INTERIM REPORT
AS TO STATUS OF GRANT FOR THE PURPOSE OF DESCRIBING VEGETATIVE CHARCTERS
OF SOME LOCAL PLANTS

ABSTRACT: This is an interim report on the progress in gathering information about the vegetative characters of some local plants.

STATEMENT OF OBJECTIVE AND HYPOTHESIS: My purpose is to attempt to compile partial descriptions of local plants so that they can be recognized in the field by observation supplemented with the use of a hand lens (10X).

It is well recognized that a person who knows a plant can recognize it even when it is without flowers or fruit.

While there is a vast amount of literature relating to the terms used to describe the vegetative appearance of plants, only a few plants have been described in any detail. It is recognized that the majority of plants have only brief descriptions available.

DESCRIPTION OF METHODS: The method used is to go into the field, take photographs of sterile (non-flowering) plants, collect only enough material to take to the laboratory to examine and photograph appropriate details, make written descriptions and scan photographs into the computer for editing reproduction.

Part of the process is an ongoing search of the literature for basic information such as that published by monographers and floras (some of it dating from the days of the first microscopes) and arranging that information with additions from my observations to provide a concise description for each taxon studied.

Attachments:
1. List of photographs
2. Plant descriptions, alphabetical by genus and species
3. Characters available for descriptions of vegetative parts of plants
4. Glossary of vegetative terms
5. Trichome types
6. Vegetative characters bibliography

RESULTS WITH DETAILED DATA ANALYSES: The results will be presented in a loose-leaf notebook format, with the pictures for each taxon presented as a montage and the concise description given for each taxon.

Results are incomplete because the investigation was not begun before last summer’s drought, and when rains revived the plants they were blooming and no longer in a vegetative phase.
A notebook with incomplete draft information is submitted with this report.

It is requested that access to Open Space properties be renewed for 2001 for the purpose of continuing this investigation.

**CONCLUSIONS, INCLUDING A DESCRIPTION OF HOW THE RESULTS APPLY TO NATURAL RESOURCE MANAGEMENT AND DECISION MAKING FOR OPEN SPACE AND/OR MOUNTAIN PARKS:** There is often a need to survey areas for plants that are present at a time when flowers and fruits may not be present. The information compiled by this investigation will assist in a timely identification of some of these plants.
Titles for photos

*Acosta diffusa*—New rosette at base of blooming plant (in field)

*Acosta diffusa*—Showing rosette attached to base of blooming stem

*Acosta diffusa*—Leaf shapes and sizes (6 inch rule)

*Acosta diffusa*—Enlargement of portion of leaf

*Acosta diffusa*—Leaf portion showing vesicular hairs and scabrous minute marginal hairs

*Astragalus drummondii*—Flowering plant in field

*Astragalus drummondii*—Leaf base and stem

*Astragalus shortianus*—Leaflets, back above and upper below

*Besseya plantaginea*—Leaf margin (light area is leaf)

*Castilleja integra*—Flowering plant

*Castilleja sessiliflora*—Stem with leaf base

*Elaeagnus angutifolius*—Short-stalked, tufted hair and almost sessile scales

*Erigeron pumilus*—Petiole with ciliate margin of tapering hairs of different lengths

*Erigeron pumilus*—Enlargement of hairs, showing that they are several—uniseriate cells

*Erigeron vetensis*—Petiole showing scattered long, ciliate hairs with small, short-stalked glandular hairs between

*Erigeron vetensis*—Enlargement of hairs, showing the curved, ciliate hairs with the small, short-stalked glandular hairs between

*Erigeron vetensis*—Leaf near tip, showing occasional long, tapered, hairs and many small, short-stalked glandular hairs on back of leaf

*Erysimum asperum*—Leaf surface with dolabriform hairs (sometimes looking like basting stitches)

*Erysimum asperum*—Enlargement of hairs showing that they are pointed at both ends

*Erysimum asperum*—Enlargement of individual dolabriform hairs. They are attached near the middle with the arms more or less equal. Note the sculpturing of the surface, and the occasional Y-shaped hair.

*Erysimum repandum*—Here with many Y-shaped hairs (attached near the junction of the arms)

*Geranium caespitosum*—Red-leaved plant in fall

*Geranium caespitosum*—Back of single leaf with stipules and centimeter rule

*Geranium caespitosum*—Petiole, showing retrorse hairs

*Heterotheca villosa*—Enlargement of leaf (both surfaces are similar). This is the plant that had been segregated as *H. horrida*.

*Heterotheca villosa*—Enlargement to show hairs and vesicles

*Lesquerella montana*—Single-celled stellate (several-branched) hair. Note hole in center where the hair broke off the leaf

*[Mentzelia]* Acrolasia albicaulis—Glochidiate hair

*[Mentzelia sp.]*—Glochidiate hair
Physaria sp.—Two different kinds of single-celled stellate hairs

*Oenothera villosa* var. *strigosa*—Fall rosette with 6-inch rule

*Oenothera villosa* var. *strigosa*—Spring rosette just before sending up flowering stalk

*Oenothera villosa* var. *strigosa*—Upper surface of leaf near tip

*Oenothera villosa* var. *strigosa*—Marginal leaf hairs

*Oenothera villosa* var. *strigosa*—Flowering stalk

*Oenothera villosa* var. *strigosa*—Flower close-up

*Oxytropis lambertii*—Upper leaf surface showing dolabriform hairs. Note branch of hair marked by arrow. The dark spot on the hair just left of center is the point of attachment with the small, pointed short branch. Tip of hair is toward bottom

*Oxytropis lambertii*—Torn leaf showing eye-lashes on the basal portion. In the original, three small hairs can be seen on the upper half

*Oxytropis sericea*—Flowering plant in field

*Oxytropis sericea*—Leaflet bases

*Solidago missouriensis*—Leaf shapes and sizes with 6-inch rule

*Solidago missouriensis*—Margin of leaf from lower stem

*Solidago missouriensis*—Margin of leaf from just below inflorescence

*Symphyotrichum porterii*—Flowering stem showing elongate cauline leaves with fascicled leaves in axils and short leaves on flowering branches

*Symphyotrichum porterii*—Cauline leaf showing minute sharp, scabrous hairs on margin

*Symphyotrichum porterii*—Flower cluster

*Verbascum thapsus*—Fall rosette

*Verbascum thapsus*—Magnified leaf cross-section. (Top of leaf is to right)

*Verbascum thapsus*—Drawing to show thick cell walls and showing several cells
ACOSTA DIFFUSA (Lamarck) Sojak

COMMON NAME: diffuse knapweed

DURATION AND HABIT: Biennial or short-lived perennial, flowering stem may produce a new rosette at ground level

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Elongate taproot

HERBAGE: Sparsely scabrous-puberulent under thin, cobwebby (arachnoid) tomentum (rough to touch)

STEM: Erect; angled but not winged; 5-8 dm tall

BRANCHES: Diffusely branched near or above base

LEAVES: DISTRIBUTION: Mostly basal; leaves few and reduced above

PETIOLE: Basal mostly short-petiolate; cauline leaves sessile

SHAPE AND SIZE OF BLADE: Basal leaves bipinnate to pinnatifid; 20 cm long by 5 cm wide; ultimate segments narrowly oblong to elliptic, usually acute and wedge-shaped. Cauline leaves smaller and pinnately lobed; upper may be entire or minutely lobed

MARGIN: Scabrous with minute, short, firm, sharp hairs ca. 0.2 mm long

SURFACE FEATURES: Apparent small (ca. 0.05 mm diameter) vescicular hairs beneath loose arachnoid pubescence (both surfaces; scabrous hairs on lower leaf surface near tip

HABITAT: Introduced noxious weed, common in disturbed areas

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES):
ASTRAGALUS ADSURGENS Pall. var. ROBUSTIOR Hooker

COMMOM NAME: standing milk-vetch

DURATION AND HABIT: Herbaceous perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Woody taproot with superficial, branching, woody caudex

HERBAGE: Grayish-pubescent or strigillose with appressed, unequally-branched (dolabriform) hairs (dolabriform hairs will pivot around the point of attachment when a needle is pushed against the longer segment) or glabrate

STEM: Clustered; decumbent or ascending; simple or branched at base; 1-4 dm tall; internodes shorter than leaves

BRANCHES: Branching only at base or inflorescence

STIPULES: Membranous, ovate, acuminate, joined (connate) 1/3 or more the length; 5-15 mm long

LEAVES: DISTRIBUTION: Stem leafy; odd-pinnate, 5-15 cm long

PETIOLE: Lower leaves petioled, petioles shorter above

LEAFLETS: 9-25

SHAPE AND SIZE OF BLADE: Narrowed at base, narrowly oblong to oblong-ovate; 1-3 cm long 3-8 mm wide

MARGIN: Entire or emarginate at apex

SURFACE FEATURES: Strigillose with dolabriform hairs; sometimes glabrate above

HABITAT: Short-grass prairies and foothills

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): This species is sometimes confused with A. agrestis. It is easily separated from that species which has hairs attached at one end (basi-fixed) by the dolabriform hairs of this species. If a young leaflet is torn in half, A. agrestis will show “eye-lashes” on only one side of the tear. A. adsurgens will have “eye-lashes” on both sides of the tear. Because the branches of the hairs are unequal, the hairs protruding from the tip portion will be much smaller. A. agrestis stems originate underground; those of A. adsurgens are superficial
ASTRAGALUS AGRESTIS  Douglas ex G. Don

COMMON NAME: field milk-vetch

INCOMPLETE are hairs appressed, leaf distribution

DURATION AND HABIT: Herbaceous perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Rhizomatous with underground, branching caudex

HERBAGE: Thinly strigulose with hairs attached at one end (basifixed) or glabrate

STEM: Simple or sometimes branched at base; decumbent to weakly erect; 1-3 dm tall

BRANCHES: Branching only at base

STIPULES: Lower stipules connate (joined around stem); linear to ovate, acute; 4-6 mm long

LEAVES: DISTRIBUTION: Alternate, odd-pinnate, 3-12 cm long

PETIOLE: Short petiole or subsessile

LEAFLETS: 11-21; odd-pinnate

SHAPE AND SIZE OF LEAFLET BLADE: Oblong or elliptic

MARGIN: Entire with retuse apex

SURFACE FEATURES: Thinly strigulose with hairs attached at one end (basifixed) or glabrate

HABITAT:

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): This species is sometimes confused with *A. adsurgens*. It is easily separated from that species which has hairs attached a short distance from one end (dolabriform) by the hairs of this species which are attached at one end (basifixed). If a young leaflet is torn in half, *A. adsurgens* will have “eye-lashes” on both sides of the tear (look closely, the hairs projecting from the tip portion of the leaf will be short). *A. agrestis* will show “eye-lashes” on only one side of the tear.
ASTRAGALUS DRUMMONDII Douglas ex Hooker

COMMON NAME: Drummond’s milkvetch

INCOMPLETE: What is leaf length; check hairs with microscope

DURATION AND HABIT: Herbaceous perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Heavy root with short-branched caudex

HERBAGE: Grayish villous hirsute with spreading or ascending, simple basifixed hairs with small bulbous base

STEM: Several, erect; hollow, ribbed; 4-7 dm tall

BRANCHES: Unbranched above base

STIPULES: Of two types: subterranean or lower, leafless nodes either joined around stem or partially so; nodes with leaves deltoid and lance-acuminate

LEAVES: DISTRIBUTION: Loosely distributed on stem, alternate, odd-pinnate

PETIOLE: Short, or leaves subsessile

LEAFLETS: Alternate, odd-pinnate; 13-31

SHAPE AND SIZE OF LEAFLET BLADE: Ovate, oblong or linear; 2-3.5 cm long by 1.2-10 mm wide

MARGIN: Entire with apex obtuse, truncate or emarginate, somewhat ciliate

SURFACE FEATURES: Villous below and often glabrate above

HABITAT: Fields and meadows

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): Astragalus drummondii

is a very distinctive plant. It grows as clusters (short-branched caudex) of erect, stout, white-hairy stems. Even though there are only a few leaves on each stem, the leaves are covered with many leaflets. The long, spreading whitish hairs give a gray-green appearance to the foliage. Because the upper leaflet surface tends to be glabrate, the marginal hairs are accentuated. When back-lighted by the sun, these hairs can give a halo effect.

Locally, this plant can be distinguished from the other erect astragalus plants such as Astragalus bisulcatus by the hairiness of A. drummondii. A. bisulcatus is glabrate.
CASTILLEJA INTEGRA A. Gray

COMMON NAME: Indian paintbrush

DESCRIPTION INCOMPLETE: Check for tips of hairs and correct words for caudex, why do the descriptions say woody crown, rather than caudex; is leaf margin ciliate?

DURATION AND HABIT: Hemiparasitic, herbaceous perennial

UNDERGROUND STRUCTURE: Root and/or rhizome: Caudex? Woody crown?; root short, easily broken, attached to root of another plant (often parasitic on plants of *Artemisia* or grasses)

HERBAGE: Whitish tomentose or lanate; hairs mostly still living at flowering time, thin-walled and becoming flattened upon drying, uniseriate to few-branched above, curving above basal cell

STEM: Clustered, erect or ascending, sometimes woody toward base; 1-3 dm tall; hairs of stem longer and more dense than on leaves

BRANCHES: Branched above or unbranched except at base

LEAVES: DISTRIBUTION: Essentially cauline with internodes much shorter than leaves; lower leaves being lost as plant sets seed; occasionally next year’s flowering stem appears as a short, leafy stem near the base, elongating later

PETIOLE: Leaves sessile

SHAPE AND SIZE OF BLADE: Linear to narrowly lanceolate, 2 to 6 cm long; involute upon drying

MARGIN: Entire

SURFACE FEATURES: Above with curved, short, uniseriate hairs, becoming glabrate; below

HABITAT: Juniper, pinon, or pine meadows

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): Whitish appearance due to hairs

Casual observations may consider the showy bracts of castillejas to be the flowers

(Personal note: A builder in Colorado Springs, seeing many plants of this plant where he was to build a new home, decided to transplant plants with bushel-sized soil clumps into squares in the backyard of his new home. I was asked to look at the plants and suggest why some of the plants had lived and others had died. The conspicuous difference was that the surviving plants were in plots with associated *Artemisia* plants [if I recall correctly, they were *A. frigida*. The dead plants were in plots without surviving artemisias.])
**ERIGERON PUMILUS** Nuttall

**COMMON NAME:** low erigeron or low daisy

**INCOMPLETE:** Check leaf hairs

**DURATION AND HABIT:** Herbaceous perennial; somewhat caespitose

**UNDERGROUND STRUCTURE:**
- **ROOT AND/OR RHIZOME:** Deep taproot with branched caudex covered by old leaf bases

**HERBAGE:**
- Hirsute with translucent, spreading hairs, often also glandular; leaf bases and petioles ciliate with tapered, multicellular, uniseriate, stiff, brittle (probably silicified), spreading and somewhat curved hairs 0.2-2 mm long; the longest (resembling the type A hairs of Nesom, 1978, for *E. hessii*) with about 12 cells: the lower cells shorter and broader, then the cells becoming progressively longer and narrower with the end cell being slender, elongat and sharp-pointed

**GROSSLY EVIDENT CHARACTERS:**

- **COLOR:**
- **TEXTURE AND TOUCH:**
- **LENGTH AND/OR DENSITY:**
- **CHARACTERS EVIDENT UPON CLOSER EXAMINATION:**
  - **LIVING OR DEAD:**
  - **LENGTH:**
  - **OUTER CELL WALL:**
  - **INSERTION:**
  - **SHAPE:**
  - **POSTURE:**
  - **NUMBER OF CELLS:**
  - **ARRANGEMENT:**
  - **ALIGNMENT OF HAIRS ON ORGAN:**
  - **STALKED OR SESSILE:**
  - **SURFACE:**

**STEM:** Slender, tufted; 5-30 cm tall; hirsute with spreading hairs, often also with small glandular hairs; and may be slightly viscid near heads

**BRANCHES:** Simple or branched

**LEAVES:**
- **DISTRIBUTION:** Basal leaves tufted and persistent; cauline leaves reduced upwards in size and distribution. In larger forms, the lower leaves may be fewer and deciduous

- **PETIOLE:** Basal and lower cauline leaves petioled; becoming shorter to sessile above

- **SHAPE AND SIZE OF BLADE:** Basal leaves oblanceolate to narrowly linear-lanceolate; 2.5-10 cm long by 2-4 mm wide

- **MARGIN:** Entire

**SURFACE FEATURES:** Hirsute
HABITAT:

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): Ciliate margins of leaf bases; many tapered hairs of various lengths
ERIGERON VETENSIS Rydberg

COMMON NAME: La Veta daisy

DURATION AND HABIT: Herbaceous perennial; somewhat caespitose

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Taproot with stout, branching caudex; caudex covered with old leaf bases

HERBAGE: Sparsely hirsute and with short, stalked glandular hairs
Longest hairs: about 2 mm long
No. of cells and/or arrangement: multicellular, uniseriate
Texture: stiff, brittle (probably silicified)
Shape: tapered and pointed, resembling Nesom’s Type A, 1976 and 1978
Position: ciliate, especially toward base; spreading and somewhat curved; in dried material many are flattened and slightly twisted; a few also on midvein below toward tip
Other hairs: short-stalked, small-headed glandular hair
Position: prominent along leaf margin between ciliate hairs

GROSSLY EVIDENT TRICHOME CHARACTERS (taken from dried specimen):
COLOR: Whitish-translucent
TOUCH:
LENGTH AND/OR DENSITY:
TEXTURE:
CHARACTERS EVIDENT UPON CLOSER EXAMINATION:
LIVING OR DEAD:
LENGTH:
OUTER CELL WALL: Thin
INSERTION:
SHAPE:
POSTURE:
NUMBER OF CELLS:
ARRANGEMENT:
ALIGNMENT OF HAIRS ON ORGAN:
STALKED OR SESSILE:
SURFACE:
STEM: 5-25 cm tall; more or less glandular and sparingly hirsute with spreading-ascending hairs

BRANCHES: Unbranched above base

LEAVES: DISTRIBUTION: Mostly basal, a few reduced leaves above

PETIOLE: Blades gradually tapering to an indistinct petiole

SHAPE AND SIZE OF BLADE: Basal leaves oblanceolate, often narrowly so; up to 15 cm long by 7 mm wide, usually smaller; cauline leaves reduced upwards in size and distribution

MARGIN: Sparsely coarsely ciliate with stiff spreading hairs, especially towards base; a number of small, short-stalked, small-headed glandular hairs between the larger, hirsute hairs

SURFACE FEATURES: Upper surface essentially glabrate; lower surface covered with small glandular hairs; a few coarse, stiff spreading hairs are on the midvein near tip

HABITAT:

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): Narrow leaves with ciliate-margined leaf bases and petioles with small glandular hairs between ciliate hairs
ERYSIMUM ASPERUM (Nuttall) DeCandolle

COMMON NAME: western wallflower

DURATION AND HABIT: Herbaceous biennial or short-lived perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Taproot with single or few-branched short caudex

HERBAGE: Silvery strigose with appressed, sharp-pointed, single-celled, dead, calcified, two- or three-branched, sessile hairs; the hairs are attached near their middle with the base embedded in the leaf; where the hairs are two-armed (branched), the hair is straight; where the hairs are two-armed the hair is Y-shaped in face view; the hairs are about 0.5-0.75 mm long and tend to be aligned parallel to the midrib

STEM: Usually single, erect; 15-35 cm tall

   BRANCHES: Unbranched or branched in the inflorescence

LEAVES: DISTRIBUTION: Leaves are numerous and crowded; basal leaves are rosulate;

   PETIOLE: Short-petiolate below

   SHAPE AND SIZE OF BLADE: Linear to lanceolate; 3-12 cm long by 2-10 mm wide

   MARGIN: Entire to remotely dentate

   SURFACE FEATURES: Strigose hairy

HABITAT:

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): This species is separated from Erysimum capitatum primarily by the spreading position of the fruits in E. asperum
OENOTHERA VILLOSA Thunberg var. STRIGOSA (Rydberg) Dorn

COMMON NAME: common evening primrose

INCOMPLETE: Look at more plants for stalked, forked hairs.

DURATION AND HABIT: Biennial or short-lived perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Somewhat fleshy taproot, that has sometimes been recommended, boiled, as a food; root tends to become somewhat woody by flowering time

HERBAGE: More-or-less densely grayish-strigose to hirsute hairs with longer reddish hairs with a pustulate base on stem;
Conspicuous hairs are whitish-translucent
More-or-less soft to touch
Hairs are flexible
There are several different kinds of hairs longest hairs about 1 mm long, many half as long; shorter hairs more-or-less erect or slightly curved toward tip or toward nearest margin; longer hairs may arise erect from the surface, then arching forward over the shorter hairs; many of the hairs on the upper surface are shorter arching hairs; those of the margin tend to be essentially incurved. One plant examined had a few of the longer hairs branched about half-way, yielding a stalked, forked hair with stalk about 0.2 mm long
Thin-walled, few-celled; cross-walls not evident
Simple, tapered, pointed at tip

GROSSLY EVIDENT CHARACTERS:
COLOR: Hairs are whitish translucent
TEXTURE AND TOUCH: Soft, almost silky
LENGTH AND/OR DENSITY: Scattered

CHARACTERS EVIDENT UPON CLOSER EXAMINATION:
LIVING OR DEAD:
LENGTH: Up to about 1 mm
OUTER CELL WALL: Thin
INSERTION AND POSTURE: Erect; longer hairs then curving about 90 degrees; shorter hairs almost erect, only slightly curving
SHAPE: Cylindrical, only slightly tapering to an almost blunt point
NUMBER OF CELLS:
ARRANGEMENT:
ALIGNMENT OF HAIRS ON ORGAN:
STALKED OR SESSILE:
SURFACE:

STEM: Strict, usually single; 0.6 to 1.5 m tall

BRANCHES: Unbranched or branched
LEAVES: DISTRIBUTION: Flat basal rosette the first year, stout flowering stalk the second year; basal rosette leaves dying and being lost by flowering time; rosettes infrequently collected

PETIOLE: Basal and lower cauline leaves somewhat petiolar, with petioles reduced upward

SHAPE AND SIZE OF BLADE: Lanceolate or lance-oblone leaves 10-30 cm long by 1.2-4 cm wide; with cauline leaves gradually reduced upwards

MARGIN: Often crisped or shallowly sinuate-denticulate; sometimes ciliate with short curved hairs

SURFACE FEATURES: Midvein tends to be whitish above

HABITAT: Often in disturbed areas

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): The leaves of the basal rosette have whitish major veins and tend to feel somewhat soft to the touch, especially when compared with the somewhat similar rosette leaves of Pterogonum alatum.
OXYTROPIS LAMBERTII Pursh

COMMON NAME: Lambert’s or purple locoweed

DURATION AND HABIT: Caespitose, herbaceous perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Stout taproot with a "knobby" or branching caudex; caudex covered with old stipules and leaf bases

HERBAGE: Silvery sericeous with appressed strigose hairs; at least some of the hairs are dolabriform often with very unequal branches; hairs are flexible, long, slender, tapered and sharp-pointed, attached near base (not stalked); surface is minutely sculptured (probably silicified); no cell divisions are evident. (With a needle, the long end of the hair can be pushed and the short end of the hair can be seen to pivot at the point of attachment.)

STEM: Essentially acaulescent; covered with stipules

BRANCHES: Only caudex branched

STIPULES: Adnate to petioles; 1-4 mm wide

LEAVES: DISTRIBUTION: Basal

LEAVES: Odd-pinnate; 10-17 cm long

PETIOLE: About as long as leafy portion of the leaf

LEAFLETS: 7-17

SHAPE AND SIZE OF LEAFLET BLADE: linear to oblong, occasionally nearly orbicular; 5-40 mm long, 1-3 mm wide

MARGIN: Entire

SURFACE FEATURES: Lower rather densely covered with dolabriform trichomes; upper somewhat more sparsely covered

HABITAT:

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): Dolabriform hairs identify this species. This species is known to poison horses and is sometimes listed as seleniferous. Species of Oxytropis have the two lower petals somewhat united into a keel and with a distinct point at the tip. When the wide wings are turned back, the tip of the keel can resemble a bird’s head and beak. Where populations of O. lambertii come into contact with populations of O. sericea, putative hybrid populations are formed with a wide range of flower color.
OXYTROPIS SERICEA Nuttall

COMMON NAME: white locoweed

DURATION AND HABIT: Caespitose herbaceous perennial

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Stout taproot with much-branched caudex

HERBAGE: Gray or silvery with appressed, basifixed (attached by the base of the hair) hairs, silky pilose with flexible, long, slender, tapered, sharp-pointed hairs; cell divisions are not evident, and surface is minutely sculptured (probably silicified)

STEM: Essentially acaulescent; stem covered by stipules

BRANCHES: Branched only at the base

STIPULES: Adnate to the petioles, joined around stem (connate), but quickly ruptured; caudex and stem covered with stipules

LEAVES: DISTRIBUTION: Clustered at base

PETIOLE: About as long or shorter than the leafy portion of the leaf

LEAVES: Odd-pinnately compound

LEAFLETS: 11-21 leaflets

SHAPE AND SIZE OF LEAFLET BLADE: Oblong to lanceolate or sometimes linear; 5-25 mm long by 2-10 mm wide

MARGIN: Entire

SURFACE FEATURES: Silvery sericeous with appressed-ascending hairs; upper surface less densely hairy than lower surface

HABITAT:

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): Distinctive by the silvery hairs; reported to be poisonous to livestock. Where Oxytropis serices populations meet populations of O. lambertii, putative hybrid populations are formed with a wide range of flower color. Species of Oxytropis have the two lower petals somewhat united into a keel and with a distinct point at the tip. When the wings are turned back, the tip of the keel can resemble a bird’s head and beak.
PTEROGONUM ALATUM Torrey

COMMON NAME: winged eriogonum or winged buckwheat

DURATION AND HABIT: Herbaceous perennial monocarp

UNDERGROUND STRUCTURE: Root and/or Rhizome: Taproot with unbranched or few-branched woody caudex

HERBAGE: Strigose to long-tomentose at least below with appressed or ascending, slender, whitish-translucent (probably silicified), slightly contorted hairs; the hairs are about 1 mm long and maintain their diameter to near tip, then gradually reducing to an acute tip; the hairs arise from the epidermis then immediately curve to create an appressed to ascending hair; no crosswalls are evident; when stroked, especially from the apex of the leaf toward the base, the hairs feel rough

STEM: Perennial rosette, essentially acaulescent; one or few flowering stems to 1 m or more tall

BRANCHES: Branching in inflorescence

LEAVES: DISTRIBUTION: Mostly basal, a few cauline, smaller

PETIOLE: Blade gradually tapers to a petiole shorter than blade

SHAPE AND SIZE OF BLADE: Linear-oblanceolate, up to 15 cm long by 1 cm wide

MARGIN: Entire; margins and midribs with long, flexible hairs

SURFACE FEATURES: Lower surface strigose; upper surface may be strigose or glabrate except at margins

HABITAT:

NOTE: (Special Characteristic of this species): Strigose hairs of leaves give a rough feel to touch, especially when stroked from apex of leaf toward base. The rosette of Oenothera villosa var. strigosa may be confuse with Pterogonum alatum, but those of O. villosa are more silky to the touch and have whitish veins.
SOLIDAGO MISSOURIENSIS Nuttall

COMMON NAME:

DURATION AND HABIT: Herbaceous perennial; stems sometimes clustered from a caudex

ROOT AND/OR RHIZOME: Long, creeping rhizome with stout branches (branching caudex)

STEM: Erect from branching caudex; glabrous or nearly so; may have small amounts of puberulence in inflorescence

LEAVES: DISTRIBUTION: Broader, larger leaves toward base, becoming progressively smaller upwards (occasionally cauline leaves better developed and basal ones deciduous)

PETIOLE: relatively short, longer toward base, leaves becoming sessile above

SHAPE AND SIZE OF BLADE: Basal leaves lanceolate, tending to be three-nerved, up to 30 cm long by 3 cm wide; cauline leaves progressively smaller

SURFACE FEATURES: Glabrous

HABITAT: Dry open places

NOTE (SPECIAL CHARACTERISTIC OF THIS SPECIES): Rhizome, glabrous surface and gradual reduction of leaves upward
VERBASCUM THAPSUS L.
COMMON NAME: woolly or common mullein

INCOMPLETE: Make new photos of hairs; and size of leaves

DURATION AND HABIT: Biennial from taproot; forming a somewhat tufted rosette the first year and producing a stout blooming stalk, fruiting and dying the second year

UNDERGROUND STRUCTURE: ROOT AND/OR RHIZOME: Taproot

HERBAGE: Densely tomentose-woolly with yellowish, stellate-, dendritic-, candelabra-branched, silicified, dead hairs, feeling like sand-paper

Trichomes are several-celled

STEM: Flowering stem erect, winged by decurrent leaf bases

BRANCHES: Sometimes branched above

LEAVES: DISTRIBUTION: Stem well-covered with leaves gradually reduced above

PETIOLE: Basal leaves tapering to short petiole, leaves sometimes persisting into second year; 8-50 cm long by 2.5-14 cm wide; cauline leaves sessile with decurrent leaf bases

SHAPE AND SIZE OF BLADE: Basal oblancolate to obovate with obtuse tip; cauline leaves oblanceolate, progressively reduced upward

MARGIN: Entire to shallowly crenate

SURFACE FEATURES: Densely covered with stellate, dendritic, or candelabra hairs

HABITAT: Dry, disturbed areas, introduced from Eurasia

NOTE: (SPECIAL CHARACTERISTIC OF THIS SPECIES): The dead silicate-covered hairs can act as sandpaper, and the leaves have been used by children to make red cheeks to avoid going to school. The dried fruiting stalks are persistent through the winter and are reported to have been dipped in tallow by the Romans to make a torch. The abundant hairs on closely packed, dried, open capsules aided in holding a large quantity of tallow.
CHARACTERS AVAILABLE FOR DESCRIPTIONS OF VEGETATIVE PARTS OF PLANTS

THIS LIST OF CHARACTERS IS PRIMARILY FOR HERBACEOUS BIENNIALS OR HERBACEOUS PERENNIALS

PERENNATING ORGANS:
   Biennials: Many Colorado biennials form a ground-hugging rosette during their first growing season, with the over-wintering bud near ground level and often protected by sometimes over-arching small leaves. Typically, these biennials then send up a flowering stem which flowers, fruits and dies.
   Short-lived perennials: Short-lived perennials may be of two types. One, the rosette may persist and grow for more than one year, eventually sending up a flowering stem which then fruits and dies. The other may initiate a new rosette at the base of the flowering stem and the new rosette may have the likelihood of blooming the following year.
   Leaves of rosettes have all the character types of other leaves for identification in a sterile state.
   Perennials: Perennials have a variety of perennating structures. A system of classification for over-wintering buds has been developed to describe the position of the over-wintering bud such as under or above ground, etc.
   More useful, for the purposes of this project, is the description of the type of new growth that is initiated one season to produce the flowering stem(s) for the next season. These vegetative structures are particular to each kind of plant, but are seldom noted in the literature. Sometimes these perennating structures can be used to separate closely related species such as Symphyotrichum ericoides and S. falcatus. Terms such as cryptophyte, hemicryptophyte, geophyte, and phanerophyte can sometimes be used to describe the position of the perennating bud.

UNDERGROUND STRUCTURES:
   Roots:
      Fibrous roots
      Taproots
   Underground stems:
      Caudices:
         Diameter
         Slender or stout
         Length
         Short or elongate
      Rhizomes:
         Diameter
         Slender or stout
         Length
         Short or elongate (try to specify lengths found)
**HERBAGE:** The general character of the surfaces of stem and leaves, whether glabrous or with an indumentum

**STEMS:**
- Direction of growth
- Branching
- Diameter
  - Size and shape
- Length (height)
- Arrangement and distribution of leaves
- Surface characters

**STIPULES:**
- Absent
- Present
  - Size and shape
  - Persistence

**LEAVES:**
- Arrangement
- Insertion
- Simple
  - Petiole
  - Blade
  - Size and shape
  - Apex
  - Base
  - Venation (This is an underused character)
  - Margin
  - Surface features (including color)
  - Duration
  - Vernation (position in bud)

**Compound**
- Petiole
- Blade
  - Number of leaflets
  - Arrangement of leaflets
    - Palmate
    - Pinnate
GLOSSARY OF VEGETATIVE TERMS

This is a limited glossary with terms defined primarily as they relate to leaf and stem surfaces. Many sources (given in Bibliography) were consulted for this list.

**abscission layer** zone of separation as in leaf fall for deciduous plants

**acuminate** margins changing from straight to concave and converging gradually to a point; somewhat attenuate

**acute** two almost straight lines converging at an angle of less than 90°

**adpressed, appressed** (ad, to; pressus from premo, premere press) position tending to parallel the attached surface

**annual** plant germinating, growing, flowering, fruiting and dying in one season

**appressed, adpressed** (ad, to; pressus from premo, premere L. press) position tending to parallel the attached surface

**ascending** [hair] positioned so that the hair tends to point toward the tip of the organ (leaf or stem); directed upwards with an oblique base

**biennial** plant germinating, growing (often forming a rosette) during one season, producing flowers, fruiting and dying the second season (many biennials produce a basal rosette the first year, then send up a flowering stem which fruits the second year, then the whole plant dies)

**biseriate** cells arranged in two series, two rows of cells

**bract** a modified, often reduced, sometimes colored leaf at the base of a flower (subtending the flower)

**bristle** a sharp-pointed, straight, rigid hair

**caespitose** forming dense patches

**caudex** a short, thick vertical (or branched) perennial stem at or below ground level

**cauline** arising from the stem

**chamaephyte** perennating bud formed at ground level

**cleft** margin cut 1/4-1/2 distance to midrib

**comose** with a tuft of hairs

**crenate** with rounded (convex) teeth; scalloped

**crisped** curled

**cryptophyte** perennating buds deeply buries

**deciduous** falling at the end of the growing season as in leaf fall

**decumbent** lying on the surface (reclining) with tips rising

**decurrent** running downwards as a leaf base running down the stem

**dentate** margin with sharp teeth at right angles to midrib
denticulate  small teeth at right angles to midrib

diminutives  are terms derived from Latin or Greek that make the meaning of the term including the diminutive smaller—examples are:

-culus, -cula, -culum  Latin
-idius, -a, -um  Latin and Greek
-illus, -a, -um  Latin  strigillose
-iscus, -a, -um  Latin and Greek
-olus, -a, -umb  Latin  strigulose; puberulous
-ullus, -a, -um  Latin
-ulus, -a, um  Latin
-unculus, -a, -um  Latin

dolabriform  derived from ax-shape; originally attached in middle with one end broad and flat and the other round and pointed; by extension it is used to refer to T-shaped hairs with a short stalk and a straight, horizontal crosspiece which is rounded and tapered to each end: the branches of the T-top may be equal or unequal

emarginate  a notch at the apex with an acute sinus

entire  margin without indentations; smooth [may have hairs]

erect  pointed upwards

falcate  scimitar-shaped

fasciculate  in a cluster from a common point; in leaves, where the primary leaf persists after the axillary stem but produces a cluster of new leaves without the internodes elongating

fruticose  shrubby [from frutex  shrub; not from fruit]

geophyte  plant with underground bud to produce perennial development

glabrate  becoming glabrous, especially when mature

glabrous  without hairs, sometimes erroneously equated with smooth;
glochid  with barbs

hemicryptophyte  perennial plant with bud at ground level

herbaceous  soft and succulent [not woody]

hirsute  covered with long, rather stiff hairs

hispid  covered with very long, rigid hairs

indument, indumentum  the hairy covering of a surface, see vesture

involute  rolled upwards (exposing the abaxial surface of a leaf)

lanate, lanuginose  woolly or cottony with long, intertwined hairs
lanceolate  narrowly lance-shaped, widest below middle; originally narrowly elliptic, tapering toward both ends

lepidote  surface with small, scurfy scales, compare with squamose

linear  narrow with essentially parallel sides

monocarp  plant flowering only once, dying after first flowering; can be used as: annual monocarp, biennial monocarp, or perennial monocarp; this last can persist in the rosette form for several to many years before sending up the flowering stalk

mucronate  abruptly terminating in a hard, sharp point

multiseriate  cells arranged in three or more series, three or more rows of cells

ob-  prefix meaning inversely

oblancolate  narrowly lance-shaped, widest above middle

oblong  elliptical, rounded at both ends

obtuse  terminating gradually in a rounded end so that a 90° angle will fit inside

ovate  egg-shaped, widest below middle

papillose  covered with minute tubercles

perennial  plant persisting for three or more years

phanerophyte  woody plants with perennating buds protected by leaves

pilose  with soft, shaggy hairs

pinnate  pinnate leaf with leaflets arranged on both sides of the main axis [from pinna feather]

polycarp  plant flowering and fruiting for two or more years

position  position or posture of an organ relative to a different organ’s surface, terms such as appressed, ascending, or spreading, which see

puberulent, puberulous  minutely pubescent

pubescence  hairiness of plants

pubescent  with soft, short, straight, slender hairs

punctate  dotted with minute impressions or depressions

retrorse  turned backward

retuse  rounded with a slight notch at the tip

revolute  rolled backward

rhizome  horizontal below ground stem [root-like]

scabrous, (scaberulous)  harsh (or slightly so) to the touch, often with short, sharp hairs

serrate  saw-toothed, with teeth pointing toward tip

sessile  [sitting] without a stalk
setose bristle-like

simple opposed to compound, simple leaf—a single blade, simple stem—not branched

sinuate with uneven margins; undulating

spreading positioned away from the attaching surface, standing outward

squamose covered with small scales, coarser than lepidote

stellate with arms attached at a central point; usually arms may parallel the surface (radiating as points of a star) or sometimes tufted with two or more arms pointing upward

strict stiff and rigid

sub- prefix meaning under, less than, not quite

trichome from the Greek, trichos, hair, not from the Latin tri, three; trichome is the term used to describe hair-like structures arising from the plant surface; trichomes come in a very large diversity of shape, which shapes can be described; see attached form with some basic classifications as to shape, number of cells, and surface features

Terms relating to trichomes

arachnoid like a spider-web

biseriate cells arranged in two series, two rows of cells

bristle a stiff, sharply pointed hair, usually with a somewhat swollen base

capitate head-like

dendroid branched, as the branches of a tree

dolabriform

glochid, glochidiate minutely barbed hair or bristle

multiseriate cells arranged in three or more series, three or more rows of cells

peltate attached to the lower surface of a somewhat broadened head

stellate with arms attached at a central point; usually arms may parallel the surface (radiating as points of a star) or sometimes tufted with two or more arms pointing upward

uniseriate cells in a single series [as beads on a string]

urent stinging hairs

therophyte dependent upon seed for surviving adverse conditions

uniseriate cells in a single series [as beads on a string]

vesture, vestiture, indument, indumentum the hairs clothing the plant; a better term than pubescence to describe the general character of plant hairs

Types of vesture

arachnoid like a spider web

barbed, barbate with short, rigid point, sometimes hooked or bent backward
bristle, bristly  stiff strong hairs, resembling a hog’s bristle

canescent  gray or white with dense fine hairs
ciliolate  fringed with hairs, resembling eyelashes
downy  with short, soft, weak hairs
fimbriate  fringed
floccose  with tufts of soft, woolly hairs, usually rubbing off easily
glabrate  becoming glabrous, especially when mature
glabrous  without hairs, sometimes erroneously equated with smooth;
glochid, glochidiate  minutely barbed hair or bristle
hirsute (hirtellous)  with rather stiff, distinct hairs (minutely hirsute)
hispid  rough with very long, stiff hairs or bristles
indument, indumentum  hairy covering, see vesture
lanate, lanuginose  woolly or cottony with long, intertwined hairs
lepidote  surface with small, scurfy scales
papilllose, papillate  covered with minute tubercles
pilose  shaggy with soft, distinct hairs
puberulent, puberulous  minutely pubescent
pubescence  hairiness of plants
pubescent  with soft, short, straight, slender hairs
scabrous, (scaberulous)  harsh (or slightly so) to the touch, often with small sharp hairs
sericeous  silky, with long (mostly straight) appressed hairs
setose  with bristle-like hairs (seta)
smooth  surface not rough or hairy, compare with glabrous
squamose  covered with small scales, more coarse than lepidote
stellate  with arms attached at a central point; arms may parallel the surface or be tufted
strigose  with sharp, coarse hairs often with a bulbous base, sometimes bent to approximately parallel surface, sometimes inserted at an angle to parallel surface
tomentose  dense, intertwined hairs
trichome  (from trichos, Gr. hair) a plant hair
velvety, velutinous
villous  long, soft, crooked [not matted] soft hairs
woolly  with long, intertwined hairs
Tentative categories (not exhaustive and not including most indumentum terminology)

TRICHOME TYPES (Most of the following can be unicellular, bicellular, or multicellular; trichomes can be living or dead at the maturity of the leaf; more than one term may be required to describe trichome)

**Simple hairs (unbranched clothing hairs)**
- Papillate--Papillas or nipples (simple protrusion of epidermal cell)
- Vesiculate--Vesicles (bladder-like)
- Elongate, villi (narrower than vesicles and somewhat longer than papillose)
  - Straight
  - Curved
  - Twisted, coiled
- Conical
  - *Cannabis* can contain crystal =Conical angled
  - *Humulus* =Conical hooked

Cylindrical
- Barrel-shaped (broader than cylindrical, somewhat wider near middle)
- Club-shaped, clavate (narrower toward base)
- Tapering (narrowing from base toward tip)
- Filiform (thread-like)
- Bristle
- Falcate (curved as a scythe)
- Hooked, uncinate (hooked at tip)
- Plumose (feathery)
- Shag(gy) (with outer cell tips free and curving backward)
  - [Unnamed] (similar to preceding, with outer cell tips free, but not turning backward)
- Barbellate (hooked protrusions or retrorse cells along sides)
- Glochidiate (hooked at tip acting like a grapnel)
  - *Mentzelia* =Glochidiate and barbellate [pagodaform with roof corners turned down]

**Branched**
- Forked
  - Bifid (two-armed)
    - *Turritis glabra* and many other mustards
  - Trifid (three-armed)
    - Many mustards
  - T-or Y-shaped, dolabriform, malpighiaceous
Some mustards
Some Astragalus

**Several-armed to Many-armed**
Stellate if flattened
*Physaria*
Tufted (fasciculate)
Many mallows (Malvaceae)
Echinoid
Peltate (shield-shaped, more or less flattened and attached at center with rays more-or-less fused)
*Physaria* and *Lesquerella*
*Shepherdia canadensis*
Dendritic (with central stalk and tree-like or antler-branches)
*Alyssum saxatile* (single-celled)
*Many mints* (uniseriate, multicellular)
Candelabra
*Verbascum thapsus*

When more than one cell is involved, additional terms will be used

*Number of cells and cell size*

*Arrangement of cells*
Uniseriate (cells in one row)
*Moniliform* (like a string of pearls)
*Petrocosmea kerrii*, underside of leaf
Biseriate (cells in two rows)
Multiseriate (cells in more rows)
*Begonia* multicellular, multiseriate trichomes, cells relatively small
*Eucodonia* sp. multicellular, uniseriate trichomes, cells relatively large
Plumose
Compound forms
*Porrect-stellate*
*Solanum rostratus*

*Presumed function*
Non-glandular
Glandular (include shape of gland, sometimes the directions of cell divisions are important—periclinal or anticlinal); glands may be any shape from capitate [spherical] to peltate; material may be secreted from gland or not; cytoplasm is frequently darker [denser])

Sessile (no stalk)
Stalked (short or long [long can usually be seen as separate cells at 10X magnification sometimes number of cells])
uniseriate
multiseriate

Stinging, uren
*Urtica, Tragia*

**Other considerations**

- Mode of attachment
- Position relative to surface to which attached
- Posture of entire trichomes
- Outer cell wall features
  - ornamentation
  - calcification
  - silicification (opalescent)
  - sclerification
- Textures
  - soft
  - stiff
  - villous (soft, wavy hairs)
  - arachnoid (cobwebby [like spider threads])
  - silky, sericeous (mostly long, straight and appressed)
  - woolly, lanate (entangled)
- Margins
  - ciliate with often larger trichomes (like eyelashes)
  - frimbriate (fringed)
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