The Xerces Society
for Invertebrate Conservation

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Monarch Joint Venture

Great Basin Pollinator Plants

Native Milkweeds
(*Asclepias* spp.)

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The Xerces Society for
Invertebrate Conservation

www.xerces.org

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Cover main: Showy milkweed (*Asclepias speciosa*) with monarch butterfly (*Danaus plexippus*), honey bee (*Apis mellifera*), and leafcutter bee (*Megachile* spp.). John Anderson, Hedgerow Farms.

Cover bottom left: Showy milkweed (*Asclepias speciosa*) seeds and fruits. Eric Eldredge, USDA-NRCS.

Cover bottom right: Showy milkweed (*Asclepias speciosa*) in a field border at the Great Basin Plant Materials Center, Fallon NV. Eric Eldredge, USDA-NRCS.

Map Credits
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The Xerces Society for Invertebrate Conservation

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The Xerces Society is a nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. Established in 1971, the Society is at the forefront of invertebrate protection worldwide.

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Great Basin Pollinator Plants

Native Milkweeds (*Asclepias* spp.)

Introduction

Fourteen species of milkweed (*Asclepias* spp.) are native to the Great Basin, occurring in a diversity of communities including deserts, rangelands, meadows, woodlands, open forests, and riparian areas. Milkweeds are vital for the monarch butterfly (*Danaus plexippus*) and support a tremendous range of pollinators and other insects with abundant, high quality nectar. Milkweed flower visitors include native bees, honey bees, butterflies, and hummingbirds.

Milkweeds are named for their milky, latex sap, which contains alkaloids and cardenolides, complex chemicals that make the plants unpalatable to most animals. The plants have fleshy, pod-like fruits (follicles) that split when mature, releasing the seeds. White, fluffy hairs (the coma), are attached to each seed. These hairs facilitate wind dispersal of the seed.

Milkweeds have a variety of ethnobotanical uses. Native Americans used stem fibers to make string, rope, and cloth. Milkweed roots were boiled to make tea that was used to treat measles, rheumatism, and coughs. Also, the latex sap was used by some tribes as an antiseptic and healing agent on sores, cuts, and for ringworm. During World War II, millions of pounds of milkweed floss were used to fill life preservers and other life-saving equipment (Berkman 1949). Milkweed floss is currently used as hypo-allergenic filling for pillows and comforters.

Like many native plant species, milkweed populations are being lost at a rapid rate due to urban and suburban development and agricultural intensification. Despite their native status and value to monarch butterflies and a diversity of other pollinators, milkweeds are sometimes perceived as weeds and are eradicated from agricultural areas, rangelands, and roadsides. While some milkweed species colonize disturbed areas, others require specific habitat conditions and are not commonly found in cultivated cropland.

Monarch caterpillar. Photo: Bryan E. Reynolds, www.bryanreynoldsphoto.com

The hydrographic Great Basin. Map: Karl Musser, 2010.

This guide covers the Great Basin, a region that encompasses the majority of Nevada and western Utah, and parts of eastern California, southern Oregon, and southern Idaho (map to the left). The hydrographic Great Basin is composed of numerous contiguous watersheds with no outlet to the Pacific Ocean. The climate ranges from arid, over much of the region, to semi-arid in the north and in some of the mountain ranges. Native plant communities in basin valleys and plateaus include sagebrush steppe, desert shrub (dominated by saltbush and greasewood), riparian, and semi-desert grassland. Mountain plant communities include pinyon-juniper woodland, mountain shrub, ponderosa pine forest, mixed conifer forest, and aspen-conifer forest.

Milkweed Pollination

Milkweed flowers have a unique shape (see photos on page 4) and are pollinated in a more specific way than most other insect-visited flowers. Rather than occurring as individual pollen grains that cling to a visitor, milkweed pollen is contained in pairs of tiny, waxy sacs (pollinia), located in vertical grooves (stigmatic slits) of the flowers. When an insect visits a flower to drink nectar, its legs, feet, or mouthparts may slip into the grooves, attaching pollinia to the insect's body. Pollination occurs when pollinia are then inadvertently transferred by the insect into the groove of another milkweed flower. See Bookman (1981) for a more complete discussion of milkweed floral morphology and terminology, and Morse (1982) for more information on pollinia transfer by insects.

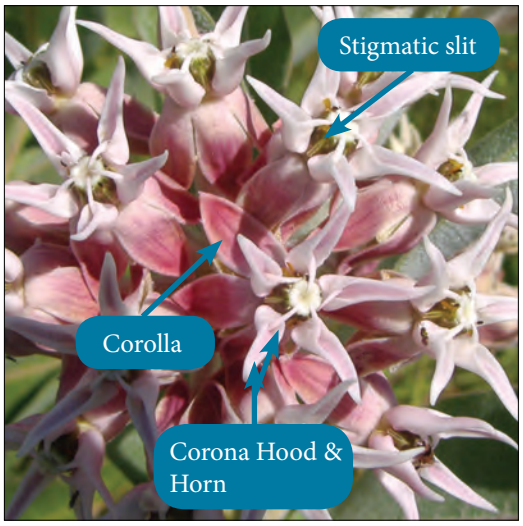


Photo: Eric Eldredge, USDA-NRCS.

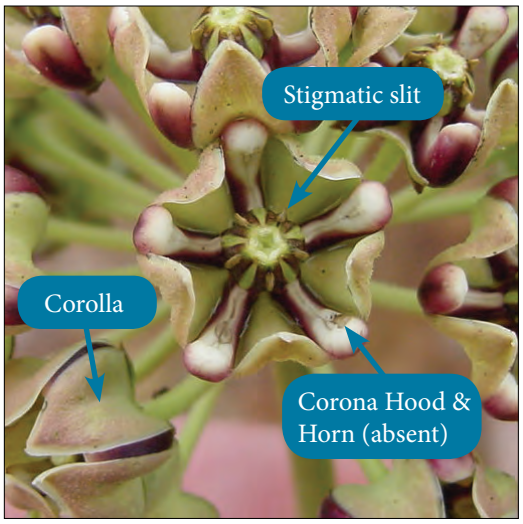


Photo: Linda Kennedy, National Audubon Society.

The structure of milkweed flowers remains consistent, despite one species appearing quite different from another. At the top is showy milkweed (*Asclepias speciosa*); at the bottom is spider milkweed (*A. asperula*).

Toxicity to Livestock

Milkweeds are generally unpalatable and livestock do not normally consume them if sufficient forage is available (Schultz 2003; Fleming et al. 1920). Most cases of milkweed poisoning result from hungry animals being concentrated in areas where milkweed is abundant (USDA-ARS 2006). Signs of poisoning include extreme dullness, unsteady gait, and loss of appetite (Fleming et al. 1920). Poisoning may also occur if animals are fed hay containing large amounts of milkweed (USDA-ARS 2006). It is important to avoid the inclusion of milkweed in prepared feeds and hay. Proper grazing management should avoid most cases of milkweed poisoning. For more information about toxic dosage and signs of potential poisoning to livestock from consuming milkweeds, see Fleming et al. (1920).

Monarch Butterflies

Milkweeds are the required host plants for monarch butterfly caterpillars. Caterpillars store the plants' distasteful chemicals in their bodies, giving them protection from predators.

The monarch's annual multi-generational migration is a widely known phenomenon, particularly the eastern population that flies to Mexico. Each fall, over one million monarchs fly from western states to spend the winter in numerous groves along the California coast. In the spring, these butterflies leave their overwintering sites in search of milkweeds on which to lay their eggs. As monarchs spread out across the western states during the spring and summer, several generations of butterflies are produced. In fall, adults of the last generation then migrate to the California coast to overwinter.

Spring-migrating monarchs may arrive in the Great Basin as early as April, but peak numbers have been recorded during June, July, and August. Monarchs are potentially present in the region through October (Dingle et al. 2005).

Annual counts of overwintering monarchs on the California coast have revealed significant population declines. For example, in 1997, Natural Bridges State Beach near Santa Cruz had an estimated 120,000 monarchs. By 2010, only 2,300 butterflies overwintered (Frey et al. 2011). A major factor contributing to these declines is the loss of milkweed plants across the western monarch's breeding range. This loss is due to urban and agricultural development and the use of herbicides on croplands, pastures, and roadsides. The protection and restoration of native milkweeds is critical to reversing this trend.

Enhancing Pollinator Populations

Wild native bees provide free pollination services, and contribute an estimated $3 billion worth of crop pollination annually to the U.S. economy (Losey & Vaughan 2006). However, these resident pollinators are active in the field longer than the duration of a crop's bloom period, and require sources of pollen and nectar throughout spring, summer, and fall. Research has shown that managed honey bees are healthier and more resistant to diseases when they have access to diverse and abundant floral resources (Alaux et al. 2010). Native plants such as milkweeds play an important role in supporting both wild bees and honey bees.

Attracting Beneficial Insects

In addition to attracting pollinators, milkweed nectar supports beneficial insects that are natural predators and parasitoids of many crop and garden pests. A recent study conducted in Washington state evaluated 43 species of native flowering perennials for their potential to attract beneficial insects. Showy milkweed (*Asclepias speciosa*) attracted the most beneficial insects of any plant species studied, including mite-eating ladybeetles (*Stethorus* spp.), minute pirate bugs (*Orius* spp.), hover flies (Syrphidae), and parasitic wasps (Ichneumonidae, Braconidae) (David G. James, unpublished data).

Insect Pests

Milkweeds are susceptible to infestation by specialist seed bugs (*Lygaeus* and *Oncopeltus* spp.), milkweed longhorn beetles (*Tetraopes* spp.), milkweed leaf beetles (*Chrysochus* spp.), and the oleander aphid (*Aphis nerii*). These insects are generally host specific and are not a threat to agricultural crops.

Incorporating Milkweeds into NRCS Conservation Practices

Beginning in 2008, the Farm Bill included language that makes pollinators and their habitat a priority for every USDA land manager and conservationist. For detailed information on how Farm Bill programs can be used to conserve and create habitat for pollinators, please consult National TN 78 (2008) "Using Farm Bill Programs for Pollinator Conservation."

Numerous NRCS conservation practices can be used to create, enhance, or manage habitat for pollinators and other beneficial insects. Including milkweeds in seed mixes and planting plans will provide both an important source of nectar from late spring through early fall (depending on the species planted) and a larval food source for the monarch butterfly. The table below features examples of practices in which milkweeds can be included; it is not meant to be an exhaustive list.

Conservation Practice	Code	Recommended Species	Notes
Channel Bank Vegetation	322	ASFA, ASSP	Species adapted to moist soils can be included in plantings for both bank stabilization and wildlife value.
Conservation Cover	327	ASAS, ASCR, ASER, ASFA, ASSP	Milkweeds may be suitable for remediation and reclamation plantings.
Critical Area Planting	342	ASAS, ASCR	These species grow well on slopes and hillsides, and may be useful for soil stabilization.
Early Successional Habitat Development/Management	647	ASAS, ASER, ASFA, ASSP	Several milkweeds have good colonizing ability and thrive in open habitats with full sun exposure.
Field Border	386	ASFA, ASSP	Use caution where spread by underground rhizomes is undesirable.
Hedgerow Planting	422	ASFA, ASSP	Milkweeds can be incorporated into hedgerow edges, adding additional plant structure. Use caution where spread by underground rhizomes is undesirable.
Pest Management	595	ASAS, ASCR, ASER, ASFA, ASSP	Milkweed nectar attracts beneficial insects that prey upon pest insects. Providing habitat for those insects has been demonstrated to be valuable for vineyards, orchards, and other crops.
Riparian Herbaceous Cover	390	ASFA, ASSP	Some observation indicates that migrating monarchs follow riparian corridors (Dingle et al. 2005).

ASAS: *A. asperula*; ASCR: *A. cryptoceras*; ASER: *A. erosa*; ASFA: *A. fascicularis*; ASSP: *A. speciosa*

Protecting Existing Milkweed Stands

Where milkweeds already occur, in remnant natural areas or non-cropped areas such as field borders, roadsides, and ditch banks, conservation practices that involve the management of existing habitat (e.g., CP 643-Restoration and Management of Rare and Declining Habitats; CP 645-Upland Wildlife Habitat Management) can serve to protect the plants as a resource for monarch caterpillars, pollinators, and other beneficial insects. It is ideal to leave milkweeds undisturbed to the greatest extent possible throughout the growing season, especially when they are flowering. Milkweeds can potentially host monarch caterpillars whenever the plants have foliage. If maintenance activities such as mowing, spraying, or burning must be conducted during the growing season, treat only a subset of the total area occupied by milkweed.

Milkweed Establishment

Milkweeds are most easily established from seed, and germination rates are typically high. They prefer full sun and most will tolerate dry soil conditions. Great Basin native milkweeds are deciduous perennials. Following seed dispersal, their above-ground growth dies back to the ground. They remain dormant during the winter, and re-emerge in the spring from established root systems. With the exception of prolonged drought, the plants will not require any supplemental watering.

Before planting, it is important to eradicate existing weed cover, deplete the amount of weed seeds in the soil seed bank, and prepare the seedbed. Weeds can be controlled through tillage, herbicide, flaming, smothering, or a combination of those methods. Depending on the abundance of weeds or weed seed at the planting site, one to two full years of weed control may be needed. Following weed removal, the soil surface must be prepared prior to planting. The seedbed should be a smooth, lightly packed surface, free of clumped sod and plant debris. For small sites, a rake or turf roller can be used to remove or break up large dirt clods. For large areas, the soil can be prepared with a cultipacker, spike tooth harrow, or similar tractor-drawn equipment. For more detailed guidance on site preparation, please consult Idaho TN 13 (2011) "Principles of Seedbed Preparation for Conservation Seedings."

Seed Collection

Milkweed seed can be hand-collected when small volumes are needed to create new habitat. Mature milkweed pods split open along a vertical seam. It is ideal to collect pods when the seam has just begun to split, but before the pod has fully opened and the floss has expanded. It is easiest to separate the seeds from the floss at this stage. If it is not feasible to regularly check plants for pod maturation, one can affix mesh "seed capture bags" over the maturing pods to retrieve at a later date.

Seeding

Milkweed seed should ideally be planted in the fall. Exposure to cold temperatures and moist conditions during winter will stimulate germination. Spring planting is also possible but artificial stratification of the seed is recommended to enhance germination. For planting areas several acres in size, milkweed can be included in native seed mixes and direct seeded to a maximum depth of ½ inch, using a specialty wildflower seed drill. For planting areas of any size, seed can also be broadcast onto a smooth, weed-free soil surface. To achieve good seed-to-soil contact, the seed should be compacted into the ground with a cultipacker, lawn roller, or the wheels of an ATV or tractor.

Seedling Propagation and Transplanting

If establishing transplants from seed, sowing the seeds in a greenhouse during February is recommended. Feedback from restoration specialists suggests that milkweed seedlings are intolerant of root disturbance. Transplant shock can be minimized by propagating seedlings in biodegradable peat pots, which can be planted directly into the ground.

Seed Sourcing

Commercial sources of Great Basin-sourced native milkweed seed are currently scarce. The Xerces Society for Invertebrate Conservation is working to change this and has launched Project Milkweed to assist the native seed industry in increasing the production of regionally appropriate seed. Seed availability is expected to increase steadily over the next several years to meet the needs of restoration projects.

Some vendors occasionally have milkweed seed in stock. For possible seed sources, please consult the Native Seed Network, www.nativeseednetwork.org, or Idaho TN 33 (rev. 2011) "Plant and Seed Vendors for Idaho – Montana – Nevada – Eastern Oregon –Utah –Eastern Washington –Wyoming."

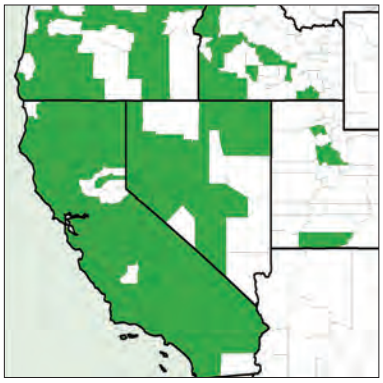
Broadly Adapted Species

Due to their ability to grow in a wide range of conditions, two species of milkweed—narrow-leaf milkweed and showy milkweed—are the most suitable for the majority of restoration efforts.

Asclepias fascicularis Narrow-leaf milkweed

Photo: Mary Ellen (Mel) Harte, Bugwood.org.

Photo: Eric Eldredge, USDA-NRCS, Fallon, NV.



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

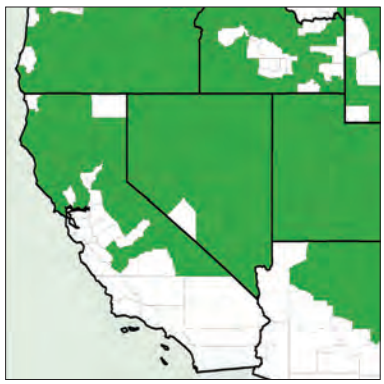
Distribution: Restricted to the western U.S., with a broad distribution in California, Oregon, and Nevada, and scattered occurrences in Idaho and Utah.

Description: Narrow-leaf milkweed, also known as the Mexican whorled milkweed, is widely distributed in the region. The species grows in pinyon-juniper, sagebrush, and mountain brush communities, and moist to dry places including stream banks, roadsides, the banks of irrigation ditches, and fallowed fields. Each plant bears multiple clusters of small pink and white flowers. The leaves are numerous and narrow, often folded lengthwise. The fruits are narrow, tapered, and smooth. This species has a similar appearance to horsetail milkweed (*A. subverticillata*) and whorled milkweed (*A. verticillata*).

Elevation: 1,640–6,560 ft (500–2,000 m)
Flowering time: June–August
Flower color: corolla pink, corona white
Maximum height: 3 ft
Average seeds per pound: 107,000

Asclepias speciosa Showy milkweed

Photo: Claudia Street, Lake County Farm Bureau.



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Distribution: Broadly distributed across the Great Basin.

Description: Showy milkweed grows in moist or moderately moist soil in open, sunny areas including wetlands, meadows, forest clearings, and dry streambeds, and also occurs along streams, roadsides, railways, and the banks of irrigation ditches. The species is tolerant of alkaline soils. Showy milkweed sometimes grows in stands of several hundred plants. The plants are stout and erect, with broad leaves covered in soft hairs. The hoods of the flowers are elongated and form the shape of a 5-pointed star. The fruits, usually borne in pairs, are rough and covered in dense, woolly hairs. Due to this species' preference for moist soils, it is not recommended for planting in areas where soil moisture is limited for much of the growing season or where irrigation is not available.

Photo: Rod Gilbert, www.pbase.com/rodg/.

Elevation: 500–8,200 ft (150–2,500 m)
Flowering time: May–August
Flower color: corolla pink, corona pink or white
Maximum height: 4 ft
Average seeds per pound: 75,000

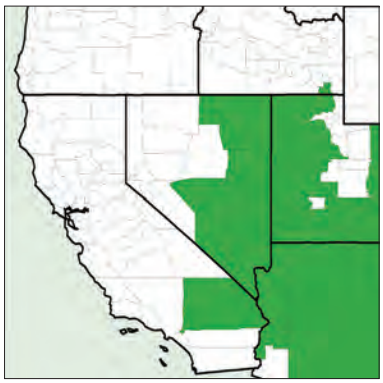
Other Common Species

Three species (spider milkweed, pallid milkweed, and desert milkweed) have a fairly wide distribution in the Great Basin, and two species (heartleaf milkweed and horsetail milkweed) are common in specific areas within the region. These species are not frequently available from commercial sources, but could be targeted for special conservation efforts where they occur.

Asclepias asperula ssp. *asperula* Spider milkweed

Photo: Fiona Reid, Painted Lady Vineyard.

Photo: Linda Kennedy, National Audubon Society.



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Distribution: Broadly distributed across the eastern half of Nevada and most of Utah, limited distribution in southern Idaho.

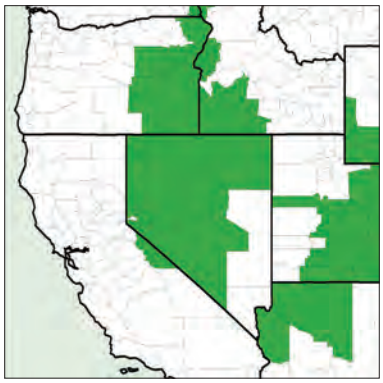
Description: Spider milkweed grows in gravelly and rocky soil or on exposed talus, in ponderosa pine woodland and pinyon-juniper, sagebrush, and mountain brush communities. The plants are low-growing and often form dense clumps. Spider milkweed flowers are distinctive from those of other milkweeds because the corolla of the flower forms a cup around the corona, rather than being bent backward. The tear-drop shaped fruits are covered in fine hairs and sometimes have a striped pattern.

Elevation: 4,100–9,022 ft (1,250–2,750 m)
Flowering time: May–July
Flower color: corolla yellowish-green, corona purple and white
Maximum height: 2 ft

Asclepias cryptoceras Pallid milkweed, Davis' milkweed

Photo: Gary A. Monroe @ USDA-PLANTS database.

Photo: Conservation Seeding and Restoration, Inc. Biology Team, www.csr-inc.com.



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Distribution: Occurs across most of Nevada and the eastern half of Utah, some occurrences in southwestern Idaho and eastern Oregon. Restricted to the western U.S. The range of the full species, rather than separate subspecies, is shown here.

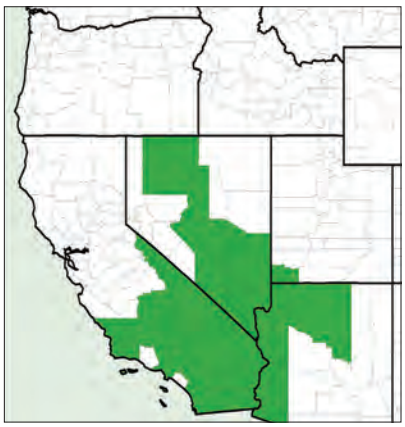
Description: Two subspecies of *A. cryptoceras* occur in the Great Basin: *A. cryptoceras* ssp. *cryptoceras* (pallid milkweed) and *A. cryptoceras* ssp. *davisii* (Davis' milkweed). While the subspecies differ in flower morphology, they are not documented to have different habitat preferences. *A. cryptoceras* grows in dry, open, barren places such as washes, slopes, and hillsides, in pinyon-juniper woodland, sagebrush communities, and salt desert shrublands. It potentially grows in clay, sand, gypsum, or serpentine soils. The plants are prostrate and low-growing, with flowers borne in small clusters on drooping stalks. A waxy coating on the leaves and stems gives them a frosted appearance. The fruits are oval shaped, smooth textured, and hairless.

Elevation: 2,460–8,200 ft (750–2,500 m)
Flowering time: May–June
Flower color: corolla pale green, corona purple
Maximum height: 1 ft

Asclepias erosa Desert milkweed

Photo © Br. Alfred Brousseau, Saint Mary's College.

Photo © 2005 Brent Miller.



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Distribution: Scattered occurrences across central Nevada; also occurs in southern California and southwestern Utah.

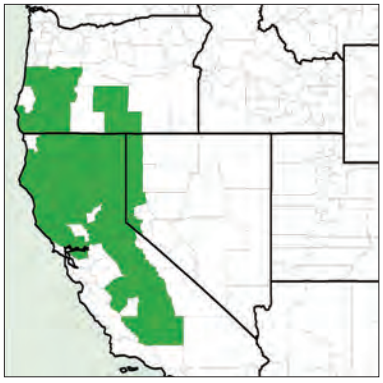
Description: Desert milkweed grows in dry washes, gulches, canyons, and roadsides in open deserts; also in creosote bush, shadscale, and sometimes sagebrush communities. The plants are tall and stout, with large, broad leaves that are opposite each other on the stem. The leaves, stems, flower buds, and fruits are covered in fine hairs.

Elevation: 500–6,725 ft (150–2,050 m)
Flowering time: April–August
Flower color: corolla pale green or yellow, corona cream or yellow
Maximum height: 6 ft

Asclepias cordifolia Heartleaf milkweed

Photo: Dr. Robert T. and Margaret Orr. © Cal Academy of Sciences.

Photo: John Anderson, Hedgerow Farms.



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Distribution: The Modoc Plateau of northeastern California, the Carson Range of western Nevada, and the southern Cascades and Basin and Range of Oregon.

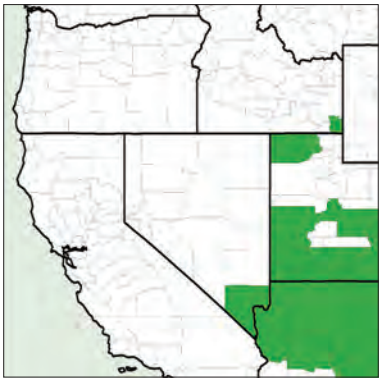
Description: Heartleaf milkweed grows on slopes and hillsides in rocky or gravelly soil in chaparral, juniper woodland, sagebrush steppe, and open pine and fir forests. The species also grows on lava flows. The leaves are heart-shaped and their waxy coating gives them a frosted appearance. The fruits, sometimes purple in color, are smooth textured and taper to a sharp point.

Elevation: 3,280–8,200 ft (1,000–2,500 m)
Flowering time: May–July
Flower color: corolla dark pink to dark purple, corona pink or white
Maximum height: 2 ft

Asclepias subverticillata Horsetail milkweed

Photo: Mary Ellen (Mel) Harte, Bugwood.org.

Photo: Mary Ellen (Mel) Harte, Bugwood.org



Map: USDA-NRCS East Remote Sensing Laboratory in conjunction with the National Plant Data Team.

Distribution: Southern Nevada and southeastern Idaho, common in southwestern Utah.

Description: Horsetail milkweed prefers sandy soils and grows in creosote bush, blackbrush, saltbush, sagebrush, rabbitbrush, pinyon-juniper, mountain brush, and open ponderosa pine communities. The species also grows on roadsides and along ditches and streams. The leaves are narrow, linear, and typically arranged in a whorled pattern around the stem. The fruits are narrow, tapered, and smooth textured. Horsetail milkweed is one of the more toxic species of milkweed; livestock managers should take appropriate measures to prevent animals from consuming the plants.

Elevation: 2,720–7,220 ft (830–2,200 m)
Flowering time: June–August
Flower color: corolla yellow to cream, corona white
Maximum height: 3 ft

Uncommon Species

Seven additional species have a very limited distribution in the Great Basin: *A. hallii* (Hall's milkweed), *A. incarnata* (swamp milkweed), *A. latifolia* (broadleaf milkweed), *A. nyctaginifolia* (Mojave milkweed), *A. rusbyi* (Rusby's milkweed), *A. subulata* (rush milkweed), and *A. uncialis* ssp. *ruthiae* (Ruth's milkweed). Please refer to the USDA PLANTS database (http://plants.usda.gov) for more information about these species.

Additional Information

For more information about using native milkweeds in restoration and revegetation efforts in the Great Basin, please contact:
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or
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