

Six occurrences of *Tuctoria greenei* are on The Nature Conservancy's Vina Plains Preserve. This species has grown in as many as seven pools on the preserve in certain years (Stroud 1990, Alexander and Schlising 1997), including one pool on the Wurlitzer Unit (California Natural Diversity Data Base 2003). The Glenn County population, on the Sacramento National Wildlife Refuge, is the only occurrence known from public land.

15. *TUCTORIA MUCRONATA* (SOLANO GRASS)

a. Description and Taxonomy

Taxonomy.—Solano grass is in the Orcuttieae tribe of the grass family Poaceae (Reeder 1965). Solano grass was originally described under the name *Orcuttia mucronata*, based on specimens collected “12 miles due south of Dixon, Solano County” (Crampton 1959:108). Reeder (1982) transferred this species to a new genus, *Tuctoria*, resulting in the currently accepted name *Tuctoria mucronata*. Other common names are Crampton's Orcutt grass (Griggs 1977b), mucronate orcuttia (Smith *et al.* 1980), and Crampton's tuctoria (Skinner and Pavlik 1994).

Description and Identification.—Characteristics of the Orcuttieae were described earlier in this document under the *Neostapfia colusana* account and those common to the genus *Tuctoria* were presented in the *T. greenei* account. *Tuctoria mucronata* is grayish-green, pilose, and viscid. The tufted stems are decumbent, 12 centimeters (4.7 inches) or less long, and do not branch. The leaves are 1 to 4 centimeters (0.4 to 1.6 inches) long, are rolled inward, and have pointed tips. The inflorescence is 1.5 to 6 centimeters (0.6 to 2.4 inches) long, and its base is partially hidden by the uppermost leaves. As for all plants in this genus, the spikelets are arranged in a spiral; the 7 to 19 spikelets in the inflorescence of *T. mucronata* are crowded together. Spikelets range from 7 to 13 millimeters (0.28 to 0.51 inch) in length and consist of 5 to 10 florets, plus two glumes. The lemmas are 5 to 7 millimeters (0.20 to 0.28 inch) long and taper towards the tip, which is curved outward. The lemma teeth are not obvious except for the central one, which has a sharply pointed tip up to 1 millimeter (0.04 inch) long. *Tuctoria mucronata* has smooth seeds about 3 millimeters (0.12 inch) long and a diploid chromosome number of 40 (Crampton 1959; Reeder 1982, 1993).

Unlike *Tuctoria greenei*, the inflorescence of *T. mucronata* remains partly hidden by the leaves, even at maturity. In addition, *T. mucronata* stems are shorter than those of *T. greenei*, and the former has tapered lemmas and larger, smoother seeds. The spiral arrangement of the spikelets and single obvious tooth per lemma distinguish *T. mucronata* from the Orcutt grasses. Finally, the tapered

lemmas of *T. mucronata* differ from the fan-shaped lemmas of *Neostapfia colusana* (Reeder 1982).

b. Historical and Current Distribution

Historical Distribution.—Prior to 1985, *Tuctoria mucronata* was known only from Olcott Lake in Solano County, which is believed to be the type locality (Crampton 1959, California Natural Diversity Data Base 2003) (**Figure II-20**). Another occurrence was discovered in 1985 about 4 kilometers (2.5 miles) southwest of Olcott Lake (California Natural Diversity Data Base 2005). A third occurrence, comprising the largest population now known, was discovered in 1993 on a Department of Defense communications facility in Yolo County (California Natural Diversity Data Base 2005). All three sites are in the Solano-Colusa Vernal Pool Region (Keeler-Wolf *et al.* 1998).

Current Distribution.— *Tuctoria mucronata* may have been extirpated from Olcott Lake; the species has not been found there since 1993, when only four individual plants were observed (California Natural Diversity Data Base 2003). Twenty-six plants were found in 2004 and 3 plants were found in 2005 at the other Solano County site (C. Witham *in litt.* 2005). The Yolo County population is extant.

c. Life History and Habitat

Typical life history and habitat characteristics for all members of the Orcuttieae and for all *Tuctoria* species were presented earlier in this document, under the *Neostapfia colusana* and *Orcuttia inaequalis* accounts.

Reproduction and Demography.—The germination period for *Tuctoria mucronata* seeds is not known, but is presumed to be in May or June (U.S. Fish and Wildlife Service 1985a). *Tuctoria* seedlings do not produce floating juvenile leaves (Griggs 1980). This species typically flowers in June and sets seed during July (Holland 1987). The demography of *Tuctoria mucronata* has not been investigated in detail. Annual estimates or counts at Olcott Lake (Holland 1987, California Natural Diversity Data Base 2005) indicated that population sizes for this species fluctuate dramatically from year to year, as do other members of the Orcuttieae. *Tuctoria mucronata* was not observed at Olcott Lake from 1976 through 1980, then reappeared in 1981 (Holland 1987), indicating that viable seeds can persist in the soil for at least 5 years. Apparently both drought years and years of excessively high rainfall are unfavorable for *T. mucronata*; the largest populations were observed after seasons of 45 to 60 centimeters (17.7 to 23.6 inches) of precipitation (Holland 1987).

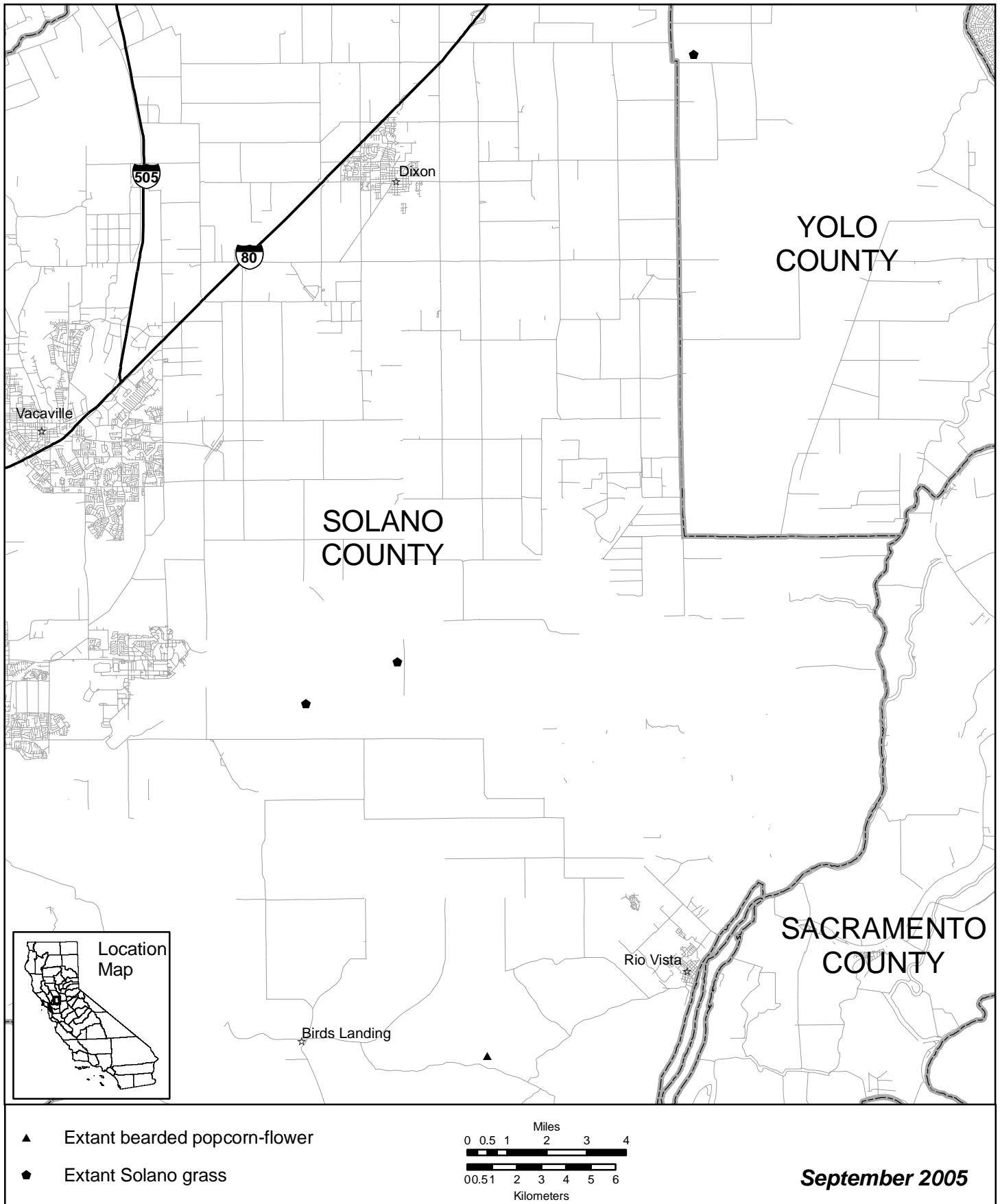


Figure II-20. Distribution of *Tuctoria mucronata* (Solano grass) and historical distribution of *Plagiobothrys hystriculus* (bearded popcorn-flower).

Habitat and Community Associations.—*Tuctoria mucronata* has been found only in the Northern Claypan type of vernal pool (Sawyer and Keeler-Wolf 1995) within annual grassland (California Natural Diversity Data Base 2005). Pools where *T. mucronata* occurs tend to be milky from suspended sediments (Holland 1987). The pools that are occupied in Solano County are more properly described as alkaline playas or intermittent lakes, due to their large surface area (Crampton 1959, U.S. Fish and Wildlife Service 1985a), whereas those at the Yolo County site are “relatively small” (C. Witham *in litt.* 2000a). Soils underlying known *T. mucronata* sites are saline-alkaline clay or silty clay in the Pescadero series (Crampton 1959, California Natural Diversity Data Base 2003). Known occurrences are at elevations of about 5 to 11 meters (15 to 35 feet) (California Natural Diversity Data Base 2005).

Tuctoria mucronata is most commonly associated with *Frankenia salina*, *Eryngium aristulatum*, and *Neostapfia colusana*; *N. colusana* occurred near *T. mucronata* at all three sites. Additional associates include *Cressa truxillensis*, *Distichlis spicata*, *Phyla nodiflora*, *Crypsis schoenoides*, *Eleocharis macrostachya*, and *Malvella leprosa* (Crampton 1959, California Natural Diversity Data Base 2003). Other than *N. colusana*, the only other rare plant featured in this recovery plan that co-occurs with *T. mucronata* is *Astragalus tener* var. *tener*; the two taxa grow in the same vernal pool complex in Yolo County, but are not found in the same pool (California Natural Diversity Data Base 2005).

d. Reasons for Decline and Threats to Survival

Most species addressed in this recovery plan are threatened by similar factors because they occupy the same vernal pool ecosystems. These general threats, faced by all the covered species, are discussed in greater detail in the Introduction section of this recovery plan. Additional, specific threats to *Tuctoria mucronata* are described below.

One additional factor potentially involved in the decline of this particular species may be overcollection (T. Griggs *in litt.* 2000, California Natural Diversity Data Base 2005). Other additional factors include the evidence that the Yolo County habitat for *Tuctoria mucronata* has been degraded by discing, excavation, herbicide runoff, application of salt, and industrial contaminants in the groundwater (K. Fuller pers. comm. 1997, C. Witham *in litt.* 2000a, California Natural Diversity Data Base 2005).

A number of specific threats to the species are also continuing. These include competition from aggressive plants at all three known sites where the species occurs or formerly occurred. The primary competitors are *Phyla nodiflora* at

Olcott Lake (C. Witham *in litt.* 2000a), *Malvella leprosa* and *Crypsis schoenoides* at the other site in Solano County (California Natural Diversity Data Base 2003), and *Lepidium latifolium* (broad-leaved pepper-weed) in Yolo County (K. Fuller *in litt.* 1999). Altered hydrology may threaten the Olcott Lake occurrence, if it is extant (T. Griggs *in litt.* 2000). Effects of inappropriate grazing continue to threaten the other Solano County population, as does trampling by hunters (California Natural Diversity Data Base 2005). Eradication of *Lepidium latifolium* is occurring at the Yolo County site, however, habitat degradation continues to be a threat (California Natural Diversity Data Base 2005, N. McCarten *in litt.* 2005). Small population size is a threat to the occurrence southwest of Olcott Lake, and to the one at Olcott Lake if it is not already extirpated. In 2005, the site southwest of Olcott Lake had declined to 3 plants and the Olcott Lake site has had no plants since 1993 (California Natural Diversity Data Base 2005).

e. Conservation Efforts

Tuctoria mucronata was listed as an endangered species on September 28, 1978 (U.S. Fish and Wildlife Service 1978a). A recovery plan was then prepared, which became effective 7 years following the listing (U.S. Fish and Wildlife Service 1985a). The California Fish and Game Commission listed *T. mucronata* as endangered in 1979 (California Department of Fish and Game 1991). *Tuctoria mucronata* is also on the California Native Plant Society's List 1B, with the highest endangerment rating possible (Skinner and Pavlik 1994). In fact, the California Native Plant Society has recognized this species as rare and endangered since it first compiled such lists (Powell 1974). In 2005, critical habitat was designated for *T. mucronata* and several other vernal pool species in *Final Designation of Critical Habitat for Four Vernal Pool Crustaceans and Eleven Vernal Pool Plants in California and Southern Oregon; Evaluation of Economic Exclusions From August 2003 Final Designation; Final Rule* (U.S. Fish and Wildlife Service 2005).

The Nature Conservancy acquired Olcott Lake in 1980 as part of the Jepson Prairie Preserve. The preserve was transferred to the Solano County Farmlands and Open Space Foundation in 1997, which manages it jointly with the University of California, Davis (C. Witham *in litt.* 1998). Livestock grazing is now excluded from the areas of the lake formerly occupied by *Tuctoria mucronata* (U.S. Fish and Wildlife Service 1985a, California Natural Diversity Data Base 2005). Money from the California Endangered Species Tax Check-Off Fund has been used to repair fences and post signs in the Jepson Prairie Preserve (California Department of Fish and Game 1991). The Nature Conservancy (1991) conducted some research on the control of *Phyla nodiflora* using herbicides and mechanical removal in the early 1990s. Private individuals have partially implemented one

aspect of the recovery plan, which was to survey suitable habitats for *T. mucronata*; their efforts led to the discovery of the two populations that were unknown at the time of listing (California Natural Diversity Data Base 2003).

B. State-Listed Plant Species and Other Plant Species of Concern

1. *ASTRAGALUS TENER* VAR. *FERRISIAE* (FERRIS' MILK-VETCH)

a. Description and Taxonomy

Taxonomy.—Milk-vetches are members of the pea family (Fabaceae). Ferris' milk-vetch was recognized and named as a distinct variety (*Astragalus tener* var. *ferrisiae*) only recently (Liston 1990b). However, Ferris had collected the type specimen in 1926, "3 miles west of Colusa," in Colusa County (Liston 1990b:100). Specimens now attributed to Ferris' milk-vetch formerly had been included under Jepson's milk-vetch (*Astragalus rattanii* var. *jepsonianus*), a serpentine endemic plant (Barneby 1964 as cited in Liston 1990b). According to Liston (1990b), further confusion about the taxonomy was generated when Abrams (1944) mistakenly provided a drawing of Ferris' milk-vetch labeled as Clara Hunt's milk-vetch (*Astragalus clarianus*). There is some speculation that Ferris' milk-vetch is an ecomorph of alkali milk vetch, *Astragalus tener* var. *tener*, a somewhat more common species of concern found in vernal pool habitats (C. Witham pers. comm. 2003). An alternative common name for *Astragalus tener* var. *ferrisiae* is Sacramento Valley milk-vetch.

Description and Identification.—The flower structure of *Astragalus* and related genera is complex. Although the calyx is unremarkable, the corolla consists of five petals that differ in size, shape, and sometimes in color. The outermost petal, which is called the banner, often curves upward away from the other petals. Just inside the banner is a pair of petals that are very narrow at the base; these separate but similar petals are known as the wings. The innermost pair of petals is called the keel because the two petals are fused to form a flattened structure resembling a boat. The pistil and stamens are hidden inside the keel. Although each flower has ten stamens, only one is separate; the filaments of the other nine are fused together (Smith 1977).

Astragalus tener var. *ferrisiae* is a delicate annual with one or more stems up to 26 centimeters (10.2 inches) long. The pinnately compound leaves have 7 to 15 wedge-shaped leaflets. The dense inflorescences arise from the leaf axils and contain 3 to 12 pinkish-purple flowers each. In *A. tener* var. *ferrisiae*, the banner ranges from 7.8 to 9.6 millimeters (0.31 to 0.38 inch) in length and has a white spot in the center. The keel is shorter than the wings, which are 5.8 to 7.1 millimeters (0.23 to 0.28 inch) long. Fruits of *A. tener* var. *ferrisiae* are