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Where Have All Our Asters Gone?

by William R. Gray, Submitted to Sego Lily April 2018

ABSTRACT: the genus *Aster* traditionally contained numerous species from both North America and Eurasia. Based on morphological evidence and DNA sequencing in the 1990s it became clear that the North American species evolved separately, and would need to be assigned to other genera. This paper outlines the evidence, and the disposition of species as carried out in the *Flora of North America* in 2006.

Whatever happened to *Aster*???

It used to be easy leading wildflower walks for UNPS. People would ask how to distinguish Asters from Daisies – and I would tell them to look behind the flower and check out the little greenish things surrounding the petals (Fig. 1). If they were all about the same length, and skinny, it was probably a daisy or fleabane (*Erigeron*). If they varied in length, were wider and overlapped, it was probably an aster (*Aster*).

For many people that was all they wanted to know and that was fine. The more curious were often fascinated that the flower was not "a flower" but a composite structure with many tiny flowers. The even more curious were intrigued by terms like 'ray flower' and 'disk flower' and 'involucral bract'. I still offer the same advice but with a vaguely uneasy conscience, being careful not to italicize my words. *Erigerons* are mostly unchanged, but our *Asters* are no more. To paraphrase an old folk song:

> Where have all our *Asters* gone?
> - - - -
> Old men renamed them, ev'ry one!

Yes, truly, all 21 *Asters* described by Cronquist in *Intermountain Flora* (Cronquist, 1994) have been reassigned to other genera by *Flora of North America* (2006). According to *FNA* there is only a single true native *Aster* in the whole of North America, down from well over a hundred before the dis-Aster. The name is now used almost exclusively for Eurasian plants because Linnaeus chose a well-known European plant and named it *Aster amellus* as typical of the genus.

Was it really necessary to change all those American names? I hope to convince you that *Aster* had to go and that the replacement names, though much harder to pronounce, do make sense. The changes in this and several other familiar groups arise from a desire to restore order rather than to create chaos. So I'll try to put the story in context with what has been happening to plant names over the past 20-30 years. We'll start by looking at the way biologists classify living things based on the evolutionary process elucidated by Darwin. Then we'll return to plants and to *Aster* in particular. Just to whet your appetite, try to guess which plant is the odd one out in Figure 2.

Figure 1 Involucres of a daisy *Erigeron divergens* (L), and an aster *Symphyotrichum spathulatum (Aster spathulatus)* (R). It is not always this clear cut!

a 

b 

c 

d 

Figure 2 Four members of the Aster tribe (Astereae). See text to learn which is the "odd one out". Photos a-c used with permission of Helen Picton, Old Court Nurseries (http://www.oldcourtnurseries.co.uk)

Evolutionary Origins

To understand why we can no longer use *Aster* for 'our' plants we need to look at the bigger story behind the naming of plants and other living things. Modern biologists accept Darwin's idea that all living species of organisms descended from older ancestors, and that the best way to classify and name them is by trying to reconstruct their ancestral tree or phylogeny. On the broadest scale it is often called the 'Tree of Life' which took root on Earth over 3.5 billion years ago. Ideally we want our named groups to represent natural branches that contain all the descendants of a single ancestor, in which case the branch is referred to as a clade, or monophyletic. If we can't quite make it we may broaden the definition to include the exceptions, or accept an incomplete group described as paraphyletic. A fine example of this dilemma concerns reptiles. They were long believed to be a natural group (Reptilia) and included turtles, snakes, lizards, crocodiles, and the extinct dinosaurs plus a few others. Mammals and birds were grouped separately as "warm-blooded". Then birds were convincingly shown to be descended from dinosaurs: the choice is to expand Reptilia to *include* birds, or to retain Reptilia as a paraphyletic group. Zoologists use various circumlocutions to handle it. Or we can abandon the original name entirely. A reverse situation occurs with flowering plants, collectively known as angiosperms. Although the monocots (lilies, grasses, sedges, orchids . . .) form a coherent group the old dicots do not and other clades of more primitive plants have to be recognized in addition. A too rigid adherence to the clade concept, however, can lead to its own problems.

There is a rich fossil record for vertebrate animals which greatly helps interpret the distant evolutionary story: the big picture for flowering plants, including composites, proved to be much more difficult because they left fewer good fossils.

Constructing a Phylogenetic Tree

We try to build a tree that starts with some ancestor as a 'root' and grows progressively upward in time. New branches arise when groups divide, while other branches become extinct once all their members die. Figure 3 illustrates this with branches a-d representing four major clades, and with present time at the top. Within **Branch a** there are recent extinctions and also rapid diversification. By contrast **Branch b** contains a single surviving group: however, this doesn't mean the group has not undergone change in all that time, merely that any divergent groups have become extinct. There may still be many changes accumulated in the genes, and current plants could look quite different from the

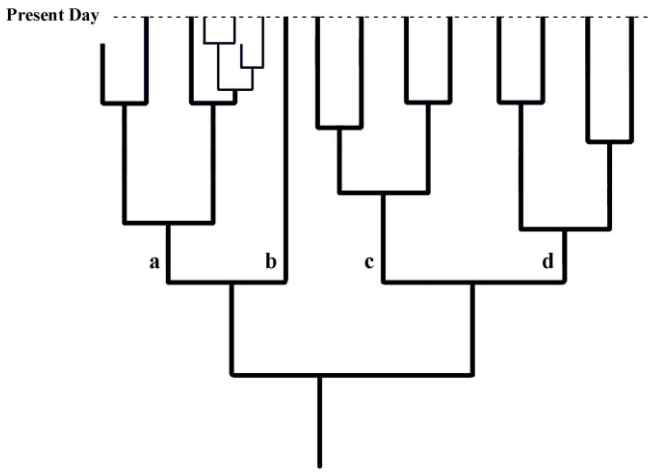

Figure 3 Illustrative phylogenetic tree. The diagram shows a branch of a hypothetical tree. The whole complex represents a single large clade which diverges into two, then four smaller clades (a, b, c, d). These are discussed separately in the text.

original ancestor of the group. **Branches c** and **d** show nothing out of the ordinary.

At any point in time all the living branch tips are the same age, though some may appear a lot more different from the first ancestor than do others. Our goal is to arrange the living species on the tree in a way that groups them according to shared characteristics that are inherited – thereby saying something about their ancestry.

In the absence of a detailed fossil record we have to work backwards from today's species and try to deduce how they are related. Until recently taxonomists (those who try to decipher the patterns and name groups) had to rely on visible characters such as flower structure, chemical tests, or genetic characters that could be analyzed by studying chromosomes or cross-breeding. At its simplest, plants that have more characters in common are judged to be more closely related. Working backwards species are grouped into genera, genera into families, families into orders and so on.

Characters vary a lot in how useful they are – in addition to being genetically based they must show variation within the group one is studying. The number of petals distinguishes mustards from geraniums, but not one milkvetch from another, or from a true vetch. Great taxonomists seem to have a knack for choosing meaningful characters: that knack is typically based on detailed study of tens or even hundreds of thousands of individual plant specimens. For the most part the quality of a phylogenetic tree improves with the number

of organisms studied and with the number of *independent* characters used: petal count and sepal count are most often the same so that works only as a single character, not two.

About 30 years ago a rich new source of information became accessible in the form of DNA sequence analysis. DNA constitutes the genetic material of all higher organisms, encoding the instructions for making components of their cells, and for controlling when and where they are made. At each new generation the DNA must be copied and passed on to the offspring. Copying is not 100% perfect despite sophisticated proof-reading systems – it is estimated to be 'only' about 99.999999% accurate (1 error in 100,000,000) from one generation to the next in humans. Still, because of the enormous length of the DNA strands this represents around 60 mutations that sneak through *each* human generation. Not many cause problems, and a very few even confer some advantage that may take the offspring into profitable new directions. The rest accumulate as a kind of background noise in the DNA.

Each of those tiny changes can serve as an independent character to track the evolutionary history and to help place organisms on a phylogenetic tree. If it helps it is quite legitimate to consider it a very tiny morphological character, albeit one that at present can only be seen indirectly. One particular region of DNA has proved especially useful in this regard, the so-called ITS sequences. They are a short 'throwaway' part of a gene that is used to make ribosomes, the little machines that build proteins. That gene is present in thousands of copies in every cell, so its DNA is easy to purify. Also the details of the spacer sequences don't seem to matter much so they can tolerate almost any simple mutation, providing many independent characters. Think of it as a high fidelity recording of the genetic noise. In a real sense the very insignificance of any one change makes them really useful collectively: they can be analyzed dispassionately without agonizing about which are most important. The constant but uneven accumulation of little changes also acts as an approximate 'molecular clock', which can be useful if some reliable calibration points can be found.

An inevitable side-effect, though, is that a human brain simply cannot handle the vast amount of information but must rely on statistical analysis by computers. Genetics researchers across the globe have collaborated for decades to share all DNA data and to make sure their collective mathematics is good. Together, under the aegis of the Angiosperm Phylogeny Group (APG) they have produced near unanimity on the broad picture of how plants evolved and therefore how they should be grouped. Wikipedia gives an excellent introduction to this project.

A Brief History of the Aster Family (Asteraceae/Compositae)

The earliest known fossils consist of pollen grains discovered in Western Antarctica in 2015 (Barreda *et al*. 2015), and date back to 66-76 million years ago (mya). At that time it was part of ancient Gondwana and the authors of the study suggested that the family originated in that old supercontinent about 85 mya. Pollen grains are tiny but surprisingly intricate structures. They survive well as fossils and microscopic details provide important clues to identification. The fossil pollen seems to have belonged to a plant very similar to modern *Dasyphyllum* which still has about 40 living species in South America. Unusually for the family as a whole these are all trees and shrubs. They belong to a small branch of the family that can confidently be called the oldest group that is still living: a long piece of DNA in their chloroplasts is oriented the same way as in plants of all other families, while all other composites have it reversed. This special group (Barnadesia subfamily) constitutes a small 'basal' lineage with less than 0.5% of living composites. In Gondwana the family diversified and three main branches have spread throughout the world. These three branches (subfamilies) make up 95% of the present family worldwide and are based on plants we are all familiar with: thistle relatives (11%), chicory or dandelion relatives (14%) and aster relatives (70%). In 2012 a beautifully preserved inflorescence was found in Patagonia, South America, reliably dated to 47.5 mya (Barreda *et al*. 2012). This was closely related to the thistle subfamily, verifying that composites had already split apart by this time. The worldwide distribution of each of the three large subfamilies suggests that they arose before the breakup of Gondwana, and that they spread northwards even while the continental fragments were migrating.

The Aster subfamily and the Aster tribe (Astereae)

Because the subfamily is so huge it has been variously organized into about 20 tribes of which the three largest are groundsels (Senecioneae, 3000 species), asters (Astereae, 2800 species) and sunflowers (Heliantheae, 2500 species). The first two are very widespread in the world, while the sunflowers are mostly confined to the American continents. Most plants of the aster tribe have alternate leaves, showy 'petals' (actually ray flowers), and soft involucral bracts; in growth form they are typically annuals or perennials, but with some shrubs.

About a quarter of the world's 2800 Astereae species live in North America where it is the largest tribe. Visually there are two main types: those whose flowers are overall yellow (goldenrods, rabbitbrushes and allies) and those with ray flowers that range from white through pink, blue and purple (asters, daisies and similar plants). How do these relate to the tribe in the rest of the world?

Linnaeus based the genus upon a European plant, *Aster amellus*, that was well known since antiquity. This is widely cultivated in Europe, and known as 'Michaelmas Daisy' in Britain. Even before Linnaeus published his *Species Plantarum* in 1753 various North American plants had been sent to Europe and placed in cultivation. Among these were two other 'Michaelmas Daisies' that in general appearance were very similar to *Aster amellus*, and that he named New York Aster and New England Aster (*Aster novi-belgii* and *A. novae-angliae* respectively).

That was just the start. Exploration of the American West in the early 19th Century led to an explosion in the number of known plants resembling *Aster*. These were seized upon by both American and European botanists who found so much variation they felt justified in splitting the genus. It was then that many new generic names were created, some of which are now reapplied as *Aster* is again being split – the rules of naming require use of the earliest validly published name.

The great English taxonomist George Bentham (1800-1884) put a halt to this 'splitting' process and he was followed somewhat reluctantly by Asa Gray in America. This very conservative approach led to many more species being placed in *Aster* and was similarly applied to other closely related groups. Several genera including tansyasters (*Machaeranthera*), rabbitbrushes (*Chrysothamnus*) and the very diverse *Haplopappus*, became holding bins for a wide range of species until more information could be assembled. This was how things stood in 1992 when Arthur Cronquist, one of the leading plant taxonomists of the century, had completed his Asteraceae text for *Intermountain Flora* (Vol. 5). The four genera mentioned were large and complex, and though Cronquist acknowledged that major revisions were probably in order, the various experts had not yet reached solid conclusions. Sadly, he died that year and did not see the finished volume which was eventually published in 1994. In *A Utah Flora* (2nd to 5th editions, 1993-2016), Welsh et al. use essentially the same nomenclature, except for parts of *Machaeranthera*. So in the Intermountain West, unless we really needed to stay tuned in to the broader world, we remained rather insulated.

In this period a new generation of botanists was making a concerted effort to tease apart these large genera into more natural groups, and also to build a coherent picture of how the tribes and genera of the Aster subfamily relate to each other. These botanists had outstanding credentials in traditional methods, but were also willing to use the new DNA technology. In addition they had a vastly greater number of specimens to study. By the mid 1990s there were several competing ideas about how the subfamily's genera should be organized into tribes, depending heavily on which morphological characters were given most weight. A challenging conclusion from one study (Nesom 1994) was that almost all members of the aster tribe in North America form a single clade that had diversified independently from asters in the rest of the world. It would be as though North American asters and rabbitbrushes were in **Branch a** of Fig. 3 and Eurasian asters were in **Branch c** or **d** – and it turned out to be correct!

Confirmation quickly came from DNA analysis of ITS sequences in 62 genera of the Aster tribe from around the world (Noyes and Rieseberg, 1999). Every way they looked at the data the North American clade held together with high confidence. This congruence of two different approaches was a turning point, and has become the standard interpretation, notably that used in the *Flora of North America* (2006). An excellent source of information is a website devoted to the Astereae tribe (Semple). As of 2009 ITS sequences from over 800 species had been analyzed and fully support the main conclusion (Brouillet *et al*. 2009).

Back to Figure 2. The odd one out is ***not*** the tall yellow shrub (**d**, Rabbitbrush, *Ericameria nauseosa*), but *Aster amellus* (**a**). The other two are the New England Aster (*A. novae-angliae*) and New York Aster (*A. novi-belgii*).

Where does that leave *Aster*?

Of the native North American species of *Aster* (in the old sense) only one, *Aster alpinus*, is closely linked by its DNA to the Eurasian *Asters*. It ranges physically from Colorado northwards through the Canadian Rockies and Alaska, and into northeastern Russia, so that agrees as well. All others fit in the North American clade. A Eurasian plant, *Aster amellus*, holds copyright on the name, having been used by Linnaeus to define the genus.

If we insist on retaining *Aster* for our other American species we have little choice but to apply the name equally to <u>all</u> <u>other</u> members of the clade – rabbitbrushes, goldenrods, etc., as well as many Eurasian species. There is zero likelihood that Eurasian

botanist would accept that solution. Before you laugh, though, remember that many of those were included within *Aster* in the late nineteenth century. A much more satisfactory solution is to restore some of the earlier names and reassign 'our' asters. ICBN to the rescue! The *International Code of Botanical Nomenclature* was a set of rules that the IRS would be proud of. It specified exactly how the renaming should be done, based on older published names. In the absence of such a name new ones have to be coined, with their own set of rules.

This was how the genus was treated in 2006 with the publication of Volume 20 of *Flora of North America*, and all but a couple of species of Aster were reassigned. The 21 species that had been described in Intermountain Flora were divided among seven genera, as shown in Table 1. Figure 4. shows representatives of all these genera from our region. One other species, *Aster kingii* is added: Cronquist had transferred it to *Machaeranthera* but most others including Welsh retained it in *Aster*. The species are not arranged alphabetically but in the order they appear in *IF* – as Cronquist had organized them to reflect his view of how they relate to each other. More than half were placed alongside the American Michaelmas daisies in *Symphyotrichum*, a genus name coined way back in 1838. It is striking that all but 2 of the *Symphyotrichum* species were already seen to be closely related. The exceptions, both of them annuals growing in salt marshes, were sufficiently distinctive

Figure 4 The "new" genera for our asters. a: *Symphyotrichum eatonii*; b: *Eurybia integrifolia*; c: *Eucephalus elegans (Aster perelegans)*; d: *Almutaster pauciflorus*; e: *Herrickia (Aster or Machaeranthera) kingii*; f: *Oreostemma alpigenum*; g: *Ionactis alpina (Aster scopulorum)*. All photos by author except g (© Steve Matson, https://calphotos.berkeley.edu).

Table 1 Reassignment of *Aster* species in Intermountain region.

IF #	Intermountain Flora (UF) 1994	Original Name (Basionym)	Date	Named by	Flora of North America 2006
01	*Aster laevis*	*Aster laevis*	1753	Linnaeus	*Symphyotrichum laeve*
02	*Aster hesperius*	*Aster hesperius*	1884	Gray	*Symphyotrichum lanceolatum* var. *hesperium*
03	*Aster welshii*	*Aster welshii*	1994	Cronquist	*Symphyotrichum welshii*
04	*Aster eatonii*	*Aster bracteolatus*	1841	Nuttall	*Symphyotrichum eatonii*
05	*Aster foliaceus*	*Aster foliaceous*	1836	Lindley	*Symphyotrichum foliaceum*
06	*Aster spathulatus*	*Aster spathulatus*	1834	Lindley	*Symphyotrichum spathulatum*
07	*Aster ascendens*	*Aster ascendens*	1834	Lindley	*Symphyotrichum chilense*
08	*Aster falcatus*	*Aster falcatus*	1834	Lindley	*Symphyotrichum falcatum*
09	*Aster pansus*	*Aster multiflorus* var. *pansus*	1928	Blake	*Symphyotrichum ericoides* var. *pansum*
10	*Aster campestris*	*Aster campestris*	1841	Nuttall	*Symphyotrichum campestre*
11	*Aster pauciflorus*	*Aster pauciflorus*	1818	Nuttall	*Almutaster pauciflorus*
12	*Aster integrifolius*	*Aster integrifolius*	1841	Nuttall	*Eurybia integrifolia*
13	*Aster wasatchensis*	*Aster glaucus* var. *wasatchensis*	1895	Jones	*Herrickia wasatchensis*
14	*Aster glaucodes*	*Eucephalus glaucus*	1841	Blake	*Herrickia glauca*
14a	*Machaeranthera (Aster) kingii*	*Aster kingii*	1871	Keck	*Herrickia kingii*
15	*Aster engelmannii*	*Aster elegans* var. *engelmannii*	1871	Eaton	*Eucephalus engelmannii*
16	*Aster perelegans*	*Eucephalus elegans*	1841	Nuttall	*Eucephalus elegans*
17	*Aster sibiricus*	*Aster sibiricus*	1753	Linnaeus	*Eurybia merita*
18	*Aster alpigenus*	*Aplopappus alpigenus*	1841	Torrey	*Oreostemma alpigenum*
19	*Aster scopulorum*	*Chrysopsis alpina*	1834	Nuttall	*Ionactis alpina*
20	*Aster frondosus*	*Tripolium frondosum*	1841	Nuttall	*Symphyotrichum frondosum*
21	*Aster brachyactis*	*Tripolium angustum*	1834	Lindley	*Symphyotrichum ciliatum*

IF# = order in which species were organized by Cronquist in *Intermountain Flora*. **Date** & **Named By** columns refer to the first publication as a species under the **Original Name (=Basionym)**. The final column shows the reassignment of genera according to *Flora of North America.* Note that 14a was traditionally referred to *Aster,* but assigned to *Machaeranthera* by Cronquist; Welsh retained it in *Aster*.

that they were originally placed with European salt marsh asters in a separate genus *Tripolium*. Otherwise there was no strong consistency between Cronquist's names and those assigned by FNA. It is noteworthy that only one of the 'new' generic names was less than 100 years old. To summarize the new names:

A Farewell to *Aster*

Bentham and Gray would surely have a fit
To find their favorite lump's been split.
Cronquist saw the writing on the wall,
But never dreamed they'd dare to change them all.
Symphyotrichum clearly won the day
With twelve of twenty one in FNA.
Two each *Eurybia, Eucephalus, Herrickia*:
But then things got a whole lot trickier.
Still having fun, and in need of practice
They resurrected *Ionactis*.
Then on to fix the last dilemma –
Almutaster and *Oreostemma*!

Other "Grabbag" Genera

Aster was not the only genus to serve as a holding bin. The other three mentioned earlier (*Machaeranthera*, *Chrysothamnus* and *Haplopappus*) all suffered similar fates based on a combination of classical morphology and DNA sequence analysis, though not because of preemption of the names by Eurasian plants. All were divided heavily, often restoring names that had been swept aside in the 19th Century consolidations. In the Intermountain region *FNA* now recognizes just one species of *Machaeranthera* rather than 17, and none of *Haplopappus* rather than 35. In the process *Ericameria* was reinstated as an important genus in the region. Again, the original ordering of species in *IF* partly reflects the subsequent splitting. The old and new names can be found in the updated version of the file posted in last year's article, link: http://www.unps.org/segolily/AstersofYesteryear.pdf

Table 2. Origin of generic names used in *Flora of North*

Genus Name	Author	Date
Aster	Linnaeus	1753
Eurybia	Cassini	1820
Symphyotrichum	Nees	1832
Eucephalus	Nuttall	1840
Ionactis	Greene	1897
Oreostemma	Greene	1900
Herrickia	Wooton	1913
Almutaster	Löve	1982

Other ways of renaming?

Even if *Aster* must be replaced, could we have gotten away with a single name? Not really, because our familiar Engelmann aster still is not close to our other aster look-alikes. The smallest natural group to contain them all would have to include *Machaeranthera, Erigeron,* goldenrods and rabbitbrushes. Choosing how to split the group is a matter for 'competent taxonomists' (which doesn't include me) to settle among themselves – until some other revolutionary technology comes along. Rest assured that the taxonomists will continue arguing about the details of this arrangement for many years, as they have for the past 200.

Does the similarity between *Aster amellus* and some North American asters reflect that they both resemble a very ancient ancestor? Or is it a fine example of 'convergent evolution' whereby species from different genetic lineages come to resemble each other physically? Internal evidence in the North American clade suggests that the first explanation may be more likely, based on the finding that *Eucephalus (Aster) engelmannii* diverged early on the continent. So there were probably plants that looked very much like modern asters back when Pangaea was breaking up. This idea is reinforced by the fact that the African genus *Amellus* fits the same pattern, yet is placed in the earliest known branch of the tribe.

One thing we can all be grateful for is that there is absolutely no need to replace 'aster' as a common name – it continues to be used exactly as it was before. We can still lead wildflower walks with a clear conscience.

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Spreading Hedgeparsely Spreads to Northern Utah

by Tony Frates

While rummaging through some plant images for another project, I stumbled across some pictures that I took on the first day of summer in 2013 depicting a mysterious white-flowered umbel growing in the foothills of Salt Lake County. Investigating further, I realized that I had also collected some associated material which, along with some field notes, had been patiently waiting for a rainy day.

The flowers were vaguely reminiscent of an *Eriogonum,* but the dense hairs especially in the inflorescence made it appear like a cryptanth of some kind. But yet it had to be an umbel, untreated in northern Utah floras. After further study, I finally realized that it was *Torilis arvensis*, an introduced species of European origin (while USDA/NRCS maps indicate that in North America it is native to British Columbia, that seems unlikely; NatureServe has flagged it as an introduced species including in Canada).

Note the stem hairs and especially the dense bristles beneath the flowers. An *Asclepias asperula* seed (upside down, light brown with tuft of hair at the end, at left half of picture) is seemingly stuck to those hairs/bristles.

T. arvensis is an annual with simple, appressed-ascending hairs throughout that become very densely packed in its branching inflorescence. The leaves are all cauline, trifoliate-pinnate, mostly ascending, serrate and quite narrow (at least in smaller-sized and less developed plants like the ones I observed). The white 5-merous flowers are very small (1-2 mm wide). The fruits are apparently densely covered with mostly straight to somewhat upwardly curved prickles that are minutely barbed, and which become greenish rose-pink in color. While the plants that I saw were less than two feet (6 dm) tall, they can reach up to three feet (1 m) tall, and perhaps more in optimal conditions.

Torilis arvensis leaves are quite distinctive; this plant is relatively small and not as fully developed as it could be, but leaf characteristics can still be seen. The plant with the long pointed leaves at right is *Asclepias asperula*. Growing on a fairly steep, dry slope.

Torilis arvensis growing in a flat area with heavy cheatgrass that seems to be choking out the remaining native vegetation.

Other common names, besides Spreading Hedgeparsley, include Field Hedgeparsley and Common Hedgeparsely (and variants).

Based on prior descriptions of its distribution in Utah and available on-line specimens, *T. arvensis* has previously only been known from Washington County. There it has been known since at least 1964 when A.H. Barnum collected it from an orchard in La Verkin. In 1973, Dr. Susan Meyer collected it about one mile south of Rockville in an area she described as a mesic ruderal riparian community, and was locally common there growing in small groups, but not otherwise observed in the vicinity. Other locations in Washington County have included Gunlock (1985), Washington City (1986 – ditch

bank and cultivated lots), the south campground of Zion National Park (1988), St. George (1998 – hillsides, vacant lots, roadsides and springs), and in Hurricane (2009 – along an irrigation ditch).

Other than in Washington County, this species seems to be largely unknown in the Intermountain West (mostly not reported for Nevada, but see DiTommaso 2014). And reports of occurrences in some western states seem to be lacking entirely (Colorado, Wyoming, Montana). It has been reported to be on state regulated lists by EDDMapS, in Washington (sale of seeds prohibited), California, Wisconsin, Illinois and Georgia.

Native members of the Apiaceae tend to be mostly glabrous and in particular lack fruits with prickles or bristles other than our native annual *Yabea microcarpa* (which in Utah is only known from Washington Co., common names include California Hedgeparsely, False Carrot, and False Hedgeparlsey). Another non-native member of the Apiaceae introduced and sometimes escaping in Utah that also has prickled fruits is *Daucus carota* (Queen-Anne's Lace or Wild Carrot), which can also be a troublesome weed and should not be planted, despite its curb appeal.

Two related introduced species in the U.S. include *Torilis japonica* (Japanese Hedgeparsely, and which has sometimes been included within, or confused with, *T. arvensis,* but it is a distinct species) and *Torilis nodosa (*Knotted Hedgeparsely). *T. japonica* has been less commonly reported in the U.S. and those reports are mainly from the northeastern, midwestern and south central sections of the country; in the West, it is known from Oregon, with reports from northern California and southwestern New Mexico possibly belonging to *T. arvensis;* while *T. nodosa* is sometimes shown as being restricted to California, where it is apparently widespread, more recent research suggests that it is also in Oregon and Arizona as well as a number of other states from Texas to North Carolina (DiTommaso 2014).

Torilis arvensis map: Google Earth map generated by Symbiota accessed via the Consortium of Intermountain Herbaria portal. The red dots represent currently available georeferenced collection points for *Torilis arvensis* in North America.

So how did *T. arvensis* manage to show up in northern Utah? The hooked bristles covering its fruits no doubt account for its spread into far flung places via attachment to birds (or to vehicles, camping equipment, bike tires, socks, shoes, and more). Where I saw these plants at about 5,050 ft. (1540 m), there were no immediately adjoining construction lots, although there has been a huge amount of home building in the general area for many decades. I saw the species in two separate, but closely-spaced, areas. In one area, it was growing directly with *Asclepias asperula* and *Gutierrezia sarothrae* on a rather steep, west/southwest-facing slope that was being inundated by cheatgrass. At another location, it was growing with one of the Central Wasatch Front's disjunct populations of *Opuntia macrorhiza,* also heavily impacted by cheatgrass and other exotics. In fact, the adjoining open natural space areas have been hit very hard by noxious species including *Linaria dalmatica, Isatis tinctoria* and more recently*, Euphorbia myrsinites* which often grows right over the top of other plants. The Dalmatian Toadflax *(L. dalmatica)* population in this area has become an increasingly significant problem for the now over 35 years that I have occasionally visited the remaining natural spaces above and around the Canyon Cove subdivision (near Cottonwood Heights and just north of the base of Big Cottonwood Canyon, but technically within Holladay, Utah).

The wide variety of habitats that *T. arvensis* has been reported from is a concern. Where I saw it was in a dry, exposed, Gambel's oak community: typical foothill habitat for Salt Lake County. If it can spread into areas like that as as well as into more mesic areas, it would be of potentially significant concern to the Wasatch Front. That this occurrence was not simply a fluke is evidenced perhaps by a southwestern Idaho collection where it somehow spread to canyon bottom (June 2010, Owyhee Co., Mansfield 10052) along the Bruneau River at an elevation of 3580 ft. (1091 meters), and was found growing among native vegetation. The ability of this species to grow in such disparate places should be of concern to land managers.

A voucher of the Salt Lake County specimen has been deposited with the Intermountain Herbarium, and image observation records made on EDDMapS and on the Intermountain Regional Herbarium Network.

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See Common Hedge Parsely page at:

http://www.illinoiswildflowers.info/weeds/plants/hdg_parsley.htm

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wonka's Botany Flashback:

...from *The Salt Lake Tribune*, June 15, 1933

NOTED WOMAN BOTANIST AT S.L. MEETING

One of the few women attending the convention of the American Association for the Advancement of Science, Pacific Division, is Miss Alice Eastwood of San Francisco.

Miss Eastwood is attending the conference as a member of the Botanical Society of America. She is curator of botany for the California Academy of Sciences, a position she has held continuously more than 40 years, except for two years after the San Francisco earthquake of 1906.* At this time she went abroad, traveling and studying in England, France, Germany and other European countries.

Miss Eastwood has done much exploration and field work, and has spent several months in Utah during the past 15 years studying plant life. At a meeting Wednesday afternoon of the Botanical society she read a paper entitled "Variation in Castilleja," a study of certain types of California plants.

**The Salt Lake Tribune,* August 15, 1909

The most remarkable feat in its way ever performed by a woman scientist is attributed to Miss Alice Eastwood, who is said to be the best systematic botanist in this country. At the time of the great earthquake she happened to be in San Francisco. The stairs in [the] building occupied by the California Academy of Sciences fell down, leaving only that portion of them to which bannisters had been attached. Upon this precarious remnant (being an experienced mountain climber) she actually made her way to the eighth floor and brought down a collection of type specimens of California plants, of priceless value, which otherwise would have been lost. A young man who was with her offered to undertake the job, but she said: "No; you have a family. Nobody depends upon me. I will go." And she did.

1st Annual Weed Day – Logan Ranger District

RELEASE: **1st Annual Weed Day – Logan Ranger District, Bridgerland Audubon Society and Utah Native Plant Society**

What: 1st Annual Weed Day - Logan Ranger District, Bridgerland Audubon Society and Utah Native Plant Society

When: Saturday, May 19, 2018, 9:00 a.m. – 1:00 p.m.

Where: Canyon Entrance Park, 2nd Dam, US 89 and Canyon Road, Logan UT

Contact: Lisa Thompson, Volunteer and Partnership Coordinator, lisathompson@fs.fed.us 801-625-5850

The Logan Ranger District of the Uinta-Wasatch-Cache National Forest, Bridgerland Audubon Society and the Utah Native Plant Society invite the public to join us for the 1st Annual Weed Day. The public is invited to participate in the community wide event. The ongoing efforts offer fun, exercise, a chance to meet new people as well as give back to the local community.

The goal of this project is to help reduce and eradicate invasive weeds threatening the native plant community of the local area. Invasive weed species threaten the ecological integrity and biological diversity of plant communities within the project area and have caused adverse impacts to recreation, wildlife and other important social and resource values.

Target weeds include, dyers woad, burdock, houndstongue, Scotch thistle and other invasive weeds.

Control methods will include hand pulling, digging and possible bagging.

We will meet at Second Dam at 9:00 a.m. for a safety meeting and weed orientation before heading out to the assigned areas. Volunteers will meet back at Second Dam at 1:00 p.m. for a "bring your own" lunch.

Volunteers should wear protective clothing, including gloves, long pants, long sleeved shirts, sturdy footwear and lots of drinking water. Some tools will be provided but it is recommended to bring your own weeding tools and shovels.

Please join the Logan Ranger District, Bridgerland Audubon Society and the Utah Native Plant Society as we work to protect our land by preventing the spread of noxious weeds in Cache County.

For more information, contact Lisa Thompson, Volunteer and Partnership Coordinator, Logan Ranger District, (801) 625-5850, Dave Wallace, Utah Native Plant Society, (425) 750-5913, or Hilary Shughart, hilary.shughart@gmail.com

Hello, all of you

The Utah Native Plant Society newsletter, the *Sego Lily* is published four times a year and is the main mode of communication and education among members of UNPS, as well as interested members of the general public. The August issue is not far off.

Your *Sego Lily* newsletter depends entirely on your participation. Participate by submitting articles about subjects that interest you and you happen to know something about, that pertain especially to the native plants of Utah and their environment. This could include, for instance, a report about a recent field trip you have taken, observations about a favorite genus, the importance of a particular pollinator, results about growing native plants in your garden, or any interaction of people, plants, animals, weather, and geology with native plants. We more than welcome technical articles about research on native and rare plants, rare and endangered plant conservation issues and historical research about botanists in Utah.

The *Sego Lily* editors can use most any text format for articles. We are happy to help with any questions you might have. Photos are always best submitted in original resolution and as individual files separate from text. You can indicate desired positioning within a document. **The soft deadline for the August, Summer Issue of the *Sego Lily* is Monday, July16th.**

Save the trees. Save paper, the cost to UNPS of printing and mailing, by electing to take the digital version, posted to unps.org. *And* the photos are so much more enjoyable in brilliant color!

I am looking forward to hearing from you. For submissions and questions: newsletter@unps.org or cathy.king@gmail.com. Thank you, Cathy King, Co-Editor *Sego Lily*

Myrtle Spurge Fact Sheet

Euphorbia myrsinites *Euphorbiaceae* Family



Distinguishing Features:
Flowers: Inconspicuous flowers with showy yellow bracts.

Seeds: Plants spread primarily by seed and are capable of projecting seed up to 15 feet.
Leaves: Blue-green triangular shaped leaves with white milky latex.

Flowering Time: April – June.

Warning!! All parts of myrtle spurge contain a caustic latex sap that can result in skin irritation, redness, swelling, and blisters.

Caution must be taken not to get any of the sap on the skin or in the eyes. If contact does occur, rinse the area thoroughly.

Impacts:

Myrtle spurge is an escaped ornamental that quickly crowds out native plants.

Although it is touted as deer resistant and an extremely drought tolerant, it has escaped its original planting and is rapidly invading our foothills and wild lands along the Wasatch Front.

It poses a threat to children and adults who come in contact with its caustic sap.

Myrtle spurge is a Utah State listed noxious weed and therefore is restricted for sale within the state.

Control:

Small infestations can be controlled through multiple years of digging up at least 4" of the root.

Myrtle spurge is best controlled in the spring when the soil is moist and prior to seed production.

Make sure to dispose of all the plant parts in the garbage instead of composting.

For larger infestations, myrtle spurge can be effectively controlled with products containing 2, 4-D and dicamba (i.e. Weed B Gon) applied in late fall.

A "purge your spurge" participant holds a bag of myrtle spurge.

SALT LAKE COUNTY
Salt Lake County Weed Control Program
www.weeds.slco.org
385-468-6101
sfitch@slco.org

WILDFLOWERS
with more than
One Color

Presented By Joel Tuhy

The deserts and mountains of Utah's canyon country, and beyond, contain wildflowers of many colors. In fact, flowers of all colors in the visible spectrum can be seen, if you know where to look.

But in a twist on this theme, some plants produce flowers that display *more than one color* in each individual flower. These plants are fewer and farther between, and some of their flower-color combinations are pretty unexpected.

Come and see some Utah wildflowers of multiple colors – *in each flower*.





Wednesday, June 6, 2018 – 7:00 p.m.

REI, 3300 South and 3300 East, SLC

Sponsored by *Utah Native Plant Society* and *The Nature Conservancy, Utah Chapter*

Your Membership

Your membership is vital to the Utah Native Plant Society. It is important that your information is correct and up to date for notifications and the delivery of The Sego Lily newsletter. Susan Sims is our UNPS Membership Committee. You may direct any questions about and updates to your information to Susan at: membership@unps.org

Lifetime Member Update:

In the past few months, the following have become lifetime members of the Utah Native Plant Society. Their support of our organization is very much appreciated.

Lucy Jordan, Celeste Kennard, Kent Morby, Erin O'Brien, and Denise Van Keuren

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Utah Native Plant Society

Utah Native Plant Society
PO Box 520041
Salt Lake City, UT, 84152-0041.

To contact an officer or committee chair write to
Webmaster: unps@unps.org

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Website: For late-breaking news, the UNPS store (posters, etc.), the *Sego Lily archives, Chapter events, sources of native plants,* the digital Utah Rare Plant Field Guide at unps.org.

Webmaster inquiries at unps@unps.org

Many thanks to Xmission.com for sponsoring our web-site.

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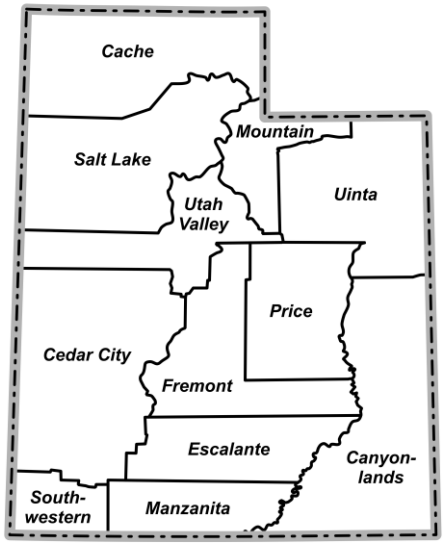
Submit articles to Cathy King: *cathy.king@gmail.com*

UNPS Chapter Map



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