



Sego Lily

Newsletter of the Utah Native Plant Society

July 2013
(volume 36 number 4)

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Low hesperochiron (*Hesperochiron pumilus*) is a stemless perennial characterized by a shallow, saucer-shaped corolla with the petal lobes many times longer than the tube. It blooms in spring and occurs in wet meadows and streamsides in the mountains and valleys over much of northern Utah. Hesperochiron can be distinguished from other members of the waterleaf family (Hydrophyllaceae) by having a basal rosette of entire, spoon-shaped leaves. Recent biosystematic research suggests that the Hydrophyllaceae is nested within the larger boraginace family and should be lumped with it (a position taken by some taxonomists in the 19th and early 20th centuries based on morphological grounds). Photo by Steve Hegji from the Snake Valley in western Utah.

Utah Native Plant Society



Utah Native Plant Society

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Sego Lily Editor: Walter Fertig (walt@kanab.net). The deadline for the September 2013 *Sego Lily* is 15 August 2013.

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Grow This: *Clematis*

Text and Photo by Robert Dorn (adapted from *Castilleja*, the publication of the Wyoming Native Plant Society, March 2013)

Clematis ligusticifolia, White Virgins-bower, is a fast-growing, deciduous vine with pinnately compound leaves. The flowers are white to cream and up to 1 inch across with few to many in the leaf axils. Male and female flowers are on separate plants. The female plants are the most attractive with fruits having feathery styles to 2 inches long. The plants occur naturally along roadsides or in thickets usually climbing on fences, trees, or shrubs in the basins, valleys, and plains. They prefer full sun or partial shade and moist to dry, well-drained soil. This is a vigorous grower but can be pruned heavily if desirable. It can be grown from seed after removing the styles. Plant in fall outdoors.

Clematis occidentalis, Purple Virgins-bower, is a deciduous vine with compound leaves with 3 leaflets. The flowers are light blue to purple and up to 2.5 inches long, nodding on long stalks from the leaf axils. The fruits are a cluster of achenes with attractive, feathery styles to 2.5 inches long.



Above: White Virginsbower (*Clematis ligusticifolia*) from Bonneville Co., Idaho.

It occurs naturally in wooded areas in the mountains and prefers light to moderate shade and well-drained, loamy soil. It can be grown from seed. First remove the styles

and sow outdoors in fall or cold stratify for 60 days for spring planting. Both *Clematis* species are also in the nursery trade.

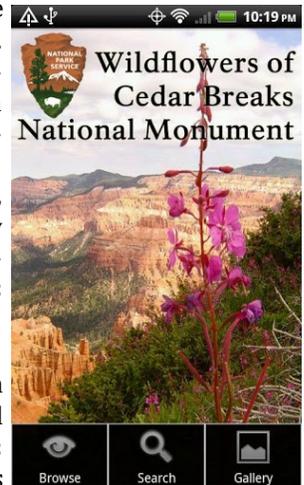
Bulletin Board

8th Annual Cedar Breaks Wildflower Festival—July 6-21, 2013: The subalpine meadows of Cedar Breaks National Monument will be bursting with wildflowers this summer. Wildflower specialists will lead free daily guided walks at 10 AM and 1 PM. Classes in wildflower identification, ecology, and photography are also being offered by the Zion Canyon Field Institute. For more information on festival highlights consult the Cedar Breaks NM website or call 435-586-0787.

To help you enjoy the wildflowers of Cedar Breaks, either during the festival or at home, download the free Cedar Breaks Wildflower app (right) from the iTunes store or Google play for iphones or android systems. The app includes descriptions and natural history information for the more common and showy wildflowers of the monument, as well as numerous color photographs.

***Calochortiana* Volume 2 Deadline:** The deadline for submissions for the second edition of the Utah Native Plant Society's annual technical journal, *Calochortiana*, has been extended to 15 October 2013 to better accommodate authors and reviewers. The inaugural issue is posted on the UNPS homepage (www.unps.org). *Calochortiana* provides a forum for articles on the natural history of native plants of Utah, protocols on growing native species, floristic checklists, and other contributions that are not readily accepted in other journals—and at no cost to contributors! Space is limited, however. For more information on format and review requirements, potential authors should contact *Calochortiana* editor, Walter Fertig (walt@kanab.net). Volume 2 of the journal is slated for December 2013.

Wetland Plant Guide Available: The Colorado Natural Heritage Program is excited to announce the completion of the *Field Guide to Colorado's Wetland Plants: Identification, Ecology, and Conservation*. The field guide combines available wetland information into an easy-to-use resource designed for both the lay person as well as the wetland scientist to not only identify wetland plants, but to apply that knowledge towards proactive conservation and protection of one of Colorado's most valuable resources. The Field Guide contains botanical descriptions of over 600 wetland plants as well as information on priority wildlife species and other wetland-dependent animals, wildlife and vegetation ecology, and rare or sensitive plants. The Guide not only assists with identifying a wetland plant, but includes information on its wetland indicator status, classification, conservation status, rarity, and ecology. The Field Guide is available for \$39.95 plus tax and shipping from CHNP's website: <http://www.cnhp.colostate.edu/cwic/ident/fieldGuide.aspx>.



Unidentified Flowering Object

This month's UFO was provided by John Toolen of the BLM Grand Junction Field Office, who took the photo on Mancos Shale of northwestern Colorado. This annual is also found in badlands habitats in Grand and Uintah counties in Utah. It can be taller than the photo shows, but the (mostly) entire leaves are distinctive. Any guesses?

The July UFO photo was a close-up of the inflorescence of Rigid spineflower (*Chorizanthe rigida*). This 1-4 inch tall annual has spiny bracts below the greenish flowers that form a bur-like skeleton that persists long after the plant has set seed and died. In the interests of full disclosure, I took the photo this spring south of Mesquite, Nevada. In Utah Rigid spineflower is restricted to warm desert and Joshua tree habitats in the Beaver Dam Wash area. Congratulations to Lee Hughes for submitting the first correct response.

Have a UFO to share? Send it in! - *W. Fertig*



Native Water-Wise Plants for Utah

Utah is the second driest state in the United States after Nevada. Despite this, Utahans still want to enjoy the benefits of landscaping and cultivating plants. The Utah Division of Water Resources and a group of 13 other government, university, and non-profit groups (including the Utah Native Plant Society) have developed a list of nearly 300 plant species that are adapted to Utah's harsh climate and can thrive with little supplemental water. The Utah Water-Wise Committee's list and additional information on cultivating water-wise species and garden design are available on the group's website at www.waterwiseplants.utah.gov.

It is important to remember, however, that water-wise is not synonymous with native. More than half of the water-wise plant species listed by the Water-Wise Plant Committee are, in fact, not indigenous to Utah. A few, such as Scotch broom (*Cytisus scoparius*), Baby's breath (*Gypsophila paniculata*), Giant reed grass (*Arundo donax*), and Ravenna grass (*Saccharum ravennae*) can be aggressive invaders.

Since one of the goals of the Utah Native Plant Society is to promote the use of native plants in horticulture and restoration, we offer the following list of native water-wise plant species suitable for use in Utah landscaping. About two dozen native species from the Water-wise Plant Committee list were dropped, as they are considered "high water use" taxa by Meyer et al. (2009). The list is annotated with information on the habitat preference of each species in Utah (D = desert; F = foothills; M = mountains) - *Walter Fertig*.

Coniferous Trees

Juniperus osteosperma (Utah juniper) D, F
Juniperus scopulorum (Rocky Mountain juniper) F, M
Pinus edulis (Pinyon pine) D, F
Pinus flexilis (Limber pine) F, M
Pinus monophylla (Single-needle pinyon) D

Deciduous Trees

Acer grandidentatum (Bigtooth maple) F, M
Amelanchier alnifolia (Saskatoon serviceberry) M
Amelanchier utahensis (Utah serviceberry) D, F
Celtis reticulata (Netleaf hackberry) D
Chilopsis linearis (Desert willow) D
Fraxinus anomala (Singleleaf ash) D, F
Quercus gambelii (Gambel oak) D, F
Robinia neomexicana (New Mexico locust) F

Shrubs

Agave utahensis (Utah agave) D
Artemisia filifolia (Sand sagebrush) D
Artemisia frigida (Fringed sagebrush) F, M
Artemisia nova (Black sagebrush) D, F
Artemisia tridentata (Big sagebrush) D, F, M
Atriplex canescens (Fourwing saltbush) D, F
Atriplex confertifolia (Shadscale) D, F
Ceanothus martinii (Utah mountain-lilac) F
Cercocarpus intricatus (Little-leaf mountain mahogany) D, F
Cercocarpus ledifolius (Curl-leaf mountain mahogany) F, M
Cercocarpus montanus (Alder-leaf mountain mahogany) F, M
Chamaebatiaria millefolium (Fernbush) D, F
Chrysothamnus [Ericameria] nauseosus (Rubber rabbitbrush) D, F, M
Ephedra viridis (Green Mormon tea) D, F
Eriogonum corymbosum (Lacy buckwheat) D, F
Fallugia paradoxa (Apache plume) D
Forestiera pubescens (New Mexican privet) D
Holodiscus dumosus (Mountain spray) F
Krascheninnikovia lanata (Winterfat) D, F
Mahonia [Berberis] fremontii (Fremont barberry) D
Paxistima myrsinites (Mountain lover) F, M
Peraphyllum ramosissimum (Squaw apple) F
Philadelphus microphyllus (Littleleaf mockorange) F
Physocarpus malvaceus (Mallow-leaved ninebark) M
Potentilla [Dasiphora] fruticosa (Shrubby cinquefoil) F, M

Purshia stansburyana [*P. mexicana*] (Cliffrose) D, F
Quercus turbinella (Shrub live oak) D, F
Rhus aromatica [*R. trilobata*] (Squawbush) D, F
Rhus glabra (Smooth sumac) F, M
Rosa woodsii (Woods rose) F, M
Salvia dorrii (Dorr sage) D
Shepherdia argentea (Silver buffalo-berry) F, M
Yucca angustissima (Narrow-leaved yucca) D
Yucca baccata (Datil yucca) D
Yucca harrimaniae (Harriman's yucca) F

Perennials

Achillea millefolium (Common yarrow) F, M
Anaphalis margaritacea (Pearly ever-lasting) M
Arenaria [Eremogone] macradenia (Showy sandwort) D
Asclepias tuberosa (Butterfly weed) F, M
Astragalus utahensis (Utah milkvetch) F, M
Baileya multiradiata (Desert marigold) D
Calylophus lavandulifolius (Lavender-leaf sundrops) D, F
Castilleja angustifolia var. *dubia* [*C. chromosa*] (Desert paintbrush) D, F
Erigeron argentatus (Silver daisy) D, F
Erigeron compositus (Fernleaf fleabane) F, M
Eriogonum heracleioides (Hercules buckwheat) F, M
Eriogonum jamesii (James' buckwheat) F, M
Eriogonum ovalifolium (Silver buckwheat) D, F
Eriogonum umbellatum (Suphur buckwheat) D, F, M
Gaillardia aristata (Blanketflower) F, M
Gaillardia pinnatifida (Hopi blanketflower) D
Haplopappus [Stenotus] acaulis (Dwarf goldenbush) F, M
Hedysarum boreale (Utah sweetvetch) F, M
Hymenoxys [Tetraneuris] acaulis (Sundancer daisy) D, F, M
Linum lewisii (Lewis' blue flax) D, F, M
Mirabilis multiflora (Desert four o'clock) D
Oenothera caespitosa (Fragrant evening-primrose) D, F, M
Oenothera howardii (Bronze evening-primrose) F
Oenothera pallida (Pale evening-primrose) D, F

- Oxytropis lambertii* (Purple locoweed) F
Penstemon barbatus (Beardlip penstemon) D, F
Penstemon caespitosus (Mat penstemon) F
Penstemon cyananthus (Wasatch penstemon) F, M
Penstemon eatonii (Firecracker penstemon) D, F
Penstemon palmeri (Palmer's penstemon) D, F
Penstemon rostriflorus (Bridges penstemon) D
Penstemon sepalulus (Littlecup penstemon) F, M
Penstemon strictus (Rocky Mountain penstemon) F, M
Penstemon utahensis (Utah penstemon) D
Penstemon whippleanus (Whipple's penstemon) M
Smilacina [*Maianthemum*] *racemosa* (False Solomon's seal) M
Sphaeralcea caespitosa (Cushion globe-mallow) D
Sphaeralcea coccinea (Scarlet globe-mallow) D, F
Sphaeralcea grossulariifolia (Gooseberry-leaf globemallow) D, F
Sphaeralcea munroana (Munro's gooseberry) F, M
Sphaeralcea parvifolia (Small-leaf gooseberry) D
Stanleya pinnata (Prince's plume) D
Viguiera multiflora (Showy goldeneye) M

Groundcovers

- Antennaria microphylla* (Littleleaf pussytoes) F, M
Antennaria parvifolia (Common pussytoes) M
Antennaria rosea (Rosy pussytoes) M
Arctostaphylos uva-ursi (Bearberry) F, M
Erigeron flagellaris (Trailing daisy) F, M
Eriogonum brevicaulis (Shortstem buckwheat) F, M
Mahonia [*Berberis*] *repens* (Creeping Oregon grape) M

Grasses

- Achnatherum* [*Oryzopsis*, *Stipa*] *hymenoides* (Indian ricegrass) D, F
Achnatherum [*Stipa*, *Jarava*] *speciosum* (Desert needlegrass) D
Andropogon gerardii (Big bluestem) F
Aristida purpurea (Purple three-awn) D, F
Bouteloua curtipendula (Sideoats grama) D, F
Bouteloua gracilis (Blue grama) D, F
Elymus [*Leymus*] *cinereus* (Great Basin wildrye) F, M
Elymus [*Pseudoroegneria*] *spicatus* (Bluebunch wheatgrass) M
Hesperostipa [*Stipa*] *comata* (Needle-and-thread) D, F, M

- Poa fendleriana* (Muttongrass) D, F, M
Schizachyrium [*Andropogon*] *scoparium* (Little bluestem) D, F
Sporobolus airoides (Alkali sacaton) D, F

Vines

- Clematis ligusticifolia* (White virgin's-bower) F, M

Cacti

- Echinocereus engelmannii* (Engelmann hedgehog) D
Echinocereus triglochidiatus [*E. coccineus*] (Claretcup cactus) D
Opuntia basilaris (Beavertail cactus) D

- Opuntia phaeacantha* (Pricklypear cactus) D
Opuntia polyacantha (Plains pricklypear) D, F

References

Meyer, S.E., R.K. Kjelgren, D.G. Morrison, and W.A. Varga. 2009. Landscaping on the New Frontier: Waterwise Design for the Intermountain West. Utah State University Press, Logan, UT. 241 pp.

Utah Water-Wise Plants Committee. Water-Wise Plants for Utah; www.waterwiseplants.utah.gov.



Above: Sundancer daisy (*Hymenoxys acaulis* or *Tetraneuris acaulis*) is a native Utah species adapted to barren rocky or sandy soils and suitable for use in a rock garden due to its low water needs. Photo by Walter Fertig.

Echinocereus mojavensis with Pink and Yellow Flowers

Text and photos by Kipp Lee and Dorde Woodruff

During a four-day cactus survey at the end of May we made an extraordinary discovery. We were traveling around central Utah trying to relocate and confirm cactus species based upon various reports. On the third afternoon, while looking for access to one of these sites, Kipp caught a glimpse of large flashy flowers growing among rocks. This first glimpse was baffling, as the combination of flowers and plant bodies fit no known Utah species of cactus.

We went over to the plants and were overcome with excitement. The flowers were in various hues of yellow and pink, from light to dark. The most unusual thing about these plants was that they were *Echinocereus mojavensis*, which normally has bright red-orange flowers selected for hummingbird pollination.

Walking around, we kept finding more and more plants, photographing the many different flower colors. Being late in the day, it was not the ideal time for photographing cactus flowers. If an *E. mojavensis* flower is going to close, it begins to partly close late in the day. But we were so lucky that we happened to be there during their bloom cycle.

These were mostly few-headed plants, so there were not as many flowers as usually seen on *E. mojavensis*, which can have very large clumps of heads. But each flower can remain open as long as 5 days or so. Many juveniles, not old enough to bloom, were also seen.

After an hour, we decided to set up camp nearby as it was beginning to get late. In the morning, we began to walk around taking measurements and photographing the flowers. The population consisted mostly of young plants with an average of 1-6 stems per plant. Single stemmed plants were common and had up to 4 flowers. The largest plant we saw had 25 stems. Measurements of heads, flowers, and spines fit well with the description of the species.



Above, left: Typical red-orange flower color of Mojave claretcup (*Echinocereus mojavensis*) with reddish-orange petals and pink filaments. Right: Flowers with pink overlaying the normal color occurs occasionally in this species, but commonly in mutant population.

Some of the petal colors observed were yellow, pale yellow, intense pink with yellow throat, light pink with pale throat, pale pink throughout, dark pink with pale throat, and red-orange with pink tips. Filaments were pale, pale yellow, pale green, or intense pink. The anthers were yellow, chrome yellow, red violet, or pale pink. Stigmas were green. The various flower colors appeared to be equally distributed throughout the population.

The cacti were growing in the pinyon-juniper association on a rocky alluvial fan. They could also be found less frequently in flatter areas with less surface rock in a sagebrush association. Associated plants included scattered *Escobaria vivipara* (pincushion cactus) and a few *Pediocactus simpsonii* (mountain ball cactus). The plants with the most heads (and therefore the most flowers) were found in the more sunny and open sage association.

E. mojavensis is found mostly in rocky places but sometimes in grasslands in northern Utah, and at higher elevations than the more southern species, *E. coccineus*, and *E. engelmannii*. For years it was known as *E. triglochidiatus*, but

careful study found that our common, more-hardy, northern hedgehog cactus is related to those farther west, not those in New Mexico, etc.

The red-orange flowers of hummingbird-pollinated hedgehogs (such as *E. mojavensis*) are colored by water-insoluble carotenoid pigments, not the water-soluble betalain pigments that produce the yellow and pink to red-violet hues that bees prefer. Between the two of us, we've seen thousands of plants of this species in our years of interest in cacti, but never a pigment switch like this. Very rarely, pink flowers have been noted in the hummingbird-pollinated species of Section *Triglochidiata* of *Echinocereus*.

Dorde did see a patch of unusually-colored flowers in *Echinocereus coccineus* in Washington County years ago. This was only a variation in the carotenoid pigments, in which the flowers ranged in color from red through orange to yellow. These flowers were being visited primarily by bees, though still by a few hummingbirds. Hummers will go to other colors of flowers, though the red-orange ones are their first choice; birds see red better than insects. The population was near the bottom of

the Kolob road on a small patch of hillside facing the road, which was then unpaved. Going back recently to relocate this population, the road was widened and paved, and the end of the hill, where these pretty flowers once were, had been removed.

But we had never seen, nor has it to our knowledge ever been reported, a whole population of *Echinocereus mojavensis* with only pink and yellow flowers, and no red-orange ones, in any species of this group.

Betalain pigments are found only in the order containing the cactus family, replacing the anthocyanins and anthoxanthins in all other plant orders. These are the same pigments that give the vivid colors to red and yellow beets, and the lovely rainbow chard now appearing in markets.

Our mutant plants were being visited primarily by bees and only a few hummingbirds. Since the plants were mostly all small, (and presumably young) we think this indicates a fairly recent mutation has caused this phenomenon.

Normal plants of this species appear to have some betacyanin (the pink to red-violet pigment), as the upper parts of the filaments may be pink and the anthers a dusty rose, or sometimes you see flowers that appear to have a bit of a pink or red-violet overlay to the carotenoid red-orange. But in normal plants of this species the carotenoid pigment is clearly dominant, while in the mutants the betalain pigments are. As in the normal plants, occasionally a flower would appear to be basically red-orange but with a pink overlay. We saw no purely red-orange flowers until we reached the upper edge of the population. Then it seemed to morph into a normal population as we kept going higher.

Our population of *E. mojavensis* is less spiny than average for the species, but does fit within its range of variation. One plant of the forma *inermis* was seen, with no spines.

These plants will be of great interest to cactus collectors. Consequently we can't reveal the location. Illegal collecting has long been a big problem with desirable cacti. We plan to make seeds of these attractive plants available in some way.



Above and below: Unusual color morphs found in a population of *Echinocereus mojavensis* in central Utah. The colors, ranging from light to dark pink or yellow, are probably due to betalain pigments predominating, rather than the typical carotenoids that bestow the red-orange flower color shown on the preceding page.



A Survey of Species in *Euphorbia* Section *Myrsiniteae*: How Many Species Could Have Contributed to the Invasiveness of *Euphorbia myrsinites* in the Intermountain West?

By J. Andrew Alexander, Curator, Utah Valley University Herbarium

When I set out to write an article on the potential for our invasive populations of *Euphorbia myrsinites* to be a hybrid swarm, I was not prepared for the number of species that have been split from this widespread taxon in recent floristic studies. Up until the late 1960's, the majority of populations with decumbent to ascending stems from the Mediterranean eastward to the Black Sea were called *E. myrsinites*. At one or more times in the past, material from this region was collected and propagated for commercial cultivation.

Now, multiple populations on islands and in mountain ranges throughout the former range of *E. myrsinites* have been split to form a complex web of species. In one recent treatment (Barberá et al. 2013, Riina et al. 2013), *Euphorbia* Section *Myrsiniteae* is composed of 14 species, all of which are endemic to countries in the vicinity of the Mediterranean and Black seas east to the Caspian Sea and Persian Gulf (Barberá et al. 2013). In general, most of the more restricted taxa in this group are found in Turkey and Iran eastward across the Transcaucasus into Turkmenistan and Uzbekistan. Across the Mediterranean Sea, all populations in different island chains are split into separate species, while the mainland species are treated as mostly *E. aleppica*, *E. myrsinites*, *E. oxyphylla*, and *E. rigida*. Very little is known about most of the more restricted species. Since there has not been a comprehensive floral treatment for all of Eurasia, there is not one single source for morphological descriptions or keys to these species.

The cultivars introduced into the United States may be from one or more of these different species, depending upon the country of origin of the nursery stock. I highly doubt



Above: *Euphorbia rigida* in its native habitat on the island of Sicily, Italy. Photo by R. Riina. Image used under creative commons license CC-BY (<http://creativecommons.org/licenses/by/3.0>) from Barberá et al. 2013.

that the collectors of the original plants propagated for use in nurseries would have paid much attention to detail and correctly identified specimens (even if there was a key available at the time). Perhaps in our region, the escaped, invasive populations are an amalgam of multiple genomes from different population across Eurasia. These cultivars, if collected today, could possibly be identified as many more species than just *E. myrsinites*. We may even have a situation where different species have been introduced in one form or another over the last century and now we have a vigorous hybrid complex that is expanding its range.

Despite its documented invasiveness in the Intermountain West, cultivated plants labeled as "*Euphorbia myrsinites*" are still promoted as "problem free" perennials

for your garden that are "quite tolerant of poor soils, including rocky, sandy ones.. [and] freely self-seeds" (<http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/plant-finder/plant-details/kc/h800/euphorbia-myrsinites.aspx>). As water-wise gardening is becoming more common in our region, the potential for more taxa within *Euphorbia* Section *Myrsiniteae* to be promoted as new water-wise cultivars is likely. Additionally, most of these taxa occur on rock outcrops in deserts or in rocky foothill areas at the edge of scrub oak forests on many types of sedimentary and igneous rock formations (Khan 1964, Tutin 1969, Babac 2004, Babac et al 2013). When considering all of these factors, most of these taxa are potential invasive weeds for the Intermountain West.

Invasive populations of *E. myrsinites* in western North America are common in several states. It has been on the Oregon and Colorado Noxious Weed Lists for a number of years. In Colorado, *E. myrsinites* is a Class A species which is supposed to be immediately eradicated once a population is found. In Oregon, the populations are large enough that complete eradication is not possible, so it has been placed on the Class B list (eradication is on a case-by-case basis). In other states, such as Utah and California, this taxon should be considered for the state-wide noxious weed lists. Though it is not in the 2011 Utah Noxious Weed List distributed by Utah State University, awareness of the invasive tendencies of this species is expanding. It is currently recognized as a noxious weed in Salt Lake County due to the consistent efforts by concerned residents and members of the UNPS. As it has in Utah, *Euphorbia myrsinites* has the potential to become an invasive weed in California. It is currently not on the California Department of Food and Agriculture's Noxious Weed List. However, it has been collected as an escaped cultivar several times in Southern California (see the distribution of the species on Calflora.org). Additionally, it is not on Idaho or

Nevada's Noxious Weed Lists nor can I find evidence of herbarium specimens in online databases indicating it as an escaped cultivar. Habitat similar to that in Utah, Oregon, and California where *E. myrsinites* has escaped certainly can be found in Nevada and Idaho, so the potential for escape should be considered high.

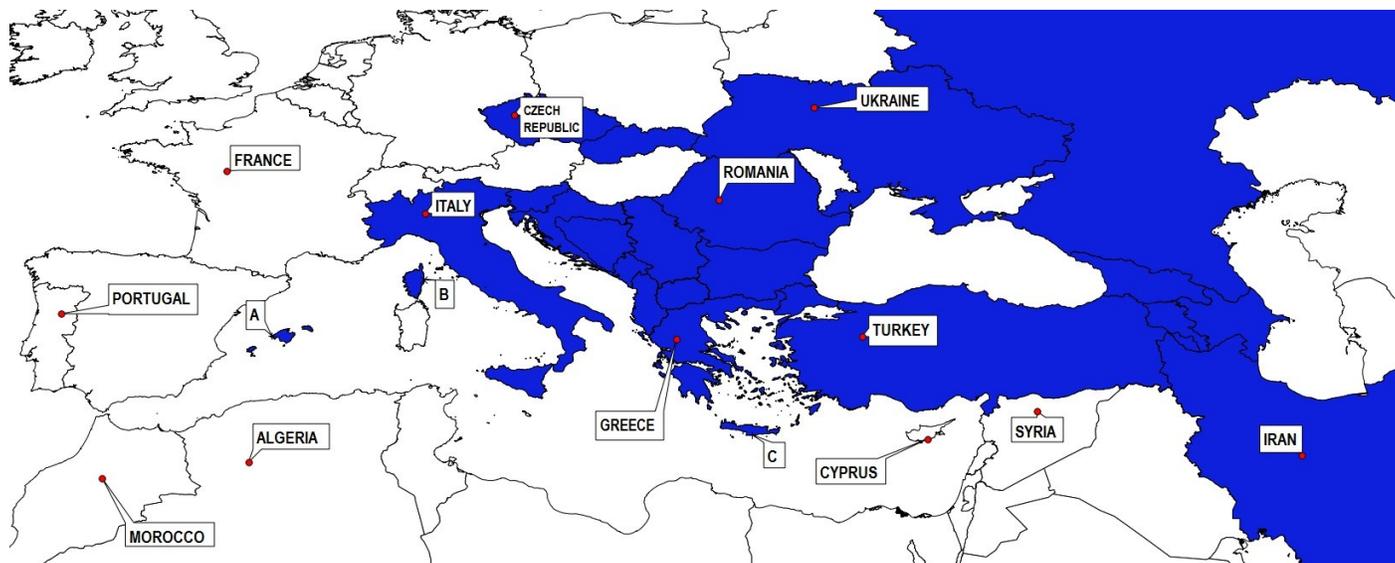
A Key to *Euphorbia* section *Myrsiniteae*

I used online floristics data combined with that from the original type publications, decades-old regional and local floras, and the limited number of journal articles on these taxa to generate the key on page 10. Although an examination of herbarium specimens and plants in the field would generate a much more rigorous treatment, the information herein is a valuable tool for a preliminary investigation of the morphological variation among the 13 species closely related to *E. myrsinites* and their potential relationship to the invasive populations in the Intermountain West. Our invasive populations deserve closer inspection to determine which of these taxa are escaping in our region.

Discussion of the major regional species groups in *Euphorbia* Section *Myrsiniteae*

Several species of this Section are endemics with a restricted range that were historically lumped with *Euphorbia myrsinites* (Tutin 1969). Four species are endemic to islands in the Mediterranean: *Euphorbia corsica* (Corsica), *Euphorbia rechingeri* (Crete), *Euphorbia fontqueriana* (Mallorca), *Euphorbia veneris* (Cyprus) (see map below). All of these endemics have been accepted at the rank of species in recent online floristic treatments (Benedí et al. 2007, Barberá et al. 2013, Govaerts 2013).

The most commonly documented of these island endemics is *Euphorbia veneris*. It was not the earliest described (*E. corsica* was described in 1825), however, it is more morphologically distinct than the other taxa. Of all the other taxa, it is the only one that seems highly likely to be on the commercial market as a cultivar in the next few years. Seeds of *Euphorbia veneris* are currently listed for sale on one website (http://www.rareplants.de/shop/product.asp?P_ID=10276). The website for the Mediterranean Garden Society (<http://www.mediterraneangardensociety.org/index-bloom.html>)



Above: Native distribution of *Euphorbia myrsinites* in Europe and Asia. Islands in the Mediterranean are marked with letter codes A (Mallorca, Spain), B (Corsica, France), and C (Crete, Greece). Map derived from Barberá et al. (2013), Govaerts (2013), Pahlevani et al. (2011), Benedí et al. (2007), and Khan (1963, 1964).

A preliminary key to the species of *Euphorbia* section *Myrsiniteae*

Morphology adapted from Khan 1963, 1964; Benedí et al. 2007, Pahlevani et al 2010; distributions adapted from Babac 2004, Babac et al. 2013, Barberá et al. 2013, and Govaerts 2013.

- 1a. Plants annual, widespread in the Mediterranean Region westward to the Transcaucasus and Crimean Regions around the Black Sea *E. aleppica*
- 1b. Plants perennial.
 - 2a. Glands of the floral appendages pectinate or denticulate.
 - 3a. Cauline leaves ± entire; terminal rays 5–8; seed surface tuberculate to rugulose; plants of Turkey, Iraq, and Iran *E. denticulata*
 - 3b. Cauline leaves denticulate; terminal rays 8–17; seed surface tuberculate; plants of Turkey, Iraq, and Iran *E. craspedia*
 - 2b. Glands of the floral appendages 2-horned
 - 4a. Cauline leaves linear, elliptic, oblong, lanceolate, or oblanceolate, length/width ratio (2.8) 3-6X
 - 5a. Stems ascending to erect; cauline leaves linear, narrowly elliptic, or narrowly oblong, length/width ratio 4-6X
 - 6a. Seeds smooth; plants widespread from Italy, Morocco, and Algeria eastward to the Transcaucasus and Crimean Regions around the Black Sea *E. rigida*
 - 6b. Seeds rugulose; plants restricted to Portugal and Spain *E. oxyphylla*
 - 5b. Stems decumbent to ascending; cauline leaves elliptic, lanceolate, oblong or oblanceolate, length/width ratio (2.5) 3-4X
 - 7a. Cauline leaves oblong to oblanceolate, the leaf apex acuminate; plants of Kazakhstan, Turkmenistan, Tajikistan, and Iran *E. monostyla*
 - 7b. Cauline leaves elliptic or lanceolate, leaf apex mucronate or shortly acuminate; plants restricted to island of Cyprus *E. veneris*
 - 4b. Cauline leaves obovate, ovate, rhombic or suborbicular, the length/width ratio 1.5–2X (-2.5X)
 - 8a. Cauline leaves obovate to spatulate, the uppermost leaves broadly expanded at the apex
 - 9a. Seeds with a basal stipe-like, narrow projection to 0.5-0.75 mm long; plants of Afghanistan, Kazakhstan, Iran, Tajikistan, Turkmenistan, and Uzbekistan *E. spinidens*
 - 9b. Seeds with a conical, basal projection, 1-1.3 mm long
 - 10a. Uppermost cauline leaves with margins irregularly crenulate or denticulate near the apex; plants restricted to the islands of Mallorca (Spain) *E. fontqueriana*
 - 10b. Uppermost cauline leaves entire.
 - 11a. Plants restricted to the island of Corsica (France) *E. corsica*
 - 11b. Plants restricted to the islands Crete (Greece) *E. rechingeri*
 - 8b. Cauline leaves ovate, oblong-ovate, rhombic, rarely suborbicular on the upper half of the stem.
 - 12a. Seeds smooth
 - 13a. Basal conical projection of the seed with an acute apex; plants of Armenia, Azerbaijan, Iran, and Turkey *E. marschalliana*
 - 13b. Basal conical projection of the seed with a concave apex; plants restricted to the island of Corsica (France) *E. corsica*
 - 12b. Seeds rugulose, plicate, tuberculate, or vermiculate
 - 14a. Seeds vermiculate to rugulose, the basal stipe-like, narrow projection 1-1.5 mm long; plants restricted to central and southern Turkey *E. anacamperos*
 - 14b. Seeds plicate to rugulose, the basal projection conical
 - 15a. Seeds shallowly rugulose, the basal, conical projection with an acute apex; plants of Armenia, Azerbaijan, Iran, and Turkey *E. marschalliana*
 - 15b. Seeds plicate and rugulose; the basal, conical projection with concave apex; plants widespread from Mallorca, Corsica and Italy, eastward to Iran, the Transcaucasus and Crimean regions around the Black Sea, and northward to Ukraine, Romania and the Czech Republic *E. myrsinites*

indicates that at least one organization is attempting to propagate *E. veneris* for commercial use: "The Agricultural Research Institute of the Ministry of Agriculture, Natural Resources and Environment are currently conducting trials to assess the suitability of *E. veneris* for garden use."

Euphorbia corsica, though raised to a species status in Barberá et al. (2013), is sympatric with *E. myrsinites* on the island of Corsica and has been split and synonymized several times since it was first described by Esprit Requien (1825). Images of *E. corsica* (that seem to match the type description) can be found on some personal image websites (<http://www.flickr.com/photos/stationalpinejosephourier/2037680548/>). Although all were taken on the island of Corsica, there are images in this photostream of *E. myrsinites* that, to me, look identical to those of *E. corsica*. It should be noted that *E. corsica* is only reported for that island in the local island chain. Although it is adjacent to Corsica, the island of Sardinia has no reported populations of either *E. corsica*, *E. myrsinites*, or *E. rigida*. The nearby island of Sicily has populations of *E. myrsinites* and *E. rigida* (Rignanese 2013). The reason for the lack of records from Sardinia from *Euphorbia* Section *Myrsiniteae* is unknown.

Descriptions and images of the last two island species, *Euphorbia fontqueriana* (<https://picasaweb.google.com/105661139501762502827/FloraMallorca#5007235567103629954>) and *Euphorbia rechingeri* (<http://www.flickr.com/photos/nturland/2637357179/>) are limited in quantity. However, these images from personal photostreams seem to indicate that these two taxa are an ecotype of smaller stature than *E. myrsinites* that favors rock cliffs and crevices. In addition to *E. myrsinites*, these two species are sympatric with the other widespread taxa, *E. rigida* and *E. oxyphylla*. These last two taxa can easily be distinguished from the endemic island taxa. The leaves are 4-6 times longer than wide in *E. rigida* and *E. oxyphylla* whereas the



Top: *Euphorbia oxyphylla*, native to Spain. Photo by J. Molero. Above: *E. myrsinites* from Iran or Turkey. Photo by Y. Salamaki and S. Zarre. Both images used under creative commons license CC-BY (<http://creativecommons.org/licenses/by/3.0>).

leaves are less than 4 times longer than wide in all of the endemic island taxa and in *E. myrsinites*.

The majority of the remaining species in this section are endemic to various montane regions of Turkey east to Afghanistan and Uzbekistan (*Euphorbia anacampseros*; *E. craspedia*; *E. denticulata*; *E. monostyla*; *E. marschalliana*; *E. spinidens*). Since *E. myrsinites* and *E. rigida* are also reported from this region, any of these endemic taxa could have been mistaken for the widespread species and introduced as cultivars. Outside of monographs, there is not very much information or pictures of these species, mostly due to the remote nature of most of the populations or the political and cultural conflicts currently in this region.

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