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A FLORA OF CRATERS OF THE MOON NATIONAL MONUMENT

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INTRODUCTION

This report contains a keyed checklist to the vascular plants of Craters of the Moon National Monument, and is a summation of data gathered while I was a Seasonal Naturalist from March to September 1967.

The project was supported by a grant from the Craters of the Moon Natural History Association and would not have been possible without the assistance and observations of Dennis Carter, Park Naturalist, and Karl Urban. Karl Urban's help in compiling distributional records, collecting specimens, and his knowledge of the flora was vital to the success of the study. I would also like to thank Brent Ritchie and Ron Gerstenberg, Seasonal Park Rangers, who helped collect and discussed distributions with me. Finally, I would like to thank Mr. Paul Fritz, Superintendent, whose interest in conservation and Craters of the Moon gave me a greater appreciation for both.

DESCRIPTION OF THE AREA

Craters of the Moon National Monument is located on the northern edge of the Snake River Plains of southern Idaho and extends into the Pioneer Mountains bordering the plains. The elevation ranges from over 7,000 feet in the Pioneers, to just under 5,000 feet at the Carey Kipuka in the south. Some of the finest examples of recent basaltic volcanism in western North America are preserved and protected within the 83 square mile area established in 1924.

Two types of volcanic eruptions combined to create the unearthly appearance of Craters of the Moon: the violent gaseous, cinder eruptions, and the rift, or fissure eruptions common over most of the Snake River Plains. The cinder eruptions built up steep-sided, sloping, cinder cones composed of volcanic ejecta. The largest cinder cone, Big Cinder Butte, rises over 700 feet above the surrounding plain. The vertical nature of the cinder eruptions contrasts with the horizontal rift type, in which sheets of liquid lava were extruded along a fault line. Two kinds of hard lava surfaces can be seen: the rough clinkery aa, and the ropery pahoehoe. The differences between these are quickly learned, and the rough nature of an aa flow accounts for the difficulty of exploring many areas.

There is considerable evidence that the volcanic activity was periodic. In roadcuts layers of ash, cinder, and soil can

Wind is one of the most important factors in the ecology of the area. The prevailing direction during all months is southwestern. On a typical summer day the wind rises in the late morning and by afternoon reaches velocities of from 15--20 mph with gusts sometimes reaching 40 mph (Eggler, 1941).

In the late spring the combined effects of wind and exposure can be observed on the southwestern sides of most cinder cones; here little snow accumulation occurs. However on the other slopes, particularly northeastern ones there are accumulations. The accumulation zones correspond to patterns in the vegetation, which become more mesic from southwest to northeast. Gail (1921) found the evaporating southwestern winds accounted for the restriction of Douglas Fir (Pseudotsuga menziesii) to northeastern slopes.

On a smaller scale the same wind and exposure patterns are visible on recent pahoehoe lava flows in the late spring. Small cracks or projections on the flow surface with a northeastern exposure shelter drifted snow. These locations usually correspond to the distribution of xeric primary succession species, with the deeper cracks occupied by less xeric species.

Most soil is accumulated from wind-borne material. Hugie, Passey and Williams (1964) have shown that the soils of the Carey kipuka (perhaps the oldest in the volcanic part) are fundamentally loess over relatively unweathered basalt. Generally southwestern exposures are cinder pavements, but

be seen in distinct bands, stratified and showing that the periods of volcanic activity alternated with periods of soil building. Several kipukas, older volcanic areas surrounded by barren recent lava flows, are present. The largest of these, the Carey kipuka, is of interest to ecologists and soil scientists as one of the few pristine vegetational areas in the Snake River Plains (Wisdale, Hironaka, and Losberg, 1965).

There is no good estimate for the most recent volcanic activity, however Stearns (1963) has attempted to date the age of the North Crater flow from tree ring samples taken from the Triple Twist Tree, a contorted limber pine (Pinus flexilis) which grew on the flow. It appears (Urban, pers. comm.) that the age of this tree is 760 years old rather than 1650 as Stearns reported. Another tree at Devils Orchard is reported to be 1210 years old (Urban Ibid.) Urbans study showed the upper aged trees to be in the neighborhood of 450 years. Agaler (1967) has shown the effects of volcanic eruptions in pine xylem patterns in Mexico, but these patterns have not been found here.

The climate is a continental one, with cold dry winters and hot dry summers. A killing frost can occur in any month.

Longmont weather data show an average annual precipitation of 16.84", with 90" as snow. The average annual temperature is 42 F.

these often have a soil underneath.

The vegetation of the Snake River Plains is almost identical to that of the Great Basin, to which it is connected by low gaps in the mountains (Daubenmire, 1952). The two largest families in the flora are the Compositae and the Gramineae. Many of the species in these families are highly adapted to invade primary, or open environmental niches, and withstand highly evaporating conditions. The same invasive characteristics (i.e., light propagules, dispersion by wind, and generally short life cycles) typify other representatives of the flora suggesting convergence or environmental selection for these adaptations. The pioneer nature of the vegetation indicates a continual disturbance of the environment.

Wind as an agent of disturbance has already been mentioned. In addition to wind one can also see evidence of disturbance from volcanism, fire and man.

Several areas show the effects of volcanism on the vegetation. In the Trench Mortar Flat and in the Tree Molds area horizontal and vertical lava casts occur with internal xylem-like patterns. These casts, or molds, were produced by lava being rapidly cooled as it flowed around the tree surface. Similar lava casts have been reported from New Mexico (Lindsey, 1949). Arnold (1947) has stated that these casts are probably nonresinous species such as walnuts, oaks, or other hardwoods. I believe these molds are from coniferous species, probably Limber Pine.

Fire seems to occur fairly commonly on the monument; records show several lightning and man-caused fires in the area. I looked at the sites of several past fires and was impressed by the uneven burning patterns. It seems topographic irregularities allow unburned vegetational islands which are then seed sources for reinvansion of the burned areas.

Man has disrupted the vegetation in several areas. Many large Douglas firs (Pseudotsuga menziesii) were logged on the northern side of Silent Cone before the monument was established. A mining operation on Little Cottonwood Creek contributed to disturbance (allowing habitats for exotic species) until purchased in 1967. Bands of sheep still pass through the monument in the spring, but no longer stay in the area, as in the past. However grazing of domestic animals still affects the monument, because deer concentrated in the Little Cottonwood drainages by adjacent overgrazing of sheep and cattle, reach very high numbers. It appears that considerable use is made of browse in this area. About 200 thousand people visit Craters of the Moon every year. The nature of the visitation is such that a drive on the 7-mile Loop Road satisfies the curiosity of most and except in localized areas little damage to the vegetation can be noted.

The greatest single factor in the disturbance of patterns of vegetation at Craters of the Moon has been the activities

of the National Park Service. The project responsible for these changes is one designed to control the infection of Limber Pine by dwarf mistletoe (Arceuthobium campylopodium) in visitor use areas. To date 6600 Limber Pines have been removed in an area of about 2 square miles. According to Karl Urban, who investigated the project in conjunction with his study of the ecology of the Limber Pine and dwarf mistletoe: the project was initiated in the visitor use portion of the Monument without consideration of the ecological impact of tree removal on the environment and also without the proper establishment of control plots which would have permitted objective evaluation of the eradication measures. Present plans call for the continuation of this program.

VEGETATION TYPES

The following is a brief account of general vegetation types commonly encountered on the monument.

Douglas Fir Forest: Mesic sites sheltered from southwest winds in the Cottonwood Creek area, Grassy Cone, Silent Cone, and Sunset Cone: Pseudotsuga menziesii, Heuchera cylindrica, and Castilleja miniata.

Riparian: Along Little Cottonwood Creek. Alnus incana, Populus trichocarpa, A. tremuloides, and Syrnus virginiana.

Sagebrush-Bunchgrass: A climax type, found in many locations climatically alternating with the Douglas Fir forest. Tisdale, Aironaka, and Fosberg, (1965) from their work on the Carey Kipuka recognized three vegetation types within this unit: Artemisia tripartita- Aeroblyon spicatum- Festuca idahoensis, the A. tridentata- F. idahoensis, and the A. longiloba- F. idahoensis- Stipa thurberiana community. Alymus cinereus and Symphoricarpos oreophilus also characterize the Sagebrush-Bunchgrass type. Alymus sp. seems to be a primary invader of burned sites.

Bare Cinders: A common pioneer type. Under the cinder erosion pavement a fine soil usually exists, which is insulated and subsequently retains moisture well into the summer. Eriogonum ovalifolium, Mimulus nanus and M. zucksdorffii, Allium tolmei,

Aster canescens, Chaenactis douglasii, Lewisia rediviva, and Mentzelia spp.

Limber Pine Forest: This type usually succeeds the Bare-Cinder Type . Limber Pine is slow-growing, conservative in its use of water, and not adapted for competition (Bates, 1923). Chrysothamnus nauseosus, Eurhnia tridentata and Ribes cereum seem to follow and replace Limber Pine. This association is followed by the Segebrush-Bunchgrass Type.

On recent pahoehoe flows there are two characteristic vegetation types.

Shallow Crevice: A primary stage of succession. The common concept of invasion by lichens and mosses followed by higher plants seems not to be important in this area. Soil formation by the accumulation of wind-borne material appears to be the critical factor to succession. Castilleja chromosa, Erigeron compositus, Penstemon laevis, Potentilla glandulosa, and Sitanion hystrix.

Deep Crevice: With above but in deep crevices protected from desiccating winds. Chamaebataria millefolium, Holodiscus dumosus, Philadelphus lewisii, and Picus flexilis.

The species in the following list are arranged alphabetically within the following groups:--Sphenophyta (scouring rushes), Pteridophyta (Ferns), Coniferophyta (conifers), and Anthophyta (Flowering plants). The Anthophyta is divided into

the Monocotyledoneae and the Dicotyledoneae.

Nomenclature follows Davis (1952) for the Sphenophyta, Coniferophyta, and monocotyledoneae; and follows Hitchcock, et. al. (1959-1960) in the dicotyledoneae.

Keys for identification of species are provided at the beginning of the checklist.

The species description includes a morphological description (when not covered by an extensive key) and information on abundance, range, and date of bloom. If a specimen was collected by the author only the collection number is given. All these are located at the U. of Kansas herbarium. Specimens cited SCS were reported by Hugie, et. al. (1964) from the Carey Kipuka; and those from the Craters of the Moon Herbarium have been cited CRMO.

The following abbreviations have been used:

Fld.	flowered	L.C.C.	Little Cottonwood
Fls	flowers		Creek
Lvs	leaves	mm	millimeter
Fr	fruits	cm	centimeter
Aks	akenes	dm	decimeter
Spkl	spikelets	m	meter

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Key To The Divisions

Plants reproducing by spores; not producing fls.

Stems jointed.

Sphenophyta

Stems not jointed.

Pteridophyta

Plants reproducing by seeds; producing fls.

Trees with needles or compressed scalelike
lvs.

Coniferophyta

Trees, shrubs, or herbs, if trees lvs not
scalelike.

Anthophyta

SPHENOPHYTA

EQUISETACEAE

1. Equisetum L.

1. E. hiemale Milde Evergreen perennial with jointed stems
tipped with a rigid point. Rare; L.C.C., 25 yards below
Martin Mine side of stream. 1052

PTERIDOPHYTA

POLYPODIACEAE

Fronds 3-9 dm high; indusia reniform.

3. Dryopteris

Fronds usually less than 3 dm high; indusia
inconspicuous.

Ultimate segments spinulose.

4. Polystichum

Ultimate segments not spinulose.

2. Cystopteris

2. Cystopteris (L.) Bernh.

2. C. fragilis (L.) Bernh. Common; lava cracks, sheltered ledges, and under shrubs near Douglas Fir Forest in L.C.C. and on Grassy Cone. 609

3. Dryopteris Adams.

3. D. filix-mas (L.) Schrott. Rare; found only 50 yds east of incinerator pit in deep pahoehoe crevice. Also collected 6 miles from monument east boundary near highway in same habitat. 893

4. Polystichum Roth.

4. P. scopulorum (Bat.) Maxon. Uncommon; deep n.-s. crevices; Needles Cave, Black, Blue Dragon, Derelict Flows, and main rift zone n. of Bear's Den waterhole. 815

CONIFEROPHYTA

Lvs needlelike, borne singly in clusters. PINACEAE

Lvs small, scalelike, flattened or awl shaped. CUPRESSACEAE

CUPRESSACEAE

5. Juniperus L.

5. J. scopulorum Segr. Tree with scalelike lvs. Rare in n., becoming locally abundant in the s., usually found in deep crevices. 776

PINACEAE

Needles borne in bundles of 5. Pinus

Needles borne singly. Pseudotsuga

6. Pinus A. Dietr.

6. P. flexilis James. The most common tree. Former stands on Inferno, Paisley, and Big Crater were greatly reduced in a mistletoe eradication project in 1962--63. In these locations relics of associated species remain. 616

7. Pseudotsuga Carr.

7. P. menziesii (Mirb.) Franco. var. glauca (Reissn.) Franco. Tree. n.e. exposures: Paisley, Silent, Sunset, and Grassy Cones, the largest trees in L.C.C. Canyon. 615

ANTHOPHYTA

Fls usually composed of 4 or 5 parts; lvs net veined, usually not grasslike: DICOTYLEDONAE

Fls composed of 3 parts or multiples of 3; lvs usually
grasslike and parallel-veined.

MONOCOTYLEDONEAE

MONOCOTYLEDONEAE

A Grasslike; perianth dry, chafflike or absent.

B Fls in axils of dry chaffy bracts.

Lvs 3-ranked

CYPERACEAE

Lvs 2-ranked

GRAMINEAE

BB Fls with a small green or brown perianth.

JUNCACEAE

AA Not grasslike; perianth usually petaloid.

C Stamens usually 6; fls regular; ovary superior.

LILIACEAE

CC Stamens 1 or 2; fls irregular; ovary inferior.

ORCHIDACEAE

CYPERACEAE

8. Carex (Rupp.) L.

Other species will probably be found.

Spikes 1.

C. filifolia

Spikes more than 1

C. scoparia

8. C. filifolia Nutt. Densely caespitose, 8--30 dm tall;
rootstocks short, stout, blackish; blades involute, stiff.

Sagebrush--Bunchgrass. Carey Kipuka and Pioneers Mtns. 661.

9. C. scoparia Schk. Caespitose, 1.5--10 dm tall; rootstocks
short, dark brown; blades not involute. Riparian; L.C.C. 759.

GRAMINEAE

A Spklt. with 2 neuter lemmas not alike and below the fertile
lemma.

Phalaris

AA Spklt. without neuter lemmas below the fertile florets.

B Spklt. sessile, borne on a rachis, the inflorescence a spike.

Spklt. solitary at each rachis node.

Axyroperon

Spklt. more than 1 at each rachis node.

Spklt. 3 at each node; the lateral ones usually reduced to awns.

Hordeum

Spklt. 2 at each node.

Spklt. readily disarticulating; glumes over 2 cm long.

Sitanion

Spklt. not as above; glumes less than 2 cm long.

Elymus

BB Spklt. pedicellate in open or contracted panicle.

C Spklt. 1-fl'd.

Lemmas hardened, without nerves.

Awn persistent and twisted.

Stipa

Awn deciduous and more or less straight.

Oryzopsis

Lemmas not hardened, nerves evident.

Callus of lemma with a tuft of hairs.

Calamagrostis

Callus without tuft of hairs.

Agrostis

CC Spklt. 2- many fld.

Glumes as long as or longer than the lowest floret.

Lemma keeled on back.

Koeleria

Lemma convex on back.

Deschampsia

Glumes shorter than the first floret.

Spklt. in dense clusters near end of panicle
branches.

Dactylis.

Spklt. evenly distributed in narrow or open panicles.

D Upper florets reduced to clubshaped rudiments, culms bulbous
at base.

Melica

DD All florets normal, culms not bulbous at base.

Spklt. 15 mm long or longer.

Bromus

Spklt. smaller.

Lemma parallel-nerved, not converging near summit.

Glyceria

Lemma converging near summit.

Lemma awnless; lvs boat shaped at tip.

Poa

Lemma awned; lvs tapering to a slender point.

Festuca

9. Agropyron Gaertn.

With creeping rhizomes.

- | | |
|-------------------|--------------------|
| Glumes awned. | <u>A. smithii</u> |
| Glumes not awned. | <u>A. riparium</u> |

Without creeping rhizomes.

Spklt. much compressed nor closely imbricated.

A. cristatum

Spklt. not much compressed nor closely imbricated.

Spklt. awnless A. inerme

Spklt. awned. A. spicatum

10. A. cristatum (L.) Gaertn. Perennial 60-100 cm tall;
blades flat. Roadside weed. 1104
11. A. inerme (Scribn. & Smith) Rydb. Perennial 60-100 cm
tall; blades 1-3 mm wide, pubescent on the lower surface.
Widespread. 885
12. A. riparium Scribn. & Smith. Perennial 40-80 cm tall;
blades flat.to involute. Range unknown. 914
13. A. smithii Rydb. Perennial 30-75 cm tall; blades strongly
nerved, tapering to a short point. Range unknown. 892
14. A. spicatum (Pursh) Scribn. & Smith. Perennial 60-100 cm
tall; blades 1-4 mm wide. Widespread. 931

10. Agrostis L.

- | | |
|---------------------|-------------------|
| Panicle open. | <u>A. soabra</u> |
| Panicle contracted. | <u>A. exarata</u> |

15. A. exarata Trin. Perennial, culms 25-95 cm high; panicle
contracted; palea obsolete or only a minute, nerveless

scale. L.C.C. 946.

16. A. scabra Willd. Perennial, culms tufted 20-80 cm high; panicles open, branches capillary and scabrous palea wanting. L.C.C. 870.

11. Bromus L.

Spklt. strongly flattened, lemma compressed keeled.

B. carinatus

Spklt. terete, lemma not compressed-keeled.

B. tectorum

17. B. carinatus Hook. & Arn. Biennial 50-100 cm tall; sheath scabrous to pilose; panicle 15-30 cm long, spreading or drooping; Spklt. 2-3 cm long, spreading (excluding awn), lemma 10-20 mm long; awn 7-15 mm long. Common locally; L.C.C. 880.

18. B. tectorum L. Annual usually 10-40 cm tall; sheath and blade pubescent; panicle 5-15 cm, drooping often purple; spklt. 12-20 mm long; lemma 10-12 mm long; awn 12-14 mm long.

A common widely distributed invader. 890.

12. Calamagrostis Adans.

19. C. koelerioides Vasey. Perennial usually more than 1 m tall; sheath slightly scabrous; ligule 3-5 mm long; blade flat, or subinvolute, scabrous, 15-25 cm long, 3-8 mm wide; lemma about 4 mm long; awn bent; Common locally; with Populus. 951.

13. Pectylis L.

20. D. glomerata L. Perennial 60-120 cm tall; blade 2-8 mm wide; panicle 5-20 cm long; spklt. fascicled; lemma compressed-keeled, 5-nerved ciliate on keel. Uncommon; L.C.C. 796.

14. Deschampsia Beauv.

Plants annual; foliage scent.

D. danthonioides

Plants perennial; foliage to $\frac{1}{2}$ the length of culm.

D. elongata

21. D. danthonioides (Trin) Munro. Annual 15-60 cm tall; blade few, short, narrow; panicle open, 7-25 cm long, the capillary branches commonly in twos; lemma smooth and shining, 2-3 mm long; awn geniculate, 5-6 mm long. L.C.C. CRM: NPS 129.

22. D. elongata (Hook.) Munro. Perennial 30-120 cm tall; blade 1-1.5 mm wide; panicle narrow up to 30 cm long; the capillary branches appressed; lemma 2-3 mm long; awn straight.

Common locally in Cottonwood drainage; shady bank near Rd. 400 yds below well #4. 951.

15. Elymus L.

23. E. cinereus Scribn. & Merr. Culms in large tufts, stout, 1-2 m tall; ligule 2-5 mm long; blades firm, flat up to 2cm wide; spike erect, dense, 15-25 cm long. Common locally, especially on old burns, as on Coyote Butte, also found on Carey Kipuka and lower part of L.C.C. 1042.

16. Festuca L.

Panicle somewhat open; lemma about 7 mm long.

F. scabrella

Panicle narrow; lemma 7-10 mm long.

F. idahoensis

24. F. idahoensis Elmer. Perennial 30-100 cm tall; blades numerous, scabrous, 10-20 cm long; branches ascending or appressed; spklt. 5-7 fld; usually 2-4 mm long. Carey Kipuka (S.C.S.), expected in other areas.
25. F. scabrella Torr. Perennial 30-90 cm tall, usually scabrous below panicle; blade narrow or involute; panicle narrow, 5-15 cm long; spklt 4-6 fld; widespread. 791

17. Glyceria R. Br.

26. G. striata (Lam.) Hitchc. Perennial 30-100 cm tall, blade 2-6 mm wide; panicle open 10-20 cm long, nodding; spklt often purplish, 3-4 mm long.
- Common locally along L.C.C. 913

18. Hordeum L.

27. H. jubatum L. Perennial 30-60 cm tall; blade 2-5 mm wide, scabrous; spike nodding, 5-10 cm long; lateral spklt. reduced to 1-3 spreading awns; glumes 2.5-6 cm long, spreading.
- Uncommon; near Beaver Dam in mine shaft. 868

19. Koeleria Pers.

28. Koeleria cristata (L.) Pers. Perennial, erect; 30-60 cm tall; blades flat or involute, 1-3 mm wide; spklt. 4-5

mm long; glumes and lemmas 3-4 mm long. widespread on developed soil. S.C.S.

20. Melica L.

29. Melica bulbosa Ceyer. Perennial 30-60 cm tall, bulbous at base; blades flat to involute, 2-4 mm wide; spklt. papery with age, 1-15 mm long. Cottonwood 300 yds below well #4. Carey Kipuka. 929

21. Oryzopsis Michx.

30. O. hymenoides (Roem. and Schult.) Ricker. Perennial 30-60 cm tall; blades slender involute; panicle open and dichotomously branched; fruit plump and silky- hairy. Common on well developed soils. 889A
- Hybrids between O. hymenoides and Stipa sp. occur. The most common is between O. hymenoides and Stipa occidentalis, forming X Stiporyzopsis bloomeri (Boland) Johnson.
- Perennial 30-60 cm tall; lvs crowded at base; blade narrow; panicle 7-15 cm long, branches stiffly ascending; fruit elliptic, densely villous. 889

22. Phalaris L.

31. P. arundinacea L. Glaucous perennial 60-150 cm tall; panicle 7-18 cm long, narrow, branches spreading during anthesis; glumes 5 mm long. Rare; L.C.C. 947

23. Poa L.

Florets converted into bulbets.

P. bulbosa

Florets normal.

Spklt. distinctly compressed.

P. pratensis

Spklt. little compressed/

Lemmas crisp-puberulent.

P. secunda

Lemmas glabrous or minutely scabrous. P. nevadensis

32. P. bulbous L. Perennial 30-60 cm tall; blade flat or involute, 1-2 mm wide; spkls. converted into bulbets with dark purple base. Rare; opposite Martin Mine Cabin. 869
33. P. nevadensis Vasey. Perennial 50-100 cm tall; blade elongate, involute or sometimes capillary; spkls. 3-5 fld, 6-8 mm long. Range unknown; Carey Kipuka, S.C.S.
34. P. pratensis L. Perennial 30-100 cm tall; blade 2-4 mm wide; spkls 3-5 fld, 3-6 mm long. L.C.C. 803
35. P. secunda Presl Perennial less than 30 cm tall; blades basal, involute, 1-2 mm wide; spkls 4-6 cm long. Pioneer Mts to Carey Kipuka. S.C.S.

24. Sitanion Raf.

36. S. hystrix (Nutt.) J.G. Smith. Perennial 10-50 cm tall; herbage glabrous to densely white pubescent; blades flat to involute, 5-20 cm long; spike 2-7 cm long; awns of glumes and lemmas widely spreading. Pioneer Mts to Carey Kipuka, all habitat types. 886

25. Stipa L.

Awn plumose below.

Ligule 3-6 mm long, hyaline

Ligule minute, mostly hairy.

Awn scabrous or nearly glabrous.

Awn 10-15 cm long.

S. thurberiana

S. occidentalis

S. comata

Awn less than 3 cm long.

Hairs on lemma copious; awn about 2 cm
long.

S. pinetorum

Hairs not copious; awn 2.5 cm long.

S. columbiana

37. S. columbiana Macoun. Perennial 30-60 cm tall; blades 10-25 cm long, mostly involute; glumes 1 cm long; awn 2-2.5 cm long, twice geniculate. L.C.C. N. slope above Beaver Dam. 964
38. S. conata Trin & Rupr. Similar to above except; glumes 1.5-2 cm long; awn 10-15 cm long. Locally abundant; foothills of Pioneers; n. slope of Big Craters; and Carey Kipuka. 884
39. S. occidentalis Thurb. Perennial 25-40 cm tall; blades 10-20 cm long, usually involute; glumes 12 mm long; awns 3-4 cm long, twice geniculate. Widespread; all habitat types. See note under Oryzopsis hymenoides. 809
40. S. pinetorum Jones. Culms 30-50 cm tall; lvs mostly basal, involute filiform; glumes about 9 mm long; awn 2 cm long, twice geniculate nearly glabrous. Range unknown, collected along e. boundary. 1203
41. S. thurberiana Piper. Perennial 60-80 cm tall; blades 10-20 cm long; usually involute; glumes 8-15 cm long; awn twice geniculate, 4-5 cm long, the first and second segments plumose. Carey Kipuka, S.C.S.

JUNCACEAE

26. Juncus L.

42. J. ensifolius Wikstr. Perennial from slender rootstocks, 2-5 dm tall, flattened and 2-edged; lvs without auricles, the blades 2-7 mm wide; heads 2-6 and many-fl'd. Common along L.C.C. 943

LILIACEAE

Styles wanting

Calochortus

Styles present.

Styles 3; perianth parts distinct or nearly so.

Zigadenus

Styles united, at least basally;

perianth parts united or distinct.

Fruit a berry.

Smilacina

Fruit capsular.

Fls umbellate.

Allium

Fls solitary.

Fls blue, each with a scarious bract at the base.

Camassia

Fls yellow without bract at base.

Fritillaria

27. Allium L.

Lvs solitary, terete.

A. nevadense

Lvs 2 or more per scape, flat or channeled.

A. tolasii

43. A. nevadense S. Wats. Perennial usually 5 cm tall from ovoid bulb; one lv, terete; perianth segments 8-12 mm long. White-pink, midribs pink; ovary with 6 distinct crests. Split Butte, Carey Kipuka, and Pioneer Mts. May-June. 777

44. A. tolmei Baker. Perennial up to 10 cm tall, often with fls borne at ground level; lvs 2 per scape, flat; perianth segments 6-12 mm long, white-pink; ovary various. Widespread; ephemeral plant of open cinder slopes and cinder flats. May-early June. 634

28. Calochortus Pursh.

Sepals exceeding the petals.

C. macrocarpus

Sepals rarely exceeding the petals.

Face of petals bearded near the gland; petals without green longitudinal, median stripe.

C. nuttallii

Face of petals glabrous; green stripe present.

C. bruneauis Nels. & Macbr. Similar to C. nuttallii except for key characters. Shallow crevices of older flows; widely distributed from Split Butte to Pioneer Mts, also reported from Carey Kipuka. July. 850.

46. C. macrocarpus Dougl. Perennial from a tunicated bulb, 2--3 dm tall; lvs linear, reduced upwards; fls 1-3, purple and white with a green stripe; ovary triangular-oblong. Sunset Cone flow. Sagebrush-Bunchgrass zone. July. CRM0: K. Urban.

47. C. nuttallii Torr. Perennial from a tunicated bulb; lvs linear, reduced upwards; fls 1-4; petals white, tinged with lilac, yellow at the base, and with purplish band above gland. Locally abundant; L.C.C. aspen-covered slope. W. of beaver ponds. Mid-July. 987

29. Camassia Lindl.

48. C. quamash (Pursh) Greene. Perennial 2-6 cm tall, from a 3-4 cm long bulb; lvs 8-20 mm wide, usually shorter than scape; fls in racemes; perianth purplish-blue, segments 2-2.5 cm long; capsule 15-18 mm long. Not collected in our area. Occurring in moist locations near Carey. May.

30. Fritillaria L.

Fls yellow.

F. pudica

Fls dull purple, mottled with greenish-yellow.

Lvs narrowly linear; capsules sharply angled.

F. atropurpurea

Lvs lanceolate; capsule broadly winged on the angles.

F. lanceolata

49. F. atropurpurea Nutt. Perennial from corm 10-15 mm in diameter; stem 1-5 cm tall; lvs alternate or upper whorled; fls commonly 1-4; perianth parts similar, 8-20 mm long. Uncommon; Sagebrush-Bunchgrass zone. June. 705
50. F. lanceolata Pursh. Similar to above, except for key characters. S.C.S., from Carey Apuka.
51. F. pudica (Pursh) Spreng. Perennial from a corm; stem

1-3 dm tall, simple; lvs several; usually one fl 1.5-2 cm long; capsule 1.5-3 cm long, obovoid-oblong. Uncommon; Sagebrush-Bunchgrass, and expected in Pioneers above springs of L.C.C. Collected in Pioneer Mts close to monument. April-May. 601

31. Smilacina Desf.

Fls numerous, paniculate.

S. racemosa

Fls few, racemose.

S. stellata

52. S. racemosa (L.) Desf. Perennial from stout, fleshy stems 3-10 dm tall; lvs 5-15 cm long; perianth segments usually white 2-3 mm long. Riparian. May-June. 717

53. S. stellata (L.) Desf. Perennial from slender rootstocks, 2-6 dm tall; lvs sessile or clasping, lanceolate to oblong-lanceolate, 4-16 cm long; perianth whitish 4-6 mm long; berry green with black stripes. Riparian. May-June. 785

32. Zigadenus Michx.

54. Z. paniculatus (Nutt.) Wats. Perennial from ovoid bulbs; stems 2.5-7 dm tall; perianth segments about 4mm long; capsule 10-12 mm long. Sagebrush-Bunchgrass zone of L.C.C. June-July. 714

ORCHIDACEAE

33. Corallorhiza (Hall.) Chat

55. C. Maculata Raf. Inconspicuous terrestrial saprophyte 1-8 dm tall; sepals and petals crimson purple and white; column yellow with magenta spots. In rich decaying humus along L.C.C.

KEY TO DICOTYLEDONEAE

A. Plants with 2-several carpels.

Stamens numerous, attached to receptacle.

RANUNCULACEAE

Stamens attached to a disc, or central portion of ovary.

Stamens twice petals or less.

Carpels more than 2 and fls yellow.

CRASSULACEAE

Without the above combination of characters.

SAXIFRAGACEAE

Stamens more than twice petals. ROSACEAE

AA. Plants with a single carpel, or carpels fused.

B. Petals separate or absent.

Shrubs or trees with compound simple (maple) lvs.

ACERACEAE

Not above.

Fls in catkins. (Trees or nettles).

willow	Lvs elliptic, linear.	SALICACEAE
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birch	Lvs ovate.	BETULACEAE
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nettle	Stinging herbs.	URTICACEAE
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Fls not in catkins. Go to "C"

C. Ovary 1-celled with free central or basal placentation.

Sepals fewer than petals. PORTULACEAE

Sepals equal to petals, if petals are present.

	Lvs opposite.	CARYOPHYLLACEAE
	Lvs alternate.	
	Fr an urticle.	
	Sepals herbaceous.	CHENOPODIACEAE
	Sepals dry and scarious.	
		AMARANTHACEAE
	Fr an ackene.	POLYGONACEAE
CC.	Ovary with axile or parietal placentation.	
	Fr a silque or sillicule.	CRUCIFERAE
	Not above.	
	D. Stamens more than 10.	
	Stamens in a column; carpels 5 or more.	
		MALVACEAE
3 choices	Cactus.	CACTACEAE
	Not either of above.	
	Fls hypogenous.	
	Lvs entire.	VIOLACEAE
STEER'S HEAD	Lvs deeply lobed.	FUMARIACEAE
	Fls epigynous or perigynous.	
	Herbs.	SAXIFRAGACEAE
	Shrubs.	
	Lvs opposite.	
		HYDRANGACEAE
	Lvs alternate.	
CURRENT.	Fr a berry.	GROSSULARIACEAE
	Fr not a berry.	ROSACEAE

Fls in cymes; plants not
glandular-pubescent.

HYDROPHYLLACEAE

Fls not as above; plants
glandular-pubescent.

SOLANACEAE

Corolla irregular.

Chlorophyll absent. Parasitic
on Artemisia.

OROBANCHACEAE

Chlorophyll present.

SCROPHULARIACEAE

DD. Fr of 4 nutlets.

Stamens 5.

BORAGINACEAE

Stamens 2 or 4.

LABIATAE

CC. Ovary inferior.

Fls borne in various types of inflorescences,
if borne in involucrate heads, then fls not
blooming in centripetal sequence.

Fls bell-shaped, blue.

CAMPANULACEAE

Not as above.

Stipules present.

RUBIACEAE

Stipules absent.

Plants woody.

CAPRIFOLIACEAE

Plants herbaceous.

VALERIANACEAE

Fls borne in involucrate, centripetally flowering.
heads.

COMPOSITAE

DD. Stamens less than 10.

Ovary superior.

Trees or shrubs.

Style 1; well-developed soil.

RHAIACEAE

Styles 4-5; cracks in lava.

HYDRANGEACEAE

Herbs.

GERANIACEAE

Ovary inferior.

Parasitic on pine. LORANTHACEAE

Not above.

Shrubs.

CORNACEAE

Herbs.

Fls borne in umbels.

UMBELLIFERAE

Fls not in umbels.

ONAGRACEAE

BB. Petals united, at least at base.

C. Ovary superior, or if inferior then stamens more numerous than corolla lobes and opposite them.

D. Fr never of 4 nutlets.

Carpels largely separate; sub-shrub.

APOCYNACEAE

Carpels united.

Corolla regular.

Carpels 3.

POLEMONIACEAE

Carpels 2.

Fls in cymes; plants not glandular-pubescent.

ACERACEAE

34. Acer L.

56. A. glabrum Torr. Shrub 1-10 m tall; lvs 2-14 cm long, trifoliate, twice serrate, samaras 2.5-3 cm long. L.C.C. and Headquarters area. May-June. CRM0. 142

AMARANTHACEAE

35. Amaranthus L.

57. A. graecizans L. Annual, prostrate to somewhat ascending; lv blades 5-30 mm long; fls in small axillary clusters; sepals 4-5; disturbed areas, L.C.C. July-Aug. 1108

36. Apocynum L.

58. A. androsaemifolium L. Stems 2-5 dm tall, essentially glabrous; lvs short petiolate, drooping 2-9 cm long; fls in axillary cymes; follicles pendulous, 6-15 cm long. W. into branch of L.C.C. near aspens. 999

BETULACEAE

Bracts of seed-bearing catkin woody, persistent.

Alnus

Bracts thin, deciduous with fr.

Betula

37. Alnus Mill

59. A. incana (L.) Moench. Shrub 2-12 m tall; bark grayish brown or reddish; lvs 3-7 cm long L.C.C. April-May. 687

38. Betula L.

60. B. glandulosa Michx. Shrub 1-5 m tall; young branches with wartlike, crystalline glands, bark reddish-brown; lvs 1-2 cm long. Headquarters area; introduced from Lost River flood plain near Arco. April-May. 651

BORAGINACEAE

Shrub-like perennial; fls yellow or whitish.

Lithospermum

Not above.

Nutlets armed with prickles.

Plants low annuals.

Lappula

Plants tall perennials.

Heckelia

Nutlets unarmed.

Fls blue.

Mertensia

Fls white to orange.

Fls orange.

Amsinckia

Fls white or inconspicuous.

Cryptantha

39. Amsinckia Lehm.

61. A. retrorsa Suksd. Plants 1-6 dm tall; stem spreading-hispid; lvs to 12 cm long; corolla orange or orange-yellow, 5-8 mm long in a scarpoid cyme. Locally abundant; disturbed areas L.C.C. and Headquarters. June-July. 804

40. Cryptantha Lehm.

Perennial.

C. interrupta

Annual.

Forming mats.

C. circumscriba

Not above.

Margin of nutlet sharply angled;

Carey Kipuka.

C. watsonii

Margin of nutlet rounded; widespread.

C. torreyana

62. C. circumsissa (H.&A.) Johnston. Dwarf annual, forming cushions 1-6 cm high. Range unknown. July. 972
63. C. interrupta (Greene) Pays. Perennial 0.5-4 dm tall; herbage with sharp, stiff hairs; basal lvs 1-6 cm long, cauline reduced; fls 2-4 mm long, white. Widespread, common in open cinders. June-July. 845.
64. C. torreyana (Gray) Greene. Annual 1-4 dm tall, simple or branched; lvs linear to narrowly oblong; spikes naked; fls minute, white. Widespread; most abundant in drier areas of cinder flats. June-July. 754.
65. C. watsonii (Gray) Greene. Annual, 1-3 dm tall; lvs linear; fls inconspicuous. Carey Kipuka. 895.

41. Hackelia Opiz.

Corolla limb blue.

H. floribunda

Corolla limb white.

H. patens

66. H. floribunda (Lehm.) Johnston. Biennial or short-lived perennial, 3-10 dm tall; stems often solitary; cauline lvs well-developed; fls numerous in a narrow inflorescence; corolla limb 4-7 mm wide. Locally abundant along L.C.C. June-Aug. 783.
67. H. patens (Nutt.) Johnston. Perennial, 2-8 dm tall; stems generally several; lvs and fls similar to above; corolla limb 6-11 mm wide. Sagebrush-Bunchgrass; locally abundant L.C.C. and Headquarters area. June-Aug. 672 A.

42. Lappula Gilib.

Marginal prickles in a single row. L. redowskii

Marginal prickles in 2 or 3 rows. L. echinata

68. L. echinata Gilib. Similar to below except for key characters. L.C.C. June-July. CMO: K. Urban.

69. L. redowskii (Hornem) Greene. Annual, 0.5-4 dm tall; lvs numerous, reduced upwards; corolla inconspicuous 2-4 mm long. Disturbed areas. L.C.C. and Headquarters area. May-July. 1020

43. Lithospermum L.

70. L. ruderale Dougl. ex Lehm. Perennial 2-6 dm tall, stems clustered on coarse woody taproot; lvs cauline; corolla light yellowish, 8-13 mm long, fragrant. Sagebrush-Bunchgrass community. June. 700

44. Mertensia Roth.

A 3-15 dm tall, blooming in summer; L.C.C. M. campanulata

AA Seldom 4 dm tall, blooming soon after snow

leaves ground; xeric sites. M. oblongifolia

71. M. campanulata A. Nels. Perennial 3-10 dm tall; basal lvs 8-25 cm long; corolla with limb shorter than the lobes. Banks of L.C.C. June-July. 866

72. M. oblongifolia (Nutt.) G. Don. Perennial 1-4 dm tall; basal lvs 2-15 cm; corolla with limb longer than the lobes. Uncommon; Sagebrush-Bunchgrass. May-June. 641

CACTACEAE

45. Opuntia Mill

73. O. polyacantha Haw. Plants forming rounded clumps 1-3 dm tall; stem joints obovate to suborbicular in outline, strongly flattened, 5-15 cm long; fl reddish or yellow 5-7 cm long. Locally abundant on Sunset Cone Flow. Early July. 1045

CAMFANULACEAE

46. Campanula L.

74. C. rotundifolia L. Perennial; 1-8 dm tall, basal lvs petiolate up to 2 cm long, often deciduous; cauline lvs numerous, commonly linear; fls erect or nodding; fl blue, 1.5-3 cm long, lobes shorter than the tube. Introduced behind maintenance shop in Headquarters area. Early July. CRM0: K. Urban

CAPRIFOLIACEAE

47. Symphoricarpos Juss

75. S. oreophilus Gray. Shrubs 0.5-1.5 m tall; lvs and young twigs densely puberulent to glabrous; lvs elliptic; fls white-pinkish. Common in L.C.C. on well developed soils, also Sunset, Grassy, and Silent cones. Late June- July. 1033

CARYOPHYLLACEAE

Sepals fused, forming a distinct tube.

Silene

Sepals not fused.

Styles 5; lvs not needlelike.

Cerastium

Styles 3; lvs needlelike.

Arenaria

48. Arenaria L.

76. A. aculeata Wats. Caespitose perennial with needlelike lvs; inflorescence densely cymose; fls white. Rare; n. face of Silent Cone. June-July. 814

49. Cerastium L.

77. C. viscosum L. Glandular pubescent annual 1-2 dm tall; stems when branched, dichotomous; cauline lvs paired. Along L.C.C. July-Aug. 1053

50. Silene L.

Corolla less than 10mm long.

S. menziesii

Corolla more than 12 mm long.

S. douglasii

78. S. douglasii Hook. Caespitose perennial with a strong taproot, 1-4 dm tall; lvs 2-5 cm long, mostly basal corolla usually whitish. Uncommon; L.C.C. n.e. slopes of Silent and Grassy cones; generally in association with Frunus. July. 921

79. S. menziesii Hook. Low perennial 5-30 cm long; lvs mainly cauline, 2-6 cm long; corolla white. Uncommon; L.C.C., Aspen-covered slope w. of beaver ponds. July. 882

CHENOPODIACEAE

Lvs spinulose

Salsola

Lvs not spinulose.

Plants annual.

Chenopodium

Plants perennial.

Lvs stellate scurfy.

Gravia

Lvs scurfy, but not stellate

Atriplex

51. Atriplex L.

80. A. confertifolia (Torr. & Frem.) Wats. Rounded intricately branched shrubs 4-8 dm tall; lvs numerous, alternate, 1-2 cm long; plants dioecious; fls mostly in the axils. Reported from Big Cinder Butte. June-July.

52. Chenopodium L.

Seed usually erect.

C. rubrum

Seed horizontal.

A Lvs entire to once or twice hastately lobed at base.

Lvs usually less than 4 times as long as broad.

C. fremontii

Lvs usually more than 4 times as long as broad.

C. leptophyllum

AA Lvs blades usually toothed on margin and frequently hastately lobed.

C. album

81. C. album L. Annual 2-10 cm tall; fls glomerate. Waste places. June-Sept. Widespread; along roads and game trails from L.C.C. to Sheeptrail Butte. CRM0: 26 July 65 Don Morning.

82. C. fremontii Wats. Annual 1-5 dm tall; lvs gradually reduced upwards; fls glomerate. June-Sept. 864

83. C. leptophyllum (Moq.) Wats. Annual, 2-6 dm tall; lvs linear or lanceolate, blades entire to lightly hastately-lobed; fls glomerate. June-Sept. Disturbed areas. 863
84. C. rubrum L. Annual 1-5 dm tall, often becoming reddish-tinged; fls glomerate. Disturbed areas. July-Oct. 862

53. Grayia H.&A.

85. G. spinosa (Hook.) Moq. Shrub to 1.5 m tall; lvs 1-2.5 cm long, entire, gradually narrowed to short petiolar base; fls in terminal and axillary spikelike clusters, imperfect. Reported from s. part of monument. Late June-July.

54. Salsola L.

86. S. kali L. var. tenuifolia Taush. Annual, with often purplish stems up to 1 m long, becoming hardened, rigid and rounded in late summer and twisting off to form tumble weeds; lvs linear 1-6 cm long, spinulose at tip; fls small, perfect solitary or clustered in axils of often spiny bracts. June-Aug. 974

KEY TO COMPOSITAE

Fls all ligulate and perfect; juice generally milky.

Pappus of simple capillary bristles.

Ackenes strongly flattened.

Lactuca

Ackenes terete.

Fls pink or whitish.

Lygodesmia

Fls yellow.

Plants fibrous-rooted.

Hieracium

Plants tap-rooted.

Heads several.

Crepis

Heads solitary.

Herbage and involucre glabrous;

ackenes beakless.

Microseris

Not with above combination.

Agoseris

Pappus of plumose bristles.

Fls pink or white.

Stephanomeria

Fls yellow.

Tragopogon

Fls not all ligulate; juice usually watery.

Heads radiate.

Rays yellow.

Pappus chaffy, or of firm awns, or none.

Receptacle chaffy or bristly throughout.

Plants scapose.

Balsamorhiza

Plants leafy stemmed.

Lower cauline lvs opposite.

Pappus persistent.

Helianthella

Pappus readily deciduous,
at least as to the 2 principal awn scales.

Helianthus

Lower cauline lvs, alternate.

Rudbeckia

Receptacle naked.

Plants resinous. Grindelia

Plants not resinous.

Herbs.

Perennial. Eriophyllum

Annual. Madia

Shrubs. Tanacetum

Pappus partly or wholly of capillary bristles.

Shrubs. Sometimes low.

, Pappus single. Haplopappus

Pappus double. Chrysopsis

Plants dying back each year.

Lvs opposite. Arnica

Lvs alternate.

Involucral bracts in 1 series.

Sencio

Involucral bracts in 2 or more
series. Solidago

Rays white to pink, not yellow.

Receptacle chaffy or bristly throughout.

Achillea

Receptacle naked.

Lvs not pinnately dissected.

Involucral bracts with chartaceous
base and evident green tip. Plants
blooming in mid-summer or later,
except Aster scopulorum. Aster

Involucral bracts not as above. Most
plants blooming in late spring and
early summer. Erigeron

Lvs pinnately dissected. Matricaria

Heads discoid or disciform, without rays.

Peppus partly or wholly of numerous capillary bristles.

Plants thistlelike. Cirsium

Not above.

Shrubs.

Involucral bracts 4-6, equal.

Tetradymia

Involucral bracts more numerous.

Chrysothamnus

Herbs.

Fls large, purple to cream.

Herbage not wooly.

Ackenes 5-angled; fls purple.

Eupatorium

Ackenes many ribbed; fls cream.

Brickellia

Fls small, grayish; herbage wooly.

Pappus bristles united at the
base, tending to fall off in a ring.

Antennaria

Pappus bristles distinct.

Anaphalis

Pappus chaffy, or of awns, or none.

Plants spiny.

Xanthium

Not above.

Receptacle chaffy or bristly throughout.

Receptacle elongate.

Rudbeckia

Receptacle flat.

Iva

Receptacle naked, or with a single row of
chaffy bracts.

Plants with an evident pappus. Herbs.

Chaenactis.

Pappus minute or absent. Shrubs, mostly.

Lvs bipinnate.

Tanacetum

Lvs entire to lobed.

Artemisia

55. Achillea L.

87. A. millefolium L. var. lanulosa Piper. Perennial herb;
fls white; lvs dissected. Common locally, disturbed
locations. July-Aug. 861

56. Agoseris Raf.

Perennials with yellow or orange ligulate fls.

Beak of ak half as long as body. A. glauca

Beak of ak more than half as long as body.

Beak less than twice as long as body;

lvs mostly entire. A. aurantiaca

Beak 2-4 times as long as body; lvs retrorsely

lobed. A. retrorsa

88. A. aurantiaca (Hook.) Greene. Common locally L.C.C.
June-July. 952

89. A. glauca (Pursh.) Raf. var. glauca. Common locally;
L.C.C. and Carey Kipuka. 708

90. A. retrorsa (Benth.) Greene. Widespread. June-July. 696

57. Anaphalis DC.

91. A. margaritacea (L.) B.&H. White-wooly leafy stemmed
perennial; lvs lanceolate, sessile. Along L.C.C.
June*Sept. 1112

58. Antennaria Gaertn.

Heads solitary, terminal.

A. dimorpha

Heads several or many.

Plants mat-forming.

A. rosea

Plants not mat-forming.

A. stenophylla

92. A. dimorpha (Nutt.) J&G. S.C.S. Carey Kipuka.

93. A. rosea Greene. Uncommon; slopes of Grassy, Silent Cones, Big Cinder Butte, and the Watchman. 981

94. A. stenophylla Gray. Carey Kipuka S.C.S.

59. Arnica L.

95. A. cordifolia Hook. Perennial; with yellow ligulate rays, lv blades, 1-2.5 times as long as broad. Locally abundant; Douglas fir forest of L.C.C. June. 721

60. Artemisia L.

Shrubs.

Lvs deeply cleft into linear or linear-oblongate divisions.

A. tripartita

Lvs merely toothed at apex.

Plants dwarf, mostly 1-4 dm tall. A. arbuscula

Plants taller, mostly 4-20 dm tall.

A. tridentata

Herbs.

Disk fls sterile with abortive ovaries. A. dracunculus

Disk fls fertile, ovary normal.

A. ludoviciana

96. A. arbuscula Nutt. Similar to A. tridentata but smaller and on less favorable sites. Widespread; slopes of older cinder cones and older cinder flats s. of Coyote Butte. Sept. 618

97. A. dracuncululus L. Nearly odorless to strongly odorless perennial herb, glabrous. Sept. Disturbed areas in L.C.C. 961
98. A. ludoviciana Nutt. var. latiloba Nutt. Aromatic perennial herb, with white tomentose herbage. Sept. Rare; Sagebrush-Bunchgrass. L.C.C. 939
99. A. tridentata Nutt. Aromatic shrub 4-20 dm tall; lvs 3-toothed at apex. Sept. Widespread. 1110
100. A. tripartita Rydb. Sub-shrub 2-6 dm tall; lvs deeply cleft into linear or linear oblanceolate divisions. Sprouts freely after burning. L.C.C. 1039

61. Aster L.

Pappus distinctly double; lvs uniform up to 4 mm wide.

A. scopulorum

Pappus simple; lvs usually reduced upward, variable in width.

Plants with a taproot.

A. canescens

Plants fibrous-rooted.

Rays pink or white.

A. eatonii

Rays blue or violet.

A. occidentalis

101. A. canescens Pursh. Biennial or short-lived perennial, 1-5 dm tall; lvs toothed. Widespread; open cinders. Late July-Sept. 924

102. A. eatonii (Gray) Howell. Perennial, 4-10 dm tall; lvs glabrous or scabrous and generally entire; stem minutely and uniformly puberulent above. Locally abundant; above Douglas fir forest stand in L.C.C. Coarse well-drained

soil. July-Aug. 916

103. A. occidentalis (Nutt.) T.&G. var. intermedius Gray.

Perennial, mostly 2-10 dm tall; lvs mostly glabrous and entire. Common locally; L.C.C. in aspens above beaver dam. July-Aug. 962

104. A. scopulorum Gray. Perennial from a branching woody caudex 4-12 cm tall; lvs, except upper ones, firm, crowded, scabrous-puberulent, sessile. Rare; Pioneer Mts and Carey Kipuka. May-June. 994A

. Balsamorhiza Nutt.

105. B. sagittata (Pursh) Nutt. Perennial with a deep-seated woody taproot and a multicapital caudex; lvs mostly triangular-hastate, up to 30 cm long, silvery beneath; rays yellow. Locally abundant; s., e., w., slopes of Sunset and Grassy Cones, Crescent and Split Buttes, and Carey Kipuka. June. 699

62. Brickellia Ell.

106. B. grandiflora (Hook.) Nutt. Herbaceous perennial, 2.5-7 dm tall; lvs mostly alternate; fls white-cream. Widespread; deep crevices of pahoehoe flows. Aug-Sept. 995

63. Chaenactis DC.

107. C. douglasii (Hook.) H.&A. Herbaceous biennial, 1-6 dm tall; lvs 1-3 times pinnatifid; heads discoid; fls white to pinkish. Widespread; open cinders. July-Sept. 1074

64. Chrysothamnus Nutt.

Twigs glabrous.

C. viscidiflorus

Twigs covered with feltlike tomentum.

C. nauseosus

108. C. nauseosus (Pall.) Britt. Shrubs with flexible twigs, to 2 m tall; rays yellow. Widespread; Sagebrush-Bunchgrass Pioneer Mts to Carey Kipuka. Aug.-Sept. 1083

109. C. viscidiflorus (Hook.) Nutt. Shrubs to 1 m tall; twigs brittle; rays yellow, minutely viscidulous. Not as common as above, occurring in a later succession stage. Aug-Sept. 1086

65. Chrysopsis Nutt.

110 C. villosa (Pursh) Nutt. ex DC. Perennial with several stems from a woody base, 1-5 dm tall; rays yellow. Locally abundant; shallow crevices, Broken Top, Blue Dragon pahoehoe and Black Flow, rare on n. Crater flow. Mid-July-Sept. 974

66. Cirsium Mill

Lvs scabrous-hispid above; stem winged.

C. vulgare

Lvs arachnoid-villous to glabrous above;

stem not winged by decurrent leaf bases.

Some of involucral bracts with a well developed, thickened, glutinous dorsal ridge.

Fls white or creamy.

C. canovirens

Fls pink-purple.

Lvs coarsely toothed to lobed,

lobes mostly over 7mm wide. C. undulatum

Lvs merely spinose-ciliate to
deeply pinnatifid, lobes mostly
3-7 mm wide.

C. canescens

Involucral bracts without thickened dorsal ridge.

Involucre 1.5-2.5 cm high.

C. subniveum

Involucre 2-4 cm high.

C. utahense

111. C. canescens Nutt. Biennial or short-lived perennial
3-8 dm tall. July. L.C.C. CRMO: D. Hornig.
112. C. canoyirens (Rydb.) Petrak. Biennial or short-lived
perennial, 5-10 dm tall. July. L.C.C. CRMO: K. Urban.
113. C. subniveum Rydb. Perennial, 3-7 dm tall. July.
L.C.C. 1205 A
114. C. utahense Petrak. 5-10 dm tall. L.C.C. July. 997
115. C. undulatum (Nutt.) Spreng. Biennial or short-lived
perennial, mostly 3-12 dm tall. July. S.C.S. Carey Kipuka
116. C. vulgare (Savi) Airy-Shaw. Biennial 3-15 dm tall; stem
spiny-winged by decurrent leaf bases; lvs pinnatifid;
heads several, purple to white; involucre 2.5-4 cm high.
Disturbed areas; L.C.C. 967

67. Crepis L.

Involucres, or lower part of stem, or both,
conspicuously setose, but not at all
glandular.

C. modocensis

Involucres and stem sparingly or not at all setose,
or if evidently setose, then the setae gland-tipped.

C. acuminata

117. C. acuminata Nutt. Perennial from a taproot, 2-7 dm tall;
basal and cauline lvs 1-4 dm long, pinnately lobed.

Common; cinders. July. 1034

118. C. modocensis Greene. Perennial from a taproot 1-3 dm tall;
basal and cauline lvs 7-25 cm long, more deeply pinnately
lobed than above. Rare; coarse cinder, summit of Split

Butte. 781

Erigeron L.

Cauline lvs ample.

E. speciosus

Cauline lvs reduced.

Basal lvs trifid to ternately dissected.

E. compositus

Basal lvs entire or slightly toothed. E. pumilus

119. E. compositus Pursh. 3-25 cm tall, herbage glandular and
hairy; basal lvs trifid to dissected; rays white. Common;
shallow crevices. Late May-June. 767

- 120 E. pumilus Nutt. 5-50 cm tall, herbage copiously spreading-
Hairy; lvs oblanceolate; rays white. L.C.C. and Carey Kipuka
July-Aug. 1063

121. E. speciosus (Lindl.) DC. Perennial, stems clustered,
1.5-8 dm tall; glabrous below inflorescence; lvs often
triple-nerved; rays blue, or white. Locally abundant
above 6000 ft; moist open sites, L.C.C. July. 950

69. Eriophyllum Lag.

122. E. lanatum (Pursh.) Forbes. var. integrifolium (Hook) Smiley. Tomentose perennial 1-2.5 dm tall; lvs mostly entire; rays yellow. Widespread: cinder flats. Late June-July. 800

70. Eupatorium L.

123. E. occidentale Hook. Perennial; several stemmed from a woody base, 1.5-7 dm tall; fls pinkish. Widespread; deep crevices. Late July-Aug. 996

71. Grindelia Willd.

124. G. squarrosa (Pursh.) Dunal. var. serrulata (Rydb.) Steyerl. Glabrous perennial with a taproot; lvs serrulate; fls yellow. Along highway and L.C.C. along access road. July-Aug. 851

72. Haplopappus Cass.

125. H. nanus (Nutt.) Eat. Much branched small shrub with brittle twigs; lvs linear. Fls yellow. Widespread; shallow crevices. Late July-Aug. 983

73. Helianthella T. & G.

126. H. uniflora (Nutt.) T. & G. Perennial 2-10 dm tall; lvs opposite; head solitary; rays yellow. L.C.C. Late June-July. 844.

74. Helianthus L.

127. H. annuus L. Coarse annual 4-20 dm tall, herbage rough-hairy; lvs alternate except uppermost, rays yellow.
Common disturbed sites. July-Aug. 1005

75. Hieracium L.

128. H. cynoglossoides Arv.-Touv. Perennial 3-13 dm tall, herbage densely hairy; lvs 10-25 cm long; fls yellow.
Uncommon; usually with Populus. June-Aug. 973

76. Iva L.

Annual; lvs long petiolate.

I. xanthifolia

Perennial; lvs sessile or subpetiolate.

I. axillaris

129. I. axillaris Pursh. 1.5-6 dm tall. Locally abundant; along road to L.C.C. Aug.-Sept. 1010
130. I. xanthifolia Nutt. Usually large and coarse up to 20 dm tall. Locally abundant; disturbed areas, L.C.C. Aug.-Sept. 1009

77. Lactuca L.

131. L. serriola L. Biennial or annual, 3-15 dm tall, glabrous; lvs prickly on midrib beneath, and margins; fls yellow; ake several nerved. Widespread; disturbed areas. July-Aug. 935

78. Lygodesmia D. Don

132. L. spinosa Nutt. Perennial from a taproot, bearing tufts of pale or brownish wool at base; stems several, 1.5-8dm tall, branches divaricate with milky juice spine tipped; fls ligulate, purple to pink. Locally abundant; open sites

on cinder cones. July-Aug. 993

79. Madia Mol.

133. M. gracilis (Smith) Keck. Annual, glandular upward with conspicuously stalked glands, 1-10 dm tall; lvs linear; fls yellow. Common locally around well #4. July-Sept. 922

80. Matricaria L.

134. M. maritima L. Annual, or perennial; lvs 2-8 cm long bipinnatifid; rays white. Rare; disturbed areas; Martin Rd. and monument residences. July-Aug. 1051

81. Microseris Don

135. M. nutans (Geyer) Schultz-Bip. Glabrous perennial, about 1 dm tall; heads nodding, mostly solitary; fls ligulate, yellow. Pioneer Mts. and Carey Kipuka. 708

82. Rudbeckia L.

136. R. occidentalis Nutt. Coarse perennial, mostly 5-20 dm tall; lvs up to 25 cm long, 15 cm wide; disc black and columnar elongating in fr. Locally abundant; L.C.C. 860

83. Senecio L.

Cauline lvs well-developed, finely toothed. S. serra

Cauline lvs generally reduced upwards, not finely toothed but may be lobed.

Plants with dense tomentum.

S. canus

Plants arachnoid-villous.

S. integerrius

137. S. canus Hook. Perennial with several stems, 1-3 dm tall, more or less strongly white-tomentose; fls yellow.

Widespread; cinder cones and shallow crevices. June-July.

769

138. S. integerrimus Nutt. var. exaltatus (Nutt.) Cronq.

Perennial, single-stemmed, stout 2-7 dm tall, herbage

hirsute to villous when young, glabrate in age; fls

yellow. Widespread; Pioneer Mts. to Carey Kipuka; open

sites, Sagebrush-Bunchgrass. June-July. 655

139. S. serpa Hook. Perennial, 5-15 dm tall; stems clustered,

thinly tomentulose; fls yellow. Locally abundant along

L.C.C. July. CRM0: MFS 206

84. Solidago L.

140. S. gigantea Ait. Perennial from creeping rhizomes, 3-20

dm tall; stem glaucous; branches of inflorescence recurved-

secund; fls yellow. Uncommon; along L.C.C. July-Aug.

1201

85. Stephanomeria Nutt.

141. S. tenuifolia (Torr.) Hall. var. myrioclada (Eat.) Cronq.

Perennial with several stems, 2-7 dm tall; lvs linear,

toothed; fls ligulate, pinkish. Milky juice present.

Common; coarse cinders and shallow crevices. July-Sept.

992

86. Tanacetum L.

142. T. vulgare L. Aromatic perennial 4-15 dm tall; lvs bipinnatifid with evidently winged rachis; head disciform yellow. Rare; lawns of residences. July-Aug. 1501

87. Tetradymia DC

143. T. canescens DC Shrub 2-6 dm tall; herbage white-tomentose; fls yellow, 4 in each head. Uncommon, well-developed soils; Pioneer Mts to Carey Kipuka. 979

88. Tragopogon L.

144. T. dubius Scop. Biennial with milky juice 3-10 dm tall; lvs grasslike; fls yellow, ligulate. Widespread; Sagebrush-Bunchgrass. 1103

89. Xanthium L.

145. X. strumarium L. Annual 2-20 dm, alternate; heads axillary; bur with incurved beaks. Locally abundant; w. canyon of L.C.C. July-Aug. 1013

CORNACEAE

90. Cornus L.

146. C. stolonifera Michx. Shrub 2-6 m tall, young branches bright red; lv blades 4-12 cm long; fls in flat-topped cymes; petals white, 2-4 mm long. H.q. area and L.C.C.
CRM: NPS 116, 7/1/38

CRASSULACEAE

91. Sedum L.

147. S. stenopetalum Pursh. Glabrous perennial, lvs alternate, linear, strongly keeled or nerved on dorsal surface 5-15

(25) mm long; petals yellow, 6-9 mm long. Uncommon.

Rocky outcrops, dry open sites, L.C.C. April-May. CRM0:

K. Urban

CRUCIFERAE

Fruit a siliole, about as long as wide.

Seeds 1 per locule.

Alyssum

Seeds 2 or more per locule.

Lepidium

Silicles to 4 mm long.

Silicles greater than 4 mm long.

Lvs not pinnatifid or lobed. Thlaspi

SHEPARD'S PURSE: Some of lvs pinnatifid or

lobed.

Capsella

Fruit a silique, more than 2 times longer than wide.

Petals yellow.

Plants conspicuously pubescent with usually 2-rayed hairs.

Erysimum

Plants glabrous to pubescent, but not with 2-rayed hairs.

Plants aquatic.

Pods terete.

Rorippa

Pods 4-sided

Barbarea

Plants not aquatic.

Plant stellate-pubescent. Descurainia

Plant with simple pubescence.

Sisymbrium

Petals white or pinkish to purple, never yellow.

Plant caespitose perennial, flowering stems merely
bracteate.

Phoenicaulis

Plant various but with well-developed flowering stems.

Plants annual.

Arabidopsis

Plants perennial.

Petals purple.

Arabis

Petals white.

Thelypodium

92. Alyssum L.

148. A. desertorum Stapf. Low grayish annual with appressed-stellate pubescence 1-3 dm tall; petals white, narrow, 3-4 mm long in elongate racemes. Disturbed locations. May-June. 627

93. Arabidopsis (DC.) schur.

149. A. salsauginea (Pall.) N. Busch. Low, glaucous annual 5-15 cm tall; lvs mostly cauline, auriculate; petals white, 2-3 mm long; siliques nearly erect, 10-16 mm long. Shallow Crevices. June. 755

94. Arabis L.

Pedicels not geniculate and abruptly reflexed at base; lvs, basal
pannose.

A. sparsiflora

Pedicels geniculate and abruptly reflexed at the base; lvs, basal
lobed and bristle-tipped or entire.

A. holboellii

150. A. holboellii Hornem. Biennial perennial, ; -10 dm tall;
basal lvs numerous, 1-5.5 cm long; racemes mostly 3-10 fld;
petals rose-purple, 5-10 mm long. Widespread; coarse cinders

June-July. 656

151. A. sparsiflora Nutt. Perennial, 3-10 dm tall; stems one to several; racemes many-fld; petals white to purple. Widespread; cinders; generally with Purshia. June-July. CRM0: Menning, B.P. 6/2/64.

95. Barbarea R. Br.

152. B. orthoceras Ledeb. Perennial 3-8 dm tall; basal lvs 2-9 cm long; petals 2.5-5mm long, yellow. Siliques erect or ascending. Along L.C.C. June-Aug. 816

96. Capsella Medic.

153. Capsella bursa-pastoris (L.) Medic. Annual 1-5 dm tall; basal lvs rosulate, oblanceolate, 3-6 cm long, upper lvs lanceolate; racemes many-fld; pedicels 7-15 mm long; sepals 2 mm long; petals 1.5-4 mm long, white; fr triangular. May-July. 957

97. Lescurainia Webb. & Barth

Pods clavate or subclavate.

D. pinnata

Pods linear, not enlarged at outer end.

Lower lvs bi- or tripinnate.

D. sophia

Lower lvs pinnate.

D. richardsonii

154. D. richardsonii (Sweet) Schulz. var. viscosa (Rydb.) Peck. Annual 2-10 dm tall; lvs pinnate-pinnatifid; petals yellow, siliques erect and appressed to axis of racemes, 5-17 mm long, strongly torulose. Disturbed areas. June-Aug. CRM0: K. Urban

155. D. sophia (L.) Webb. Annual 3-10 dm tall; lvs mainly

cauline, mostly decompound into linear segments 1 mm broad; racemes often half total height of plant; petals yellow shorter than sepals. Disturbed areas. June-Aug. 956

156. D. pinnate (Walt.) Britt. Annual, 1-6.5 dm tall; lvs 1-7 cm long, pinnate, or bipinnate; petals yellow. Disturbed areas. June-Aug. 1204

98. Erysimum L.

157. E. asperum (Nutt.) DC. Cinereous to greenish perennial, 2-10 dm tall; basal lvs rosulate, entire to sharply dentate; outer sepals saccate at base; petals yellow-orange, 15-25 mm long; June-July. 787

99. Phoenicaulis Nutt.

158. P. cheiranthoides Perennial from a thick taproot and branched caudex covered with marcescent leaf bases; lvs in thick rosettes, 3-15 cm long, blade oblanceolate, entire; sepals pink or purplish; petals reddish-purple; siliques divericate; midnerve of valve prominent. Uncommon; coarse cinders n. slope of Big Cinder Butte and shallow crevices of Big Cinder n.w. flow, Black Flow and Big Craters n.w. Flow. July-Aug. 772

100. Rorippa Scop.

159. R. nasturtium-aquaticum (L.) Schinz & Thell. Fleshy perennial with stems often rooting at nodes, 1-5 dm long; lvs glabrous 4-12 cm long; fls white-purplish, 3-4 mm

long. L.C.C. June-July. 900

101. Sysymbrium L.

160. S. altissimum L. Branched annual, 3-15 dm tall; lvs lanceolate or oblong; petals yellow, 6-8 mm long; siliques linear, 5-10 mm long. Disturbed areas. July-Aug. 814

102. Thelypodium Endl.

161. T. sagittatum (Nutt.) Endl. Glaucous biennial, 3-7 dm tall; lvs sessile, auriculate; sepals erect at base, pink-purple; petals purple; siliques straight, ascending. Range unknown; collected near trail to tree molds. July-Aug. 757

103. Thlaspi L.

162. T. arvense L. Glabrous annual with simple to freely branched stems to 3 dm tall, basal lvs few, oblanceolate; sepals to 2 mm long; petals to 4 mm long, white. Silicles strongly obcompressed, wing-margined all around. Disturbed sites n. of highway and residence area. April-July. 762

FUMARIACEAE

104. Dicentera Bernh.

163. D. uniflora Kell. Glaucous perennial; scape and lvs are separately attached to root below ground; lvs long petioled lobed to divided; corolla white-pinkish, appearing as a cow's skull. Expected in Pioneers. Collected near Big Cottonwood Creek and main highway

junction ca 1 mile from w. boundary. April-May. 608

GERANIACEAE

105. Geranium L.

164. G. viscosissimum F. & M. var. nervosum Perennial 4-9 dm tall; lf 5-12 cm broad, toothed; sepals 8-12 mm long; petals pink-purple, 14-20 mm long. Locally abundant; Sagebrush-Bunchgrass n. of highway. June-July. 867

GROSSULARIACEAE

106. Ribes L.

Fls bright yellow.

R. aureum

Fls other than bright yellow.

Ovary and herbage with yellow crystalline glands; growing along L.C.C.

R. hudsonianum

Not as above; plants of dry areas.

R. cereum

165. R. aureum Pursh. Unarmed shrub; lvs mostly 3-lobed fls in racemes, yellow. Common in n. part. May-June. 712
166. R. cereum Dougl. Shrub; lvs stipitate glandular, 3-5 lobed less than half length; fls capitate racemose, white-pink; Common. June-July. 1027
167. R. hudsonianum Richards. Shrub; lvs cordate 3.5-9 cm broad, primarily 3-lobed less than half of length; fls white in racemes; Banks of L.C.C. June-July. 715

HYDRANGEACEAE

107. Philadelphus L.

168. P. lewisii Pursh. Shrub; lv blades ovate-elliptic; fls

white, 10-20 mm long; stamens many; fr a woody capsule.

Deep-crevices. June-July. CRM0.

HYDROPHYLLACEAE

Fls solitary.

Name

Fls not solitary.

Lvs pinnatifid into 7-11 sessile leaflets.

Hydrophyllum

Lvs not as above.

Phacelia

108. Hydrophyllum L.

169. H. capitatum Dougl. ex Benth. var. capitatum Plant 1-4 dm tall; stems solitary or few, some attached below ground, pinnatifid into 7-11 sessile leaflets; corolla blue. Moist areas. L.C.C. and Silent Cone. June. 654

109. Name L.

170. H. densum Lemmon. Dwarf prostrate, dichotomously branched, annual, sparsely or moderately spreading hispid throughout; lvs oblanceolate; corolla white to lavender, 2.5-5mm long. Uncommon; disturbed sites. 970

110. Phacelia Juss.

Herbage silvery or stem prostrate.

P. hastata

Herbage green and stem erect.

P. heterophylla

171. P. hastata Dougl. Perennial, taproot usually surmounted by a branched caudex; stems, up to 5 dm tall; herbage silvery; corolla white-purple, 4-7 mm long. Common; open cinders. June-Aug. 849

172. P. heterophylla Pursh. Similar to above. Sagebrush-bunchgrass and disturbed areas.

LABIATAE

Corolla only obscurely or scarcely bilabiate.

Mentha

Corolla strongly bilabiate.

Stamen with a single functional pollen sac.

Scutellaria

Stamen with 2 pollen sacs.

Stamens evidently exserted.

Agastache

Stamens not exserted.

Marrubium

111. Agastache Clayton.

173. A. utricifolia (Benth.) Kuntze. Perennial; stems 4-15 dm tall; lvs 4-10 cm long and 2-8 cm wide; corolla white, 10-14 mm long. Stream banks and adjacent hillsides of L.C.C. June-Aug. 857

112. Marrubium L.

174. M. vulgare L. Perennial; stems 3-10 dm long, white-wooly; lvs cauline, calyx tube 4-5 mm long; corolla white. Rare; w. L.C.C. roadbed. June-Oct. CRM: K. Urban

113. Mentha L.

175. M. arvensis L. Perennial; stems 2-8 dm tall; verticels of fls compact; corolla white to purple or pink, 4-7 mm long. Streambed of L.C.C. July-Sept. 858

114. Scutellaria L.

176. S. antirrhinoides Benth. Perennial, 1-3 dm tall; lvs 1.5-3.5 cm long; fls solitary in axils; calyx 3.5-5.5 mm

long; corolla blue-violet, 15-18 mm long, pressed. Shallow
crevices of black flow, and ridges e. Carey Ripuka. L.C.C.
May-June. 840

LEGUMINOSAE

Lvs trifoliate.

Plants 0.5-3 m tall.

Melilotus

Plants less than 0.5 m tall.

Trifolium

Lvs not trifoliate.

Plants palmately compound.

Lupinus

Plants not palmately compound.

Keel of corolla not abruptly beaked.

Astragalus

Keel of corolla abruptly beaked. Oxytropis

115. Astragalus

Plants with pubescence of two branched hairs.

A. canadensis

Plants with pubescence of basally attached hairs.

Terminal leaflet not confluent with rachis.

A. convallarius

Terminal leaflet confluent with rachis.

Leaflets 11-19.

A. dasycalottis

Leaflets 19-29.

A. stenophyllus

177. A. canadensis L. Perennial 3-8 dm tall; lvs mostly 10-20
cm long; leaflets 13-29; fls ochroleucous, to white 12-18
mm long; keel usually purplish-tinged, white. Roadside of
L.C.C. and H.Q. area. June-July. CPMO: MFB: 96

178. A. convallarius Greene. Rushlike perennial, 3-6 dm tall; leaflets usually lacking; lvs linear, 4-12 cm long; fls 8-12 mm long, purplish. Uncommon; observed in secondary succession study plot (pyric) 7 mi e. HQ along highway. June-July. CRM O K. Urban 1966.
179. A. dasyglottis Fish. ex DC. Low perennial 1-3 dm tall; lvs 4-10 cm long; leaflets 11-19; fls 13-19 mm long, purple-white. Aspen stands of L.C.C. June-Aug. CRM O. K. Urban. 13 July 1966.
180. A. stenophyllus T. & G. Slender perennial 1.5-4 dm tall; lvs 5-21 cm long; leaflets 19-29; fls white-cream. S.C.S. May-July.

The lupines do not fall neatly into species. The main characters of the following species seem to be represented.

116. Lupinus L.

Basal lvs present at time of flowering.

Calyx spurred.

L. caudatus

Calyx not spurred.

L. leucophyllus

Basal lvs usually absent at time of flowering and calyx not spurred or conspicuously hairy.

L. argenteus

181. L. argenteus Pursh. Perennial 1.5-4 dm tall; stems several, lvs nearly all cauline; leaflets 6-9; fls white-blue, 4-12 mm long; pods 1.5-2.5 cm long, very hairy; widely distributed. June-July. 980.

182. L. caudatus Kell. Perennial 2-3.5 dm tall; stems several; lvs nearly all cauline; leaflets 7-9; fls blue-violet, 10-12 mm long; pods 2-3 cm long, silky. Common; Sagebrush-Bunchgrass and open cinders. June-July 713
183. L. leucophyllus Dougl. Perennial 3-7 dm tall; stems several, grayish to rust colored; lvs mainly cauline; leaflets 7-10; fls white-lilac, 8-16 mm long; pods 1.5-2.5 cm long, shaggy with rusty hairs. Dry hillsides of L.C.C. June-July.

117. Oxytropis D.C.

184. O. lagopus Nutt. Sericeous-silky caespitose perennial; lvs semiopposite; fls with keel prolonged to a point; fls purple-yellow. Pioneer Mts. May-June. 671

Inflorescence subtended by an involucre of bracts 3 mm or more in length.

T. pratense

Inflorescence not as above.

T. repens

118. Trifolium L.

185. T. pratense L. Trifoliate perennial 3-10 dm tall; fls deep red 13-20 cm long. July-Aug. L.C.C. 1054
186. T. repens L. Stoloniferous trifoliate perennial 2-5 dm tall corolla white-pink. Along L.C.C. 872

LOASACEAE

119. Mentzelia L.

Petals greater than 1.5 dm long.

M. laevicaulis

Petals less than 1.5 cm long.

Inflorescence congested; capsules linear.

M. dispersa

Inflorescence not congested; capsules noticeably broadened upward.

M. albicaulis

187. M. albicaulis Dougl. ex Hook. Annual 1-2 dm tall; lvs 2-10 cm long, basal usually linear and entire to shallowly few-lobed; petals yellow, 2-6 mm long. Widespread; disturbed areas and open cinders. June-July. 985
188. M. dispersa Wats. Annual 1-2 dm tall; lvs lanceolate to entire to sinuate-lobed or even subpinnatifid, 3-10 cm long; petals yellow, 3-6 mm long. Same range as M. albicaulis. June-July. 984
189. M. laevicaulis (Dougl.) T. & G. Biennial 3-10 dm tall; lvs deeply pinnatifid, to 15 cm long; petals yellow, 2.5-8 cm long. Widespread; disturbed area and open cinders. July-Aug. CRMO 730

LORANTHACEAE

120. Arceuthobium Bieb.

190. A. campylopodum Engelm. f. cyanocarpum (A. Nels.) Gill.
A parasite on P. flexilis, causing proliferation of growth and "Witches Brooms." Widespread; from Sunset Cone to Fissure Butte. 616

MALVACEAE

- Plants usually over 1 m; lvs 5-15 cm long. Iliamna
- Plants under 1 m; lvs 2-6 cm long. Sphaeralcea

121. Iliamna Greene

191. I. rivularis (Dougl.) Greene. Herbaceous stellate perennial, 1-2 m tall; lvs lobed, 5-15 cm long; fls white-

red. Along L.C.C. June-Aug. 1018

122. Sphaeralcea St. Hil.

192. S. munroana (Dougl.) Spach. ex Gray. Perennial 2-8 dm tall; lvs 2-6 cm long, reniform to ovate-deltoid; petals apricot pink-reddish. June-July. Infrequent, summit of Carey Kipuka and e. base of Sunset Cone. 894

ONAGRACEAE

Fls 2-merous; fr with hooked hairs.

Circaea

Fls 4-merous; fr not bristly.

Seeds with a tuft of long hairs at tip. Epilobium

Seeds glabrous.

Petals under 5mm.

Gayophytum

Petals over 5 mm long.

Oenothera

123. Circaea L.

193. C. alpina L. perennial, 1-5 dm tall, clear green; lvs opposite, 2-6 cm long; petals white, 1-1.5 mm long; Along L.C.C. in deep shade. July-Aug. 1000

124. Epilobium L.

Petals more than 1 cm long.

E. angustifolium

Petals less than 1 cm.

Plants of xeric sites; epidermis exfoliating.

E. paniculatum

Plants of moist sites; epidermis not exfoliating.

Plants over 3 dm tall.

E. glandulosum

Plants under 3 dm tall.

E. alpinum

194. E. alpinum L. var. nutans (Hornem.) Hook. Perennial
1.5-3 dm tall; stems decumbent based; lvs 1.5-3 dm long;
petals pink, 5-8 mm. Along L.C.C. July-Aug. 945
195. E. angustifolium L. Perennial, 1-3 m tall; lvs alternate,
10-15 cm long; petals rose-purple, 8-20 mm long. Roadside
in Douglas Fir Forest above beaver pond and isolated
occurrences in shallow crevices w. Needles Cave and
shallow crevices s. Little Prairie aa flow. July-Aug.
902
196. E. glandulosum Lehm var. glandulosum Perennial 0.5-9 dm
tall, lvs opposite, 1-12 dm long; petals pink or purplish,
notched, 3-10 mm long; capsules slender, 2-7 cm long.
L.C.C. July-Aug. 1001
197. E. paniculatum Nutt. Annual 3-9 dm tall; lvs linear, 2-3
cm long, alternate; petals rose-lilac. Widespread. 1080

125. Gayophytum Juss.

Capsules nearly or quite sessile.

G. racemosum

Capsules pedicelled.

Petals scarcely 1 mm long; capsules seldom over 6 mm long,
shorter than the usually sharply reflexed pedicels.

G. ramosissimum

Petals usually over 1 mm long, or the capsules well over
.6 mm long and exceeding the erect to spreading pedicels.

G. nuttallii

198. G. nuttallii T. & G. Annual, 1.5-6 dm tall, diffusely
branched; lvs linear, 1.5-5 cm long, reduced upwards;

petals white-pinkish, 1-5 mm long. July-Aug. Widespread.

839

199. G. racemosum T. & G. Annual low, diffusely branched 5-20 cm tall; lvs linear 0.5-3.0 cm long; capsules sessile, 7-15 mm long. Widespread. 693
200. G. ramosissimum Nutt. Annual 1.5-4 dm tall, freely and diffusely branched; lvs linear, 1-3.5 cm long; sepals and petals about 0.5 mm long; capsule pedicellate, 3-6 mm long, distinctly torulose. Widespread; open cinders. CRM0: NPS 55 Virginia H. Chase.

126. Oenothera L.

Fls white, aging pinkish.

Oe. caespitosa

Fls yellow.

Oe. heterantha

201. Oe. caespitosa Nutt. Caespitose perennial; lvs narrowly to broadly oblanceolate, 10-25 cm long; petals 2.5-4.5 cm long; capsule woody, oblong-ovoid, 1-4 cm long. Slopes of Sunset Cone and adjacent flat. June-July. 711
202. Oe. heterantha Nutt. ex T. & G. Caespitose perennial; lvs 5-20 cm long; capsule 12-18 mm long. Rare; roadside n. Sunset Cone. June-July. 780

OROBANCHACEAE

127. Orobanche L.

Fls with bractlets just beneath calyx.

O. californica

Fls without bractlets.

O. fasciculata

203. O. californica Cham. & Schlecht. Plants 5-12 cm tall, glandular-puberulent; inflorescence short and dense; fls subtended by a pair of narrow bractlets just beneath corolla; corolla purplish, mostly 22-28 mm long. Parasitic on Artemisia tridentata. Uncommon; Artemisia belt between Watchman and Split Butte. June-Aug. 779
204. O. fasciculata Nutt. Stems 3-15 cm long, yellow or purple; plants glandular; fls without bractlets, in a flat-topped corymb; corolla purple or yellow 15-30 mm long. Artemisia belt between Watchman and Split Butte. June-July. 892

POLEMONIACEAE

Calyx tube of essentially uniform texture throughout.

Collomia

Calyx tube with green costae separated by hyaline intervals.

Filaments very unequally inserted.

Perennial.

Phlox

Annual.

Microsteris

Filaments about equally inserted.

Heads distinctly tomentose with very fine, interwoven hairs.

Eriastrum

Heads not as above.

, Herbs.

Fls yellow, congested.

Navarretia

Fls white, or red.

Gilia

Subshrubs.

Leptodactylon

128. Collomia Nutt.

Stamens unequally inserted.

C. linearis

Stamens equally inserted.

Corolla 8-14 mm long.

C. tinctoria

Corolla 4-6 mm long.

C. tenella

205. C. linearis Nutt. Annual 1-6 dm tall; lvs numerous, nearly all alternate, sessile or nearly so, 1-7 cm long; corolla pink or bluish to white, 8-15 mm long. Widespread; open cinders and Sagebrush-Bunchgrass. June-Aug. 758

206. C. tenella Gray. Annual up to 1.5 dm tall; lvs 1-5 cm long; corolla lavender, pink to white 4-6 mm long. Range unknown. June-July.

207. C. tinctoria Kell. Uncommon; gravelly soil of hillsides, L.C.C. June-Aug.

129. Eriastrum Woof. & Standl.

208. E. sparsiflorum (Eastw.) Mason. Annual up to 3 dm tall; lvs 1-3 cm long, linear and entire; head few fld, compact; corolla blue-white, 7-13 mm long. Locally abundant; dry slopes +- n. Split Butte, to , Carey Kipuka. June-Aug. 893

130. Gilia R. & P.

Perennial; corolla red, 1.5-3.5 cm long.

G. aggregata

Annual; corolla usually whitish, less than 1 cm long.

G. leptomeria

209. G. aggregata (Pursh) Spreng. Short-lived perennial blooming once, mostly 2-10 dm tall, with 1 or several stems; lvs pinnatifid, cauline well-developed. Locally abundant.

L.C.C. and e. slope knoll n. incinerator pit. June-Aug.
789

210. G. leptomeria Gray. Annual seldom over 2.5 dm tall; lvs spinulose-tipped; fls 3-7 mm long. This species is close to G. sinuata. Widespread; open cinders. June-July. 994

131. Leptodactylon H. & A.

211. L. pungens (Torr.) Nutt. Sub-shrub 1-6 dm tall; lvs numerous, mostly 5-12 mm long, spinulose-tipped; corolla 1.5-2.5 cm long, white. Widespread; shallow crevices, and Sagebrush-Bunchgrass. June-July. 611

132. Microsteris Greene

212. M. gracilis (Hook.) Greene. var. gracilis Annual 5-15 cm high; lvs linear; fls mostly in pairs at ends of stems, one subsessile, the other pedicellate; corolla 5-15 mm long with white or yellow tube and pink-lavender limb. Locally abundant; L.C.C. 605

133. Navarretia R. & P.

213. N. breweri (Gray) Greene. Annual to 1 dm tall; lvs to 2.5 cm long, pinnatifid; corolla yellow, 5-8 mm long, Uncommon; roadside of L.C.C. and on Carey Kipuka. June-July.

873

134. Phlox

Plants more or less erect, or loosely repent, with well-developed internodes.

P. longifolia

Plants forming mats, lvs crowded; internodes not well developed.

P. hoodii

214. P. hoodii Rich. Caespitose perennial; lvs firm and pungent, narrowly linear; fls mostly solitary; corolla blue, pink to white. a. side of Sunset Cone and Carey Kipuka. June-July. 611.
215. P. longifolia Nutt. Perennial 1-4 dm tall; lvs linear, 1.5-8 cm long; inflorescence loosely cymose; corolla pink. Common in a. part, Sagebrush-Bunchgrass. June-July. 657.

POLYGONACEAE

Lvs with sheathing stipules.

Perianth segments 6.

Rumex

Perianth segments 5.

Polygonum

Lvs without sheathing stipules.

Eriogonum

135. Eriogonum Michx.

Annuals.

Peduncles reflexed.

E. cernuum

Peduncles not reflexed.

E. vinineum

Perennials.

Perianth narrowed to slender stipelike base.

Involucres solitary at tip of naked fl-stems.

E. caespitosum

Involucres either more than 1 per stem, or stem with a whorl of lvs from below mid-length to immediately below involucres.

Fl-stems with a whorl of foliaceous bracts about midlength, sometimes reduced to 1 or 2, or wanting; lvs mostly linear, usually 3 times longer than broad.

E. heracleoides

Fl-stems usually not as above; lvs oblanceolate to elliptic or oval; rarely 3 times longer than broad.

E. umbellatum

Perianth rounded to acute at base without stipelike base.

Plants shrubby at base.

E. microthecum

Plants not shrubby, but forming mats. E. ovalifolium

216. E. caespitosum Nutt. Low spreading, cushion-forming perennial; lvs numerous, 5-15 mm long, including petiole; fls numerous, yellow-rose tinged, 2.5-5 mm long. Carey Ripuka, and Pioneer Mtns. above well #4. 1109.

217. E. cernuum Nutt. Annual, 1-4 dm tall; lvs basal, oval, 1-2 cm long; stem dichotomous above; involucre single at nodes on slender, reflexed peduncles; perianth white to pink. Along side of L.C.C. Rd. at base of Pioneer foothills. Aug. 998.

218. E. heracleoides Nutt. Perennial, forming clumps up to 6 dm broad and 1-4 dm tall; lvs linear, narrowed gradually to a slender petiole; inflorescence an umbel; perianth white-yellow. Widespread; older cones and flats

eroded pahoehoe flows near Great Owl Cavern. June-July. 1039.

219. E. microthecum Nutt. Perennial 1-4 dm tall; lvs linear to oblong, 1-3 cm long narrowed gradually to a very short petiole; inflorescence freely branching, open, flat topped; perianth white, or pink. Widespread; Sagebrush-Bunchgrass and open cinders, also shallow crevices s. of Crystal Pit and s. of Watchman. June-July. (1975.)
220. E. ovalifolium Nutt. Caespitose perennial, forming mats up to 3-4 dm broad; lvs all basal, white tomentose on surface; flowering stems leafless; inflorescence a capitate cluster of several involucre; perianth yellow, pink to purplish. June-July. Abundant; slopes of cinder cones and cinder flats. Plants with scapes less than 1 dm tall are referable to the var. depressum Blank 1205.
221. E. umbellatum Torr. Perennial forming flat mats up to 6 dm broad, 1-3 dm tall; inflorescence a simple to compound umbel, primary rays subtended by a whorl of leaflike bracts; perianth yellowish tinged with rose in age. Common; Sagebrush-Bunchgrass usually. June-July. 1042.
222. E. vimineum Dougl. 2-3 dichotomously branched annual, 5-30 cm tall; lvs basal, oval; inflorescence cymose, involucre nearly or quite sessile; perianth white-pink.

Common; disturbed sites and open cinders of recent
cinder cones. July-Aug. Crmo: K. Urban 1966.

136. Polygonum L.

- Ackene brownish black. P. aviculare
Ackene raven-black. P. douglasii
223. P. aviculare L. Annual, 1-12 dm long. Disturbed areas.
224. P. douglasii Greene. Annual 1-4 dm tall. Uncommon;
heavily vegetated n. slopes and open cinders of sum-
mits of Silent Cone and Big Cinder Butte. July-Sept.
1926.

137. Rumex L.

225. R. salicifolius Weinm. var. montigenitus Jeps.
Glabrous perennial with a strong taproot; stems 2-6 dm tall;
lvs numerous, mainly cauline, not strongly reduced upward;
fls perfect, greenish brown to deep pink, ultimately glom-
erate. Roadsides of L.C.C. and H.Q. area. July-Sept. 878.

PORTULACACEAE

- Plants annual. Calyptridium
Plants perennial. Lewesia

138. Calyptridium Nutt.

226. C. roseum Wats. Small reddish annual 2-8 cm tall, with
fleshy, rosulate basal lvs. June-July. Abundant; open
cinders from Sunset s. to Inferno cone. 841.

139. Lewisia Pursh.

227. L. rediviva Pursh. Perennial from a several branched deep-seated, fleshy taproot; lvs basal, fleshy, nearly terete, beginning to wither and dry at anthesis; fls single; scape leafless, 1-3 cm tall, white to pink. Common; open cinders. Late June-July. 848.

RANUNCULACEAE

Fls bilaterally symmetrical.

Delphinium

Fls radially symmetrical.

Petals prominently spurred.

Aquilegia

Not as above.

Pistil 1; fr a berry.

Actaea

Pistils 2 or more; fr an akene or follicle.

Calyx and corolla both present, showy.

Ranunculus

Corolla absent.

Thalictrum

140. Actaea L.

228. A. rubra (Ait.) Willd. Perennial stems 1-several, 4-10 dm tall; lvs cauline, 2-3 ternate, 3-9 cm long, toothed and lobed; fls white or red. Occasional along L.C.C. June-July. 719.

141. Aquilegia L.

229. A. formosa Fisch. Perennial stems 1.5-10 dm tall; lvs triternate; sepals red; spurs red, straight. Along L.C.C. July-Aug. 937.

142. Delphinium L.

230. D. andersonii Gray. Perennial, stems mostly single, erect, 1.5-5 dm tall; lvs basal or on lower third of stem; sepals blue; upper petals whitish and blue-tipped. Common; open cinders. June. 887.

143. Ranunculus L.

Fls reddish; roots fibrous.

R. andersonii

Fls yellow; roots fleshy.

R. glaberrimus

231. R. andersonii Gray. Reddish perennial with fibrous roots; lvs 2-4 cm long, dissected into linear segments; scapes 5-15 cm tall, usually single-fl'd and leafless; petals 5, white-pink. One of the first plants to bloom on snow melt. I have collected this plant in fl from frozen ground. Carey Kipuka to n. part.
232. R. glaberrimus Hook. Perennial with fleshy roots; lvs mainly basal, the blade rather fleshy; fls 1-several; petals 5 (6-8) yellow; stamens many. There are 2 recognizable varieties: var. ellipticus with elliptical lvs and var. glaberrimus with ovate lvs. Both are common early in the season from Carey Kipuka to n. part, in well-developed soil (Sagebrush-Bunchgrass). April-May. 803.

144. Thalictrum L.

233. T. occidentale Gray. Dioecious perennial, stems 4-10 dm tall; lvs mostly cauline 3-4 times ternate; sepals greenish-white to purple; stamens purplish 4-8 mm long. Moist woods of L.C.C. and on Silent Cone. July. 1011

RHAMNACEAE

145. Ceanothus L.

234. C. velutinus Dougl. Shrub 0.5-2 m tall, lvs ovate to ovate-elliptic, 5-10 cm long, 3-veined from base; fls white; capsules 4-5 mm long. Dry e. slopes of Pioneer foothills between Big Cottonwood Creek and L.C.C. on Goodale Cutoff. June-July. 807

ROSACEAE

Plants prickly-bearing.

Plants erect.

Rosa

Plants trailing.

Rubus

Plants not prickly-bearing.

Calyx adnate to compound, 2-5 carpellary, more or less completely inferior ovary.

Amelanchier

Calyx sometimes enclosing but not adnate to 1 to several superior, 1- carpellary ovaries.

Plant a shrub or tree with large, simple lvs.

Prunus

Plant an herb or shrub; lvs lobed or compound.

A. Shrubs.

B. Lvs deeply 3-toothed at the tip, otherwise entire, revolute-margined, greenish above, tomentose beneath.

Furshia

BB. Lvs lobed or dissected.

C. Lvs pinnately dissected, plant aromatic glandular. Chamaebatiaria

CC. Lvs not dissected, plant not aromatic glandular. Holodiscus

AA. Herbs.

B. Style deciduous; lvs lyrate-pinnatifid.

Geum

BB. Style persistent; lvs not as above.

Potentilla

146. Amelanchier Medic.

235. A. alnifolia Nutt. Shrubs or small trees 1-5 m tall; young branches reddish brown; lvs 2-4 cm long, oval to elliptic; petals white, 10-20 mm long; fr globose 10-14mm long, dark purplish. Uncommon; usually in protected sites throughout monument. Cultivated in H.Q. area. May-June. 650

147. Chamaebatiaria (Porter) Maxim.

236. C. Millefolium (Torr.) Maxim. Aromatic, glandular, shrub 1-2 m tall; lvs bipinnate; fls in panicles; petals white; follicles 5-6 mm long. Recent lava flows. June-Aug. 989

148. Geum L.

237. G. macrophyllum Willd. Perennial; basal lvs rosulate, lyrate-pinnatifid, up to 3 dm long; petals yellow, 4-6 mm long; Near L.C. C. June-Aug. 852

149. Holodiscus Maxim.

Lv blades 1-2 cm long; lava flows.

H. dumosus

Lv blades over 3 cm long; H.Q.

H. discolor

238. H. dumosus (Hook.) Heller. Shrub 5-15 dm tall; lvs in fascicles, 1-2 cm long; petals white about 2 mm long. abundant locally; recent lava flows. June-Aug. 988
239. H. discolor (Pursh.) Maxim. Introduced and local at H.Q. area.

150. Potentilla L.

Plants without rootstocks; stamens 10-20.

Lower lvs 5-foliolate.

P. rivalis

Lower lvs 3-foliolate.

P. biennis

Plants with well developed rootstocks; stamens 20-30.

Plants mostly over 4 dm tall; L.C.C.

P. arguta

Plants usually less than 4 dm tall; common on recent lava flows.

P. glandulosa

240. P. arguta Pursh. Perennial, 4-8 dm tall; lvs, basal pinnate; petals white-yellow; achenes 1-1.3 mm long. June-July. CRM: NOS 185

241. E. biennis Greene. Annual or biennial, 1-6 dm tall; lvs mostly cauline, reduced upwards; petals yellow; L.C.C. June-July. 960
242. E. glandulosa Lindl. Glandular perennial 1.5 -4 dm lvs pinnate; leaflets 5-9, sharply serrate; petals yellow; Shallow crevices. 836
243. E. rivularis Nutt. Annual or biennial with a strong taproot; lvs, lower often 5-foliate, upper cauline always 3-foliate; petals yellow. Along L.C.C. June-Aug. 792

151. Prunus L.

244. P. virginiana L. Shrubs or trees 1-6 m tall; lvs elliptic to ovate, finely serrate, 4-10 cm long; fls in terminal racemes; petals white 4-6 mm long; drupe red-black. Widespread; common along L.C.C. June-July. 799.

152. Purshia DC.

245. P. tridentata (Pursh) DC. Shrubs 1-2 m tall; lvs 10-20 cm long, 3-toothed at tip; fls yellow, 6-9 mm long. Widespread; Sagebrush-Bunchgrass. May-June. Cmo.

153. Rosa L.

246. R. woodsii Lindl. Armed shrubs 1-2 m tall; leaflets 5-9 up to 5 cm long; petals pink to rose, 1.5-2.5 cm long. Along L.C.C. and in H.V. area. June-July. 853.

154. Rubus L.

247. R. idaeus L. Prickly perennial, 1-2 m tall, with exfoliating bark; leaflets ovate 4-10 cm long; petals white, 4-6 mm long; fr yellow-red. Deep crack 300 yds s. of highway about 7 miles from e. boundary. July-Aug. 9961
248. R. parviflorus Nutt. Shrubs with shreddy brown bark, 0.5-2m tall; lvs palmately 5-lobed; petals white, 15-30 mm long; fr red. Uncommon; L.C. C. July-Aug. 795

RUBIACEAE

155. Galium L.

Plants annual.

G. aparine

Plants perennial.

Frs appearing glabrous.

G. boreale

Frs hairy.

Frs with straight white hairs.

G. multiflorum

Frs with hooked hairs.

G. triflorum

249. G. aparine L. Annual 1-10 dm tall; stems weak and tending to scramble on other vegetation; frs with hooked hairs. June-Sept. Thickets of L.C.C. 723.
250. G. boreale L. Perennial 2-8 dm tall; stems short-bearded just beneath nodes; lvs in fours; fls in cymose panicles, showy; corolla white; fr with short hairs, inconspicuous to naked eye, or glabrous. Abundant; heavily vegetated n. slopes: Big Cinder, Silent, Grassy and Sunset Cones and L.C.C. June-Aug. 1057.

251. S. multiflorum Mill. Perennial to 3 dm tall, often woody at base; lvs mostly in 4's, sessile; fls pale greenish-yellow; fr clothed with long spreading white bristles.

H. part. June-Aug. 927

252. G. trifolium Michx. Creeping perennial 2-8 dm long; fls usually borne in 3's. Along banks of L.C.C. 1200

SALICACEAE

156. Populus L.

Bark smooth; buds not resinous; petioles laterally flattened.

P. tremuloides

Bark rough; buds resinous; petioles terete.

P. trichocarpa

253. P. tremuloides Michx. Trees with smooth, greenish-white bark; lvs trembling in the slightest breeze. L.C.C. e. slope of Big Cinder Butte, n. slope Fissure Butte; deep crevices n. Silent Cone and w. of Carey Ripuka, Blue Dragon Flow. 617

254. P. trichocarpa T. & G. ex Hook. Trees with rough bark; lvs strongly resinous. Locally abundant; restricted to L.C.C. 617.

157. Salix

255. S. exigua Nutt. Shrub or small tree; lvs lance linear (ribbonlike); bark reddish-brown. Along L.C.C. 1101
There are probably 3 or 4 other species of willow in L.C.C.

SAXIFRAGACEAE

Plants annual.

Lithophragma

Plants perennial.

Plants reddish; in volcanic areas.

Saxifraga

Plants not reddish; in Douglas Fir Forest.

Heuchera

158. Heuchera L.

256. H. cylindrica Dougl. Perennial 1.5-5 dm tall; lvs 1-6 cm broad, more or less ovate, basal; petals white-yellow, hypanthium present. L.C.C, Douglas Fir Forest, Grassy Cone, and Silent Cone. June-Aug. 959

159. Lithophragma Nutt.

Cauline lvs bulbiferous.

L. bulbifera

Cauline lvs not bulbiferous.

L. tenella

257. L. bulbifera Rydb. Annual 5-30 cm tall; cauline lvs, bearing reddish purple bulbets in axils; fls white or replaced by bulbets. Common. 7 miles to west. April-May. 619.

258. L. tenella Nutt. Annual 10-25 cm tall; plants seldom purplish; fls white. Uncommon, Sagebrush-Bunchgrass. June-Aug. 702

160. Saxifraga L.

259. S. occidentalis Wats. Perennial with short horizontal rhizomes, pubescence reddish-glandular; lvs ovate to elliptic, coarsely-serrate; petals white, 1.5-3.5 mm long. Rare; n.e. side of Big Craters. June-Aug. 778

SCROPHULARIACEAE

Corolla galeate, i.e. upper lip forming a hood or beak that tends to enclose anthers.

Plants perennial.

Castilleja

Plants annual.

Cordylanthus

Corolla not galeate.

Filaments 5.

Lvs alternate.

Verbascum

Lvs opposite.

Penstemon

Filaments 2-4.

Anthers 2.

Veronica

Anthers 4, one pair somewhat reduced in Mimetanthe.

Fls with central lobe of lower lip forming a pouch which encloses the stamens.

Collinsia

Fls not forming a pouch.

Calyx strongly S-angled.

Nimulus

Calyx not angled.

Mimetanthe

161. Castilleja Nutt

Galea half length of corolla tube or less.

C. flava

Galea longer than half length of corolla tube.

Lvs entire.

C. miniata

Lvs toothed.

Bracts purplish.

C. angustifolia

Bracts bright red, scarlet, or yellow.

C. chromosa

260. C. angustifolia (Nutt.) G. Don. Perennial 1.5-3 dm tall; lvs linear below, usually trifid above; bracts at least 3-lobed; calyx purplish, 15-25 mm long; corolla a little longer than calyx. June-Aug. 1004
261. C. chromosa A Nels. Perennial, 1-4 dm tall; bracts white, pink, red, or yellow, 3-5 parted, 15-25 mm long. Corolla 20-40 mm long; galea about equaling tube. Sagebrush-Bunchgrass and shallow crevices. June-July. 707
262. C. flava Wats. Perennial 2-5 dm tall; bracts broader than lvs, 3-5 parted, yellow; calyx 12-18 mm long; corolla 15-25 mm long, lower lip reduced. 875
263. C. miniata Dougl. Perennial 2-8 dm tall; lvs linear or lanceolate; inflorescence red or rarely yellow; bracts oblong-ovate; calyx 15-30 mm long; corolla 20-40 mm long. Sagebrush-Bunchgrass. L.C.C. June-Aug. 841.
162. Collinsia Nutt.
264. C. parviflora Lindl. Annual usually 6.5-1dm tall; lvs up to 5 cm long; calyx 3-6 mm long; corolla blue with whitish upper lip, 4-7 mm long, tube abruptly bent near base. Widespread; open cinders. June-Aug. 658
163. Cordylanthus Nutt.
265. C. ramosus Nutt. Stems 1-3 dm tall; lvs 1.5-3.5 cm long, parted into filiform revolute divisions; corolla purplish 1.5-2.5 cm; capsule half as long as calyx. Sagebrush-Bunchgrass. Carey Kipyka. 1064

164. Mimulus L.

Plants tap-rooted.

Fls yellow.

Herbage viscid-pubescent; petiole present.

M. floribundus

herbage finely glandular pubescent; petioles absent.

M. suksdorfii

Fls white to reddish.

M. nanus

Plants fibrous-rooted; L.C.C.

Fls yellow.

M. guttatus

Fls white to red.

M. lewisii

266. M. floribundus Lindl. Annual to 1 dm tall; herbage viscid-pubescent and glandular, often shiny; calyx 4-8 mm long; corolla yellow often with red spots, 6-14 mm long. Moist shaded waterholes and depressions, Little Prairie Fissure. July. 990

267. M. guttatus DC. Fibrous-rooted annual or perennial; lower lvs petiolate, upper becoming sessile; corolla 1-4 cm long, with flaring throat, yellow marked with maroon. Along L.C.C. July. 855

268. M. lewisii Pursh. Perennial 3-10 dm tall; herbage viscid-villous; lvs sessile; fls pink-purple, marked with yellow, 3-5.5 cm long. Uncommon; banks of L.C.C. July. 854.

269. M. nanus A. & N. Dwarf annual to 1 dm high, finely glandular-puberulent; lvs 3-5-nerved acute; fls magenta to whitish, marked in throat with yellow and deeper red, 1-5.5 cm long

Common; open cinders. June-July. 909.

270. M. suksdorfii Gray. Very small glandular-puberulent annual to 3 cm tall; corolla yellow, faintly red-spotted, narrow, 4-8 mm long. Common, but inconspicuous. Open cinders. May-July. 620.

165. Mimetanthe Greene.

271. M. pilosa (Benth.) Greene. Annual to 1 dm tall; corolla yellow, with maroon dots, 5-9 mm long. Widespread; dry soil and cinders. S. of Tutimaba wilderness boundary and in L.C.C. June-Aug. 991.

166. Penstemon Mitch.

Fls white; lvs serrate.

P. deustus

Fls blue; lvs entire.

Calyx 4-7 mm long.

P. cyaneus

Calyx 2-3.5 mm long.

P. laxus

272. P. cyaneus Penn. Perennial 4-8 dm high; lvs entire; fls blue, 25-30 mm long, tube purplish. June-July. N. part. 888.
273. P. deustus Dougl. ex Lindl. Perennial 2-6 dm tall; lvs reddish early in season, becoming green, toothed; fls white-pinkish veined, 8-20 mm long. Shallow crevice. June-July. 768.
274. P. laxus A. Nels. Perennial 3-7 dm tall; lvs entire, all cauline; fls blue-purple, 11-15 mm long. June-July. 725. n. part.

167. Verbascum L.

275. V. thapsus L. Coarse perennial, producing a rosette of basal lvs in 1st year, and in 2nd a single erect stem 0.4-2m tall; herbage copiously tomentose; corolla yellow, 1-2 cm wide; capsule 7-10 mm long. Disturbed areas. June-Sept. 923

168. Veronica L.

276. V. americana Benth. Perennial with shallow creeping rhizomes, glabrous; lvs opposite; fls blue in terminal and axillary racemes. Along L.C.C. June-Sept. 1022

SOLANACEAE

169. Nicotiana L.

277. N. attenuata Wats. Glandular pubescent annual 3-10 dm tall; lvs entire, 2.5-12 cm long, 1-5 cm wide; fls in a mixed panicle; corolla white; fr a capsule about 1 cm long. Disturbed locations. June-Sept. 877

UMBELLIFERAE

Leaflets 3, very large, mostly 1-4 dm long and wide.

Leaflets usually more than 3, usually less than Heracleum 1 dm wide.

Fruit linear, 8-22 mm long.

Osmorhiza

Fruit ovoid.

Fruit more than 4 mm long; fls yellow.

Dorsal ribs of fruit winged. Cymopterus

Dorsal ribs of fruit filiform and wingless.

Lomatium

Fruit less than 4 mm long; fls white.

Angelica

170. Angelica L.

278. A. pinnata Wats. Perennial 3-10 dm tall; lvs pinnate; fls white; fr minute and somewhat terete. Along L.C.C. July-Aug. 1012

171. Cymopterus Raf.

279. C. terebinthinus (Hook.) T & G. Glabrous aromatic perennial from a stout taproot, 10-60 cm tall; lvs numerous, 3-18 cm long, ternately-pinnately dissected; fls yellow; fr 5-11 mm long. Widespread, Sagebrush-Bunchgrass and open cinders. Blooming at temperatures below freezing in April. April-June. 1028.

172. Heracleum L.

280. H. lanatum Michx. Robust, single-stemmed perennial, 1-3 m tall; lvs once ternate, leaflets 1-3 dm long and wide; fls in umbels, terminal umbel 1-2 dm wide, fls white; fr 7-12 mm long. Along L.C.C. July-Aug.

173. Lomatium Raf.

Fls white; lvs attached below or at surface. L. gormanii

Fls yellow or purple; lvs various.

Lvs cleft into long narrow segments. L. triternatum

Lvs ternate-pinnate dissected.

Plants robust-stemmed. L. dissectum

Plants without stems. L. foeniculaceum

281. L. dissectum (Nutt.) M. & C. Robust perennial 5-15 dm tall; lvs large, dissected; fr elliptic, 8-17 mm long. Widespread; dry s.-se. slopes of Crescent, Big Cinder, Split Buttes and Sentinel. June-July. 722
282. L. foeniculaceum (Nutt.) C. & R. Acaulescent perennial; lvs ternate-pinnately dissected; fls yellow, Sagebrush-Bunchgrass. June-July. 746
283. L. gormanii (Howell) C. & R. Low perennial; lvs attached at or below level of ground, dissected; fls white with Purple anthers. Carey Kipuka. April. 602
284. L. triternatum (Pursh.) C. & R. Perennial 2-8 dm tall; lvs cleft into long narrow segments or leaflets 1-10 cm long. Widespread; dry, shaded sites with well-developed soil, lower hillsides of L.C.C. n. slope Silent Cone, n.w. slope Big Cinder Butte. June-July. 724

174. Osmorhiza Raf.

Fls yellow; stems clustered. O. occidentalis

Fls greenish-white; stems mostly solitary. O. chilensis

285. O. chilensis H. & A. Perennial 3-10 dm tall; lvs biternate; fr linear-oblong, 12-22 mm long. Banks of L.C.C. June-July. 716
286. O. occidentalis (Nutt.) Torr. Plants, with a strong odor somewhat like that of licorice; 4-12 dm tall; lvs 1-3 ternate or ternate-pinnate; fr linear oblong, 12-20 mm. Banks of L.C.C. June-July. 726

URTICACEAE

175. Urtica L.

287. U. dioica L. Perennial with stinging hairs, 1-3 m tall;
lvs 7-15 cm long; lanceolate-ovate, coarsely serrate.
Locally abundant. L.C.C. and pahoehoe crevices at n.
base of Grassy Cone. June-Aug. 883

VALERIANACEAE

176. Valeriana L.

288. V. acutiloba Rydb. Fibrous rooted perennial, 1-6 dm tall;
lvs glabrous, basal petiolate; corolla white, 4-7 mm long;
fruits 3.5-5.5 mm long. Uncommon; along L.C.C. June-July.
765

VIOLACEAE

177. Viola L.

Lvs compound or deeply dissected. V. beckwithii

Lvs neither compound nor deeply dissected.

Lvs veins purplish; upper petals deep purple on back.

V. purpurea

Lvs veins not purplish; upper petals brown on back.

V. nuttallii

289. V. beckwithii T.&G. Perennial 5-12 cm tall; lvs, ternately
decompound into linear segments; fls about 1.5 cm long;
upper pair of petals reddish-purple, lower ones white,
yellowish at base. Common locally in Sagebrush-Bunchgrass;
Carey Kipuka and expected in n. part. April-May. 647

290. V. nuttallii Pursh. Perennial; lvs ovate-lanceolate, generally less than 5 cm long; upper petals yellow, brown-backed; fls 8-15 mm long. Uncommon; Sagebrush-Bunchgrass. April-June. 644
291. V. purpurea Kell. var. venosa (Wats.) Brain. Perennial 5-15 cm tall; herbage often purplish, or purple veined; lvs 1-3 cm broad; fls yellow, brownish-pencilled. Wide-spread; moist, shaded sites on n. slopes Big Cinder Butte. June. 718