fruits are pubescent instead of glabrous, globose rather than inversely top-shaped, and slightly if at all compressed contrary to the partition.

Chorispora R. Brown, The Purpleweeds

Chorispora tenella (Pallas) DC.; adventive; submontane-montane; Gunnison, Ke 7/49 WS; Powderhorn, S 64-62 RMBL; Jack's Cabin Pass, B 21a-57; Gothic, B 34-57. It is interesting that this adventive should have been collected in Gunnison as early as 1949. For I can report that it first made its appearance in the neighborhood of Gothic around 1954. The purple flowers of the plant are striking and attractive; but the fruits are the most torulose of any crucifer in the Basin; that is, the main body of the silicle is like a chain of round beads, in this case ending in a sharp beak.

Descurainia Webb & Berthelot, The Tansy Mustards

The tansy mustards, as the name suggests, are plants about the size of the common tansy, with finely dissected leaves and yellow, mustardlike flowers not more than two or three millimeters in diameter. Technically, they are usually separated by means of small differences in the silicles. But the three Gunnison Basin species can be distinguished by habit of growth, frequency, habitat, and other non-morphologic characteristics.

Descurainia Richardsonii (Sweet) Schulz; cordilleran; submontane-alpine; Sapinero Guard Station, B 67-65; Gothic, S 64-66 RMBL; Willow Creek Mesa, B 53-65; Snow Mesa, B&S 324-62. Although extending as high as the lower alpine zone, and descending to the upper submontane zone, this plant is most at home in the meadows and aspen groves of the montane zone. It is much the most frequent of the Gunnison Basin species, and may be recognized by its vertical habit. Commonly, the plant grows as a sheer wand; and even when the plant sends out branches, these branches usually continue the vertical habit not far from the main stem.

Descurainia Sophia (L.) Webb; adventive; submontane-montane; Powderhorn, B&S 50-62; Cathedral, B&S 425-62; Cabin Creek Cow Camp, B 147-60 CS. This weedy adventive is a plant of cattle yards, roadsides, and waste places--habitats quite different from those of D. Richardsonii. In maturity, it has a peculiar habit: the upper part of the plant is all silicles, the middle part a cluster of bipinnate and even tripinnate leaves, and the lower part bare stem.

Descurainia pinnata (Walter) Britton; widespread North American; submontane-montane; Sapinero', Wh 472 (1898) COLO; Cathedral, B&S 318-62. This plant is more brushy than the other two species, frequently sending out several main stems from the summit of the root. In leaves, flowers, and silicles, it resembles D. Richardsonii; but it will be noted that its leaves are more compact, usually having fewer pinnae and the pinnae being closer together. It shares both the range and the habitats of D. Richardsonii, but is much less common.

Draba L., The Drabas

Some fourteen species of Draba have been collected thus far in the Gunnison Basin, with a strong likelihood that the addition of further species is waiting only for a pair of sharp botanical eyes. But whether the species found are new or old, in collecting Draba one must remember that the color of the flowers is a prime diagnostic and should be noted at the time of collection. For the whites fade into brown, and the yellows fade to white before turning into brown, and after a few years, it may be impossible to tell from the herbarium sheet the original color of the flowers.

The white-flowered alpine drabas

Draba lanceolata Royle; boreal; alpine; North Italian Mtn., W&L 9292 (1955) COLO; Baldy Chato, B&S 262-62. To me, the dentate leaves are the most striking

character of this plant. True, not all the leaves are thus dentate, but enough are so to catch the eye of the collector. The hairs of the vesture are both forked and simple, and the pubescent pod, or silicle, is sausage-shaped with the stigma sitting on top like a squat chimney.

Draba fladnizensis Wulfen; cordilleran; alpine; Cumberland Pass, Sh 56-33 RMBL; Snow Mesa, B&S 328-62. Here the pods are strictly glabrous with a bit of a style between pod and stigma. But I think the identifying feature of this plant is found in the acute ends of the leaves and pods. Although the plant scarcely grows above an inch and a half high, the impression is of a number of spearpoints directed upward and outward. The vesture of the plant is composed both of simple and of forked hairs, as in D. lanceolata.

Draba nivalis Liljeblad; boreal; alpine-subalpine; Conundrum Pass, B 70d-55, S 67-158 RMBL; North Italian Mtn., W&L 9311 (1955) COLO; Schofield Pass, W 9360 (1955) COLO. Here the determining characteristic will probably be found in the basal leaves, which grow in imbricated globose clusters, the inner sides tending to be glabrous, the outer pubescent with stellate hairs. The narrow, glabrous pods, scarcely more than a centimeter in length, tend to be scimitar-shaped.

The yellow-flowered alpine drabas

Draba crassa Rydberg; cordilleran; alpine; Mt. Belleview, B 56a-57; Pearl Pass, B 59a-57; Handiés Peak, P 1535 (1940) COCO. This is a rare plant in the Gunnison Basin, which makes it odd that it should be so robust and spectacular. Its heads of flowers are a vivid, rich yellow; its glabrous, asymmetrically elliptical pods have a look of their own; and the elliptical basal leaves on long petioles are thick and glabrous save for a few cilia on the edges. The only other alpine crucifer that approaches this one for spectacularity is Erysimum asperum, and the only other draba, D. spectabilis, found in meadows one or two zones below.

Draba crassifolia Graham; cordilleran; alpine-subalpine; Ohio Peak, W&B 9205 (1955) COLO; Gothic, B 23-55; Conundrum Pass, B 212-61 RMBL; Baldy Chato, B&S 265-62; Calf Creek Plateau, B&S 83-66. This draba is placed here to deconfuse confusability. But the confusability is in name only! For D. crassifolia is as obscure as D. crassa is conspicuous, as prevalent as D. crassa is rare; and whereas D. crassifolia in the Gunnison Basin is widespread, D. crassa seems to be limited to the Elk Mountains. Frequently only an inch high at flowering time, D. crassifolia continues to grow from its basal rosette of leaves until it is two or three times taller when bearing mature fruit. The glabrous fruits are symmetrically elliptical, and held vertically at a little distance from the stem. A short-lived perennial, the plant seems like an annual, and indeed frequently flowers in the same season in which it germinates. The flowering racemes of the subalpine plant are not so short as those of the alpine plant, but the basal rosettes can be just as small.

Draba oligosperma Hooker; cordilleran; alpine; Mt. Belleview, S 65-99 RMBL; Virginia Basin, B 4-67; Matchless Mtn., L 1312 (1951) COLO. The leaves in this species have heavy, doubly pectinate hairs, while the elliptical pods are clothed only with simple or forked hairs. Usually, skeletons of the old inflorescences are left standing among the new, with only the ribs of the pods left, looking like the empty frames of one-lensed spectacles. The plant, apparently, is restricted to the Elk Mountains section of the Gunnison Basin.

Draba incerta Payson; cordilleran; alpine; North Italian Mtn., L 3965 (1954) COLO, S 67-167. If the preceding species is restricted to a single section of the Gunnison Basin, this species is restricted to a single mountain top, and indeed to a small area of metamorphosed limestone on that mountain top. Yet the plant, which resembles the preceding, is by no means inconspicuous; in fact it is the larger and more vigorous of the two. Technically, it may be separated from D. oligosperma by its glabrous pods, and by its longer basal leaves which are not imbricated and only lightly clothed with doubly pec-

tinate hairs. Incidentally, and as far as I know, the above is the only station for this plant in Colorado.

Draba ventosa Gray; cordilleran; alpine; North Italian Mtn., L 3964 (1954) COLO, S 67-167a. Here an attention to the color of the inflorescence pays dividends even in the field. For this species grows with the preceding, but can be separated by the color alone, that of the preceding being a pale lemon-yellow, of this, a deep orange-yellow. The plant is also smaller and more heavily pubescent; in fact the grayish green caused by its pubescence further separates it from the brighter green of D. incerta. As with D. incerta, the above is apparently the only station for D. ventosa either in the Gunnison Basin or in Colorado.

The ubiquitous draba

Usually, in the Gunnison Basin, when a genus is represented by a dozen or more species there is one that is found everywhere, literally high and low, a plant that is tolerant of drought and of moisture, of shade and of sun, and is resistant to extremes of temperature. So it was with Artemisia,* and so it is with Draba, the plant in this case being D. aurea, which oddly enough seems to be of boreal origins.

Draba aurea Vahl; boreal; alpine-submontane; Gothic Mtn., B 60-55; Monarch Pass, B 76-60; Cochetopa Pass, B&S 110-66; Baldy Chato, B&S 473-62; Cathedral, B&S 167-62; Tenmile Springs, B 29-65. The flowers are yellow, but this is by no means the chief character of the plant. Rather, I think the chief character is found in the ascending, sessile cauline leaves that punctuate the many stems which rise from the perennial root. The pods are often twisted, and frequently, except for the short pedicels, seem to be a continuation of the cauline leaves.

The showy montane draba

* See above, p. 91, A. ludoviciana.

Draba spectabilis Greene; cordilleran; submontane-alpine; Sapinero, Wh 520 (1898) COLO; Washington Gulch, S 64-130; Copper Creek Valley, B 6a-54; Conundrum Pass, B 213-61. This handsome draba descends to the submontane zone, and climbs to the subalpine and alpine zones, but is most at home in the montane zone. It is here that in the month of June it grows in populations sufficiently dense to color a meadow and justify the name of spectabilis or showy. Like D. aurea, it has sessile, ascending cauline leaves; but these are more prominently toothed, and also give the appearance of being glabrous even if they are not strictly so. And besides, the yellow of their flowers is of a brighter, more golden hue than that of D. aurea.

The four annual drabas

Draba reptans (Lamarck) Fernald; widespread North American; submontane; Sapinero, Wh 497 (1898) COLO. This is the only white-flowered lowland draba in the Basin, and probably will be recognized when it is encountered. The white petals are very small (sometimes they are even lacking), and the leaves are clustered at the base of the plant. The fruits, however, are conspicuous, each cluster being held aloft like a bunch of inverted micro-bananas.

Draba rectifructa C.L.Hitchcock; southwestern; montane; Los Pinos Pass, B&S 41-62. This yellow-flowered annual, known only from a grassy meadow near the summit of Los Pinos Pass, is like no other draba in the Basin. There is no naked stem, the flowers (or fruits) beginning where the leaves leave off, while the plant is so pubescent that it can only be described as woolly.

Draba nemorosa L.; cordilleran; submontane-montane; Gothic, Ke 7/4/49 WS; Parlin, E (1888) COLO; West Pass, H 9005 (1959) CS; Cathedral, S 62-22. This annual draba has flowers as small as those of D. reptans, but yellow instead of white. As the ascending fruits emerge from the small flowers, the pedicels grow apace, so that the disproportionately long pedicels become the

best-remembered character of the plant. The basal leaves are broadly oval and moderately pubescent.

Draba stenoloba Ledebour; cordilleran; montane; Gothic, Wi 10677 (1954); Slate River Valley, B 108-61. This plant, which is facultatively annual, is confusable with D. nemorosa; but the confusion can be avoided. The petals of D. stenoloba are of a deeper yellow, its fruits are not so exaggeratedly pediceled, and its basal leaves are markedly narrower and less pubescent.

Erysimum L., The Wallflowers

Erysimum asperum (Nuttall) DC.; cordilleran; submontane-alpine; Hartman Rocks, B 6-61; Signal Peak Ridge, B 21-61; Gothic, B 104-52; Cathedral, S 62-29; Schofield Pass, B 15a-55; Cumberland Pass, B 35a-57; Slumgullion Mesa, B&S 134-62. It is not surprising that frequently in the Gunnison Basin the widest-ranging species show the widest range of variation; for undoubtedly, it is the latter trait that permits the former. E. asperum is a good example. It ranges from a plant a foot and a half high in the submontane zone to an alpine dwarf of only two and a half inches; its petals range in color from yellow through orange to purple; and its leaves are variously entire or denticulate, linear or oblanceolate. It also is found in dry and in moist habitats, in shady or in sunny, and in cold or warm places. Yet always the typical wallflower blossom is present with its large, clawed petals; its deep, cylindrical calyx; and those curious appressed longitudinal hairs that when examined closely are seen to be attached in the middle. The flowers usually are delightfully fragrant, and the plant is commonly biennial in the lower zones, perennial in the upper.

Erysimum cheiranthoides L., boreal; montane; Crested Butte, R 10377 (1959) CS; Gothic, B 223-60 CS, RMBL. This slight, frequently wandlike annual might easily be taken for a descurainia. Its yellow blossoms are only two or three millimeters in diameter, and the upraised silicles have the same habit of growth. But the flowers (under magnification) are clearly similar to those of

E. asperum--even to the appressed hairs; and so are the leaves. A plant of boreal origins, it seems to be as infrequent in the Gunnison Basin as E. asperum is frequent.

Hutchinsia R. Brown, The Hutchinsias

Hutchinsia procumbens (L.) Desvaux; boreal; submontane; Parlin, E (1888) COLO; Sapinero, Wh 534 (1898) COLO. The only species of its Eurasian genus to extend to North America, this little annual is a plant of moist places. The Gunnison Basin specimens are not more than six inches in height, and the white flowers are minute. The fruiting stems lengthen as the silicles mature; but the general habit of the plant (as the specific name indicates) is sprawling. It is curious that the plant has not been collected in the Gunnison Basin since the nineteenth century.

Lepidium L., The Peppergrasses

Lepidium montanum Nuttall; cordilleran; submontane-montane; Almont, B 36a-54; Lake Fork Canyon, B&S 41-60 CS, RMBL; Glacier, K 535 (1947) DBG; Cathedral, B&S 317-62; Goose Creek Valley, B&S 105-65. This is the commonest lepidium in the Gunnison Basin, and is found most often in dry, open places; but it can also be found growing luxuriantly in moist places in dense shade! I think the strongest impression of the plant is of its leafiness. L. densiflorum thrusts its naked fruiting racemes upon the collector's eye. But in this species, the blossoms are more conspicuous than the fruits, and the leaves can be more conspicuous than either. Usually pinnate, they are occasionally entire, with or without denticulations on the edges. The species is perennial or biennial.

Lepidium densiflorum Schrader; boreal; montane; Gothic, Wi 10094 (1954); Slumgullion Gulch, B&S 245-62; Sugar Creek Valley, B 43-64. Here the blossoms are never more conspicuous than the fruits because

they are, in fact, without petals. As for the leaves, which are predominantly linear and entire, they frequently seem insufficient to nourish the dense, naked racemes of fruits. And the truth of the matter is that the green silicles themselves, until they mature, account for a large part of the photosynthesis of the plant. This species is annual, as is the next.

Lepidium virginicum L.; widespread North American; submontane; Gunnison, W 9335 (1955) COLO. Known from the Gunnison Basin only by the cited collection, this species can be confused with L. densiflorum. But its fruits are clearly more circular than those of L. densiflorum, which are just as clearly ellipsoidal. Petals are also clearly present, although they may have disappeared if the collection is a late one.

Lepidium ramosissimum Nelson; relict of the plains; submontane-montane; Sargents, W&J 8550 (1953) COLO; Gothic, Pe 3831 (1954) COLO; West Pass, H 9002 (1959) CS. This species is also confusable with L. densiflorum. In both species the petals are lacking or vestigial, and the fruits are ellipsoidal. But L. ramosissimum is a larger, more branched, and hence more bushy plant than L. densiflorum. Furthermore its flowers and fruits, as mentioned in Harrington's Manual,* are congested in short axillary racemes as well as in terminal ones, the last collection cited being a good example of this. The species is usually biennial.

Lepidium perfoliatum L.; adventive; submontane; Gunnison, Wi 10635 (1954); Parlin, B 103-61. This annual lepidium has the tripartite habit of Descurainia Sophia.** The top third of the plant is given over to the racemes of silicles, the middle third to the curious perfoliate leaves, and the lower third to a cluster of finely dissected bipinnate (and even tripinnate) leaves. These latter have usually disappeared by the time the fruits are mature.

* Page 260.

** See above, p. 153.

Lesquerella Watson, The Bladderpods

Lesquerella montana (Gray) Watson; cordilleran; submontane; West Pass Creek Valley, Jo 10 (1960) CS; Cochetopa Park, B 23a-57; Gold Basin Creek drainage, B 77-65. This low, but handsome perennial plant of the sagebrush zone bushes out from the summit of a taproot. The yellow petals turn crimson in drying, and the close, cinereous pubescence is remarkable. It is composed of symmetrically stellate hairs, appressed to the leaf, and attached at the middle. This same pubescence will be found in the closely related genus, Physaria.

Nasturtium R.Brown, Watercress

Nasturtium officinale R.Brown [Rorippa Nasturtium-aquaticum (L.) Schinz & Thellung]; adventive; submontane-montane; Jack's Cabin, B 202-60 CS, RMBL; Gunnison, B 213-60 CS; Cement Creek Valley, S 64-250. The common watercress used as a salad green is so well established in the Gunnison Basin that it grows not only in rivers and irrigation ditches but merely in muddy ground. The petals are white and the short silicles, which retain the style as an abrupt beak, are both torulose and curved.

Physaria (Nuttall) Gray, The Twinpods

Although this genus is represented in the Gunnison Basin by only three species, the three species have so much in common that separating them is not so easy as one would like. Technically, the separation of the three species is usually made by the depth and width of the notch between the upper halves of the silicle. But this notch is by no means uniform, and as a consequence, the practical botanist is apt to fall back upon gross characters of habit and foliage. It is interesting that two of the three Gunnison Basin species are limited to Colorado, and the third to Colorado and New Mexico. It would appear that all three are specializations of the

cordilleran flora and probably closely related to one another. No doubt this is the chief reason for the difficulty of distinguishing among them. All three are perennial plants.

Physaria acutifolia Rydberg; Coloradan; alpine-submontane; Avery Peak, B 107a-57; North Italian Mtn., L 720 (1950) COLO; Lake City, Ke 7/17/49 WS; Gunnison, K 1500 (1949) DBG. Here the basal leaves furnish the most dependable gross character. Attached to the petiole at one end of the long diameter, they are prevailingly rhomboidal. Occasionally, there is the suggestion of a tooth at each end of the short diameter. The plant also seems to show a radical differentiation between the numerous rhomboidal basal leaves and the smaller and fewer elliptical cauline leaves.

Physaria floribunda Rydberg; southwestern; submontane-montane; Parlin, W 4707 (1949) COLO; Lake Fork Canyon, B 42-60 RMBL; Powderhorn, B&S 31-62; Lake City, Ro 51-104 COLO. This species does not show such a marked differentiation between basal and cauline leaves as P. acutifolia. The cauline leaves, although slender, are long and numerous and seem to fill the space between basal leaves and inflorescence. The basal leaves, for their part, are inclined to be sinuate-dentate, and frequently have an extra pair of teeth halfway down the petiole.

Physaria Osterhoutii Payson; Coloradan; submontane; Cebolla Hot Springs, B&S 499-62, B 72-64; Hierro, B&S 73-66; Gunnison, Ke 6/26/49 WS. P. Osterhoutii seems to have a chemistry different from that of the other two species. Its leaves and stems are a bluish, rather than a yellowish, green. Furthermore it is tolerant of alkaline soil with no perceptible modification of the plant. In shape, its leaves seem to be a slender variety of those of P. floribunda; but there are fewer basal leaves, and what ones there are seem to lose themselves among the numerous stems. In fruit, the pedicels have a tendency to droop.

Rorippa Scopoli, The Yellow Cresses

Rorippa islandica (Oeder) Bórbas; boreal; montane-submontane; Gothic, Wi 10675 (1954); Cebolla Hot Springs, B 123-64. This is an erect, yellow-flowered annual (or biennial), ranging in height from less than a foot to nearly a yard. The leaves vary in shape from pinnate, through pinnatifid, to entire with merely a few teeth. In the Gunnison Basin, it is much less frequent than R. obtusa, although it is tolerant of alkaline soil.

Rorippa obtusa (Nuttall) Britton; cordilleran; submontane-alpine; Gold Basin Creek drainage, B 92d-57; Dry Lake, B&S 225-62; Gothic, Wi 10311 (1954); Sylvanite Basin, B 243a-61; American Flats, B&S 65-191 RMBL. This plant is also a yellow-flowered annual, and can be erect, but is more apt to be decumbent or even prostrate. Even when erect, I have never seen it more than seven or eight inches high. Its leaves are less pinnate or pinnatifid than those of R. islandica, a common shape being that of a symmetrically dentate ellipse with two pairs of pinnae on the petiole beneath the ellipse.

Sisymbrium L., The Hedge Mustards

Sisymbrium altissimum L.; adventive; submontane; Almont, B 60a-54; Parlin, B 99-61. Elsewhere in the West, this annual species is one of the better known tumbleweeds. In the Gunnison Basin it is not common enough to be so known, and simply takes its place among the many erect roadside weeds of the Basin floor. Its leaves are pinnate (or pinnatifid), with the peculiarity that the pinnae become more and more slender until finally they merge with the slender silicles. The flowers in the small corymbose heads are yellow.

Sisymbrium linifolium Nuttall; cordilleran; submontane-montane; Gold Basin Creek drainage, B 20-60 RMBL; Quartz Creek Valley, B 8-65; Powderhorn, B&S 28-62; Little Iron Mtn., B 103-64. Here the leaves are prevailingly linear and once again blend

with the slender silicles. Occasionally, rudimentary pinnate leaves will be found at the base of the plant if the collection is an early one. The blossoms are yellow and relatively large, and the plant is a perennial.

Sisymbrium Loeselii L.; adventive; submontane; Powderhorn, B&S 52-66. This, the first known record of the species in the Gunnison Basin, is probably close to the date of the plant's migration into the Basin, for the plant is a conspicuous one and was collected in a conspicuous place. Its rich green leaves (sparsely pubescent with white hairs) are doubly pinnatifid in a peculiarly handsome way, and the yellow inflorescence at the summit of the wandlike stem is striking. The plant is a vigorous annual.

Smelowskia C.A.Meyer, The Fernleaf Candytufts

Smelowskia calycina (Desvaux) C.A.Meyer; cordilleran; alpine; Virginia Basin, B 16a-54; Dorchester Pass, B 34a-54; Slumgullion Mesa, B 131-61; Handies Peak, P 1532 (1940) COCO. By common consent, this is one of the most beautiful of the cordilleran alpine plants. In the Gunnison Basin, the small corymbose heads are more apt to be lilac-colored than white, and are charmingly fragrant. They are lifted several inches above the cushions of leaves and stems next to the ground, the leaves being simply pinnate. The species is a long-lived perennial.

Streptanthus Nuttall, The Twistflowers

Streptanthus cordatus Nuttall; cordilleran; submontane; Sapinero, Wh 488 (1898) COLO; Powderhorn, B&S 46-62; Gunnison, Ke 7/15/49 WS. This is a most distinctive plant. The upper half of the stem is given over, without leaves or bracts, to the flowers; the lower half bears the principal leaves, the basal leaves being already withered when the stems are in their prime. The leaves, ending in one to several apical teeth, are glaucous, glabrous, and succulent; the petals, protruding from the bottle-like calyces, are twisted and a reddish-brown. The species is a short-lived perennial.

Thelypodium Endlicher, The Thelypodiums

Thelypodium integrifolium (Nuttall) Endlicher [T. lilacinum Greene]; cordilleran; submontane; Parlin, E (1898) COLO; Cebolla Hot Springs, B&S 442-62. This erect, biennial plant, growing to a height of two feet or more, is easily recognizable even from a passing automobile. True, the basal leaves are withered by flowering time, and the ascending cauline leaves, without auricles, are not conspicuous. But the handsome, lilac-colored inflorescence occupying the upper third of the stem is striking. And as if to form a frame underneath the corymbose heads of fresh flowers, the maturing, torulose silicles arch up like the arms of a small candelabrum. The plant is tolerant of alkaline soil.

Thlaspi L., The Wild Candytufts

Thlaspi alpestre L.; cordilleran; alpine-submontane; Slumgullion Mesa, B&S 136-62; Emerald Lake, B 7d-54; Avery Flats, B 10a-54; Los Pinos Pass, B&S 40-62; Cochetopa Park, B 95-55; Sapinero, Wh 405 (1898) COLO. This cordilleran species is as widespread and as much at home in the Gunnison Basin as it is in the mountains of western North America or those of Europe and Asia. This means that in the Gunnison Basin it is also very nearly as variable as over its whole geographic range. In the moist, rich, but not too dense spruce-fir forest of Avery Flats, it is a single-stemmed, wandlike plant as much as eight inches high. At 12,000 feet on Slumgullion Mesa, the stems shrink to two or three inches, and instead of one, there may be as many as fifteen to a plant. On the arid floor of Cochetopa Park plants can be found no more than an inch in height. But always the glabrous, gray-green leaves are present,

and always the small corymbose heads of white candytuft flowers.

Thlaspi arvense L.; adventive; submontane-montane; Quartz Creek Valley, B 9-65; Gothic, B 206-52; Cathedral, B&S 90-62, B&S 279-62. It is an oddity that the two Gunnison Basin species of Thlaspi should be so different from each other. T. arvense, an annual, is an adventive plant limited to roadsides and disturbed sites. T. alpestre, a perennial, is a native plant able to compete with any other plant for a suitable habitat. Again, the much smaller white flowers of T. arvense in no way suggest those of the candytuft. On the other hand, its flat coinlike silicles with a notch at the top are so striking that they have given it its popular name of pennyweed.

CYPERACEAE, The Sedge Family

The sedge family is usually associated with the grass family, and there are many similarities and parallels between them. Both families show a history of wind-pollination with a reduction of the flower essentially to stamens and pistil, and in both families the flower becomes so small that the word floret is more appropriate than the word flower. Again, in both families, the florets occur in spikelets, although in the genus Carex, as in the agrostid grasses, the spikelet has been reduced to a single floret with occasional vestiges of the former rachilla. Finally, in both families, there is a development of protective scales, whether at the base of floret or spikelet, and whether one in number, or two.

Carex L., The Carices

With more than sixty species, Carex is the largest genus in the Gunnison Basin. It is also a genus in which the species differ not only in form but in zone and habitat, so that once the collector has adjusted himself to the unspectacular marks by which they differentiate themselves morphologically, he seems to be on unusually firm ground. Yet the fact that they constitute the largest genus in the Basin means that in this study they will often be represented by single collections only. A student of Carex concentrating upon the single genus would, I am sure, add greatly to the limited treatment of the genus presented in this flora.

But he would do more. For the genus is found in all parts of the Basin, and would offer an admirable approach to the plant geography and ecology of the Basin as a whole. For instance, the proportions of boreal and cordilleran carices are respectively about 34 per cent and 57 per cent of the total carices, not significantly different from the proportions of the other boreal and cordilleran plants in the Basin. Furthermore the proportions hold pretty generally for the individual zones. But there is one notable exception. In the moister parts of the montane zone (which is tantamount to the upper montane zone), these proportions are suddenly reversed. The boreal carices comprise nearly 80 per cent, the cordilleran about 20 per cent, of the carices of the zone. Now in the past, such reversals have frequently led to significant advances in science. I am convinced they would here if only one had the time to follow them up.

There remain a few morphological peculiarities of Carex to be added to those already observed of the family. Whereas in most grasses and in many sedges, the floret contains both pistil and stamens, in the genus Carex, it contains just one or the other; and accordingly, how the pistillate and staminate florets are aggregated into spikes or heads becomes a diagnostic of great value. Frequently, whole spikes are either staminate or pistillate, and the diagnostic is striking and easy. But the spikes or heads can be part and part. When they are staminate at the top and pistillate at the bottom, they are called androgynous; when they are pistillate at the top and staminate at the bottom, they are called gynaecandrous. Finally, there is an interesting peculiarity of the scales. Whether derived from the floret or from the base of the hypothesized original spikelet, only one scale remains to protect the staminate

floret. But in the case of the pistillate floret, in addition to the lower scale, an upper, or ventral, scale grows around the ovary to form a protective envelope called the perigynium. This protective envelope shows a great deal of differentiation, and offers a last character of great value in coming to know Carex.

The low alpine carices

It has already been remarked that the upper alpine zone is the zone of cushion plants and of low grasses, sedges, and forbs.* However appropriate it may be in other parts of Colorado to speak of these plants as forming tundra, it is not appropriate in the Gunnison Basin. Webster's New International Dictionary defines tundra as occurring on "mucky soil."** Nothing could be further from the soil on which the low alpine carices of the Gunnison Basin grow. The sites are dry or dryish, and usually windswept. If the sites have moisture, even at 13,000 feet, then the species of Carex are tall, C. chalciolepis being the most conspicuous example. Such sites are not common. But they do occur, and show that the controlling factors in the upper alpine zone are drought and wind.

Carex elynoides Holm; cordilleran; alpine; Engineer Pass, B 136-64; Trallala Peak, B 235-65; Sawtooth Mtn., B&S 87-66; Baldy Chato, B&S 465-62 CS, USFS; Avery Peak, B 105-57 COLO; Virginia Basin, B 8-67. Of all the low alpine carices in the Gunnison Basin, this species is by far the most common. It extends from timberline to the highest elevations, and in the alpine zone occurs everywhere in the Basin. In height, the plant ranges from one inch to nine, but usually is between two and four inches. It bears a single androgynous spike at the summit of the culm, the upper staminate portion seeming to be the greater part when the spike is immature; but in maturity, this part may largely have disappeared and the spike may seem to be

* See above, p. 47.
** Springfield, Mass., 1963, p. 2463.

pistillate. Yet with access to the Creutzburg drawing,* identification should not be too difficult. The closest relative of the plant, C. filifolia, with which it might be confused, apparently does not grow in the Basin.

Carex Hepburnii Boott; cordilleran; alpine; Avery Peak, B 106-57; Blaine Basin, B 110-57 RMBL; Crystal Peak, B 189-60 CS, RMBL. In habit, this plant can be taken for C. elynoides; but there are many differences. In the first place, it is as rare as C. elynoides is common, and in fact is known only from the Elk Mountains section of the Basin where it seems never to grow higher than four inches. Again, its solitary androgynous spike is shorter and stubbier; and at no time can the staminate portion be taken for the greater part. Finally, C. Hepburnii is a primitive carex, bearing within the perigynium a rudimentary rachilla from the time when the perigynium (then probably not completely closed) contained several ovaries on a central axis. The rudimentary rachilla is small; but it can be seen with a handlens, and one might as well give himself training since there are several plants, for example, Agrostis Thurberiana, that can be identified only by means of such a rudimentary rachilla.

Carex rupestris Allioni [C. Drummondiana Dewey]; boreal; alpine; Cottonwood Pass, G 2439 (1962) CS; Crystal Peak, L 986 (1950) CS; North Italian Mtn., W&L 9312 (1955) COLO; North Pole Basin, Cl 8/6/56 RMBL. Here is another low alpine carex apparently limited to the northeastern quarter of the Gunnison Basin. But this time the leaves are curling and flat, and form a protective cover over the spikes. The plant furthermore is rhizomatous, while the few perigynia at the base of the androgynous spike are concealed by the scales. Although purely within the floristic Gunnison Basin, the last station cited above is two miles northwest of the topographic

* Mackenzie, K.K. & Creutzburg, H.C., North American Cariceae, 2 vols., New York, 1940, I, 206.

Basin. It is cited here because of mention in the Introduction.*

Carex obtusata Liljeblad; cordilleran; alpine-submontane; Mesa Seco, G 2772 (1964) WS; Cathedral, B&S 8-62 RMBL, USFS; Gold Basin Creek drainage, B 5-60; Cement Creek Valley, Ke 7/3/49 WS; North Pole Basin, Cl 8/6/56 RMBL. In the alpine zone, this species grows with C. rupestris as an ecological equivalent. But it is scarcely confusable with it. Its habit is quite different, being vertical; and in any event the beak of its perigynium will separate it from any other carex in the Basin. This is split in front, but encircles the style, rising in the rear like an Elizabethan ruff. The plant appears to be more rhizomatous in the lower zones, more luxuriant in the alpine zone, thus suggesting once again that rhizomes are frequently developed in response to less favorable ecologic conditions. Once again, the last station is cited because of reference in the Introduction.**

Carex perglobosa Mackenzie; southwestern; alpine; North Italian Mtn., W&L 9270 (1955) COLO, S 67-248. The specific name of this low carex means very globose, and that describes the green, inflated perigynia to a T. The perigynia are largely concealed by the scales so that the heads, solitary at the summit of each stem, appear brown, not green. But lift back a scale, and the identity of the plant will be clear in a moment. In the Gunnison Basin, the plant seems to be restricted to the summit of a single one of the Elk Mountains.

Carex Engelmannii Bailey; cordilleran; alpine; Blaine Basin, B 100-59 CS, RMBL; Rustler's Gulch, B 242-60 RMBL. C. Engelmannii is another primitive, monocephalic carex apparently restricted to the Elk Mountains section of the Gunnison Basin. The head is androgynous and ovoid, and the perigynium is inflated making it relatively easy to remove in order to see the vestigial rachilla, which in this case extends above the ovary. The plant is rhizomatous.

* See above, p. 3.

** See above, pp. 3 and 6.

Carex Nelsonii Mackenzie; cordilleran; alpine; Blaine Basin, B 109-57. This black-scaled carex is notable for having a gynaecandrous terminal spike and one or two lateral pistillate spikes. The spikes are pointed (as well as the scales), and closely joined, so that the head frequently resembles a small architectural trefoil.

Carex pyrenaica Wahlenberg; cordilleran; alpine; Blaine Basin, B 101a-59 CS, RMBL; Rustler's Gulch, B 244-60 CS, RMBL, USFS; Mt. Baldy, B 231-61 CS; American Basin, B&S 166-66 USFS. This non-rhizomatous carex with its solitary androgynous heads superficially resembles several other low alpine carices. But its perigynium is quite different. It is fusiform, or spindle-shaped, and set up on a stipe, the stipe flexing downward when the fruit is mature.

Carex nigricans C.A.Meyer; cordilleran; alpine-subalpine; Rustler's Gulch, B 241-60 CS; Cottonwood Pass, B 255-60 CS, RMBL; American Basin, B&S 66-225; Ohio Peak, B 75-57 RMBL; Copley Lake, B 142-60 CS, RMBL. This species, a near relative of the preceding, also has a fusiform perigynium set up on a stipe, which reflexes, in its case, before the fruits can be said to be mature. But C. nigricans has a distinctive growth habit. It has a horizontal rootstock which sends up at intervals, like a row of soldiers, a series of vegetative and fertile shoots. C. pyrenaica, in contrast, has the bunchgrass habit. It is interesting that these two species, at an elevation of around 12,500 feet, were collected on the same day as ecological equivalents in American Basin in Hinsdale County. Yet C. nigricans reaches down to elevations of 10,600 feet, while C. pyrenaica does not. Such overlappings are frequent in the Gunnison Basin.

Carex brevipes W.Boott; cordilleran; alpine-subalpine; Virginia Basin, Wi 10196 (1954); Mesa Seco, B 75-64 RMBL; Cumberland Pass, G 2762 (1964) WS. Although belonging to the group of carices typified by C. Rossii, which show two kinds of inflorescence, the upper androgynous, the lower pistillate, C. brevipes has the habit of C. rupestris; that is, both kinds of

inflorescence are found within, and thus protected by, the single clump of leaves of each plant. The basal kind of inflorescence becomes, in fact, sessile, and sometimes it is the only kind of inflorescence there is.

The tall alpine carices

I hope the distinction between high and low alpine carices does not seem arbitrary. It is true that C. elynoides can be found as tall as nine inches, and C. chalciolepis as low as four inches. But C. chalciolepis is frequently found twelve or fourteen inches high at 12,000 feet, and this simply is not the case with any of the low alpine sedges. The tall alpine carices are also coarser, stouter plants even when low. The distinction is easily made in the field without measurement or close inspection.

Carex chalciolepis Holm; cordilleran; alpine; Ohio Peak, B 74-57; Cumberland Pass, B 104a-57; Monarch Pass, B 75-60 CS, RMBL; Baldy Chato, B&S 469-62 CS, USFS; Trallala Peak, B 231-65, 234-65 RMBL; South Baldy, B 177-66 USFS. Of all the tall alpine carices this is the commonest. It is to be seen everywhere in the Gunnison Basin above timberline. Usually, the plant can be recognized at a considerable distance by its oval, nodding heads with their symmetrical, herring-boned scales. But sometimes the heads do not nod, and one should be warned that this is the same plant. I have not had the time to study this peculiarity carefully, but I suspect that it happens when by chance the peduncle is stouter or the head slightly lighter.

Carex albonigra Mackenzie; cordilleran; alpine; Carson Pass, B&S 269-65 RMBL; Baldy Chato, B&S 471-62 CS, RMBL, USFS; Long Branch Baldy, B&S 116-66. This erect plant is confusable with those occasional individuals of the preceding species which do not have nodding spikes. The scales of C. chalciolepis can even have white hyaline margins that simulate the more regular ones of C. albonigra. There is, however, one criterion that never fails. Look at a perigynium of

C. chalciolepis. It is round as a pumpkin in comparison with the more oval perigynium of C. albonigra, and wider by a third or a half.

Carex atrata L.; boreal; alpine-subalpine; Mesa Seco, Joh J64-95; Pass Creek, G 3069 (1965) WS. C. atrata is also confusable with C. chalciolepis, the relative length of scale and perigynium being the usual differentia between them. The perigynia of C. atrata are longer than the upper scales, those of C. chalciolepis shorter. But the shape of the upper part of the perigynium will serve as well. In C. chalciolepis, this is broadly rounded; in C. atrata, it slopes away in an ellipse.

Carex saxatilis L. [C. physocarpa Presl]; boreal; alpine-montane; American Flats, B&S 271-65 RMBL; Calf Creek Plateau, B 679-62 RMBL, USFS; Cottonwood Pass, B 256-60 RMBL, USFS; The Craters, B&S 191-66; Crested Butte, B 173-59 RMBL, USFS. The eye of the plant collector above timberline cannot escape being caught by this plant. As he approaches a tarn on the great basaltic plateau of Calf Creek at an elevation of more than 12,000 feet, he will notice, around the edge, a tall sedge with one to three half-inch brown pistillate spikes beneath one or two faded terminal staminate spikes. The plant has a horizontal rootstock, so that the stems and leaves are frequently in ranks, and really, the plant is so distinct that further description is unnecessary. The interesting thing is that this brown-spiked alpine carex closely resembles the Scandinavian plant. Yet as one descends in elevation, the pistillate spikes lose their brownness, and take on a greenness (as well as a slight inflation), until at 9,000 feet the collector has C. physocarpa exactly as described in the manuals and pictured in the Creutzburg drawing.* In the Gunnison Basin not a line of demarcation can be found; it is smooth transition all the way.

Carex ebenea Rydberg; cordilleran; alpine; Avery

* In North American Cariceae as cited, II, 512.

Peak, B 107-57 RMBL; Twin Lakes, B 122-60 CS; Devil's Lake, B&S 636-62 USFS; Slumgullion Mesa, B 258-65; Lake City, B&S 32-66. Since C. ebenea, one of the most frequent of alpine carices, commonly occurs as a plant not more than six inches high, its inclusion among the tall alpine carices may seem strange. But it just as commonly grows to the height of a foot or more, and as a matter of fact all the collections cited except the last fall into this category. The last collection comes from a relict population left behind in the montane zone, and as usual is not included in the zonal range of the plant. The single heads of the species, at the summits of their stems, are nearly always ragged and nearly always V-shaped at the bottom. Usually, one or two heads also show an inverted V above the lower V, so that the head is rhomboidal.

Carex Haydeniana Olney; cordilleran; alpine; Cumberland Pass, B 104-57 RMBL; East Maroon Pass, B 189-59 RMBL; Mt. Baldy, B 228-61 CS. C. Haydeniana is the only alpine carex in the Gunnison Basin that can be said to be confusable with C. ebenea; fortunately for the collector, it is both limited to the Elk Mountains and rare even there. Usually, it can be separated from C. ebenea by the flat bottoms of the heads; for these bottoms are almost never V-shaped. If they are, then recourse must be had to the shape of the respective perigynia. As with C. chalciolepis and C. albonigra, the perigynia of C. Haydeniana are a third to half again as wide as those of C. ebenea.

Carex arapahoensis Clokey; Coloradan; alpine; Cumberland Pass, G 2760 (1964) WS, G 3059 (1965) WS. This plant is something like C. Haydeniana, but taller, and with the heads not so dark. Again, the scales (frequently hyaline-margined) are nearly as long as the perigynia; they are not nearly as long as the perigynia in C. Haydeniana. Finally, the hyaline-tipped perigynia of C. arapahoensis are about halfway in width between those of C. ebenea and those of C. Haydeniana.

Carex scopulorum Holm; cordilleran; alpine; Engineer Pass, B 137-64; Rough Creek Cirque, B&S 593-62 CS;

Cottonwood Pass, B 253-60 CS, B 254-60 CS; Twin Lakes, B 121-60 CS, RMBL. This vigorous plant, once known, is afterward immediately recognized. It is the most strongly rhizomatous of all the alpine carices, in this respect resembling C. aquatilis and C. rostrata of the lower zones. The vivid green of its leaves is in strong contrast with the black scales of the short, cylindrical spikes. In youth, the green perigynia can be seen behind the dark scales; but in maturity they can turn as dark as the scales, making the whole spike black. The species is a plant of moist habitats.

Carex gymnoclada Holm; cordilleran; alpine; Rough Creek Cirque, B&S 594-62. Unusual interest attaches to the cited collection, not because it is the only one from the Gunnison Basin (a situation, unfortunately, all too common), but because it was collected just a few feet from one of the cited collections of C. scopulorum. For C. gymnoclada has been regarded as a variety of C. scopulorum, a situation in this study declared possible in the Gunnison Basin only if the variety is phenotypic. But these two collections came from the same place, with no difference in habitat that either of them could have been responsive to. Again, in the year of collection, both must have experienced the same beginning of the growing season, the same sun and rain, and the same nights of frost or lack of it. In the light of this, it surely is of interest that the collection of C. scopulorum is so close to maturity that the short, cylindrical spikes are rough with the perigynia expanding beyond the scales, while the collection of C. gymnoclada is so far behind maturity that the perigynia have not yet disturbed the smooth outlines of the long, narrow, pointed spikes. It will be recalled that this difference in flowering and fruiting seasons is very nearly the rule in the Gunnison Basin when two species of a genus grow in proximity to each other.* As a matter of fact, I regard the two species as morphologically distinguishable. C. gymnoclada is much less strongly rhizomatous than C. scopulorum, and its basal

* See above, p. 33, Lupinus and Oxytropis.

sheaths with rudimentary blades or none constitute a character not found in C. scopulorum.

The subalpine carices

Carex nova Bailey; cordilleran; alpine-subalpine; Trallala Peak, B 233-65 RMBL; Emerald Lake, B 79-59 CS, RMBL; Gothic Natural Area, B 177-59 CS; Lake City, B&S 34-66. Like C. Nelsonii, this species, which seems to prefer moist habitats, frequently ends in a head composed of one terminal gynaecandrous spike, and of two lower, lateral pistillate spikes. But here the heads are rounded, not sharp-pointed, so that the trefoil is not architectural but cloverlike. Commonly, the terminal spike is somewhat prolonged. In passing, the reader will note that as with C. ebenea, C. nova was collected out of range in Henson Creek Canyon just beyond Lake City. Besides these two carices, the colony of relicts included Juncus Drummondii and J. Mertensianus. In an earlier year, Arenaria rubella was similarly collected at this station.

Carex bella Bailey; southwestern; subalpine-montane; Long Branch Baldy, B&S 111-66; Peeler Basin, B 323-61 CS, RMBL; Schofield Pass, Wi 10675 (1954); Gothic, Wi 10078 (1954). This striking species is at its most typical hanging out over an opening, or along a trail, in the subalpine forest. The slender spikes are all gynaecandrous, and are not aggregated into a head, but are on progressively longer peduncles as they descend the stem. The scales are shorter than the perigynia, so that almost until the moment of maturity, perigynium and scale give a most handsome variegated appearance.

Carex limosa L.; boreal; subalpine; Peeler Basin, B 266-60 CS, COLO, B 267-60 CS, COLO; Leechmere, S 66-218. Here the terminal spike is staminate, the lower, lateral ones pistillate. But much of what was said about the preceding species applies. The perigynia appear beyond the edges of the scales so that the pistillate spikes are strikingly variegated and the lower

peduncles are longer than the upper. And here, too, the plants are found in subalpine forests, but in this case leaning out over meadowy pools. In fact, the plants not only lean over the pools but advance out over the water, becoming truly aquatic with long, dangling, felted roots.

Carex illota Bailey; cordilleran; alpine-montane; East Maroon Pass, B 190-59 RMBL; Sylvanite Basin, B 244-61; Redwell Basin, B 261-60 CS, RMBL; Copley Lake, B 84-60 CS, RMBL; Castle Park, B 69-59 CS, RMBL. Here is a carex that although clearly centered in the subalpine zone extends upward into the alpine zone and down into the montane zone. Its gynaecandrous spikes are aggregated into small heads that are solitary at the summits of their stems and frequently resemble small obtuse cones. Yet they can also give that three-spiked, trifoliate appearance mentioned of other species. The small, flask-shaped perigynia are sharp-edged but not winged, and the plant is an inhabitant of moist open places.

Carex canescens L.; boreal; subalpine-montane; Copley Lake, B 144-60 CS, RMBL; Schofield Pass, B 210-61; Rough Creek, B&S 232-62 CS, RMBL, USFS; Lake City, B&S 66-8. This species is another denizen of moist, open places and occurs as an ecological equivalent both of C. illota (as in the first collection cited) and of C. phaeocephala (as in the third collection cited). Its gynaecandrous spikes do not form a head, but are staggered up and down the stem at its summit. They may seem at first to be composed entirely of perigynia; but a look at the bottoms will disclose the empty scales that bear witness to the former staminate flowers. There is something extremely neat about the small, well-defined perigynia and the short, well-defined spikes. This is one carex that when once known will always be recognized.

Carex phaeocephala Piper; cordilleran; alpine-montane; Cumberland Pass, Wi 10649 (1954); Castle Pass, B 110-59 RMBL; Rough Creek Pass, B&S 666-62 CS, USFS; Sawtooth Mtn., B&S 89-66; Rough Creek, B&S 183-62 CS, RMBL, USFS, B&S 184-62 CS, RMBL, USFS.

Ecologically, this is one of the most interesting of the Gunnison Basin carices. It is tolerant both of wetness and of dryness, and when growing on a dry alpine slope develops woody, horizontal rootstocks. But in a moist montane meadow, it grows like a luxuriant bunchgrass. The plant is rather easy to recognize. When the spikes are aggregated into a head, the bottom of the head always tapers asymmetrically to the stem. When the spikes are not aggregated, usually they are still distributed asymmetrically along the sides of the stem. The light-brown scales of the florets have bright-green midribs; and when the midribs mature and turn brown, then the bright-green perigynia appear from behind the scales.

Carex laeviculmis Meinshausen; cordilleran; subalpine; Schofield Pass, S 66-167. This plant of moist shady places is a grassy sedge; that is, it is not stiff and upright, but delicate-stemmed with thin, pliable leaves that frequently overtop the inflorescence. Here again the spikes do not form a head, but are distributed along the upper part of the stem, the lowest spike (in the axil of a bract) being somewhat removed from the rest. At the moment of writing, the above station is apparently the only one known in the Rockies south of Montana.

Carex Rossii Boott; cordilleran; subalpine; Capitol City, B 17-64; Leechmere, S 66-222; Schofield Pass, B&S 66-70. C. Rossii is also a grassy sedge. The thin, flat leaves are profuse, and the tallest inflorescences have a grassy bract at the base, often surmounting the inflorescence. But there are also inflorescences on shorter stems that do not have such bracts, and the two kinds of inflorescence become a character for this particular group of carices, especially since the shorter, bractless inflorescences are pistillate only, the taller, androgynous. C. Rossii likes the partial shade of spruce and fir, and soils that are neither too moist nor too dry. The leaf-bases are often a warm brick-red.

Carex atrosquama Mackenzie; cordilleran; subalpine;

Schofield Pass, W 9166 (1955) COLO; Pass Creek, G 3070 (1965) WS. This carex is confusable chiefly with C. Nelsonii. But the black scales of the latter, without the relief of lighter margins, more nearly cover the perigynia and produce a much darker spike. C. atrosquama also resembles C. atrata and C. chalciolepis. But the perigynia both of C. atrosquama and of C. Nelsonii slope away from the beak more sharply than is the case either with C. atrata or with C. chalciolepis. As was the case with C. laeviculmis, C. atrosquama seems not to have been collected in Colorado or Wyoming except for the collections here cited.

Carex vesicaria L.; boreal; subalpine; Avery Flats, B 95-57 CS. This tall paludal sedge is confusable with that other tall paludal sedge, C. rostrata. But the differences are many. C. rostrata is wider-ranging and clearly centered in the montane zone. C. vesicaria seems to be restricted to the subalpine zone and to the Elk Mountains section of the Gunnison Basin. Again, the pistillate spikes of C. rostrata are both wider and more squarrose at maturity. But perhaps the most striking character of C. rostrata is provided by the long, cordlike rhizomes that extend in every direction and make collection extremely difficult. C. vesicaria has none of these, but, as Mackenzie points out,* merely a short-creeping rootstock. Besides being found on Avery Flats just north of Gothic, C. vesicaria is known to grow (together with C. rostrata) along the edges of the Mexican Cut ponds, a mile or so north of the topographic Gunnison Basin, but well within the floristic Gunnison Basin.

Carex pseudoscirpoidea Rydberg; cordilleran; subalpine; Schofield Pass, B 256-61 RMBL. This odd-ball carex should be easy to identify because of its very oddity. In the first place, it is dioecious, the staminate and fertile culms being found on separate plants. Again, the culms, which rise from a stout horizontal

* Mackenzie, Kenneth K., North American Flora, Volume 18, New York, 1931-1935, p. 452.

rootstock, emerge from basal crowns of old leaves. Finally, not only are the leaf sheaths pubescent, but the scales are both erose and ciliate. The species is a plant of dry, open places.

Carex Geyeri Boott; cordilleran; subalpine-montane; Ohio Peak, B 68-57 RMBL; Gothic, B 95-60 RMBL; East Red Creek Valley, B 59-65; Engineer Pass, B 41-61 CS; Marshall Pass, B 131-60 CS, RMBL; Signal Peak Ridge, B 25-61 CS. One of the most widespread and distinctive of the Gunnison Basin carices, C. Geyeri is a plant of dry to median situations, and of open to dense aspen or coniferous forest. Its rootstocks are long-creeping, and the flat, vertical leaves rise to the height of the culms or above them. The plant bears a single, androgynous, spikelike inflorescence at the summit of the culm, usually more compact than in the Creutzburg drawing,* and frequently containing but a single perigynium at the base of the spike, or none.

The montane carices of moist habitats

In the Gunnison Basin, the submontane is the driest zone, and the alpine the next most dry. The upper montane zone is the wettest, while the subalpine and lower montane zones come somewhere in between. Therefore, since the genus Carex is well known to be characterized by marshy plants, it is not surprising that the greatest number both of species and of individuals should occur in the montane zone. Some may find the previously mentioned reversal of boreal and cordilleran species also unsurprising,** although here, it seems to me, the implications go way beyond the predilections of a marshy genus. In any event, what does seem surprising to me is that eight of the moist montane species extend to the zone above or below, or to both, that another eight montane species are found in dry as well as in moist habitats, and that one montane species is a plant apparently of dry habitats only. In other words, it would seem

* In North American Cariceae as cited, I, 258.
** See above, p. 167.

that in the Gunnison Basin adaptivity to drought is the chief evolutionary characteristic, not only of the flora as a whole, but even of the marshy genus Carex.

Carex rostrata Stokes; boreal; subalpine-submontane; Gothic, B 38-59 RMBL; Gunnison, Ke 7/10/49 WS; Cathedral, B&S 348-62. This species has been discussed with the preceding C. vesicaria, to which the reader should turn.

Carex aquatilis Wahlenberg; boreal; subalpine-submontane; Leechmere, B 66-57 RMBL; Gothic, B 134-59 RMBL; West Pass Creek Valley, H 9053 (1959) CS; Powderhorn, B 122-64; Hot Springs Creek Valley, B 2-66. C. aquatilis has the same range in the Gunnison Basin as C. rostrata; but whereas the latter is more commonly found along the edges of ponds and streams, C. aquatilis, in addition, covers extensive areas of swampy ground. Conceivably it could be confused with C. rostrata since both plants have the same type of inflorescence and both plants are strongly rhizomatous. But C. aquatilis has only two stigmas (instead of three), and its perigynia are never inflated. The perigynia are, in fact, flattened, and bow out on each side of the narrow scales in a symmetrical manner. The species is exceedingly variable, but I have found the latter character always sufficient to diagnose it.

Carex lanuginosa Michaux; boreal; subalpine-submontane; Irwin, B 82-60 CS, RMBL; Gothic, B 56-59 CS, RMBL; Gunnison, B 62-60 CS, RMBL; Fish Creek, B&S 406-62. This rhizomatous species has the range of the two preceding species, and is like them both in habit and in habitat. But the dense pubescence of the perigynia should leave little doubt as to its identity.

Carex media R.Brown; boreal; montane-subalpine; Castle Park, B 70-59 CS, RMBL; Cathedral, B&S 148-62 CS, RMBL, USFS; Pass Creek, G 3065 (1965) WS. C. media is a caespitose plant of open or shady moist places. Growing to the height of a foot or more, its small terminal spike is gynaecandrous, the one or two lateral spikes pistillate. Its black scales are both

shorter and narrower than the perigynia, and as the latter mature they produce a pattern of green and black that makes an effective diagnostic of the species.

Carex Hallii Olney; cordilleran; montane-submontane; Dry Lake, S 64-20a RMBL; Mineral Creek, B&S 517-62 CS, RMBL, USFS; Quartz Creek Valley, S 65-108 RMBL; Gunnison, B 76-61. C. Hallii is closely related to C. media, but the two plants are not alike in general appearance. The conspicuous feature of C. Hallii is the long terminal spike, which may be the only one, and may be either pistillate or staminate. The plant is a low one, seldom more than eight inches high, and is rhizomatous.

Carex microptera Mackenzie; cordilleran; montane-submontane; Gothic, B 54-59 CS; Gunnison, B 61-60 CS, RMBL; Lake City, B&S 249-62 CS, USFS; North Beaver Creek Valley, B&S 579-62 USFS. Although the Creutzburg drawing of this species* is taken from the type collection, the latter comes from Nevada and is not representative of the species as it occurs in the Gunnison Basin. In the Gunnison Basin, the spikes are seldom distinguishable, but are gathered together in a flat-bottomed, moundlike head that is prickly-looking from the beaks of the perigynia. A plant of open or shady moist places, it is frequent throughout the montane zone and common around Crested Butte and Gothic, especially where the meadows become wet. Indeed the prickly heads can be seen at a distance, forming an aerial carpet a foot or more above the ground.

Carex capillaris L.; boreal; montane-subalpine; Gothic, B 81-59 CS, RMBL; Peeler Basin, I 18869 (1961); Cathedral, B&S 149-62 CS, USFS. The type of inflorescence of this plant has been met before: a terminal staminate spike, and two or three pistillate spikes on increasingly long peduncles as they descend the stem. But here everything is of great delicacy. The plant may be a foot tall, but the spikes are less than half an inch in length and the peduncles are capillary. The leaves, of course,

* In North American Cariceae as cited, I, 125.

are grasslike, and the plant seems to prefer moist shady places.

Carex aurea Nuttall; boreal; montane-submontane; Gothic, B 107-59 CS; Gunnison, B 77-61; Mineral Creek, B&S 515-62 USFS. Once again the inflorescence shows a terminal staminate spike and two or three lower pistillate spikes. But the plant is rhizomatous, not caespitose, and a seeker of moist open, not shady, places. Furthermore, the peduncles of the lower pistillate spikes are not capillary (some seem to be on culms of their own), and most striking of all, the mature perigynia are a bright gold.

Carex Buxbaumii Wahlenberg; boreal; montane; Gothic, W 9369 (1955) COLO, B 116-59 CS, RMBL (two different stations). This rhizomatous carex of medium height is, in its own moderate way, one of the most handsome in the Gunnison Basin. Each inflorescence has a basal bract like an exclamation mark, the scales are exclamatory with their light-colored midribs prolonged into awns, and the glaucous green perigynia rise above the scales giving a bright touch to the whole plant. The terminal spike is gynaecandrous, the lower spikes pistillate, and the plant prefers wet, open places.

Carex viridula Michaux; boreal; montane; Cement Creek Valley, S 64-247, S 65-203 RMBL. This species may well seem like a diminutive edition of C. rostrata. The terminal spike is staminate, the lower spikes pistillate, and the perigynia both inflated and ribbed! But everything is shortened and condensed, and in addition, the plant has a habit all of its own. Not only are there lower, strictly axillary spikes, but even the terminal inflorescence seems axillary since there is always a leaf or bract far exceeding it in length.

Carex gynocrates Wormskjöld; boreal; montane; Gothic, R 10437 (1959) CS, S 64-164 RMBL; Cement Creek, W&L 9276 (1955) COLO. With its single androgynous spike, and the mature perigynia reflexed beneath the staminate portion, this plant might suggest the more frequent C. nigricans; and indeed they are about the

same height. But C. gynocrates is a much more delicate plant, its style has only two stigmas instead of three, and its slightly ribbed perigynia are not stipitate. Furthermore it has been collected only in the montane zone; C. nigricans not below the subalpine zone.

Carex microglochin Wahlenberg; boreal; montane; Cement Creek Valley, S 65-40 RMBL. Here is another delicate carex five or six inches high with reflexed perigynia below the staminate portion of the solitary, terminal spike. But C. microglochin is one of those primitive carices with the rudimentary rachilla of the former spikelet still existent, and in this case conspicuously protruding with the stigmas through the opening of the perigynium!

Carex interior Bailey; boreal; montane; Crested Butte, B 90-59 CS, RMBL. This slender carex of wet meadows, growing nearly two feet high, usually has three small spikes at the summit of a culm without any bracts or leafage whatsoever. The spikes, with their reflexed perigynia, may seem to be entirely pistillate. But if the collector looks closely with his lens at the base of the terminal spike he will see traces of a few erstwhile staminate florets.

Carex simulata Mackenzie; cordilleran; montane; Cathedral, B&S 88-62 CS, RMBL, USFS; Cement Creek Valley, S 65-48 RMBL. I have often wondered what carex Mackenzie thought this plant was simulating when he named it. Perhaps C. pregracilis; for the two plants are frequently similar in general appearance. But the rhizomes of C. praegracilis are dark if not black; those of C. simulata strikingly light-colored between the nodes. Again, the scales at the base of the spikes in C. simulata are awned; in C. praegracilis these scales are sharp-pointed, but not awned. Finally, the perigynia in C. simulata are relatively rotund, not slender and oval as in C. praegracilis.

The montane carices of indeterminate habitat

These are the montane carices concerning which nothing can be asserted on the basis of habitat. They are found in diverse hydrographic situations, whether moist, median, or dry; often both in shade and in the open; and frequently in zones other than the montane.

Carex siccata Dewey; boreal; alpine-submontane; Rough Creek Cirque, B&S 230-62 CS, RMBL, USFS; Monarch Pass, B 73-60 CS; Mt. Wilkinson, B 65-60 CS, RMBL; Gothic, B 14-59 RMBL; Slate River, B 107-61; Gunnison, B 57-60 CS. The most striking character of this plant, and the one that in most treatments sets off the entire group, is the horizontal, long-creeping rootstock. Sending up at short intervals culms or tufts of leaves, this rootstock lies only an inch or two beneath the surface of the ground and is uncommonly easy of collection. That is why it has always seemed illogical to me to prefer the name C. foenea Willdenow, the type collection of which admittedly lacks this principal character.* In any case, the spikes at the summit of the culm of this species have a distinctive arrangement. The terminal one is gynaecandrous, the middle ones staminate, and the lower ones pistillate. In the Gunnison Basin, the plant is found in dry or moist soils, and both in open places and in light or partial shade.

Carex Raynoldsii Dewey; cordilleran; montane; Gothic, B 60-59 CS, RMBL, S 64-133 RMBL (two stations); Castle Park, S 64-222. Growing to a height of two feet or more, this handsome, vigorous carex is one of the most easily recognized in the Gunnison Basin. Its spikes (the terminal staminate, the lateral pistillate) are short and thick and subtended by leaflike bracts, the lowest usually overtopping the inflorescence. The turgid, ribbed, light-colored perigynia are much larger than the dark-brown scales, and the two give the spikes a variegated appearance. The plant grows in median as well as in moist situations.

Carex Egglestonii Mackenzie; cordilleran; montane-subalpine; Gothic Natural Area, La 11 (1950) COLO;

* Cf. Svenson, Henry K., Rhodora, 40 (1938), 325-329.

Avery Flats, B 84a-57; Gothic, B 84-57. In Mackenzie's monograph, this species (the type collection of which comes from the Gunnison Basin) is said to occur in dry, open soil.* And so it does. But it occurs also in partial shade and in soils verging on the moist. In its vigor and size, this species takes after C. Raynoldsii. But in C. Egglestonii the spikes are all gynaecandrous, and aggregated into a head that is frequently triangular. Again, the sharp terminations of scales and perigynia give the head a prickly appearance. Finally, the heads show a variegation of green perigynia and of light, warm-brown scales that is distinctive enough to serve as a character.

Carex Hoodii Boott; cordilleran; subalpine-submontane; Schofield Pass, B&S 76-66; Gothic, B 39-59 CS, RMBL; Gold Basin Creek drainage, B&S 66-23. Centered in the montane zone, this carex is one of those plants easy enough to recognize when once known, but difficult to identify when not known. It grows in moist, median, or dry places, and is found both in shade and in the open. It is a tall, caespitose sedge, and its androgynous heads at the ends of their culms have a distinctive oblong shape, the scales being of the same size as the perigynia, with conspicuous green ribs when young. The species is confusable with C. occidentalis, a plant largely of the submontane zone, and the reader should consider the two plants together.

Carex Eleocharis Bailey; cordilleran; montane-submontane; Dry Lake, B&S 15-62 CS, USFS; Killdeer Creek Valley, B 21-65; Hot Springs Creek Valley, B 20-66; Cochetopa Park, B&S 513-62 CS, RMBL; Wolf Creek Valley, S 65-39. This species is much like its confusable, C. obtusata. Both plants are rhizomatous, several individuals at a time being linked by a single rhizome. Again, both plants have the same general appearance, the capitate inflorescence of C. Eleocharis frequently resembling the single spike of C. obtusata. The two species are also both androgynous, and curiously,

* In North American Flora, Volume 18, as cited, p. 154.

the beaks of the two perigynia end in a sort of collar. Morphologically speaking, the only quick diagnostic between the two species lies in the three stigmas of C. obtusata, the two stigmas of C. Eleocharis.

The geography and ecology of the two species is interesting to study. C. Eleocharis is found on the plains and prairies east to Iowa. But whereas in the Gunnison Basin the relicts of the plains are partial, if not restricted, to the submontane zone, C. Eleocharis, although seeking open places, much prefers the montane zone where it is frequent as high as 9,800 feet. It thus shows its cordilleran rather than plains origins, although at the same time suggesting that it is not a plant of the mountains proper but rather of the intermontane valleys. On the other hand, C. obtusata would seem to be a plant of the mountains proper. It is tolerant of shade in the montane zone (as C. Eleocharis is not), and climbs far above the montane zone to the alpine zone where it seems to be at its best. C. Eleocharis is found both in moist and in dry habitats, C. obtusata in dry habitats.

Carex praticola Rydberg; boreal; montane-submontane; Fish Canyon, B&S 393-62 CS, RMBL, USFS; Lake City, B&S 66-5; Gold Basin Creek drainage, B 143-65 RMBL. This grassy-leaved, caespitose sedge is one of the easier carices of the Gunnison Basin to identify. In its loose head, there is an alternation of green perigynium-edge and tan scale that reminds one of C. phaeocephala. But the distinctive character comes from the way in which the broadish perigynia, in growing away from the axis of the spike, bend out and up. This outward and upward bending is then continued by what is easily the longest combination of style and stigma among the Gunnison Basin carices. The plant varies between sun and partial shade, and also between moist and dry habitats.

Carex Douglasii Boott; cordilleran; montane-submontane; Dry Lake, B&S 227-62 CS, RMBL, USFS, B 1-64, B 2-64; Hot Springs Creek Valley, B 1-66; Hartman Rocks, B 28-60 RMBL. Among the Gunnison Basin

carices, C. Douglasii is unique in several ways. For one thing, it can be the largest-headed of the various species, as the Creutzburg drawing goes far to suggest.* Again, it is one of the few species concerning which the claim of dioeciousness can be made, although some staminate plants will be found that are pistillate in the lower portions of the head. The plant is rhizomatous, and the anthers end in sharp, needle-like projections. Mackenzie gives its habitat as dry soil,** but in the Gunnison Basin the plant is more often found where the soil is moist.

Carex disperma Dewey; boreal; montane-subalpine; Gothic, B 72-60 CS, RMBL, B 96-60 RMBL; Rough Creek, B&S 231-62 CS, RMBL, USFS; Pass Creek, G 3067 (1965) WS. This delicate, grassy carex seldom grows more than ten inches high, and is easily recognized by its small spikes composed usually of but two perigynia, surmounted by a few staminate florets. Although drawn from Quebec material, the Creutzburg drawing closely resembles the Gunnison Basin plant,*** which grows both in the open and in the shade, and in places that range from wet to distinctly median.

The montane carex of dry habitats

Carex festivella Mackenzie; cordilleran; montane; Cochetopa Park, H 9061 (1959) CS; Taylor Park, G 2766 (1964) WS. In a single plant, the small gynaecandrous spikes of this species can be clearly distinct or aggregated into a dense head suggesting a smaller, finer version of C. Egglestonii--even to the bract that frequently accompanies the inflorescence. A plant of dry meadows in the Gunnison Basin, C. festivella has not been confused with other species. But nearly all collections of C. microptera have first been thought to be C. festivella, probably because the Creutzburg drawing of C. microptera is of the type collection,

* In North American Cariceae as cited, I, 15.
** In North American Flora, Volume 18, as cited, p. 33.
*** In North American Cariceae, I, 82.

which comes from Deeth, Nevada.* Actually, the two species in the Gunnison Basin do not overlap by a wide margin.

The submontane carices

Carex praegracilis W. Boott; cordilleran; submontane-montane; Hot Springs Creek, B&S 118-66, B&S 120-66; Gunnison, B&S 10-62 CS, RMBL, USFS; Cebolla Hot Springs, B&S 446-62 CS, RMBL, B 113-64; Cathedral, B&S 423-62 CS, RMBL, USFS. Mackenzie thought this the most widely distributed carex in the western United States;** but in the Gunnison Basin it is frequent only in the lowest zone. It has the long, horizontal rootstocks of C. siccata; but in C. praegracilis these are black, and the plant is tolerant of alkaline soil, as C. siccata apparently is not. The cylindrical heads culminating the stems are androgynous; but curiously, there is a tendency (as pointed out by Mackenzie)*** for the plants to become staminate and pistillate, this tendency in the Gunnison Basin seeming to be responsive to moist and dry situations respectively. In the Gunnison Basin the plant occurs as the ecological equivalent of Deschampsia caespitosa, Poa secunda, Puccinellia distans, and Poa pratensis.

Carex vallicola Dewey; cordilleran; submontane-montane; Gunnison, B 60-60; Razor Creek Valley, B&S 66-48 USFS; Gold Basin Creek drainage, B&S 45-66; McIntyre Gulch, B&S 66-27 USFS; Cement Creek Valley, B 82-57 RMBL. This species is confusable with the preceding. The androgynous, cylindrical heads are similar, and the stembases are often black. But here the similarity ends. For the rootstocks of C. vallicola are never long and horizontal but so short that frequently the plant appears caespitose. Finally, whereas C. praegracilis is usually a plant of moist situations, seldom of dry, C. vallicola is usually a plant of dry situations,

* See above, p. 182 (ftnt).
** In North American Flora, Volume 18, as cited, p. 36.
*** On the same page.

seldom of moist. In fact, more often than not, it is found in company with sagebrush. Both plants grow to the height of a foot or two.

Carex Sartwellii Dewey; cordilleran; submontane; Parlin, W 9157 (1955) COLO, B 80-60 RMBL (one station). This species also would be confusable with C. praegracilis if it were more common in the Gunnison Basin. But it is known only from the low swales along Tomichi Creek near Parlin, which are probably too wet for C. praegracilis. In any event, there is a morphological character, seldom used by students of Carex, which works perfectly in the case of these two species. The sheath of the leaf, instead of being cut off horizontally to meet the edges of the continuing leaf (as in C. praegracilis), is prolonged above to produce a tube-like structure between the continuing leaf and the culm. This is admirably illustrated in the Creutzburg drawing.*

Carex nebraskensis Dewey; cordilleran; submontane; Gunnison, B 62a-60, B&S 189-62 (one station). This strongly rhizomatous species resembles vigorous specimens of C. aquatilis, although its flat, tapered leaves are of a lighter green. The really significant difference appears in the inflorescence. In addition to the terminal staminate spike, there are usually one or two smaller staminate spikes beneath it. And in the Gunnison Basin plants, the still lower pistillate spikes are occasionally staminate at the top. Known only from the above station, this is the unusual carex referred to on page 24 of the Introduction. It grew in a moist part of the old field.

Carex geophila Mackenzie; southwestern; submontane-montane; Snyder Gulch, B 27-66; Huntsman Mesa, S 64-55 RMBL; Powderhorn Divide, B&S 30-62 CS, RMBL, USFS. This southwestern species belongs to the same group of carices as the subalpine C. Rossii; but it is not nearly so grasslike. The bracts of the taller, androgynous inflorescences are really bracts--shorter than the inflorescences and sometimes even lacking.

* In North American Cariceae as cited, I, 19.

The leaves, too, are narrower, stiffer, and often involute. Finally, the pistillate inflorescences, merely shorter in C. Rossii, become basal in C. geophila, and are hidden among the leaves. C. geophila is a plant of dry, open places, usually found in the company of sagebrush; the closest it comes to the partial shade of C. Rossii is in the very open ponderosa-pine forest of the Powderhorn Divide.

Carex heliophila Mackenzie; relict of the plains; submontane; Almont, Ke (1949) WS. Closely related to C. pensylvanica of the Middle Western and Eastern prairies, this carex also proliferates by rhizomes rather than by short-creeping rootstocks, and is also reddish at the base. But its perigynia are orbicular in cross-section, not triangular. It belongs to the same general group of carices as C. Rossii and C. geophila, but does not have the two kinds of inflorescence characteristic of those species.

Carex occidentalis Dewey; cordilleran; submontane-montane; Gold Basin Creek drainage, B 15-59 CS, RMBL; Lake Fork Canyon, B 39-60 RMBL; Los Pinos Creek Valley, B 52-60 CS, RMBL; Fish Creek Valley, B&S 339-62 CS, USFS. Although C. occidentalis and C. Hoodii can be distinguished by means of floret and spike alone, the variation within each species makes this difficult, and it is easier to separate them by means of gross features. In the first place, although both species are inhabitants of moist as well as of dry places in the Gunnison Basin, C. occidentalis is rare in the montane zone, C. Hoodii rare in the submontane zone. Again, even when the individual spikes are detectable, the inflorescence of C. Hoodii is always more compact than that of C. occidentalis, which is frequently strung along the stem to twice the length of C. Hoodii. Finally, the inflorescence of C. occidentalis is always more slender than that of C. Hoodii, so that even if one thinks its inflorescence is oblong, he would have to say narrowly oblong.

Eleocharis R. Brown, The Spike Rushes

Superficially, the spike rushes might be taken for some of the simpler carices, since the inflorescence in both cases is solitary at the end of the culm. But the inflorescence of Eleocharis is neater and trimmer, and the reason for it is readily apparent. Whereas in Carex nigricans, for example, the inflorescence is a true spike, the individual florets (presumably vestigial spikelets) spreading and reflexing on their minute peduncles, in Eleocharis, the solitary inflorescence is a single spikelet, there being no minute peduncles, and the scales and florets arising directly from the culm itself. This morphological feature, once explained, is apparent even in E. acicularis, the smallest of the Gunnison Basin species.

Eleocharis acicularis (L.) Roemer & Schultes; boreal; montane; Grant Lake, B 182-59; Nicholson Lake, S 65-177 RMBL. The specific name of this plant means needle-like, and indeed there could hardly be a more descriptive epithet; for the plant resembles nothing so much as a tuft of fine needles about three inches high. Fine rhizomes link the tufts together, and both collections reported came from the exposed shores of small lakes near Crested Butte. The only other plant in the Gunnison Basin resembling this plant is the grass Muhlenbergia filiformis, which comes from similar situations.

Eleocharis palustris (L.) Roemer & Schultes [E. macrostachya Britton]; boreal; montane; Gothic, B 115-59; Hot Springs Creek Valley, B 81-61 CS; Cebolla Hot Springs, B&S 496-62 CS, RMBL. This is the commonest spike rush of the Gunnison Basin, occurring in fresh and alkaline marshes alike. It grows as high as twenty inches, and is without leaves, although the culms that lack spikelets may look like leaves. The bases of the culms are red as they rise in rows along the rhizomes.

Eleocharis pauciflora (Lightfoot) Link; boreal; subalpine-submontane; Copley Lake, B 116-60; Gothic, B 91-59; Cement Creek Valley, S 65-42 RMBL; Gunnison, B 68-60 CS, RMBL. This spike rush grows to a height

about halfway between that of E. acicularis and that of E. palustris; and like the former, it has genuine leaves. But unlike E. acicularis, the culms and leaves rise vertically from the root, instead of radiating from the root in a tuft. It can be found with strong brown rhizomes and dark red roots, and really, is not to be confused with either of the preceding two species.

Eriophorum L., The Cotton Grasses

No other plants in the Gunnison Basin except the members of this genus could possibly be called cotton grasses, and it does seem, at least in this one instance, that the popular name is enough to identify the genus. The fine, white bristles that give the appearance of cotton are found between scale and floret, and are undoubtedly vestiges of the former perianth of the flower.

Eriophorum angustifolium Honckeny; boreal; subalpine; Peeler Basin, B 265-60 CS, RMBL. The inflorescence of this plant hangs like a collection of white tassels from the summit of the culm. The plant grows a foot and one-half tall, and frequents wet places in the open or in partial shade. In addition to the above station, the plant is known to occur around the Mexican Cut ponds, well within the floristic Gunnison Basin, but a mile or so north of the topographic basin. It must also be reported that the similar, but more delicate, E. gracile has been collected in what is undoubtedly still the floristic Gunnison Basin, but just to the west of Castle Pass. The spikelets of this latter species are not so drooping; in fact they can even be upright.

Eriophorum Scheuchzeri Hoppe; boreal; alpine; Rustler's Gulch, B 240-60 CS, RMBL, WS, COLO.* The globe of cotton at the top of the culm makes this eriophorum unmistakable. Rhizomes radiate from the base of the culm in all directions, and it is no surprise that the plant can cover the entire surface of an alpine bog. The species is also known from Ice Lake Basin

* See above, pp. 20-21.

in the San Juans; but these two Colorado stations are apparently the only ones known in North America south of Canada.

Kobresia Willdenow, The Kobresias

Kobresia differs from Carex principally in the fact that perfect florets are found along with staminate and pistillate ones, and that the perigynium (presumably a scale that has grown together around the ovary) has not yet come together but displays a deep split on the dorsal side.

Kobresia myosuroides (Villars) Fiori [K. Bellardii (Allioni) Degland]; boreal; alpine; North Italian Mtn., W&L 9300 (1955) COLO; Blaine Basin, B 101-59. This plant is so much like Carex elynoides (even to the smutting of the perigynia) that almost any botanist would be exonerated from confusing the two prior to inspection with a handlens. The florets are perfect with the exception of the uppermost staminate one, and occasional pistillate ones.

Scirpus L., The Bulrushes

Scirpus is closely akin to Eleocharis, the chief outward difference being that the spikelets, instead of being one to a culm, range from a cluster of three or four (as in S. americanus) to a large, panicled inflorescence composed of hundreds of spikelets (as in S. rubrotinctus). The spikelets, however, still maintain the neat look of Eleocharis, and in their small way help to determine Scirpus.

Scirpus americanus Persoon; widespread North American; montane; Cement Creek, L 509 (1949) CS. S. americanus is a plant of wet meadows, growing six or seven inches high in the cited collection. Its single cluster of spikelets appears lateral, but in reality is terminal, since what seems to be the prolongation of the stem is simply the long bract of the inflorescence.

Scirpus rubrotinctus Fernald; boreal; submontane-montane; Parlin, B 79-60 CS; Fish Creek, B&S 416-62. This strongly rhizomatous plant of wet places is the most frequent scirpus in the Gunnison Basin. It can be found growing a yard high, and bearing at the summit of the stout culm, its innumerable spikelets in an inflorescence five or six inches high and as many inches across. Above each node, the culm is reddish, which is the character that has given the plant its specific name.

Scirpus validus Vahl; widespread North American; montane; Gothic, B 181-60 CS, RMBL. It would seem that the American bulrush, the famous tule of the San Joaquin and Sacramento River Valleys, should be known to all Americans interested in plants. The almost leafless culms grow five or six feet tall, and bear at the top a disproportionately small cluster of spikelets with a disproportionately small bract appearing to be a continuation of the stem. The stout, woody, horizontal rhizomes, as thick as the culms, are something to marvel at.

ELAEAGNACEAE, The Oleaster Family

Shepherdia Nuttall, The Buffalo Berries

Shepherdia canadensis (L.) Nuttall; boreal; montane-subalpine; Gothic, B 141-60 RMBL; Tin Cup, B 177-52; Spring Creek Pass, B 50-61 RMBL. Here is a plant that stretches across the North American continent from Alaska to Newfoundland, extending south to Colorado, Michigan, and New York; hence according to the criteria of this flora,* it must be classified as boreal. Furthermore in the Pacific Northwest and in the Atlantic Northeast, it seems to be chiefly an inhabitant of moist, open places. But in Colorado and apparently the whole cordilleran region, the shrub is found in dry to median habitats, usually not far from woods, whether lodgepole pine, spruce, or aspen. The buffalo berry,

* See above, p. 41.

in other words, behaves in cordilleran regions like a cordilleran plant. Could it be a cordilleran plant that migrated east (and west) in one of the Pleistocene interglacials, perhaps even the last? Or is the cordilleran tolerance of dryish conditions, and of partial shade, an adaptation of a truly boreal species? These are intriguing questions. The plant itself is unmistakable. Its smallish, entire, spearhead leaves are bi-colored and scurfy, its unisexual flowers appear before the leaves, and its red berries are unpalatable and hence consigned to the buffalos.

ELATINACEAE, The Waterwort Family

Elatine L., The Waterworts

Elatine triandra Schkuhr; boreal; montane; Gothic, L 4492 (1959) RMBL, COLO. The plants of this collection from a kettlepond south of Gothic were submerged at the time of collection although in a portion of the pond destined to dry out in the summer if the pond itself did not totally disappear. Yet being an annual, the species can complete its life-cycle in the short time between the filling of the ponds with meltwater and their partial or entire disappearance in the summer. The small leaves are lanceolate with wide petioles, and contain the flowers (or capsules) in their axils. The collector will note that the stems, very wide at the base, narrow somewhat in each internode.

EQUISETACEAE, The Horsetail Family

Equisetum L., The Horsetails

Equisetum arvense L.; boreal; subalpine-submontane; Flag Creek, L 1245 (1951) COLO; Taylor River, Ke 6/29/49 WS; Fish Creek, B&S 34-62; Sapinero, H&Sm 1304 (1945) CS. This is the common horsetail of every one's acquaintance. The green vegetative stalks follow the brown flowering stalks so quickly in the Gunnison Basin

that a vegetative stalk from the same root will be partly grown when the flowering stalk is just coming into flower.

Equisetum hyemale L.; boreal; montane; Cement Creek Valley, B 202-61; Spring Creek Valley (south), B&S 66-32. No one can miss the stout, evergreen, unbranched stalks of this species. The sheaths are gray, giving the stalks a variegated appearance, and the plant inhabits dry to median woodsy places.

Equisetum kansanum Schaffner; cordilleran; submontane-montane; Almont, B 41-59; Gunnison, B 4-64; Johnson Gulch, B 85-65; Cathedral, 95-66. The sheaths of this species are of the same green as the stems, with just a slight brown edging at the top. The stalks are annual, as in the case of E. arvense, and both E. arvense and E. kansanum are dwellers in moist places, E. arvense preferring muddy soils, E. kansanum sandy soils.

Equisetum variegatum Schleicher; boreal; montane-submontane; Gothic, Wi 10062 (1954); Cement Creek, L 1523 (1951) COLO; Sargents, R 10624 (1959) CS. The sprawling stems of this horsetail are so much narrower than those of any other Gunnison Basin species that there is no possibility of misidentification. To the collector, the plant will be a distinct species from the moment he catches sight of it in some moist place.

ERICACEAE, The Heath Family

Arctostaphylos Adanson, The Manzanitas

Arctostaphylos Uva-ursi (L.) Sprengel; boreal; submontane-alpine; Hartman Rocks, B 1-61; Cathedral, S 62-6; Los Pinos Creek Valley, B&S 185-65; Crested Butte Mtn., B 32a-57; Cumberland Pass, B 35e-57. The bearberry is one of those universal plants in the Gunnison Basin, found from the lowest zone to the highest, in sun and in shade, in sandy granitic soils and in the rich loam of an aspen grove. It is an evergreen prostrate shrub, climbing over rocks, but also

forming carpets on a level forest floor. The small white flowers are urn-shaped, and the berries are red. For further details, see the next species.

Gaultheria L., The Wintergreens

Gaultheria humifusa (Graham) Rydberg; cordilleran; subalpine; Peeler Basin, I 18889 (1961). The creeping wintergreen is also an evergreen prostrate shrub, but a very small one. Its leaves are round or roundish (those of the bearberry elliptical), and it seems to be restricted to moist, mossy places in the subalpine forest, one of the few habitats where the bearberry is not found. It is as rare as the bearberry is common.

Moneses Salisbury, The One-flowered Wintergreen

Moneses uniflora (L.) Gray; boreal; montane-subalpine; Rough Creek, B&S 454-62; Gothic, B 250-61. Linnaeus regarded this species as one of the pyrolas. The more recent view that it belongs to a genus of its own would appear to be the view of common sense since the solitary white flowers, sometimes very nearly an inch in diameter, do not seem to be those of just another pyrola. The species grows in the shade of moist spruce forest, and since the southern half of the Basin is generally drier than the northern half, it is surprising to find the plant more prevalent in the southern half than in the northern half.

Pyrola L., The Shinleafs

Pyrola asarifolia Michaux; boreal; subalpine-montane; Gothic Natural Area, B 275-61; Los Pinos Pass, B 161-64; Fish Creek Valley, B&S 340-62. This is the largest of the Gunnison Basin pyrolas, and also the only one with pink to red flowers. It is found in moist to median, coniferous or aspen woods.

Pyrola minor L.; boreal; subalpine-montane; Gothic Natural Area, B 274-61; Slate River Valley, B 100-60

RMBL; Rough Creek, B&S 456-62. This pyrola has the habit of P. asarifolia, that is, a vertical flowering stem rising from a cluster of basal leaves and bearing the pendent blossoms in a simple raceme at the end of the stem. But, as the specific name indicates, everything is smaller. And besides, the blossoms are white.

Pyrola secunda L.; boreal; subalpine-montane; Gothic Natural Area, B 264-61; Cathedral, B&S 457-62; Mineral Creek Valley, B&S 536-62. P. secunda is a lower plant than P. minor, and its leaves are more acutely elliptical; but the chief diagnostic of its identity is given in its specific name. The small white flowers are arranged on one side of the stem. Curiously, it seems to do better in mesophytic spruce forest than in moist.

Pyrola virens Schweigger [P. chlorantha Swartz]; boreal; montane-subalpine; Rough Creek, B&S 455-62; Cement Creek Valley, B 203-61; Gothic Natural Area, O 7/15/58 RMBL. In this species, there is a return to the bent style and the habit of P. asarifolia (in the two other species the style is straight). But most characteristic are the greenish blossoms, which are the source of the specific name. The species is found both in moist and in dry forest.

Vaccinium L., The Blueberries

Vaccinium caespitosum Michaux; boreal; subalpine-alpine; Virginia Mine, B 26-55; Cumberland Pass, Ke 7/30/49 WS. In the Gunnison Basin, this species is a plant of openings in the spruce-fir forest and of the alpine zone above, whereas the next species is an inhabitant of the forest floor. The branchlets are brown and not angled, the pink blossoms are urnlike and not more than five millimeters in length, and the small leaves are of a leathery texture and not translucent.

Vaccinium Myrtillus L.; cordilleran; subalpine; Gothic Natural Area, B 35-64; Virginia Mine, B 2-67. The branchlets of this species are green and ridged, the leaves are thin and translucent, and the flowers are

white and globose. The plant subsists on the light that filters down from the tops of the trees, and hence its habit is sprawling and diffuse. The blossoms usually measure more than five millimeters from the bottom of the hypanthium to the top of the corolla.

Vaccinium scoparium Leiberg; cordilleran; subalpine-alpine; Schofield Pass, B&S 66-71; Sawtooth Mtn., B&S 66-89. One cannot help wondering if this cordilleran plant is not the offspring of the two preceding species. Its blossoms are pink and urceolate, but in length, transitional between those of the other two species. Its branchlets, although thinner, are green and ridged like those of V. Myrtillus; yet it has the bushy, compact habit of V. caespitosum besides the individuality of parallel branchlets. Finally, the leaves, too, are transitional--greener and thinner than those of V. caespitosum, but not translucent, and with the further individuality of raised veinlets. The plant seems to have a predilection for open, rocky places in the subalpine zone and lower alpine zone.

EUPHORBIACEAE, The Spurge Family

Euphorbia L., The Spurges

The spurges are characterized by a unique floral structure. The stamens and pistils are gathered together in a small cup called a cyathium, the top of which is frequently ornamented with glands or pseudo-petals or both. Later, the pistils enlarge, and as fruits hang over the sides of the cyathium. It seems as if almost every one must have observed this with respect to the common Christmas poinsettia, which is a spurge with scarlet uppermost leaves.

Euphorbia robusta (Engelmann) Small; cordilleran; submontane-montane; Red Creek Valley, S 64-101 RMBL; Powderhorn, B&S 44-62; Cement Creek Valley, S 65-63. This is the only spurge that is at all frequent in the Gunnison Basin. A vigorous, herbaceous perennial with a bushy habit and numerous red stems, the plant in the

Gunnison Basin does not seem to grow more than ten inches high. Its lower leaves are alternate, but above, they become paired and even trifoliate. The collector will note that the glands of the cyathium are two-horned, and that the pseudo-petals between the glands are tipped with red and ciliate. The plant is tolerant of alkaline soil.

Euphorbia Esula L.; adventive; montane; Crested Butte, B 362-61. With its terminal umbellate clusters of flowers and bracts and its linear leaves, this species is close to the common cemetery spurge, and indeed seems to be its big brother. A common weed of stock pastures in the West, I am surprised that I have seen it only once in the Gunnison Basin.

Euphorbia glyptosperma Engelmann; boreal; submontane; Parlin, W 9451 (1955) COLO. This little spurge is a glabrous, prostrate annual with axillary cyathiums. Its small leaves are oblong and opposite.

Euphorbia serpyllifolia Persoon; cordilleran; montane; Lake City, Ke 7/17/49 WS. Also a glabrous, prostrate little annual with axillary cyathiums, the paired leaves of this species are cuneate at the bottom.

FAGACEAE, The Beech Family

Quercus L., The Oaks

Quercus Gambellii Nuttall; southwestern; submontane; Lake Fork Canyon, B 40-60 RMBL, B&S 504-62 (two stations). Prevalent in the sagebrush country along the western margin of the Gunnison Basin between the West Elks and the San Juans, Gambel's oak is the only oak in the Basin and presents no problem of identification. The cup almost encloses the acorn, and the rhizomes are remarkable for their straightness. On a mesa top in its country, one often sees an isolated line of the low, shrubby trees, the whole line having sprung from a single acorn.