

Plant of the Year

Green-flowered Wild Ginger

(*Asarum wagneri* Lu & Mesler)

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Green-flowered wild ginger (*Asarum wagneri*) grows in the southern Oregon Cascades in the vicinity of Mt. McLoughlin. Photo by Norm Jensen.

“It looks like it should be called elk lettuce,” was my companion’s first comment about a plant that was emerging from under boulders along the ridgeline overlooking Sky Lakes Wilderness. In the shadow of Mt. McLoughlin, Bob and I [Cindy Roché] were looking for evidence of elk foraging. The snow had not been gone long, but when I searched under the tightly clustered leaves, I found a few immature green flowers and knew it was ginger, and not lettuce.

Because the site was in the Cascade Mountains, I looked first in *Vascular Plants of the Pacific Northwest* (Hitchcock *et al.* 1964). They listed only one wild ginger, and clearly this one didn’t fit the description for western wild ginger (*Asarum caudatum*). Next, I checked the *Manual of the Higher Plants of Oregon*, where I found that Peck (1961) had described a new variety of western

wild ginger in the southern Oregon Cascades: green-flowered wild ginger (*Asarum caudatum* var. *viridiflorum*). After that, I consulted *Asarum* in Volume 3 of the *Flora of North America* (Whittemore *et al.* 1997) and learned that Peck’s variety had been raised to species rank, as *Asarum wagneri*. Kozloff (2005) mentions green-flowered wild ginger in his key as a note under western wild ginger. Kelly (2001) also included it in his monograph of *Asarum* sect. *Asarum*. Because this taxon doesn’t occur in California, green-flowered wild ginger is not included in the *Jepson Manual* (Hickman 1993).

Despite the number of references I consulted to learn its identity, green-flowered wild ginger has been recognized as a species for nearly 25 years. Karen Lu and Michael Mesler (1983) stated that it was a distinct species, and not simply a green-flowered form of western wild ginger. They named it in honor of Professor Warren

H. (Herb) Wagner, Jr. (1920-2000), in recognition of his many contributions as a teacher of botany. Herb Wagner, Michael Mesler's advisor at the University of Michigan, was an expert on ferns. Morton Peck of Willamette University had collected the type specimen from the north end of Lake-of-the-Woods in Klamath County on 3 July 1931 (OSC¹). However, Kelly (2001) noticed that Peck wrote "type" on the specimen at WILLU and "isotype" on the UC and OSC specimens. Larry Kelly (Cornell University) therefore considered the WILLU specimen to be the holotype.

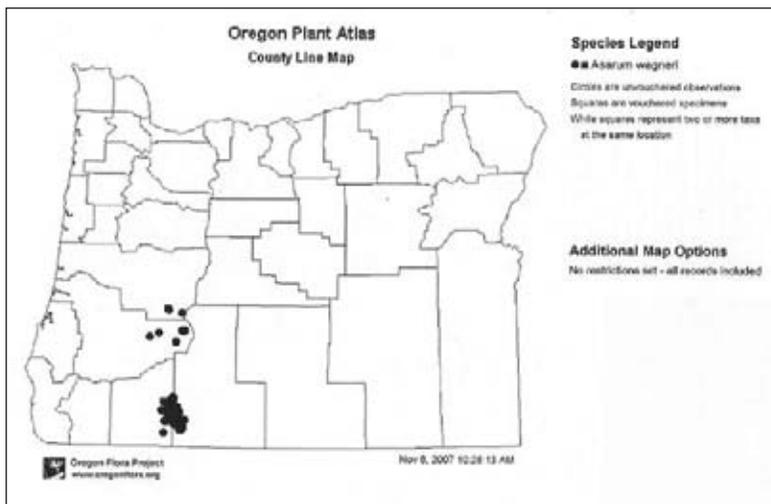
At one time, botanists considered green-flowered wild ginger rare enough to track locations for protection as a rare Oregon endemic (Lu and Mesler 1983). Originally known only from the area between Mt. McLoughlin and Lake-of-the-Woods in the southern Cascade Range (Jackson and Klamath counties), later collections (Oregon Flora Project) expanded the range to include Douglas and Lane counties. (see map) Previous reports from Josephine County were based on undocumented plant lists and were likely misidentifications.

Wild Gingers in Oregon

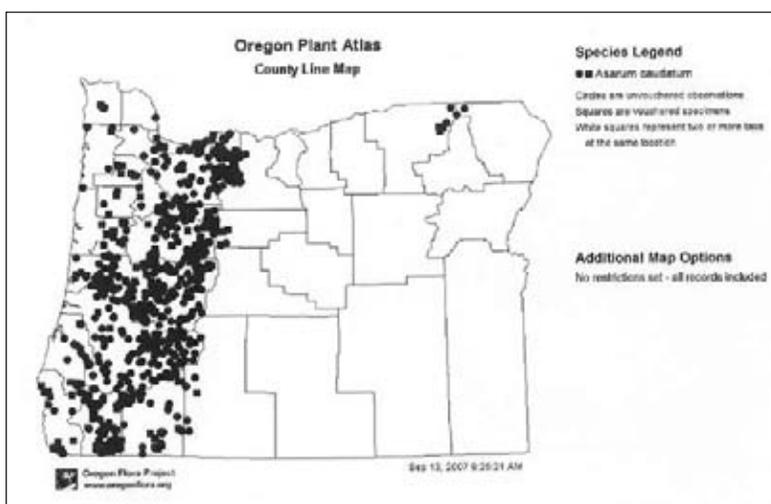
Asarum is the sole native representative of the pipe-vine family (*Aristolochiaceae*) in Oregon. Of the six species of *Asarum* in North America (Kelly 2001, Whittemore *et al.* 1997), two are widespread: one in the East (Canadian wild ginger, *A. canadense*) and one in the West (western wild ginger, *A. caudatum*). Two are California endemics (Lemmon's and Hartweg's wild gingers, *A. lemmonii* and *A. hartwegii*), another is an Oregon endemic (green-flowered wild ginger), and yet another (marbled wild ginger, *A. marmoratum*) grows in southwestern Oregon and northern California. Western wild ginger grows west of the Cascade Range from northern California to British Columbia, as well as in the Blue Mountains of northeastern Oregon, and in the northern Rockies (Idaho, Montana, BC). In the past, marbled wild ginger was commonly misidentified as Hartweg's wild ginger in Oregon. This confusion resulted from Peck's view that *A. marmoratum* was a synonym of *A. hartwegii*. Current opinion is that these two taxa are two distinct species with marbled leaves, with distributions that overlap in the Klamath Mountains, but not in the Cascade and Sierra Nevada ranges.

In southwestern Oregon, the ranges of three wild ginger species overlap. Marbled wild ginger, found in Lane, Douglas, Curry, Josephine and Jackson counties, is easily identified by its marbled leaves. Leaves of both western wild ginger and green-flowered wild ginger are uniformly green, but the two are generally not difficult to distinguish. Flowers of western wild ginger are dark red-maroon, with long attenuate calyx lobes. Flowers of

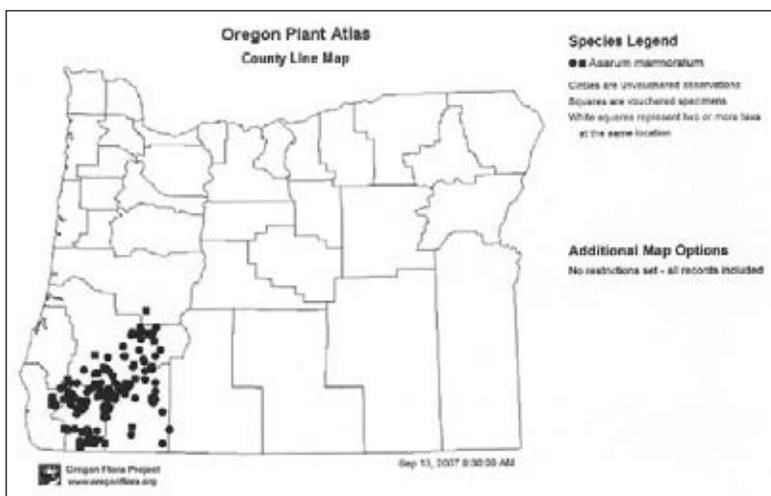
¹OSC is the abbreviation in Index Herbariorum (the international reference for herbaria) for Oregon State University herbarium. WILLU represents Willamette University (now the Peck herbarium at OSU) and UC, the Herbarium at UC Berkeley.



Distribution map of *Asarum wagneri*, from the Oregon Atlas Project website (<http://cladonia.nacse.org/platlas/jclass/OPAJava20.htm>; Accessed 18 November 2007)



Distribution of *Asarum caudatum*, from the Oregon Atlas Project website.



Distribution of *Asarum marmoratum*, from the Oregon Atlas Project website.

green-flowered wild ginger are red or maroon only at the base of the short, bent calyx lobes and on top of the ovary. Some confusion exists over populations of western wild ginger with whitish or pale green flowers, especially in Josephine, Curry, and Coos counties.



Flowers of *Asarum caudatum* are dark red-maroon with long attenuate calyx lobes. Photo by Norm Jensen.

Frank Callahan (pers. comm.) reports that pale flowered wild ginger appears to share a distribution range with Port Orford cedar, often on serpentine-influenced soils. Because the annual increment of shoot growth in green-flowered wild ginger is short (5-20 mm), individual plants usually form tighter clumps than the sprawling clones typical of western wild ginger. According to Lu and Mesler (1983), flowers of green-flowered wild ginger produce a faint foul odor, something like dish rags left wet for long periods of time. The foliage of green-flowered wild ginger has a gingery fragrance, albeit fainter and different than the fragrance encountered in western wild ginger. Odors of wild gingers likely vary among populations and during phenological development, but probably not nearly as much as the perception of odors among botanists!

Habitat

The preferred habitats of green-flowered wild ginger appear to be humus soils under forests of Shasta red fir (*Abies magnifica* var. *shastensis*) and white fir (*Abies concolor*) at moderate elevations (1360 to 1660 m [4,500 to 5,500 ft.]) as well as open boulder fields with mountain hemlock (*Tsuga mertensiana*) and subalpine fir (*Abies lasiocarpa*) near timberline (>1800 m [6,000+ ft.]) (Eastman 1990, Lu and Mesler 1983, Whittemore *et al.* 1997). This species is also known from a lodgepole pine stand near the intersection of the Dead Indian Memorial Highway, USFS Road 37 (1400 m [4,600 ft.]) in Jackson County (between Ashland and Klamath Falls), and in the Johnson Prairie area north of State Route 66 near the Klamath/Jackson county line.

Pollination

The dark maroon flowers of western wild ginger resemble flowers that are pollinated by carrion insects, but they lack the characteristic foul odor associated with the sapromyophilous syndrome² (Lu 1982). Despite flower color, morphology, and location near the ground, Lu (1982) reported that western wild ginger primarily self-pollinates, and that flies or fungus gnats, the putative pollina-

²Plants growing in humus whose reproductive structures resemble decaying organic material in order to attract flies that facilitate cross-pollination.

tors suggested by Vogel (1978a), play only a minor role. Lu (1982) described a three-phase pollination process: first, the six stigmas are apparently receptive for cross-pollination, while the twelve stamens remain recurved with their anthers adjacent to the top of the inferior ovary. After about a week, the filaments of the inner six stamens straighten, and deposit pollen on adjacent stigmas. In the third stage, two or three days later, anthers of the remaining six stamens dehisce and their filaments straighten to a position directly below the stigmas, also potentially contributing to self-pollination.

Pollination in Hartweg's wild ginger follows the same process, but its flowers emit a faint, musty fragrance and mushroom flies perform some cross-pollination (Mesler and Lu 1993). Green-flowered wild ginger probably primarily self-pollinates, but may also attract a suite of fungus-visiting flies, as in the cases of Hartweg's and western wild gingers.

Meeuse and Morris (1984) reported that female fungus gnats deposit eggs in the throat of flowers of western wild ginger and other *Asarum* species. The larvae that hatch from these eggs start eating almost immediately, but the tissues of the flower are so poisonous that the young insects quickly die. They observed that in some localities 35% of the flowers of western wild ginger contained eggs and larvae. This appears to be a case of 'ruthless' exploitation of a pollinator by a plant, comparable to the cases of *Stapelia* and certain water lilies (Meeuse and Morris 1984). If, as argued by Mesler and Lu (1993), self-pollination in *Asarum* was superimposed on a system fundamentally adapted for pollination by fungus flies, then perhaps it was because the host was too treacherous!

Procter and others (1996) discuss the sapromyophilous syndrome in detail using a number of different species including Western wild ginger as example an example of brood site imitation without prolonged imprisonment. They cite Vogel's work (Vogel 1978a and b) with Western wild ginger without mentioning Mesler and Lu (1993) or Meeuse and Morris (1984).

Seed Dispersal

Apparently, seeds of all species in the Section *Asarum* (Kelly 2001) are equipped with fleshy glutinous structures called elaiosomes, which are rich in lipids and proteins. These structures are highly nutritious, and ants collect and carry the seeds to their nest. After feeding the elaiosomes to their larvae, the ants discard the seeds, which are still viable, in their waste disposal area. Thus, by transporting but not consuming the seeds, ants may play an important role in plant distribution for wild gingers. Other western wild-flowers known to produce elaiosomes include the familiar western bleeding heart (*Dicentra formosa*) and miner's lettuce (*Claytonia perfoliata*). In contrast to ant behavior, rodents destroy a large number of fruits of western wild ginger (Lu 1982).

Chemistry

A plant's common name is often based on some noticeable morphological or chemical feature. Or, if there is no known colloquial name, it may be given a contrived common name based on its formal botanical name (Hartweg's wild ginger, *Asarum hartwegii*, for example). The crushed leaves of many species of *Asarum* emit an odor resembling that of the culinary herb ginger (*Zingiber officinale*), hence the common name "wild ginger." *Zingiber*, from



Both *Asarum hartwegii*, left (photo by Frank Lang), and *A. marmoratum*, right (photo by Norm Jensen), have marbled leaves.

Southeast Asia, is strictly a cultivated plant, no longer found in the wild. Because the leaves of green-flowered wild ginger are odorless and the flowers are foul-smelling, it is probably safe to assume that it has little or no culinary value. In addition, it is rare enough that digging its roots or rhizomes is strongly discouraged.

Rex Cates (1975), a student of B. J. D. Meeuse at the University of Washington, investigated banana slug (*Ariolimax columbianus*) predation on western wild ginger, which appears to have evolved two strategies to cope with herbivory. He found that natural populations of western wild ginger are polymorphic for seed production, growth rate, and palatability to these native slugs. In habitats where slugs were uncommon, wild ginger had individuals that invested more energy into early rapid growth and seed production and less energy to the production of an antiherbivore substance. When and where slugs were more abundant, natural selection had favored wild ginger that invested more energy into producing the anti-herbivore substance. These latter plants grew more slowly and produced fewer seeds, but were at a competitive advantage because less photosynthetic material was consumed by slugs.

Wild ginger is not culinary ginger, even though one encounters advice like this:

“Wild ginger tastes like commercially available gingerroot, with the exception that the leaves are more strongly flavored than the root... In other words, this plant is used in exactly the same manner as gingerroot” (Tilford 1997). “Native Americans apparently used roots of our species to make a tea for a variety of cures for ailments ranging from indigestion, coughs, colds, heart conditions, female ailments, throat ailments, nervous conditions, to cramps” (Moreman 1998).

Medical authorities strongly warn against all uses of species containing aristolochic acids because they may cause severe kidney damage (Lord *et al.* 1999) and urinary tract cancer (Norteir *et al.* 2000). In addition, a European species, *A. europeaeum*, contains a rich assortment of essential oils implicated in poisonings when used in folk medicine as an emetic, diuretic or abortifacient (Frohne and Pfänder 2005). One should remember that *Asarum* evolved toxic chemicals to deal with herbivores.

Horticultural Value

Asarum is well-known to garden plant enthusiasts as a low-growing woodland herb. An impressive array of species are available through nurseries and mail-order, either as seed or plants. The Royal Horticultural

Society plant finder indicates 79 taxa for *Asarum* (<http://www.rhs.org.uk/rhsplantfinder/PFGenera.asp>), including several North American species: *Asarum canadense*, *A. caudatum*, *A. hartwegii*, and *A. lemmonii*. Wild gingers are particularly popular in rock gardens, especially those species with attractive evergreen leaves that contain chemicals that deter slugs. Some species, however, appear to lack these chemicals and growers of *Asarum* should be alert to the possibility of slug predation. Kozloff (1976) commented that our native banana slugs inflict little damage to garden plants; most is done by introduced slugs. Rathcke (1985), working with three alien slugs in Eastern North America, suggested that the velvety pubescence on leaves of Canadian wild ginger deters slugs from crawling and feeding on leaves. Slugs consumed less than 10% of leaf area, in contrast to 58% of the flowers on the same plants. Leaves of Western wild gingers are not as hairy as Canadian wild ginger, so may be more vulnerable to alien slug damage. Kruckeberg (1996) finds that *Asarum marmoratum* (*hartwegii*) is avidly sought by slugs. Because of the nomenclatural confusion surrounding the two taxa the wisest course of action would be to assume both are consumed by slugs. If using slug bait around garden-grown wild gingers, remember that the poison is lethal to native slugs, even though they are not causing the damage.

Leaves of green-flowered wild ginger are deciduous and not marbled, making the species less desirable for gardens. In addition, it would need to be started from seed, because plants should not be dug from the wild.



Flowers of *Asarum hartwegii* are also maroon-red, with long, attenuated calyx lobes. Photo by Norm Jensen.

Conclusion

With its limited distribution southern Oregon, green-flowered wild ginger is not as well known as its widespread relative, western wild ginger. Now that you know about it, look for it and other wild gingers when botanizing southern Oregon. (If you see elk eating wild ginger, let us know. We found no evidence that elk use it; and after what we learned of its chemistry, no longer expect to!)



Western wild ginger has solid green leaves and maroon-red flowers with long calyx lobes. Photo by Norm Jensen.

Acknowledgements

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Vegetative key to *Asarum* species in Oregon and adjacent California

Because of early taxonomic confusion (Peck 1961) and the possibility that *A. hartwegii* might occur in Oregon, it is included in this key.

- 1a. Upper leaf surfaces marbled with white or silvery lines, primarily along the veins.
 - 2a. Leaves with marginal cilia perpendicular to edge...
A. marmoratum
 - 2b. Leaves with marginal cilia that angle toward apex...
A. hartwegii
- 1b. Upper leaf surfaces uniformly green, not marbled.
 - 3a. Leaves heart-shaped, usually persistent, annual increment of shoot growth long (14-60 mm), upper leaf surfaces uniformly sparsely pubescent...
A. caudatum
 - 3b. Leaves kidney-shaped (wider than long), deciduous, annual increment of shoot growth short (5-20 mm), upper leaf surfaces pubescent only on the veins...
A. wagneri



Hairs along the edge of the leaf angle toward the apex in *Asarum hartwegii*. Photo by Norm Jensen.

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