

## ***Salsola* of the Pacific Coast States**

Barbara L. Wilson for the *Carex* Working Group

This is a working DRAFT written for our own use, made available for those botanists crazy enough to try to identify *Salsola*. This is a test version. Let me know if it seems to work or how it can be improved.

Tumbleweeds are sometimes variable, but in most keys all the specimens key to the same thing. Are there other *Salsola* out there? Nearly all plants will be *S. tragus*, but keep an eye out for other possibilities.

### **References:**

- Hrusa, G. F., and J. F. Gaskin. 2008. The *Salsola tragus* complex in California (Chenopodiaceae): characterization and status of *Salsola australis* and the autochthonous allopolyploid *Salsola ryanii*, *sp. nov.* Madroño 55: 113-131.
- Mosyakin, Sergei L. 2003. *Salsola*. pp. 398 – 403 in Flora of North America Editorial Committee, eds. Flora of North America North of Mexico, Vol. 4: Magnoliophyta: Caryophyllidae, part 1. Oxford University Press, New York.

Basically, this is the Flora of North America treatment (Mosyakin 2003; also available at [http://www.efloras.org/florataxon.aspx?flora\\_id=1&taxon\\_id=129079](http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=129079)) but I added *S. australis* added from Hrusa & Gaskin 2008. (Lead 7 is mine)

In addition to the species in the key, one might find these hybrids, especially in California:

*Salsola ryanii* Hrusa & Gaskin is a fertile hexaploid hybrid of *S. tragus* and *S. australis* and has arisen at least three times in California. It is intermediate between the parents in most ways; see table below.

*Salsola* X *gobicola* Iljin is the hybrid of the tetraploids *S. tragus* and *S. paulsenii*. It appears wherever the ranges of the parents overlap. Usually the hybrids have stem papillae with non-spinose mature perianth. Fruit wing texture is variable but usually hyaline. It may mix longer trichomes with stem papillae.

Underlined taxa have been found in Oregon. *Salsola tragus* is by far the most common. More species may show up.

### **THE KEY:**

1. Subshrubs, densely pubescent with smooth and minutely denticulate (barbellate) hairs (sometimes becoming glabrous at maturity); leaves and bracts with obtuse apex; perianth segments ± pubescent (not papillose) apically ..... *Salsola vermiculata*  
Rare introduction to California. Divergent; will go to another genus, *Caroxylon*. Highly polymorphic. Flowering spring to summer. Diploid (2X).

- 1' Herbs, glabrous or papillose to hispid; leaves and bracts with spinose (or at least mucronulate) apex; perianth segments completely glabrous, or indistinctly papillose (occasionally ciliate at apical margins)
2. Leaves (especially proximal ones) opposite or subopposite, blade apex mucronulate, not spinose; bracts distinctly swollen at base, alternate or almost opposite; perianth segments usually with margins crenate or pectinate-ciliate apically; plants glabrous ..... *Salsola soda*  
 Introduced to the San Francisco Bay area. Flowering spring and summer.  
 Coastal and disturbed saline environments. Southern, Mediterranean.  
 Diploid (2X).
- 2' Leaves all alternate or, sometimes, 1-3 pairs of proximal almost opposite, blade apex spinose or spinescent (rarely, almost mucronulate); bracts not swollen or indistinctly swollen at base, usually alternate; perianth segments with margins entire (sometimes papillose, but never crenate or pectinate-ciliate) apically; plants papillose to hispid, occasionally glabrous
3. Leaf blades fleshy (in living plants), linear, in herbarium specimens 1-2 mm wide, ± acuminate into firm apical spine; bracts reflexed at maturity
4. Perianth segment apices long-acuminate or long-subulate and spinose, at maturity forming slender columnar beak beyond broad wings; fruiting perianth 7-12 mm diam.; open sands and inland, saline habitats ..... *Salsola paulsenii*  
 Southern Great Basin; disturbed sandy soils including deserts. Flowering spring to summer. Tetraploid (4X).
- 4' Perianth segment apices short-acuminate or triangular, forming conical (not slender) columnar beak at maturity; fruiting perianth 4-6(-8) mm diam.; maritime saline habitats ..... *Salsola kali ssp. pontica*  
 Rare introduction, OR, CA, at coast. Beaches, salt marshes. Flowering summer to fall. Tetraploid (4X)
- 3' Leaf blades usually not fleshy (occasionally somewhat fleshy in plants growing in saline and alkaline habitats), narrowly linear to filiform, in herbarium specimens less than 1 mm wide, in most cases abruptly narrowed into weak apical spine; bracts reflexed or appressed at maturity
5. Bracts appressed, strongly imbricate at maturity, gradually narrowed into subulate, spinose apex; spikes rather dense, not interrupted at maturity; perianth segments wingless or rarely with narrow erose wing; stems usually erect, branched beyond or near base ..... *Salsola collina*  
 Mainly midwestern (so far), with some populations in UT, AZ, NM. Waste places, 100 – 2000 meters. Flowering summer to fall. Diploid (2X).
- 5' Bracts reflexed, not imbricate at maturity, usually ± abruptly narrowed into spinose or submucronulate apex; spikes at maturity interrupted at least in proximal <sup>1</sup>/<sub>2</sub>; perianth segments usually with membranous wing; stems erect or ascending, normally branched from base
6. Perianth segment apices long-acuminate and spinose, at maturity forming slender columnar beak beyond wings; two smaller perianth segments with much reduced subulate wing-like appendages; fruiting perianth 7-12 mm diam ..... *Salsola paulsenii*

- 6' Perianth segment apices obtuse to weakly acuminate or reflexed, at maturity not forming columnar beak; two smaller perianth segments with reduced by not subulate wing; fruiting perianth usually 3-10 mm diam.
7. Anthers 0.45 – 0.7 mm long; habit more upright, with branches spreading more horizontally, often somewhat succulent and brittle; plant usually staying in place after death; inflorescences less condensed; flowers at lower nodes winged; minor-wing broadly obovate; fruit exposed, not invested in the bract; tepal-wing summit margin smooth to slightly irregular; stems glabrous or with trichomes < 0.2 mm long (rarely longer); fruit falls off at maturity ..... [\*S. australis\*](#) California (north to about Monterey), AZ, TX, northern Mexico. Flowering summer to fall. Diploid (2X).
- 7' Anthers 0.6 – 1.3 mm long; habit more rounded, with branches more ascending, tough, wiry, not succulent; plant breaking off and becoming a tumbleweed after death; inflorescences more condensed; flowers at lower nodes wingless; minor-wing linear to blunt elliptic; fruit deeply invested in the bract; tepal-wing summit margin markedly irregular (rarely smooth); stems sparsely to densely hispid with trichomes > 0.2 mm long (rarely glabrous); fruit persistent on plant ..... [\*Salsola tragus\*](#) Very widespread and common. Highly polymorphic, probably with cryptic species. Flowering summer to fall. Tetraploid (4X).

Comparison of *Salsola tragus*-like species in California.  $x = 9$  in these plants. *Salsola ryanii* is a fertile hexaploid hybrid of *S. tragus* and *S. australis*. Characters in blue are ones I added to the table, from information in the Hrusa & Gaskin article.

| Character                              | <i>Salsola tragus</i> L.   | <i>Salsola ryanii</i>                     | <i>Salsola australis</i> R. Br.   | <i>Salsola paulsenii</i>           |
|--|--|---|---|------------------------------------|
| Range                                  | very widespread  | CA (Kern, Fresno Co.)                     | CA N to Monterey, TX, AZ, Mexico  | Great Basin                        |
| Elevation                              | to 2500 m  | to 300 m                                  | to 400 m  | to 1900 meters                     |
| Chromosome number                      | 4X, sometimes 6X   | 6X  | 2X  | 4X                                 |
| Habit                                  | rounded, ascending-branched tumbleweeds with dense, spike-like inflorescence | intermediate                              | more upright habit, more horizontally branched, inflorescences less condensed | more upright, conical              |
| Plant texture                          | thin, wiry, tough  | intermediate                              | thicker, often semi-succulent, brittle  |                                    |
| Flowers at lower nodes                 | wingless   | winged                                    | winged  |                                    |
| Fruit diameter incl. wing              | 2.9 – 8.4 mm<br>mean 4.9 mm  | 4.6 – 8.1 mm<br>mean 6.3 mm               | 4.8 – 7.9 mm<br>mean 6.6 mm   | 6.6 – 10.7 mm<br>mean 8.7 mm       |
| Minor-wing shape                       | linear to blunt elliptic   | narrowly obovate to spatulate             | broadly obovate   | obsolete or narrowly linear        |
| Fruiting tepal                         | hyaline, soft, not spinose   | haline, soft, not spinose                 | haline, soft, not spinose   | hard, spinose                      |
| Fruit/bract relationship               | fruit deeply invested  | fruit mostly exposed, not deeply invested | fruit exposed, not invested   | fruit exposed, not invested        |
| Winged-fruit development pattern       | end of flowering season  | middle of flowering season                | beginning of flowering season, as individual flowers mature                   | end of flowering season            |
| Tepal-wing opacity & color (fresh)     | opaque, white to pink/red  | opaque, white to light pink               | opaque to semi-transparent, white to light pink                               | translucent, clear to rarely white |
| Tepal-wing summit margin               | markedly irregular to rarely smooth  | slightly irregular                        | smooth to slightly irregular  | smooth, to slightly irregular      |
| Anther length                          | 0.6 – 1.3 mm<br>mean 1.02 mm   | 0.5 – 1.3 mm<br>mean 0.96 mm              | 0.45 – 0.7 mm<br>mean 0.58 mm   | 0.43 – 0.68 mm<br>mean 0.59 mm     |
| Stem vestiture                         | sparsely to densely hispid with trichomes > 0.2 mm, or +/- glabrous          | sparsely hispid to +/- glabrous           | glabrous or with trichomes < 0.2 mm. Rarely hispid with longer trichomes      | papillate                          |
| Stem vestiture position (when present) | mostly stem ribs   | mostly stem ribs                          | stem ribs   | stem ribs and inter-rib area       |
| Fruiting internode length              | shorter than adjacent bract  | shorter to longer than adjacent bract     | usually longer than adjacent bract  | shorter than adjacent bract        |
| Mature fruit behavior                  | persistent on plant  | semi-persistent                           | abscises at maturity  | abscises at maturity               |
| Post-senescent behavior                | tumbleweed   | some tumbling to +/- persistent in place  | +/- persistent in place   | +/- persistent in place            |