tolerant of alkaline soil.

Poa arctica R. Brown; boreal; alpine-montane; Rough Creek Pass, B&S 628-62 RMBL, AGUW; Gothic Natural Area, B 142-59 CS, RMBL, AGUW; Gothic, B 116b-59 CS, RMBL, AGUW; Cathedral, B&S 217-62 CS, RMBL, AGUW. The most distinctive character of this species is probably the pubescence on the margins and keels of the lemmas. The amount of it varies; but it can be so dense on the margins as to be visible to the naked eye, and so abundant on the keel that only close inspection will reveal that it is not web from the base of the lemma but crinkled hairs from the middle of the keel. The panicle, in anthesis, is open and pyramidal, and the lowest branches may be horizontal or deflexed. Oddly enough, the plant seems to be equally at home in open dry places and in shaded moist places.

Poa curta Rydberg; cordilleran; subalpine; Cottonwood Pass, I 19045 (1961). With respect to rhizomes and lemmas, this grass might be confused with a lightly pubescent variety of P. arctica. But the panicles of P. curta are long and slender, and so are the spikelets. The latter measure about seven millimeters in length; those of P. arctica not more than six. The anthers

* In the work as cited, p. 117.

seem to be even more precise. Those of P. arctica are not more than a millimeter and a half long, while those of P. curta are two millimeters long.

Poa nervosa (Hooker) Vasey; cordilleran; subalpine-montane; Cottonwood Pass, I 10933, 10934 (1961); Cathedral, B&S 424-62 CS, RMBL, AGUW. Here is a species that to a large extent splits the difference between P. arctica and P. curta. Its spikelets are as long as those of P. curta, but its anthers are as short as those of P. arctica. The pubescence of its lemmas is also in between--less than that of P. arctica, more than that of P. curta. Its panicle is sometimes long and slender, but more often of a raggedy indeterminate shape with upward-pointing branches. Even when exposed to the sun it remains curiously green, although the base of the plant frequently shows the vegetative redness that is mentioned in the manuals.

Palustres, The Bog Bluegrasses

The Alpinae will be remembered as the poas with neither web nor rhizomes, the Pratenses as the poas with both web and rhizomes. Hence it should not be surprising that the present section of the poas offers the combination of web and no rhizomes. Nor is the name of "bog poas" any less welcome than that of "alpine poas." At the very least it justifies making clear for a second time that the classification is morphological, not ecologic. But as with the Alpinae, so with the Palustres. It happens that in the Gunnison Basin a large proportion of the Palustres are dwellers in bogs. Nevertheless, a number of these have their dryland variants, and one must constantly remember that the overriding adaptivity of the Gunnison Basin plants is away from moisture, toward drought.

Poa palustris L.; boreal; subalpine-submontane; Gothic Natural Area, B 276-61; Gothic, B 133-59 CS, RMBL; Crested Butte, B 172-59 CS, RMBL, AGUW; Powderhorn, B 107-64; Cathedral, B 693-62 CS, AGUW. P. palustris is a large grass, usually growing to a height

of two feet or more. As a matter of fact this peculiarity, in combination with its minute spikelets, gives a character that is almost recognizable from horseback. For its spikelets are only about three millimeters long, a tininess, among the Gunnison Basin poas, equalled only by the spikelets of P. Lettermanii; and in the latter case the plant is not two feet, but often less than an inch, tall. Really no other character is needed for P. palustris. That is why one of the misidentifications I am truly ashamed of concerns this species. I came upon the plant (B 276-61) on the top of a craggy, jutting cliff in the midst of the spruce-fir forest--about as far removed from a bog as can well be imagined. In other words, I was thrown off by the name! My one consolation is that I have seen the same mistake elsewhere, for it so happens that P. palustris is a species of cliff-crevices as well as of bogs.

Poa interior Rydberg; boreal; montane; Gothic, B 116c-59 CS, RMBL; Copper Creek Valley, B 169-59 CS, RMBL; Fish Creek Valley, B&S 541-62 CS, RMBL, AGUW; Cathedral, B 389-62 CS, AGUW. The spikelets of P. interior are so close to those of P. palustris that it would take a brave botanist to base the distinction between the species upon the spikelets alone. P. interior, however, as a plant, is shorter than P. palustris, and resembles nothing so much as a whiskbroom stood upon its handle. The culms ascend, and the short panicle branches ascend. Furthermore the species is a dweller in dry, thin-soiled habitats. Even the cliffs of P. palustris (which usually face east, north, or west) present pockets where moisture can collect. But P. interior seems to deprecate moisture. If the collector desires still another character I suggest that he consider the stemleaves. Those of P. palustris are long-bladed and frequently reach the panicle; those of P. interior are short-bladed and do not reach the panicle.

Poa reflexa Vasey & Scribner; cordilleran; alpine-subalpine; Lake Irwin Basin, B 131-59 CS, AGUW; Copper Creek Valley, R 10460 (1959) RMBL; Peeler Basin, I 18925 (1961). No doubt the most striking character-

istic of this poa lies in the reflexed panicle branches. But almost as noticeable are the empty glumes spread wide apart. For as though the species were conscious of the shortness of the alpine and subalpine summer, the spikelets mature and fall early, leaving the empty glumes behind. These are held apart at an angle of from 60° to 90°, and allow the species to be recognized almost instantly.

Poa bulbosa L.; adventive; montane; Dutch Gulch, B&S 108-62 CS, RMBL, AGUW. As far as I know, the above is the only collection of this plant from the Gunnison Basin. It was growing in a moist, trodden place, and is totally unlike any other grass in the Basin. One of the florets of a spikelet becomes a bulb instead of a flower, and the other florets turn into bracts, one of which is greatly prolonged and attracts the eye as much as the purple base of the lemma surrounding the bulb. The bases of the culms are also bulblike, and all in all, there would seem to be no possibility of confusing this grass with any other.

Poa Tracyi Vasey [P. occidentalis Vasey]; cordilleran; montane; Gothic, L 222 (1949) COLO. This is a large meadow grass more than two feet tall, with the inflorescence accounting for half the height of the plant. The sheaths of the leaves are completely smooth; but the internerves of the lemmas, unlike those of P. pratensis, are pubescent.

Poa leptocoma Trinius; cordilleran; alpine-subalpine; Cottonwood Pass, I 19126 (1961); Avery Flats, B 84-59. P. leptocoma and P. macroclada are so much alike morphologically that their differences will be discussed together. In the first place, there is a clean-cut difference in habitat. P. macroclada is a meadow plant of subalpine mountain slopes; P. leptocoma is a bog plant of the spruce-fir forest and lower alpine zone. Again, although the alpine specimens of P. leptocoma show a coloring of the glumes and lemmas, this is as nothing in comparison with the deep purple of P. macroclada. The spikelets of P. macroclada are also consistently larger, reaching a maximum of around six millimeters

instead of around five. But the best differentia is found in the glumes. In P. macroclada a lower glume can be found that is actually wider than the upper glume. In P. leptocoma, the lower glume is so much narrower that sometimes it seems a mere sliver in comparison with the upper.

Poa macroclada Rydberg; cordilleran; subalpine; Teocalli Mtn., L 980 (1950) CS. For a discussion of this species, see the preceding P. leptocoma.

Epiles, The Glabrous Bluegrasses

Since the poas are generally glabrous the above name for the subgenus may seem to be redundant. But the glabrousness in question has to do with the lemmas, which are without pubescence and which impart a sort of sheen to the compact (but not necessarily spikelike) inflorescence.

Poa epilis Scribner; cordilleran; alpine-subalpine; Rustler's Gulch, B 249-60 CS; Taylor Pass, B 46-59; Ohio Peak, B 76-57 RMBL. This poa does not need a lens. The basal leaves are long and involute, the stem-leaves short and flat. The contrast is really quite striking.

Poa Lettermanii Vasey; cordilleran; alpine; North Italian Mtn., W&L 9272 (1955) COLO. As previously pointed out, the spikelets of this species share with those of P. palustris the distinction of being the smallest among the Gunnison Basin poas. In the plants of the above collection they are two-flowered, the plants themselves being only about a half-inch tall.

Scabrellae, The Round-backed Bluegrasses

The spikelets of nearly all the poas are flattened sidewise, so that the central rib of the lemma becomes, in fact, a keel. The peculiarity of the above group is that with them this does not happen.