A BOTANICAL INVENTORY OF THE ROCKY FLATS AEC SITE

FINAL REPORT

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ABSTRACT OF FINAL REPORT

An inventory has been made of the vascular plants, bryophytes, and lichens occurring naturally on the Rocky Flats Site. 327 species of vascular plants, 25 lichens and 16 bryophytes, and one macroscopic green alga are reported. The floristic spectrum represents a residual tall-grass-prairie, short-grass plains, ponderosa pine woodland, and foothill ravine flora which has been extremely depauperated by human activity dating back to aboriginal activity, involving fire, overgrazing, timber-cutting, road-building, and other modern disturbance. Introduced Eurasian weeds constitute a significant percentage of the flora. The disturbance of the area has been accelerated by the characteristic high-wind activity of the site.

During the field season June through September 1973, a systematic inventory was made of the flora of the Rocky Flats Site. 1973 was a "good" year from the standpoint of vegetation development, and we feel confident that we have been able to discover 99% of the species present on the site. Funding of the project did not begin until the early spring part of the season (April-May) was already past, but we were able to detect most of the early spring plants in their post-flowering stages and have had the opportunity to study the area in the early months of 1974 (unfortunately 1974 was an unusually dry year and very little flowering was observed).

An inventory of the vegetation of the Rocky Flats area should have been undertaken before the plant was developed more than twenty years ago. The site has been greatly altered since its acquisition, and there is no base-line from which to judge just how the present vegetation compares with that existing earlier. In this sense, to undertake a survey of the vegetation now is to lock the barn door after the horse has been stolen. Granting the futility of hindsight in this situation, it is doubly unfortunate that such an inventory of the flora was not solicited and undertaken much earlier in view of the fact that ecological studies of various kinds have been in continuous progress for many years in the complete absence of any basic floristic or vegetational base-line analysis. While we feel that we have accomplished a basic mission in the present study, we also realize that the site has deteriorated markedly in the intervening years, and we regret that the sequences of cause and effect have not been carefully documented. We would like to observe that environmental impact studies by ecological teams should always be preceded by botanical, zoological, geological, and climatological inventories performed by systematics specialists in these respective disciplines. Good base-line inventories are of paramount importance in preventing substantial errors of interpretation by later, less systematics-oriented research workers. In the botanical and zoological areas, misidentification of major components of the biota could be reduced to a minimum were these investigations done in logical and proper sequence instead of "putting the cart before the horse" as in the history of the present area.

For our inventory of the flora of the Rocky Flats Site, we have systematically explored the area for vascular plants and for bryophytes and lichens. We have not attempted to survey the aquatic and soil algae, nor the autotrophic and parasitic fungi, all of which lie completely outside our areas of competence.

The species listed below are documented by herbarium specimens on permanent file in the University of Colorado Museum herbarium. A second set, complete except for species that were in extremely short supply, has been deposited with the management of the Rocky Flats Plant. A third set has been given to the herbarium of Colorado State University of Fort Collins for the use of scientists involved in continuing ecological studies on the site. Because of the special requirements of preservation, infrequency of the finds, and the very technical taxonomy of the group, we did not prepare duplicate collections of the bryophytes or lichens for on-site documentation. These, however, are permanently on file in the Museum herbarium.

SEASONALITY

There are three distinct "waves" of flowering:

1. Early spring flowering involves mainly native vegetation flowering from mid-March through early June. Characteristic early spring species: Lithospermum incisum, Alyssum minus, Androsace occidentalis, Astragalus shortianus, Carex heliophila, Castilleja sessiliflora, Cerastium arvense, Cerastium nutans, Collinsia parviflora, Collomia linearis, Delphinium nelsonii, Erodium cicutarium, Erysimum asperum, Euphorbia robusta, Hydrophyllum fendleri, Ipomopsis spicata, Lesquerella montana, Leucocrinum montanum, Lomatium orientale, Mahonia repens, Mertensia lanceolata, Musineon divaricatum, Nothocalais cuspidata, Oxytropis lambertii, Ribes aureum, Senecio plattensis, Townsendia hookeri, Viola nuttallii. 28 species, 8.6% of flora.

2. Midsummer flowering, mid-June through July. Most of the species bloom in the second period. 85.6%.

3. Late summer flowering, August to September. Late summer flowering species include: Andropogon gerardii, Aster porteri, Cenchrus longispinus, Epilobium paniculatum, Grindelia squarrosa, Helianthus annuus,

Lactuca serriola, Liatris punctata, Muhlenbergia montana, Panicum capillare,
Panicum perlongum, Panicum virgatum, Schedonnardus paniculatus, Schizachyrium
scoparium, Senecio spartioides, Solidago mollis, Sporobolus cryptandrus, Sporo-
bolus heterolepis, Gutierrezia sarothrae. 19 species, 5.8% of the flora.

FLORISTIC STATISTICS

The vascular flora is broken down below in order of floristic importance (numbers of species) as follows [other measures of "importance" will be provided later on by vegetational analytics].

Compositae (Sunflower family): 53 species

Gramineae (Grass family): 41

Cyperaceae (Sedge family): 24

Leguminosae (Pea family): 22

Cruciferae (Mustard family): 17

Scrophulariaceae (Figwort family): 13

Rosaceae (Rose family): 12

[18 families contain from 3 to 10 species each; 11 families contain only 2 species each; and 22 families are represented by a single species each.]

58 families are represented in the vascular flora.

56% of the plants fall into only 7 families having over 10 species each.

38% of the families have only one species each.

91% of the families are represented by less than 10 species.

86% of the flora is represented by 43% of the families (those having 3 or more species).

The early spring species have essentially disappeared and dried up when the second bloom comes on, and August-September has so few conspicuous species in flower that the entire area has a brown and sere aspect by August. There is no conspicuous later summer flowering aspect on the Rocky Flats pediment comparable to what one finds in more well-watered lowland areas of the adjacent Piedmont Valley.

ANNOTATED LIST OF THE PLANTS OCCURRING ON THE
ROCKY FLATS SITE

VASCULAR PLANTS [327 SPECIES]

The list is arranged alphabetically by species, with the family indicated secondarily. We feel that this arrangement is more suitable for users who are not professional botanists. We are adding, in square brackets [] some species that have been reported by Whicker (1973) but which we did not find in our inventory. In some instances we have no reason to doubt their reports; in others we suspect these reports to be misidentifications, and in a few we use a different name for the same plant. Whicker does not appear to have preserved voucher specimens of the plants reported in his list. The abbreviations are interpreted as follows: ADV = Adventive, IND = Indigenous, AN = Annual, BIEN = Biennial, PER = Perennial. The number given at the end of each item is the collection number of the herbarium voucher.

ACHILLEA LAMULOSA Nutt. "Yarrow" (Compositae). Frequent to common on pediment and valley slopes and meadows. IND PER. Occurs as isolated plants, never forming large stands. June-September. 129.

AGOSERIS GLAUCA (Pursh) Raf. "False Dandelion" (Compositae). Common on pediment and valley slopes. IND PER. Relatively short-lived and unimportant as ground cover. May-July. 69.

AGRIMONIA STRIATA Michx. "Agrimony" (Rosaceae). Frequent in ravines in northwest corner of site. IND PER. June-September. This species is clearly relictual on the site as it is elsewhere in Colorado, where it is restricted to mesic gulches, usually in shade, in the foothill canyons of the eastern slope. It is a species of the East and Middle West and is present in such small numbers and in such a specific niche on the site that any disturbance will likely destroy the colony. 282.

AGROPYRON DESERTORUM (Fisch.) Schult. "Crested Wheatgrass" (Gramineae). Abundant around farm buildings, Sec. 3. ADV PER (Asiatic), imported for soil-binding. June-September. 161.

AGROPYRON REPENS (L.) P. Beauv. "Quack-Grass" (Gramineae).

Infrequent along wet ditches (Woman Creek). ADV PER of no great importance on the site, although a pernicious weed in cultivated areas elsewhere. Ripening in early August. 321.

AGROPYRON SMITHII Rydberg. "Western Wheat-grass" (Gramineae).

Common on slopes of valleys and drainage systems. IND PER forming thin stands of isolated stems connected below ground by underground rhizomes, typical of otherwise poorly vegetated sites. Ripening in June and July. 114.

AGROPYRON TRACHYCAULUM (Link) Malte. "Slender Wheat-grass"

(Gramineae). Common on slopes throughout the plant site. IND PER bunch-grass. 213.

AGROSTIS GIGANTEA Roth (A. alba of American treatments). "Red-top"

(Gramineae). Frequent in wet meadows. ADV PER, cultivated as a pasture grass. 314.

ALISMA PLANTAGO-AQUATICA L. ssp. BREVIPES (Greene) Samuelsson.

"Water plantain" (Alismaceae). Locally abundant along edges of ponds and muddy areas. IND PER. June-September. 335.

ALLIUM CERNUUM Roth. "Nodding Onion" (Liliaceae). Found only on

the slopes of a ravine in the NW corner of the site, in shade. IND PER.

July-August. 341.

ALLIUM TEXTILE Nels. and Macbr. "Plains Wild Onion" (Liliaceae).

Common on high level ground and on well-drained slopes of valleys over the entire site. IND PER. Late May-early July. 23.

ALYSSUM ALYSSOIDES L. "Sweet Alyssum" (Cruciferae). Common along roadsides and on disturbed ground. ADV from Europe. Annual or short-lived perennial. May-July. 37.

ALYSSUM MINUS (L.) Rothmaler. "Alyssum" (Cruciferae). Infrequent, collected on sloping firebreak along west boundary. ADV (Eurasian). This species first appeared in Colorado less than ten years ago and has "exploded" in this area. It has a very early and short growing season and is able to take advantage of sites that are not densely vegetated early in the season. June - July. 67.

AMBROSIA ARTEMISIIFOLIA L. "Roman wormwood" (Compositae).
An abundant weed in disturbed ground. ADV AN. July-September. 368.

AMBROSIA PSILOSTACHYA DC. "Western wormwood" (Compositae).
Common in disturbed ground. IND PER. July-September. 362.

AMBROSIA TRIFIDA L. "Giant Ragweed" (Compositae). Common in
disturbed ground. ADV AN (locally). July-September. 366.

AMELANCHIER ALNIFOLIA Nutt. "Shadbush" or "Serviceberry" (Rosaceae).
Frequent on steep N-facing slopes of ravines in NW corner of plant site. IND
shrub. June-July. 276.

AMORPHA FRUTICOSA L. var. OCCIDENTALIS (Abrams) Kearney and
Peebles. "Lead-plant" (Leguminosae). Frequent along streams and irrigation
ditches. IND shrub. June.

[Amorpha nana.] In the absence of a voucher, we suspect that this is
a misidentification of Amorpha fruticosa.

ANDROPOGON GERARDII Vitm. "Big Bluestem" (Gramineae). Common on
slopes of gulches. IND PER bunchgrass, ripening August-September. A remnant
of the original midgrass prairie vegetation of more protected sites. 375.

[Andropogon hallii.] We suspect this report to be a misidentification of
A. gerardii. A. hallii has not yet been found in the Boulder area and is typical
of sand dune areas to the east.

ANDROSACE OCCIDENTALIS Pursh. "Western rock-primrose" (Primulaceae).
Frequent on open slopes of valleys. IND AN, very short-lived and inconspicuous.
May-June. 146.

ANEMONE CYLINDRICA Gray. "Thimbleweed" (Ranunculaceae). Infre-
quent on slopes of drainage gulch NE of plant. IND PER. June. 181.

ANTENNARIA PARVIFOLIA Nutt. "Pussytoes" (Compositae). Common on
slopes of gulches. This is a plant of wooded slopes and probably is indicative
of residual forest conditions on the site. IND PER mat-former. May-July. 32.

ARABIS FENDLERI (Wats.) Greene. "Rock Cress" (Cruciferae). Frequent
on well-drained slopes. IND PER. May-June. 144.

ARABIS GLABRA (L.) Bernh. "Tower Mustard" (Cruciferae). Frequent in
disturbed ground. ADV BIEN. May-June. 81.

ARABIS HIRSUTA (L.) Scop. "Hairy Rock-cress" (Cruciferae). Common on high level ground and well-drained slopes. Biennial or short-lived perennial. IND. May-June. 88.

ARENARIA FENDLERI Gray. "Sandwort" (Caryophyllaceae). Common on high level ground. IND PER. May-July. 25.

ARGEMONE POLYANTHEMOS (Fedde) G. B. Ownbey. "Prickly Poppy" (Papaveraceae). Common throughout the site especially in disturbed ground. IND BIEN. July-September. 277.

ARISTIDA BASIRAMEA Engelm. "Havard Three-awn" (Gramineae). Abundant along the south side of the railroad tracks near the west boundary. IND AN. This species was known in Colorado previously from only one other locality, White Rocks, 8 miles NE of Boulder, where it is a rare inhabitant of sandy soils in depressions of the sandstone caprock. Here on the site it is behaving as a weedy plant in an open disturbed sandy site. July-September. 393.

ARISTIDA LONGISETA Steud. "Red Three-awn" (Gramineae). Common on high flat ground and on well-drained slopes. IND PER. August-September. We would have expected to find Aristida fendleri on the site and perhaps have actually overlooked it. The latter species should be here. 388.

ARNICA FULGENS Pursh. "Orange Arnica" (Compositae). Common, showy species of the meadows and moister depressions on the pediment. IND PER. May-June. 39.

ARTEMISIA CAMPESTRIS L. "Field Wormwood" (Compositae). Common on high level ground, forming discrete clumps. IND PER. July-September. 359.

ARTEMISIA DRACUNCULUS L. "Linear-leaved Wormwood" (Compositae). Common weedy species of high, level and disturbed ground. IND PER. Late July-September. The European race yields the spice, tarragon. 345.

ARTEMISIA FRIGIDA Willd. "Pasture Sagebrush" (Compositae). Common on rocky pediment. IND PER. July-August. 406.

ARTEMISIA LUDOVICIANA Nutt. ssp. LUDOVICIANA. Abundant on pediment and slopes. June-July. 405.

ASCLEPIAS SPECIOSA Torr. "Showy Milkweed" (Asclepiadaceae). Common in valley bottoms, especially along the firebreaks. IND PER. July-September. 302.

[Asclepias stenophylla.] We undoubtedly overlooked this species, which occurs very sporadically and never occurs in large numbers.

ASCLEPIAS VIRIDIFLORA Raf. "Green Milkweed" (Asclepiadaceae). Frequent in gulches and on ridges S of site, on rocky soils. IND PER. July-August. 295.

ASPARAGUS OFFICINALIS L. "Asparagus" (Liliaceae). Escaped from cultivation near ranch buildings, Sec. 3. ADV PER. June-August. 317.

[Aster commutatus crassulus.] = Aster falcatus Lindley. Very late-flowering species which we may well have missed. However, there is also the possibility of a misidentification of Aster porteri.

[Aster ericoides.] See note under A. commutatus. Both species should occur in the area.

ASTER PORTERI Gray. "White Aster" (Compositae). Frequent on well-drained slopes of valleys. IND PER, endemic along the east side of the Front Range in Colorado and New Mexico. It is somewhat unusual to find this species well out from the mountain front. It is most commonly found in the foothill canyons. August-September. 396.

ASTRAGALUS ADSURGENS Pall. var. ROBUSTIOR Hook. "Milk Vetch" (Leguminosae). On flats and well-drained slopes of gulches. IND PER. May-July. 121.

ASTRAGALUS BISULCATUS (Hook.) Gray. "Two-grooved Milk Vetch" (Leguminosae). Drainage gulches along E side of site. IND PER. May-June. This is one of the species that is often an indicator of selenium in soils, and is poisonous to cattle. 177.

ASTRAGALUS CRASSICARPUS Nutt. "Ground-plum" (Leguminosae). Frequent in drainage gulches NE of plant. IND PER. May-June. The fruits of this legume are large, fleshy, and firm in texture, of a greenish color. 187.

ASTRAGALUS DASYGLOTTIS Fisch. ex DC. "Milk Vetch" (Leguminosae). Abundant on the rocky pediment and on well-drained slopes, forming discrete clumps several feet in diameter. IND PER. May-June. 66.

ASTRAGALUS DRUMMONDII Dougl. ex Hook. "Milk Vetch" (Leguminosae). Frequent on flats and well-drained slopes of the gulches. IND PER. May-June. A bushy white-flowered vetch with very hairy leaves. 92.

ASTRAGALUS FLEXUOSUS (Dougl.) Don. "Milk Vetch" (Leguminosae). Frequent in meadows. IND PER. May-June. A sprawling inconspicuous species with pale pink flowers. 122.

ASTRAGALUS SHORTIANUS Gray. "Milk Vetch" (Leguminosae). Frequent in meadows. IND PER. May-June. A handsome little species with silky-hairy pinnate leaves at ground level and a few large magenta flowers. It has a short blossoming season. 143.

BARBAREA ORTHIOCERAS Ledeb. "Winter Cress" (Cruciferae). Common over the area in well-drained sites. IND PER (but weedy). May-June. 19.

BIDENS CERNUS L. "Nodding Bur-marigold" (Compositae). Frequent in meadows that are wet in late summer. IND AN. July-September. 399.

BOUTELOUA GRACILIS (H.B.K.) Lag. "Blue Grama" (Gramineae). Widely distributed on the pediment and ridges on well-drained sites. IND PER. Late July-September. 377, 357.

BOUTELOUA CURTIPENDULA (Michx.) Torr. "Side-oats Grama" (Gramineae). Common on well-drained pediment and ridge-top sites. IND PER. July-September. 376.

BROMUS BRIZAEFORMIS F. and M. "Rattlesnake Grass" (Gramineae). Infrequent on well-drained slopes and occasionally on the pediment. ADV AN (Eurasian). 293.

BROMUS INERMIS Leyss. "Smooth Brome" (Gramineae). Common in valley meadows, often cultivated as a hay and pasture grass regionally. ADV PER, reaching maturity late June-July. 196, 315.

BROMUS JAPONICUS Thunb. "Japanese Brome" (Gramineae). Frequent with Bromus tectorum in disturbed soil. ADV AN. June-July. 407.

BROMUS TECTORUM L. "Cheat-grass" (Gramineae). Abundant weedy grass occurring nearly everywhere on the site, a clear indicator of land misuse and disturbance. ADV AN (Eurasia), early maturing and because of its dry straw, a range fire hazard. May-June. 62, 136.

BUCHLOE DACTYLOIDES (Nutt.) Engelm. "Buffalo Grass" (Gramineae). Common on the pediment and well-drained slopes and ridges. IND PER. One of the original dominant grasses, with Bouteloua, persisting despite human activity. June-August. 199, 264.

CALLITRICHE PALUSTRIS L. "Water Starwort" (Callitrichaceae). Aquatic,

common in ponds. IND AN. July-September.

CALOCHORTUS GUNNISONII Wats. "Mariposa or Sego Lily" (Liliaceae). Common on well-drained north-facing slopes. IND PER. June-July. 197, 242.

CALYLOPHUS SERRULATA (Nutt.) Raven. "Bushy Evening-Primrose" (Onagraceae). Infrequent on slopes of drainage gulches. IND PER. June-July. 191.

CALYSTEGIA SEPIUM (L.) R. Br. ssp. AMERICANUM (Sims) Brummitt. "Hedge Bindweed" (Convolvulaceae). Infrequent along bottoms of drainage gulches. IND PER. June. 174.

CAMELINA MICROCARPA Andrz. "False Flax" (Cruciferae). Common throughout the site. ADV AN. May-July. 28.

CAMPANULA ROTUNDIFOLIA L. "Common Harebell" (Campanulaceae). Common on well-drained slopes. IND PER. June-July. 218.

CARDARIA DRABA (L.) Desv. "Whiteweed" (Cruciferae). Common in dense stands along valley bottoms. ADV PER, one of the principal noxious weeds of the region. June-August. 292.

CARDUUS NUTANS L. ssp. MACROLEPIS (Poter.) Kazmi. "Nodding Thistle" (Compositae). This is the very tall and handsome weedy thistle dominant in the southeast corner of the site and generally distributed in disturbed areas throughout. It first appeared in the area not more than ten years ago and has "exploded" over the area, completely dominating fallow and disturbed areas. In recent years it has spread up the foothill canyons and has established stands near Nederland and in Rocky Mountain Park. This species underwent a severe infestation in 1973 by the butterfly "Painted Lady" (Vanessa cardui) during mid-June, during a nationally observed migration of the species. The butterfly lays eggs on the thistle and the larvae feed chiefly on this weed during their development. However, the infestation did little to control the thistle. ADV (southeastern Europe) BIEN. June-August. 274.

CAREX ATHROSTACHYA Olney. "Sedge" (Cyperaceae). Common along streams. IND PER. June-July. 238.

CAREX AUREA Nutt. "Sedge" (Cyperaceae). Infrequent along streams. IND PER. July-August. 325.

CAREX BREVIOR (Dewey) Mack. "Sedge" (Cyperaceae). Common in persistently wet soils in the valleys. IND PER. June-July. 206, 188, 219, 164 (det. Miriam Colson).

CAREX DOUGLASII Boott in Hook. "Sedge" (Cyperaceae). Occasional along Church Ditch, an intermittent stream. IND PER. June-July. 166.

CAREX EMORYI Dewey in Torr. "Sedge" (Cyperaceae). Infrequent along permanently wet banks of spring-fed drainages. IND PER. June-July.

[Carex filifolia.] We suspect that this report refers to Carex oreocharis.

CAREX HELIOPHILA Mack. "Sedge" (Cyperaceae). Common on well-drained slopes, one of the earliest species to flower, and one of the few species typically occurring on rather dry ground. IND PER. June-July. 145.

CAREX HYSTRICINA Muehl. "Bottle-brush Sedge" (Cyperaceae). Frequent along banks of ponds and streams. IND(?) PER. June-July. 152.

CAREX INTERIOR L. H. Bailey. "Sedge" (Cyperaceae). Common in permanently wet soils in gulches. IND PER. June-July. 118, 150.

CAREX LANUGINOSA Michx. "Sedge" (Cyperaceae). Frequent in permanently moist soils in the gulches. IND PER. June-July. Forming swards in wet ground.

CAREX NEBRASKENSIS Dewey. "Sedge" (Cyperaceae). Common along streams and spring-fed rivulets and forming the dominant cover of such areas. Even early in the season the species is easily recognized by its glaucous spears of leaf-blades. Later the species forms continuous swales. IND PER. June-July. 125, 71.

CAREX OREOCHARIS Holm. "Sedge" (Cyperaceae). Common on well-drained slopes. IND PER. June-July. This sedge has a curious distribution, occurring on the outwash pediments of the outer foothills and recurring again in morainal soils in the subalpine parks at much higher altitudes. It seems to be nowhere abundant except locally on such sites. 153, 158.

CAREX PRAEGRACILIS Boott. "Sedge" (Cyperaceae). Common in permanently moist ground in the valley bottoms. IND PER. June-July. 117, 163.

CAREX SCOPARIA Schkuhr. "Sedge" (Cyperaceae). Frequent on banks of streams. IND PER. June-July. 237.

CAREX SIMULATA Mack. "Sedge" (Cyperaceae). Infrequent or rare, but forming sizeable stands in permanently wet soils of valley bottoms (100 yards SE of barn in Sec. 3). IND PER. June-July. 220, 149.

CAREX STENOPHYLLA Wahlenb. ssp. ELEOCHARIS (L.H. Bailey) Hulten. "Sedge" (Cyperaceae). Frequent on rather dry slopes. IND PER. June-July. 207, 303.

CAREX STIPATA Muehl. "Sedge" (Cyperaceae). Frequent along banks of streams in permanently wet soils. IND PER. June-July. 235.

CAREX UTRICULATA Boott. "Sedge" (Cyperaceae). Frequent in wet ground in valleys. IND PER. June-July. This evidently represents an extreme low-altitude occurrence of a plant that is characteristic of montane and subalpine pond-shores. 162.

CASTILLEJA INTEGRA Gray. "Orange Paintbrush" (Scrophulariaceae). Infrequent on well-drained slopes of SE corner of site. This is about the northernmost locality for the species. This is another species that has two altitudinal phases, on the pediments of the outer foothills and in the morainal soils of the mountain parks. IND PER. June. 138.

CASTILLEJA SESSILIFLORA Pursh. "Plains Paintbrush" (Scrophulariaceae). Common in early springtime on the higher parts of the rocky pediment. IND PER. May-June. 21.

CENCHRUS LONGISPINUS (Hack. in Kneuck.) Fern. "Sand Bur" (Gramineae). Common weed of disturbed soil. IND PER. August-September. 378.

CERASTIUM ARVENSE L. "Field Mouse-ear" (Caryophyllaceae). Common in the meadows of the valleys. IND PER. May-June. 74.

CERASTIUM FONTANUM Baumg. "Mouse-ear" (Caryophyllaceae). Infrequent weed in grassy meadows. ADV PER. June-July. 254.

CERASTIUM NUTANS Raf. var. BRACHYPODUM Engelm. "Mouse-ear" (Caryophyllaceae). Common in slight depressions moist in early springtime on the rocky pediment. IND AN. May-June. 52.

[Cercocarpus montanus.] We did not find this conspicuous shrub and feel obliged to doubt the report.

CHAMAESYCE GLYPTOSPERMA (Engelm.) Small. "Thyme-leaved Spurge"

(Euphorbiaceae). Common along roadsides in sandy soil. IND AN. July-August. 291.

CHENOPODIUM ALBUM L. "Common Pigweed" (Chenopodiaceae). Common weed in disturbed ground. ADV AN. June-August. 271.

CHENOPODIUM BOTRYS L. "Jerusalem-oak" (Chenopodiaceae). Common weed in disturbed ground. ADV AN. June-August. 370.

CHENOPODIUM LEPTOPHYLLUM (Moq.) Wats. "Narrow-leaved Goose-foot" (Chenopodiaceae). Common in disturbed ground. IND AN. June-August. 273, 299.

[Chrysopsis villosa.] This is the same as Heterotheca villosa.

[Chrysothamnus nauseosus pinifolius.] We do not believe that we could have overlooked this conspicuous shrub, and we suggest that this report was possibly based on a misidentification of Gutierrezia sarothrae.

CICHORIUM INTYBUS L. "Chicory" (Compositae). Frequent in meadows and along roadsides and firebreaks. ADV PER. July-August. 318.

CIRSIUM ARVENSE (L.) Scop. "Canada Thistle" (Compositae). Frequent, forming dense stands in moist meadows. ADV. PER. July-August. 330.

CIRSIUM OCHROCENTRUM Gray. "Thistle." Common on pediment and ridge-tops. IND BIEN. June-July. We have not previously recognized this species in the Front Range area having confused it with the more common C. undulatum. C. ochrocentrum differs from C. undulatum in having somewhat longer spines of the phyllaries (5-10 mm) and stouter spines, wider at the base, with less of a tendency for these to turn and twist. The phyllaries themselves appear to be somewhat wider. 182.

CIRSIUM UNDULATUM (Nutt.) Spreng. "Wavy-leaved Thistle" (Compositae). Frequent in well-drained sites. IND BIEN. June-July. 300.

CLEMATIS LIGUSTICIFOLIA Nutt. "Western Virgin's-bower" (Ranunculaceae). Frequent in ravine bottoms in Sec. 3. IND, woody vine. June-July. 284.

COLLINSIA PARVIFLORA Lindl. "Baby-blue-eyes" (Scrophulariaceae). Frequent in early springtime on N-facing steep slopes in NW corner of site. IND AN. May-June. 6.

COLLOMIA LINEARIS Nutt. "Collomia" (Polemoniaceae). Common on well-drained slopes and rocky pediment. IND AN. May-June. 18, 27.

COMANDRA UMBELLATA (L.) Nutt. "Bastard Toadflax" (Santalaceae). Frequent on rocky slopes. IND PER. A semi-autotrophic root-parasite. May-June. 36, 185.

CONVOLVULUS ARVENSIS L. "Bindweed; Creeping-Jenny" (Convolvulaceae). Common along fencerows, near buildings, and in disturbed areas. ADV PER. June-July. 96.

CORYPHANTHA MISSOURIENSIS (Sweet) Britt. and Rose. "Nipple Cactus" (Cactaceae). Common on well-drained slopes, but very inconspicuous. IND PER. June. 131.

CRATAEGUS ERYTHROPODA Ashe, "Hawthorn" (Rosaceae). Abundant on slopes of ravines in Sec. 3. IND shrub. May-June. 2.

CREPIS OCCIDENTALIS Nutt. "Hawksbeard" (Compositae). Frequent on well-drained slopes of valleys. IND PER. May-July. 133.

CREPIS RUNCINATA T. and G. "Hawksbeard" (Compositae). Common on rocky pediment and in meadows of valleys in seasonally wet ground. IND PER. May-June. 103, 148.

CUSCUTA APPROXIMATA Bab. "Dodder" (Convolvulaceae). Infrequent, parasitic on various herbaceous hosts, on slopes of ravines, Sec. 3. IND AN. July-August. 342.

CYNOGLOSSUM OFFICINALE L. "Hound's-tongue" (Boraginaceae). Abundant near apple orchard S of plant. ADV BIEN. June. 126.

[Cyperus filiculmis.] We doubt that this species occurs in the area, but in the absence of a voucher specimen, we cannot guess what other species might have been mistaken for it.

DACTYLIS GLOMERATA L. "Orchard Grass" (Gramineae). Abundant in moist soil along streams. ADV PER. June-July. 195.

DALEA CANDIDA Willd. "Prairie-clover" (Leguminosae). Frequent on slopes of drainage valleys. IND PER. June. 176.

DALEA PURPUREA Vent. "Prairie-clover" (Leguminosae). Abundant on the rocky pediment and on well-drained slopes. IND PER. June-July. 260.

DELPHINIUM NELSONII Greene. "Larkspur" (Ranunculaceae). Abundant on rocky pediment and valley slopes. IND PER. May-June. 38.

- DELPHINIUM VIRESCENS Nutt. "Plains Larkspur" (Ranunculaceae).
Infrequent in meadows S of plant. IND PER. June-July. 241.
- DESCURAINIA PINNATA (Walt.) Britt. "Tansy Mustard" (Cruciferae).
Abundant weed in disturbed ground. IND AN. May-June. 99.
- DESCURAINIA SOPHIA (L.) Webb. "Tansy Mustard" (Cruciferae). Abun-
dant weed in disturbed ground. ADV AN. May-June. 17.
- DODECATHEON PULCHELLUM (Raf.) Merrill. "Shooting-star" (Primulaceae).
Common in valley meadows. IND PER. June. 110.
- DYSSODIA PAPPOSA (Vent.) Hitchc. "Fetid Marigold" (Compositae).
Abundant weed in disturbed ground. IND AN. July-September. 349, 367.
- ECHINOCEREUS VIRIDIFLORUS Engelm. "Hen-and-chickens" (Cactaceae).
The most abundant small barrel cactus of well-drained slopes and pediment.
IND PER. June. 132.
- ECHINOCHLOA CRUS-GALLI (L.) P. Beauv. "Barnyard Grass" (Gramineae).
Locally abundant near ranch buildings, Sec. 3. ADV. AN. July-September. 356.
- ELEOCHARIS COLORADOENSIS (Britt.) Gilly. "Spike-rush" (Cyperaceae).
Occasional along intermittent "Church Ditch" W of plant. IND PER. June. 170.
- ELEOCHARIS ELLIPTICA Kunth var. COMPRESSA (Sull.) Drap. and Mohl.
"Spike-rush" (Cyperaceae). Frequent along banks of streams. IND PER. June.
57.
- ELEOCHARIS MACROSTACHYA Britt. "Spike-rush" (Cyperaceae). Abundant
along banks of streams. IND PER. May-July. 70, 105.
- ELYMUS CANADENSIS L. "Canada Wild-rye" (Gramineae). Frequent along
roads and firebreaks. IND PER. June-July. 275.
- EPILOBIUM ADENOCaulon Hausskn. "Northern Willow-herb" (Onagraceae).
Common in permanently wet ground, cat-tail association. IND PER. June-August.
252, 380.
- EPILOBIUM PANICULATUM Nutt. "Panicked Willow-herb" (Onagraceae).
Infrequent on well-drained slopes along firebreaks. IND AN. August-September.
389.
- EQUISETUM LAEVIGATUM A. Br. "Scouring-rush" (Equisetaceae). Frequent
in meadows and on valley slopes. IND PER. 94.

ERIGERON CANUS Gray. "Fleabane" (Compositae). Frequent in meadows along Woman Creek. IND PER. June-July. 239.

ERIGERON DIVERGENS T. and G. "Spreading Fleabane" (Compositae). Abundant on well-drained valley slopes. IND AN BIEN. June. 26, 84.

ERIGERON FLAGELLARIS Gray. "Trailing Fleabane" (Compositae). Abundant on valley slopes and on rocky pediment. Two forms occur, one with normal development of ray-flowers and one with vestigial ray-flowers. IND PER. May-July. 201, 84 in part, 240.

ERIGERON PUMILUS Nutt. "Low Daisy" (Compositae). Infrequent on well-drained valley slopes. IND PER. June-July. 204.

[Erigeron speciosus.] This report must represent a misidentification, most likely of Erigeron strigosus.

ERIGERON STRIGOSUS Muehl. "Daisy Fleabane" (Compositae). Abundant along roads and firebreaks. ADV AN BIEN PER. July-August. 350.

ERIOGONUM ALATUM Torr. "Winged Eriogonum" (Polygonaceae). Abundant on the rocky pediment, very conspicuous in fruiting condition because of its tall spire-like inflorescence with dangling three-cornered fruits. IND PER BIEN. July. 297.

ERIOGONUM UMBELLATUM Torr. "Sulphur-flower" (Polygonaceae). Abundant on well-drained slopes and on rocky pediment. IND PER. May-June. 47, 157.

ERODIUM CICUTARIUM (L.) L'Her. "Filaree" (Geraniaceae). Common weed in disturbed ground, probably the earliest plant to blossom in the spring as soon as the soil is warm enough. ADV AN. May-July. 86.

ERYSIMUM ASPERUM (Nutt.) DC. "Western Wallflower" (Cruciferae). Abundant on rocky pediment and on valley slopes. IND BIEN PER. May-June. 20.

[Euphorbia dictyosperma.] We have only found this species outside the site boundary.

EUPHORBIA MARGINATA Pursh. "Snow-on-the-Mountain" (Euphorbiaceae). Common in disturbed soil along firebreaks and roads. IND AN. July-September. 301.

EUPHORBIA ROBUSTA (Engelm.) Small. "Rocky Mountain Spurge"
(Euphorbiaceae). Frequent on the rocky pediment and valley slopes. IND PER.
May-June. 35.

FESTUCA PRATENSIS Huds. "Meadow Fescue" (Gramineae). Common in
the valley meadows. ADV PER. July-August. 331.

FRASERA SPECIOSA Dougl. "Monument Plant" (Gentianaceae). Infrequent
on ridges and well-drained slopes. IND PER. June-July. 227.

GAILLARDIA ARISTATA Pursh. "Blanket-flower" (Compositae). Abundant
on the rocky pediment and valley slopes and meadows. IND PER. June-July. 93.

GALIUM APARINE L. "Cleavers" (Rubiaceae). Abundant under shrubs on
steep slopes of Sec. 3. IND AN. May-June. 7.

GALIUM BOREALE L. "Northern Bedstraw" (Rubiaceae). On rocky slopes
and along streams. IND PER. An unusually low altitude to find this species,
usually a plant of the montane and subalpine zones. June-July. 216.

GAURA COCCINEA Nutt. "Scarlet Gaura" (Onagraceae). Common on rocky
slopes. IND PER. June. 65.

GENTIANA AFFINIS Griseb. Infrequent, collected only along intermittent
"Church Ditch" west of plant. IND PER. July-August. A late-blooming gentian
exhibiting the bimodal distribution pattern involving the subalpine mountain parks
and the outer foothill pediments. 353.

GERANIUM CAESPITOSUM James (G. fremontii of Colorado literature).
"Wild Geranium" (Geraniaceae). Abundant on well-drained slopes. IND PER.
May-July. 12, 224.

GILIA OPHTHALMOIDES Brand ssp. CLOKEYI (Mason) A. and V. Grant.
"Gilia" (Polemoniaceae). Frequent on rocky pediment and dry hillsides. IND AN.
June. 102.

GLYCERIA MAXIMA (Hartm.) Holmboe ssp. GRANDIS (Wats.) Hulten.
"American Manna-grass" (Gramineae). Frequent in wet ground near valley
bottoms. IND PER. July. 312.

GLYCERIA STRIATA (Lam.) Hitchc. "Fowl Manna-grass" (Gramineae).
Frequent in wet soil along valley bottoms. IND PER. May-June. 83.

GLYCYRRHIZA LEPIDOTA (Nutt.) Pursh. "Wild Liquorice" (Leguminosae). Infrequent on hillsides. IND PER. June-July. 286.

GRINDELIA SQUARROSA (Pursh.) Dunal. "Gumweed" (Compositae). Abundant weed in disturbed ground, late-blooming. IND BIEN. July-August. 346.

GUTIERREZIA SAROTHRAE (Pursh.) Britt. and Rusby. "Snakeweed" (Compositae). Abundant and very late-blooming, on the rocky pediment. IND PER. August-September. 384, 371.

HARBOURIA TRACHYPLEURA (Gray) C. and R. "Whiskbroom Parsley" (Umbelliferae). Infrequent on rocky slopes. IND PER. June-July. 217.

HEDEOMA HISPIDUM Pursh. "Pennyroyal" (Labiatae). Frequent on rocky pediment. IND AN. June-July. 229.

HELIANTHUS ANNUUS L. "Common Sunflower" (Compositae). Abundant along roads, firebreaks and in disturbed ground. IND AN. July-August. 270.

[Helianthus petiolaris.] We may have overlooked this species, which is very similar to H. annuus. Both species and hybrids between them occur commonly in the Boulder area.

HELIANTHUS PUMILUS Nutt. "Sunflower" (Compositae). Frequent on well-drained slopes. IND PER. June-July. 202.

HERACLEUM LANATUM Michx. "Cow Parsnip" (Umbelliferae). Occasional, on valley slopes in shrub association above permanent springs. IND BIEN PER. June. 173.

HETEROTHECA VILLOSA (Pursh.) Shinn. "Golden Aster" (Compositae). Abundant on rocky pediment and well-drained valley slopes. IND PER. June-July. 209.

HEUCHERA PARVIFOLIA Nutt. "Alum-root" (Saxifragaceae). Infrequent on slopes of ravines, Sec. 3. IND PER. May-June. 5.

HORDEUM JUBATUM L. "Foxtail Barley" (Gramineae). Abundant in disturbed ground. IND PER. July-September. 379.

HYDROPHYLLUM FENDLERI (Gray) Heller. "Waterleaf" (Hydrophyllaceae). Abundant in moist soils and especially in shaded sites in the valleys. IND PER. May-June. 1.

HYMENOPAPPUS FILIFOLIUS Nutt. (Compositae). Occasional on valley slopes. IND PER. June-July. 198.

HYPERICUM PERFORATUM L. "Klamath Weed" (Hypericaceae). Abundant weed in disturbed ground. Potentially a very dangerous plant (having cost millions of dollars in control in the Pacific Northwest), Klamath weed has infested the Rocky Flats area evidently since the building of the Moffat road. For years, it dominated the flats from Bull Gulch out to the plant site. About 15 years ago, Mr. S. B. Detwiler imported the "Australian Beetle," a biological control specific to the plant, and Klamath weed has been effectively controlled. Control is effected by the adult beetles feeding on the foliage. In some seasons, it is hardly visible. However, recently, with increased development of the foothills for residential sites, Klamath weed has appeared in the Nederland and Sugar Loaf areas but does not seem to have the potential there for infestation that it shows on Rocky Flats. It is strange that the species never spread beyond this small area, some 20,000 acres, in over 50 years. ADV PER. June-July. 257, 50.

IPOMOPSIS SPICATA (Nutt.) V. Grant. "Spike Gilia" (Polemoniaceae). Occasional on rocky, well-drained valley slopes. IND BIEN. June. 120.

IRIS MISSOURIENSIS Nutt. "Wild Iris" (Iridaceae). Abundant in wet meadows. IND PER. June. 111.

JUNCUS ARCTICUS Willd. ssp. *ATER* (Rydb.) Hulten. "Baltic Rush" (Juncaceae). Abundant in flood plain along streams. IND PER. June. 49, 80, 91.

[*Juncus balticus*.] = *Juncus arcticus* ssp. *ater*.

JUNCUS BUFONIUS L. "Toad Rush" (Juncaceae). Infrequent, in very wet ground in pediment depressions and on pond margins, apparently grazed by deer. IND AN. June-September. 398.

JUNCUS DUDLEYI Wieg. "Rush" (Juncaceae). Abundant in at least seasonally saturated ground on the pediment and along streams. IND PER. June-July. 215, 42.

JUNCUS NODOSUS L. "Rush" (Juncaceae). Frequent in wet ground, valley sloughs and ditches. IND PER. July-August. 339.

JUNCUS SAXIMONTANUS A. Nels. "Rush" (Juncaceae). Abundant along streams, Sec. 3. IND PER. June. 214.

JUNCUS SPHAEROCARPUS Nees. "Toad Rush" (Juncaceae). Common but inconspicuous in slight depressions on the pediment where soil moisture is high in springtime. This has not been taken in the Boulder area before. It is similar to J. bufonius but the perianth segments are acute rather than obtuse in mature specimens. ADV AN. June-July. 189, 269, 266.

JUNCUS TORREYI Cov. "Rush" (Juncaceae). Frequent in ditches and the bottoms of gulches, in constantly wet ground. IND PER. July-August. 347.

JUNCUS TRACYI Rydb. "Rush" (Juncaceae). Frequent along valley streams. Another example of montane and subalpine species occurring at an extremely low altitude. IND PER. June-July. 243.

[Kochia iranica.] This is the most abundant ruderal weed in the Boulder area. We did not see it in our inventory, but it probably occurs, most likely in the vicinity of buildings within the security fence.

KOELERIA GRACILIS Pers. "June Grass" (Gramineae). Abundant on well-drained slopes. IND PER. June. 68, 56.

LACTUCA SERRIOLA L. "Prickly Lettuce" (Compositae). Abundant weed in disturbed ground. ADV AN. August-September. 363.

LAPPULA REDOWSKII (Hornem.) Greene. "Beggar's Tick" (Boraginaceae). Occasional on valley slopes. IND AN. May-June. 140.

LATHYRUS EUCOSMUS Butters and St. John. "Pea-vine" (Leguminosae). Common on valley slopes. IND PER. June. 127.

LEMNA MINOR L. "Duckweed" (Lemnaceae). Common floating aquatic on ponds. IND AN PER. May-September. 106.

LEPIDIUM CAMPESTRE (L.) R. Br. "Field Cress" (Cruciferae). Frequent weed in disturbed ground. ADV AN. June. 167.

[Lepidium densiflorum.] This undoubtedly occurs as a weed in the area, possibly within the plant enclosure. We did not see it in the area which we covered.

LESQUERELLA MONTANA (Gray) Wats. "Mountain Bladder-Pod" (Cruciferae). Abundant on the rocky pediment. IND PER. May-June. 22.

LEUCANTHEMUM VULGARE Lam. "Ox-eye Daisy" (Compositae). Infrequent on floodplain of Woman Creek. ADV PER. June-July. 236.

LEUCOCRINUM MONTANUM Nutt. "Sand Lily" (Liliaceae). Abundant in early springtime on well-drained slopes. IND PER. April-June. 134.

LIATRIS PUNCTATA Hook. "Blazing Star" (Compositae). Abundant on the pediment and well-drained valley slopes, especially in disturbed ground. IND PER. August-September. 372.

LINARIA DALMATICA (L.) Mill. "Butter-and-eggs" (Scrophulariaceae). Occasional on valley slopes. This species has appeared in Colorado only in the past fifteen years and now occurs in widely scattered areas on the east and west slopes. ADV (Southeastern Europe) PER. June-July. 208.

LINUM LEWISII Pursh. "Wild Blue Flax" (Linaceae). Common on valley slopes. IND PER. June. 87.

LITHOSPERMUM INCISUM Lehm. "Narrow-leaved Puccoon" (Boraginaceae). Frequent on S-facing slopes. IND PER. May. 401.

LOMATIUM ORIENTALE C. and R. "Salt-and-pepper" (Umbelliferae). Abundant in early springtime on rocky pediment. IND PER. April-June. 31, 40.

LUPINUS ARGENTEUS Pursh. "Lupine" (Leguminosae). Abundant in meadows south of plant. IND PER. June. 123.

LYSIMACHIA CILIATA L. "Fringed Loosestrife" (Primulaceae). Common along ditches. We consider this a relictual species of the midwest, which reached the area along watercourses during the Pleistocene and has persisted locally in mesic sites at the foot of the mountains while the intervening area to the east has been rendered uninhabitable by increasing aridity. IND PER. July-August. 352.

LYTHRUM ALATUM Pursh. "Winged Loosestrife" (Lythraceae). Frequent in moist ground along streams. IND PER. July-August. 329.

MAHONIA REPENS (Lindl.) G. Don. "Oregon-grape" (Berberidaceae). Abundant on slopes of ravines, Sec. 3. IND Shrub. May-June. 10.

MEDICAGO LUPULINA L. "Black Medic" (Leguminosae). Abundant prostrate weed on pediment and slopes. ADV PER. July-August. 320, 248.

MELANDRIUM DIOICUM (L.) Coss. and Germ. "White Champion" (Caryophyllaceae). Occasional in disturbed ground. ADV PER. July-August. 334.

MELANDRIUM DRUMMONDII (Hook.) Hulten. "Campion" (Caryophyllaceae). Frequent on well-drained slopes of gulches. IND PER. July-August. 348.

MELILOTUS ALBA Desr. "White Sweet-clover" (Leguminosae). Abundant in disturbed ground. ADV AN BIEN. June-July. 288.

MELILOTUS OFFICINALIS (L.) Lam. "Yellow Sweet-clover" (Leguminosae). Abundant in disturbed ground along roadsides and firebreaks. ADV AN BIEN. June-July. 95.

MENTHA ARVENSIS L. "Field Mint" (Labiatae). Abundant in wet meadows and around springs. IND PER. July. 313.

MERTENSIA LANCEOLATA (Pursh.) A. DC. "Narrow-leaved Mertensia" (Boraginaceae). Frequent in early spring on well-drained slopes and in meadows. IND PER. May-June. 9.

MIMULUS FLORIBUNDUS Dougl. "Monkey-flower" (Scrophulariaceae). Infrequent and inconspicuous in seasonally wet depressions on the pediment. IND AN. May-June. 54.

MIMULUS GLABRATUS H.B.K. "Smooth Monkey-flower" (Scrophulariaceae). Frequent in perpetually wet muddy soil. IND PER. June-September. 108, 397.

MONARDA FISTULOSA L. "Pink Bergamot" (Labiatae). Abundant in gulches and along roadsides. IND PER. June-July. 283.

MUHLENBERGIA MONTANA (Nutt.) Hitchc. "Mountain Muhly" (Gramineae). Frequent on rocky slopes and pediment. IND PER. August-September. 390.

MUSINEON DIVARICATUM (Pursh.) Raf. "Musineon" (Umbelliferae). Common early spring bloomer on pediment and valley slopes. IND PER. May-June. 142.

MYOSURUS MINIMUS L. "Mousetail" (Ranunculaceae). Rare, in seasonally wet depressions in pediment north of plant and in wet soil south of ranch buildings in Sec. 3. Our first record in the Boulder area, and our only previous records from Denver in 1890's. An extremely easily overlooked species. IND AN. June. 171, 267.

NASTURTIUM OFFICINALE R. Br. (formerly called Rorippa nasturtium-aquaticum [L.] Schinz and Thell.). "Water Cress" (Cruciferae). Abundant in springs and in very wet ground of spring-fed drainages. IND PER. June. 113.

NAVARRETIA MINIMA Nutt. "Navarretia" (Polemoniaceae). Rare, on rocky pediment west of plant. ADV (in our area at least) AN. Our only record of this east of the Continental Divide previously was in a cattle wallow along the mesa trail between Bear Canyon and Eldorado Springs, where it was very abundant in a very small area. June-July. 265.

NEPETA CATARIA L. "Catnip" (Labiatae). Common weed in moist meadows. ADV PER. July-August. 328.

NOTHOCALAIS CUSPIDATA (Pursh.) Greene. "False Dandelion" (Compositae). Frequent in early spring on well-drained slopes. IND PER. May-June. 43.

OENOTHERA BRACHYCARPA Gray. "Yellow Stemless Evening-primrose" (Onagraceae). Frequent on slopes of gulches E and NE of plant, on bare areas. The flowers last only one day, and are yellow when fresh, turning orange-red as they wilt. IND PER. June. 175.

OENOTHERA FLAVA (A. Nels.) Munz. "Evening-primrose" (Onagraceae). Frequent on slopes of gulches E of plant. The flowers are yellow when young, peach-colored with age, and much smaller than the last. IND PER. June. 193.

OENOTHERA STRIGOSA (Rydb.) Mack. and Bush. "Tall Evening-primrose" (Onagraceae). Frequent along firebreaks and roadsides in disturbed ground. IND BIEN. June-July. 255.

ONOSMODIUM MOLLE Michx. var. OCCIDENTALIS (Mack.) Johnston. "False Gromwell" (Boraginaceae). Frequent on slopes of drainage valleys. IND PER. June. 186.

OPUNTIA COMPRESSA (Salisb.) Macbr. "Prickly-pear Cactus" (Cactaceae). Abundant on rocky pediment and well-drained valley slopes. IND PER. June-July. 245.

OPUNTIA FRAGILIS (Nutt.) Haw. "Brittle Cactus" (Cactaceae). Occasional on well-drained slopes. IND PER. June. 139.

OPUNTIA POLYACANTHA Haw. "Starvation Cactus" (Cactaceae). Abundant on rocky pediment and well-drained slopes. IND PER. June. 212.

[Opuntia rafinesquei.] = O. compressa.

OROBANCHE FASCICULATA Nutt. "Clustered Cancer-root" (Orobanchaceae). Frequent on well-drained valley slopes. A root-parasite, commonly attached to

Artemisia frigida. IND AN. May-June. 60.

OXALIS DILLENII Jacq. "Wood-sorrel" (Oxalidaceae). Frequent on banks of streams. IND PER. June. 79.

OXYBAPHUS LINEARIS (Pursh.) Robinson. "Narrow-leaved Umbrella-wort" (Nyctaginaceae). Occasional in valley meadows. IND PER. July. 305, 332.

OXYBAPHUS NYCTAGINEUS (Michx.) Porter and Coulter. "Heart-leaved Umbrella-wort" (Nyctaginaceae). Occasional on valley slopes and in disturbed ground. IND PER. June-July. 287.

OXYTROPIS LAMBERTII Pursh. "Colorado Loco" (Leguminosae). Abundant on rocky pediment. IND PER. May-June. 46.

PANICUM CAPILLARE L. "Witchgrass" (Gramineae). Frequent on disturbed ground E of plant. IND PER. August-September. 386.

PANICUM OLIGOSANTHES Schult. "Panic-grass" (Gramineae). Frequent along streams, especially near rock outcroppings. IND PER. June-July. 234.

PANICUM PERLONGUM Nash. "Panic-grass" (Gramineae). Rare, just S of railroad tracks W of plant. IND PER. August-September. 395.

PANICUM VIRGATUM L. "Switchgrass" (Gramineae). Abundant in gulches valley slopes and along ditches which traverse the pediment. IND PER. August-September. 391, 344.

PARONYCHIA JAMESII T. and G. "Nailwort" (Caryophyllaceae). Abundant on rocky pediment. IND PER. June-July. 51, 298.

PEDIOCACTUS SIMPSONII (Engelm.) Britt. and Rose. "Mountain Ball Cactus" (Cactaceae). Occasional on well-drained valley slopes. IND PER. June. 172.

[Penstemon angustifolius.] We suspect this report to be a misidentification of Penstemon virgatus ssp. asagrayi.

PENSTEMON VIRENS Pennell. "Penstemon" (Scrophulariaceae). Abundant on well-drained pediment. IND PER. May-June. 24, 44.

PENSTEMON VIRGATUS Gray ssp. ASA-GRAYI Crosswhite. "One-sided Penstemon" (Scrophulariaceae). Locally abundant on well-drained rocky slopes. IND PER. June. 119, 251.

PERSICARIA LAPATHIFOLIA (L.) S.F. Gray. "Smartweed" (Polygonaceae).

Infrequent in wet ground in valleys N of plant. ADV AN. July-August. 316.

PERSICARIA MACULATA (Raf.) S. F. Gray. "Lady's Thumb" (Polygonaceae). Frequent in wet ground, valley bottoms. ADV AN. July-August. 360, 337.

[*Petalostemon purpureus*.] = *Dalea purpurea*.

PHACELIA HETEROPHYLLA Pursh. "Scorpion Weed" (Hydrophyllaceae). Abundant in disturbed ground, especially along roadsides and firebreaks. IND PER. May-June. 33.

PHLEUM PRATENSE L. "Timothy" (Gramineae). Common in valley meadows, introduced as a pasture grass. ADV PER. June-July. 244.

PHYLA CUNEIFOLIA (Torr.) Greene "Fog-fruit" (Verbenaceae). Abundant in pediment depressions seasonally wet, along pond margins and other seasonally moist sites. IND PER. July-August. 268.

PHYSALIS LOBATA Torr. "Purple-flowered Ground-cherry" (Solanaceae). Occasional on slopes. IND PER. June-July. 211.

PHYSALIS VIRGINIANA Mill. "Ground-cherry" (Solanaceae). Occasional along firebreak near southern border of site. IND PER. June-July. 253.

PHYSOCARPUS MONOGYNUS (Torr.) Coult. "Ninebark" (Rosaceae). Infrequent on steep N-facing slopes, Sec. 3. IND shrub. June. 225.

PINUS PONDEROSA Laws. var. SCOPULORUM Engelm. "Ponderosa Pine" (Pinaceae). Frequent on and below ridges N of plant site. IND tree. 402.

PLANTAGO LANCEOLATA L. "English Plantain" (Plantaginaceae). Abundant weed in disturbed soil. ADV BIEN PER. May-June. 98.

PLANTAGO PATAGONICA Jacq. "Woolly Plantain" (Plantaginaceae). Common on dry, level sites on the pediment. IND AN. June. 228.

POA CANBYI (Scribn.) Piper. "Blue-grass" (Gramineae). Common on rocky pediment. IND PER. June-July. 194, 41.

POA COMPRESSA L. "Canada Blue-grass" (Gramineae). Abundant on rocky pediment and valley meadows. IND PER. May-July. 58, 324, 258.

PODOSPERMUM LACINIATUM (L.) DC. (Compositae). Frequent on well-drained valley slopes. This is another southeastern European weed that appeared in the area about a decade ago and has "exploded" over the Boulder area after a few years of relative quiescence. It is one of the most abundant weeds of early spring and summer all over the Boulder Valley. ADV BIEN PER.

May-June. 63.

POLYGONUM DOUGLASII Greene. "Knotweed" (Polygonaceae). Occasional on well-drained sites, pediment, and valley slopes. IND AN. June-July. 261.

POLYPOGON MONSPELIENSIS (L.) Desf. "Rabbitfoot Grass" (Gramineae). Abundant in seasonally saturated ground near farm buildings, Sec. 3. ADV AN. July-August. 364, 338.

POPULUS SARGENTII Dode. "Plains Cottonwood" (Salicaceae). Frequent along streams and pond margins. IND tree. May-June. 72.

POTAMOGETON NATANS L. "Pondweed" (Potamogetonaceae). Abundant aquatic in ponds. IND PER. July. 309.

POTENTILLA FISSA Nutt. "Sticky Cinquefoil" (Rosaceae). Abundant near streams and ditches. IND PER. May-June. 30.

POTENTILLA GRACILIS Dougl. ex Hook. "Cinquefoil" (Rosaceae). Occasional on valley slopes. IND PER. June. 221.

POTENTILLA HIPPIANA Lehm. "Woolly Cinquefoil" (Rosaceae). Occasional in meadows. IND PER. June. 165.

PRUNELLA VULGARIS L. "Self-heal; Heal-ail" (Labiatae). Common on banks bordering streams and on floodplains. IND PER. June-July. 233.

PRUNUS AMERICANA Marsh. "Wild Plum" (Rosaceae). Frequent on steep N-facing slopes in Sec. 3. IND shrub. May-June. 285.

PRUNUS VIRGINIANA L. var. MELANOCARPA (A. Nels.) Sarg. "Choke-cherry" (Rosaceae). Frequent on steep N-facing slopes, Sec. 3. IND shrub. May-June. 4.

PSORALEA TENUIFLORA Pursh. (Leguminosae). Abundant on rocky pediment and valley slopes and meadows. IND PER. June-July. 231.

PYRUS MALUS L. "Apple" (Rosaceae). In meadows S of plant and near farm buildings in Sec. 3. Residual from former cultivation. ADV tree. May. 403.

RANUNCULUS AQUATILIS L. "Water Crowfoot" (Ranunculaceae). Frequent aquatic in ponds. IND PER. June. 154.

[Ranunculus glaberrimus.] We do not believe this occurs on the site,

but have no idea what other species might be meant.

RANUNCULUS MACOUNII Britt. "Buttercup" (Ranunculaceae). Frequent in very wet ground along streams, spring drainages and on pond margins. IND PER. May-June. 109, 160.

RATIBIDA COLUMNIFERA (Nutt.) Woot. and Standl. "Prairie Cone-flower" (Compositae). Frequent on well-drained slopes and rocky pediment. IND PER. July-August. 294, 307, 279.

RHUS TRILOBATA Nutt. "Skunkbrush" (Anacardiaceae). Frequent on steep ravine slopes, Sec. 3. IND shrub. May-June. 3.

RIBES AUREUM Pursh. "Golden Currant" (Grossulariaceae). Frequent in shrubby association in the bottoms of ravines, Sec. 3. IND shrub. May-June. 15.

[Rorippa islandica.] The report undoubtedly refers to Rorippa palustris ssp. hispida.

RORIPPA PALUSTRIS (L.) Besser ssp. HISPIDA (Desv.) Jonsell. "Yellow-cress" (Cruciferae). Occasional along streambanks and pond margins. IND AN BIEN. June. 205.

ROSA ARKANSANA Porter. "Wild Prairie Rose" (Rosaceae). Frequent on rocky pediment and well-drained valley slopes. IND shrub. June-July. 193.

RUBUS IDAEUS L. var. STRIGOSUS (Michx.) Maxim. "Wild Raspberry" (Rosaceae). Infrequent along streambanks. IND shrub. June. 168.

RUDBECKIA HIRTA L. "Black-eyed Susan" (Compositae). Frequent in valley meadows near streams. IND PER. June-July. 232.

RUDBECKIA LACINIATA L. var. AMPLA (A. Nels.) Cronquist. "Tall Cone-flower" (Compositae). Common along streams in permanently wet ground. IND PER. July-August. 322.

RUMEX ACETOSELLA L. "Sheep Sorrel" (Polygonaceae). Common in disturbed ground, especially roadsides. ADV PER. May-July. 78.

RUMEX CRISPUS L. "Curly Dock" (Polygonaceae). Common weedy species in disturbed soil. ADV PER. June-August. 200.

RUMEX SALICIFOLIUS Weinm. ssp. TRIANGULIVALVIS Danser. "Willow Dock" (Polygonaceae). Common weedy species in disturbed soil. IND PER. June-August. 361.

[Sagittaria cuneata.] We found only S. latifolia, but it is entirely possible that S. cuneata occurs on the site, since they frequently inhabit the same areas; they are only distinguishable on examination of mature fruit.

SAGITTARIA LATIFOLIA Willd. "Arrowhead" (Alismaceae). Frequent in very wet ground or in shallow water along pond margins. IND PER. July-August. 336, 311.

SALIX AMYGDALOIDES Anderss. "Peach-leaved Willow" (Salicaceae). Occasional along streambanks. IND tree. May-June. 77.

SALIX EXIGUA Nutt. "Sand-bar Willow" (Salicaceae). Frequent along streambanks. IND shrub. May-June. 73.

SALIX INTERIOR Rowlee. "Sand-bar Willow" (Salicaceae). Common along streams and gulch bottoms. IND shrub. May-June. 180.

SALIX LIGULIFOLIA (Ball) Ball. "Willow" (Salicaceae). Infrequent along streambanks. IND shrub. June. 169.

[Salsola kali tenuiflora.] This is the common "Russian Thistle," Salsola iberica Sennen and Pau. It must be present on the area and we are at a loss to know why we overlooked it.

SALVIA REFLEXA Hornem. "Lance-leaved Sage" (Labiatae). Frequent weedy species in disturbed soil. IND AN. July-August. 369.

SCHEDONNARDUS PANICULATUS (Nutt.) Trel. "Tumble-grass" (Gramineae). Frequent on rocky pediment in disturbed ground. IND AN. August-September. 387.

SCHIZACHYRIUM SCOPARIUM (Michx.) Nash (Andropogon scoparius of older treatments). "Little Blue-stem" (Gramineae). Frequent on well-drained slopes and in disturbed soil of pediment. A relictual species of the westernmost Pleistocene extension of the mid-grass prairie element. IND PER. August-September. 382.

SCIRPUS ACUTUS Muehl. "Bulrush; Tule" (Cyperaceae). Frequent along spring drainages and streams, always with its "feet in the water." IND PER. June-July. 116.

SCIRPUS AMERICANUS Pers. "Three-square" (Cyperaceae). Frequent along streams and rivulets in very wet soil. IND PER. June-July. 250.

SCIRPUS LACUSTRIS L. ssp. VALIDUS (Vahl) Koyama. "Bulrush; Tule" (Cyperaceae). Occasional along streams. IND PER. June. 135.

[Scirpus microcarpus.] = Scirpus pallidus.

SCIRPUS PALLIDUS (Britt.) Fern. (Cyperaceae). Frequent along streams. IND PER. July-August. 323.

SCROPHULARIA LANCEOLATA Pursh. "Figwort" (Scrophulariaceae). Frequent in shrub association on slopes of ravines and in gulches. IND PER. May-June. 13.

SCUTELLARIA BRITTONII Porter. "Skullcap" (Labiatae). Occasional on rocky pediment. IND PER. June. 179.

SECALE CEREALE L. "Rye" (Gramineae). Recently introduced along Walnut Creek around "holding ponds," Sec. 11. ADV AN. June-July.

SEDUM LANCEOLATUM Torr. "Stonecrop" (Crassulaceae). Common on rocky pediment and well-drained slopes. IND PER. June. 156.

[Senecio atratus.] This is a species of scree slopes in the subalpine zone and hardly would be expected to occur on the site. Very likely this was a misidentification of Senecio integerrimus.

SENECIO INTEGERRIMUS Nutt. "Butterweed" (Compositae). Common in valley meadows. IND PER. June. 115, 137.

SENECIO PLATTENSIS Nutt. "Butterweed" (Compositae). Frequent in valley meadows. IND PER. May-July. 29.

SENECIO SPARTIOIDES T. and G. "Broom Ragwort" (Compositae). Common on well-drained slopes and rocky pediment. IND PER. August-September. 373, 383.

SETARIA VIRIDIS (L.) P. Beauv. "Green Bristle-grass" (Gramineae). Frequent weed in valley meadows. ADV AN. July. 333.

SILENE ANTIRRHINA L. "Sleepy Catchfly" (Caryophyllaceae). Frequent on well-drained valley slopes. ADV AN. June. 89.

SISYMBRIUM ALTISSIMUM L. "Jim Hill Mustard" (Cruciferae). Abundant weedy species in disturbed soil. ADV AN. May-July. 210, 246.

SISYRINCHIUM MONTANUM Greene. "Blue-eyed-grass" (Iridaceae). Frequent in valley meadows in moist ground. IND PER. June. 75.

[Sitanion hystrix.] = Sitanion longifolium.

SITANION LONGIFOLIUM J. G. Smith. "Squirrel-tail" (Gramineae).
Bundant on well-drained slopes and pediment. IND PER. June-July. 61, 280.

SMILACINA STELLATA (L.) Desf. "False Solomon's Seal" (Liliaceae).
Frequent in shrub association on N-facing slopes of gulches. IND PER. Late
June-July. 223.

[Solanum eleagnifolium.] We do not doubt this report. The plant could
occur very sporadically in waste ground, but we did not see it.

SOLANUM ROSTRATUM Dunal. "Buffalo Bur" (Solanaceae). Occasional
in disturbed ground. ADV (here at least) AN. Late June-July. 290.

[Solidago ciliosa.] Highly unlikely for Rocky Flats and probably based
on a misidentification of Solidago missouriensis.

SOLIDAGO MISSOURIENSIS Nutt. "Smooth Goldenrod" (Compositae).
Frequent in valley meadows. IND PER. July-August. 326.

SOLIDAGO MOLLIS Bartl. "Goldenrod" (Compositae). Occasional on
rocky pediment. IND PER. August-September. 394.

SPARTINA PECTINATA Link. "Prairie Cordgrass" (Gramineae). Frequent,
forming swales in wet ground along streams. IND PER. July-August. 319.

SPHAERALCEA COCCINEA (Pursh.) Rydb. "Copper Mallow" (Malvaceae).
Abundant on rocky pediment and well-drained slopes. IND PER. June. 76.

SPOROBOLUS CRYPTANDRUS (Torr.) Gray. "Sand Dropseed" (Gramineae).
Frequent on level pediment east of plant in sandy, disturbed soil. IND PER.
August-September. 381.

SPOROBOLUS HETEROLEPIS Gray. "Prairie Dropseed" (Gramineae).
Frequent along railroad right-of-way W of plant, pediment, and on slopes of
gulches. An indicator of relictual mid-grass prairie. IND PER. August-September.
392, 343.

STELLARIA LONGIFOLIA Muehl. "Long-leaved Stitchwort" (Caryophyl-
laceae). Occasional in valley meadows. IND PER. June. 155.

STEPHANOMERIA PAUCIFLORA (Torr.) Nees. "Wire-lettuce" (Compositae).
Occasional on south-facing valley slopes. IND PER. July. 289.

[Stipa comata Trin.] This species should be in the area, but we did not
find it in our survey. We see no reason to doubt the report.

[Stipa neomexicana.] This species should be in the area, and it is very dis-
tinctive, but we did not find it in our survey. We see no reason to doubt the report.

STIPA VIRIDULA Trin. "Green Needle-grass" (Gramineae). Common on well-drained rocky slopes and pediment. IND PER. June-July. 184, 203.

SYMPHORICARPOS OCCIDENTALIS Hook. "Snowberry; Buckbrush" (Caprifoliaceae). Abundant on valley slopes throughout site, forming closed stands. IND shrub. July. 308.

SYMPHORICARPOS OREOPHILUS Gray. "Snowberry; Buckbrush" (Caprifoliaceae). Common on steep north-facing slopes in shrub association, Sec. 3. IND shrub. Late June-July. 278.

TALINUM PARVIFLORUM Nutt. "Fame-flower" (Portulacaceae). Common on rocky pediment only. IND PER. June-July. 263.

TARAXACUM OFFICINALE Web. in Wiggers. "Common Dandelion" (Compositae). Common weed in disturbed ground and meadows. ADV PER. May-September. 159.

THELESERMA MEGAPOTAMICUM (Spreng.) Kuntze. "Green-thread" (Compositae). Occasional on pediment, Sec. 2. IND PER. August. 374.

THERMOPSIS DIVARICARPA A. Nels. "Golden Banner" (Leguminosae). Abundant on valley slopes and meadow associations and on rocky pediment. IND PER. May-June. 97, 16.

[Thlaspi alpestre.] = Thlaspi montanum L. "Candytuft" (Cruciferae). T. alpestre is restricted to Eurasia, although the name has been used until recently for the latter. We do not doubt the report, but we did not find this in our survey.

THLASPI ARVENSE L. "Penny Cress" (Cruciferae). Common weed of cultivated or disturbed ground. ADV AN. May-June. 14.

TINIARIA CONVULVULUS (L.) Webb and Moq. (Bilderdykia convolvulus [L.] Dum.). "Black Bindweed" (Polygonaceae). Frequent in cultivated or disturbed ground, firebreaks, etc. ADV AN. July-August. 296, 306.

TOWNSENDIA GRANDIFLORA Nutt. "Easter Daisy" (Compositae). Frequent on rocky pediment and north-facing slopes. IND BIEN. May-June. 178.

TOWNSENDIA HOOKERI Beaman. "Easter Daisy" (Compositae). Frequent on valley slopes and pediment. IND PER. April-May.

TOXICODENDRON RYDBERGII (Small ex Rydb.) Greene. "Poison Ivy" (Anacardiaceae). Infrequent on N-facing slopes in Sec. 3. IND PER. June-July. 409.

TRADESCANTIA OCCIDENTALIS (Britt.) Smyth. "Spiderwort" (Compositae). Frequent on valley slopes. IND PER. May-June. 64.

TRAGOPOGON DUBIUS Scop. "Salsify" (Compositae). Abundant on valley slopes and in meadows; also frequent on disturbed pediment. ADV BIEN PER. May-June. 45.

TRAGOPOGON PORRIFOLIUS L. "Purple Salsify" (Compositae). Occasional on valley slopes. ADV BIEN PER. June. 249.

TRIFOLIUM HYBRIDUM L. "Alsike Clover" (Leguminosae). Occasional in valley meadows. Cultivated in pasture mixes. ADV PER. June-August. 355b.

TRIFOLIUM PRATENSE L. "Red Clover" (Leguminosae). Frequent in valley meadows. Cultivated in pasture mixes. ADV PER. June-August. 355a, 247.

TYPHA LATIFOLIA L. "Broad-leaved Cat-tail" (Typhaceae). Frequent along streams and pond margins. IND. June-July.

VACCARIA PYRAMIDATA Medic. "Cow Cockle" (Caryophyllaceae). Occasional on gentle valley slopes. ADV AN. July. 304.

VERBASCUM BLATTARIA L. "Moth Mullein" (Scrophulariaceae). Occasional in meadows south of plant. ADV BIEN. July. 327.

VERBASCUM THAPSUS L. "Great Mullein" (Scrophulariaceae). Common weed in disturbed ground. ADV BIEN. June-July. 124.

VERBENA BRACTEATA Lag. and Rodr. "Prostrate Vervain" (Verbenaceae). Common weedy species in disturbed ground, roadsides, and firebreaks. ADV AN. June-August. 222, 385, 85.

VERBENA HASTATA L. "Blue Vervain" (Verbenaceae). Occasional in permanently moist ground, valley bottoms. IND PER. June-August. 281.

[Veronica americana.] Probably a misidentification of V. anagallis-aquatica, although there is no reason why it could not occur here.

VERONICA ANAGALLIS-AQUATICA L. "Water Speedwell" (Scrophulariaceae). Frequent in permanently wet ground, valley bottoms. ADV PER. June. 107.

VERONICA PEREGRINA L. "Purslane Speedwell" (Scrophulariaceae). Frequent in seasonally wet ground, depressions in pediment. ADV AN. May-June. 53.

VICIA AMERICANA Muehl. "Common Vetch" (Leguminosae). Frequent on valley slopes and meadows. The rust fungus frequently infesting the leaves is Acromyces coloradensis Ell. et Ev. (det. W. G. Solheim). IND PER. June. 104.

VIOLA CANADENSIS L. "White Violet" (Violaceae). Frequent on steep N-facing slopes, Sec. 3. IND PER. May-June. 8.

VIOLA NUTTALLII Pursh. "Yellow Violet" (Violaceae). Occasional on valley slopes and in meadows. IND PER. June. 141.

VULPIA OCTOFLORA (Walt.) Rydb. "Six-weeks Fescue" (Gramineae). Common in disturbed soil and well-drained slopes. IND AN. June-July. 230.

XANTHIUM STRUMARIUM L. "Cocklebur" (Compositae). Frequent along irrigation ditches and in disturbed ground. ADV AN. July-August. 351.

YUCCA GLAUCA Nutt. "Spanish Bayonet" (Liliaceae). Common on rocky pediment and dry slopes. IND shrub. June-July. 226.

ZIGADENUS VENENOSUS Wats. var. GRAMINEUS (Rydb.) Walsh ex Peck. "Death Camas" (Liliaceae). Occasional in moist meadows south of plant. IND PER. June. 112.

LICHENS AND BRYOPHYTES

Rocky Flats provides an extremely marginal habitat for lichens and bryophytes. The level pediment, scoured as it is by blowing gravel and sand particles, bone-dry in the summer and too often snow-free in the winter, lacking in sites protected from wind or sun, can support only the most meagre covering of pioneering soil lichens and mosses. The shrub cover is too scattered to provide protection and screening of one shrub by another, so the lichens and bryophytes that do occur on shrubs are extremely rare and are to be found only as the meagrest remnants on the leeward side of branches or in the most protected sites on the base of the trunks near the ground level. Lichens and mosses are found on the largest boulders on the slopes of the gulches, but the representation in species is a mere echo of the rich assemblage that would be found on the same kinds of rocks lying a few miles to the west in the protection of the

mountain escarpment. Topographical and lithological diversity is essential to the development and maintenance of a rich lichen and bryophyte flora, but on the Rocky Flats, the only places where any semblance of this is provided is on the north-facing slopes of the few drainage gulches. A few bryophytes that are typically associated with wet ground persist in the lowest-lying areas of the stream-bottoms and on the margins of springs, where they are active during the early months of spring before these areas become choked with taller vegetation.

There are no bryophytes or lichens that are especially characteristic of the Rocky Flats site. Most of the species are types that represent vestiges of the vegetation that once occurred in the area before it was deforested and opened to the continuous ravages of the winter winds and intense summer heat. The remainder represent common floodplain species of the surrounding piedmont valleys. There are not enough lichens or bryophytes on the site to permit one to utilize any members of these groups in future studies of environmental impact.

LICHENS [25 Species]

ACAROSPORA FUSCATA (Schrader) Arn. Sec. 3; on ridge S of ranch buildings; on exposed faces of small rocks and in joint cracks in the rock. L-59089, 59091.

ASPICILIA CAESIOCINEREA (Nyl.) Arn. Sec. 3; along rocky ridgetop, on siliceous rock. L-59105.

CALOPLACA LAMPROCHEILA (DC.) Flag. Sec. 3; on sandstone on slopes of ravine. L-59095.

CANDELARIELLA ROSULANS Muell.-Arg. Common on soil in cracks of rocks larger than 15 cm. diameter. L-59080.

CLADONIA PYXIDATA (L.) Fr. High level pediment along southern boundary of site; forming crusts on soil, very abundant. L-59079; Sec. 3, ridge S of farm buildings; on soil between rocks. L-59086.

DERMATOCARPON LACHNEUM (Ach.) A. L. Sm. Forming crusts on soil W of factory. L-59081.

DIMELAENA OREINA Norm. Sec. 3; on ridge S of farm buildings, on small rocks. L-59090.

DIPLOSCHISTES SCRUPOSUS (Schreb.) Norm. Sec. 3; on N-facing slope of ridge S of farm buildings; on soil. L-59085.

LECANORA CHRYSOLEUCA (Sm.) Ach. Sec. 15, S of Woman Creek; on sides of rocks. L-59087.

LECANORA MURALIS (Schreb.) Rabenh. Sec. 15, W boundary of site S of railroad tracks; on rock. L-59103.

LECIDEA AURICULATA Th. Fr. Sec. 3, ridge S of farm buildings; on siliceous rocks. L-59088.

PARMELIA EXASPERATULA (Ach.) Nyl. Sec. 3; slopes of ravine, on bark of Crataegus. L-59099.

PARMELIA SUBDECIPIENS Vain. ex Lynge. Sec. 3; on S-facing slope of ravine, on sandstone. L-59083.

PARMELIA SUBRAMIGERA Gyel. Sec. 3; ridge N of farm buildings, on granite. L-59093.

PARMELIA ULOPHYLLODES (Vain.) Savicz. Sec. 3; on N-facing slope of ravine; on bark of Crataegus. L-59101.

PARMELIA (Xanthoparmelia) indet. Sec. 3; on rocks of ridgetop S of farm, and on slope of ravine. L-59092, 59102.

PELTIGERA CANINA (L.) Willd. var. RUFESCENS (Weiss) Mudd. On soil over rock in high level ground S of Church Ditch. L-59078.

PHYSCIA ORBICULARIS (Neck.) Poetsch. Sec. 3; near farm buildings, on bark of Populus. L-59084.

PHYSCIA CAESIA (Hoffm.) Hampe. On siliceous rocks under Crataegus, Sec. 3. L-59097.

PHYSCIA DUBIA (Hoffm.) Lett. Sec. 3; on slopes of ravine under shrubs, on granite. L-59098.

PHYSCIA STELLARIS (L.) Nyl. Sec. 3; on bark of Crataegus. L-59096.

PHYSCONIA GRISEA (Lam.) Poelt. Sec. 3; on slopes of ravine, on bark of Crataegus. L-59094.

RINODINA sp. indet. Sec. 3; on N-facing slope of ravine, on wood of Crataegus. L-59100. Our reference collection of Rinodina is on loan to the monographer and names are not yet available.

SARCOGYNE CLAVUS (Ram. ex Lam. and DC.) Kremp. Sec. 3; along ridgetop, on granite. L-59104.

XANTHORIA FALLAX (Hepp in Arn.) Arn. Sec. 3; N slope of ravine, on bark of Crataegus. L-59082.

BRYOPHYTES [16 Species]

AMBLYSTEGIUM SERPENS (Hedw.) B.S.G. var. JURATZKANUM (Schimp.) Rau et Herv. Abundant along intermittent streams, terricolous. B-46173.

BRACHYTHECIUM FENDLERI (Sull.) Jaeg. et Sauerb. Sec. 3; on shaded slopes of ravine, terricolous. B-46175.

BRYUM ARGENTEUM Hedw. On soil in shade of ravine. B-46174.

BRYUM CAESPITICIUM Hedw. On rocky pediment S of Church Ditch, terricolous. B-46177.

BRYUM CAPILLARE Hedw. On soil in wet depression, meadows S of factory. B-46179; near farm buildings, Sec. 3, on upper surfaces of decaying timbers fallen across a small spring-fed rivulet. B-46187.

CAMPYLIUM CHRYSOPHYLLUM (Brid.) J. Lange. SE of farm buildings, in outflow of spring. B-46182 (with Marchantia polymorpha).

CERATODON PURPUREUS (Hedw.) Brid. With Bryum and Myosurus in very wet soil (seasonally wet only). B-46183.

DREPANOCLADUS ADUNCUS (Hedw.) Warnst. Sec. 3; near farm buildings, below pond, on wet bank of rivulet. B-46181.

GRIMMIA MONTANA B.S.G. Sec. 15; W boundary of site S of railroad tracks, on rock. B-46186.

MARCHANTIA POLYMORPHA L. SE of farm buildings in outflow of spring. B-46182 (with Campylium chrysophyllum).

ORTHOTRICHUM PALLENS Bruch ex Brid. Det. Dale Vitt, 1973. On bark of Crataegus near base of tree, outwash ravine. B-46172.

ORTHOTRICHUM PUMILUM Sw. Sec. 3; N-facing hillside, on bark of Crataegus near base of tree. B-46185.

PHYSCOMITRIUM PYRIFORME (Hedw.) Hampe. In outflow of spring in meadows S of factory. B-46180.

POHLIA NUTANS (Hedw.) Lindb. On rocky pediment S of Church Ditch. B-46178.

POLYTRICHUM PILIFERUM Hedw. Rocky pediment, in gravelly soil. B-46176.

TORTULA RURALIS (Hedw.) Gaertn. Sec. 3; on rocky N-facing hillside; on soil. B-46184.

MACROSCOPIC GREEN ALGAE

CHARA species (Characeae). Abundant in shallow ponds. IND. 130.

DISCUSSION

A piece of the biotic landscape can be likened to a house that has had many owners, each of whom have occupied it, lived in it, modified its interior to their particular tastes, and eventually moved on. Every occupant of the house leaves some sort of tracks, whether a layer of wallpaper or a fragment of a partly removed joist or the outline of a long since blocked-up door or window. The vegetation that is present in a piece of landscape at any one time represents everything that has persisted in the area back to the oldest remnant. In much the same way as the flaking layers of wallpaper in the old house tell of its occupants, so the floristic elements represent a three-dimensional mosaic that tells a four-dimensional story.

Piecing the story together from its present flora, we believe that in pre-historic times the Rocky Flats pediment must have been more densely tree covered than it is now. The persistence of distinct forest elements in the north-facing slopes of the ravines and gulches testifies to this probability. Species that indicate forested conditions are: Agrimonia striata, Campanula rotundifolia, Carex interior, Galium boreale, Physocarpus monogynus -- not a large list,

because the attrition has been very great. There are still a few ponderosa pines on the site, and in the north-facing slopes of the gulches, there is a depauperate residue of the typical woody flora that characteristically chokes the gulches to the west, back against the mountain escarpment.

If we examine the more natural sites at the base of the "Flatirons," we can see that Rocky Flats may once have been like a gently sloping pediment covered with pines, with openings of grassland supporting a remnant of the mid-western mid-grass prairie. These mid-grass prairie species, in my opinion, reached the foot of the mountains during the Pleistocene when a general depression of timberline and modified climate permitted migrations of the Cordilleran forest eastward (on the higher areas) and migrations of the midwestern prairie flora westward (interfingering along the river valleys and adjacent slopes). Degeneration of the Pleistocene climate and the concomitant drying out of the high plains has isolated a significant number of prairie species in mesic pockets in the protection of the Front Range escarpment and left some Cordilleran elements stranded far to the east of their present major ranges (Weber 1965). The Black Hills of South Dakota seem to be the largest area in which this fascinating mixture of elements still persists on a large scale. In the Rocky Flats flora, there are only a very few of the prairie species left, but the fact that they are still present in protected spots indicates that the Rocky Flats in time past must have resembled in most respects the adjacent and better vegetated areas nearer to the foothills, such as the Enchanted Mesa area at the base of the Flatirons. Andropogon gerardi, Sporobolus heteropetis, and Schizachyrium scoparium are indicator species still present on Rocky Flats.

Rocky Flats has been violently altered, mostly by the hand of man. Indians routinely burned the forests to improve hunting conditions; the white man cut timber for housing, roads, and firewood; and until relatively recently, cattle overgrazed the Rocky Flats to exhaustion. Old photographs of the Boulder town-site and its backdrop of the Flatirons show that the handsome tree cover that we see now has returned as a result of protection given it since the 1870's. The forest has recovered not only on the colluvial fans and pediments, but on the mountains themselves, which were extensively denuded. But the Rocky

Flats has never been able to revegetate to the same extent. There are several good reasons for this. Overgrazing, cutting of timber, and burning have opened the area to the ravages of the winter winds; the topsoil has blown away, and there is little prospect of recovery of the area to its former state without the institution of elaborate measures to create shelterbelts, topographic diversity for wind protection, and deliberate long-range programs of reseeding, resodding, and plant introduction.

On the other hand, it seems to us that present land use practices on the site are not directed to the recovery of the vegetation of the area, but on the contrary, tend to destroy what little there is left of the natural vegetation. Bulldozing of roads, excavation of barrow pits, travel of vehicles over the roadless areas of the site, widespread utilization of weed control pesticides, and dumping of piles of rocks and assorted debris contribute to the development of a fringe area that is no longer in any sense "natural" and is likely to become a ruderal weed patch unless conscious planning is undertaken to improve it.

It probably is not practicable to bring the Rocky Flats area back to a pristine condition nor would there be any great aesthetic or scientific value to be gained. However, it seems to us that if the present use of the site is to continue, all revegetation methods possible should be undertaken to ameliorate the single most potentially deleterious climatic effect that continues to pose serious hazards to the landscape and to public health -- the effect of the wind in soil transport. We would recommend that every effort be made to obtain the advice of experts in shelterbelt development and contour planting, and to obtain funding for a comprehensive plan to reshape the landscape of the plant environs and to establish both topographic and vegetational buffering against wind erosion. Further, we recommend that the use of weed control chemicals be coordinated so as not to further decimate the natural vegetation or to negate or to hamper the research projects that may be going on in the same areas.

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