USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Guide

GREAT CAMAS
Camassia quamash (Pursh) Greene ssp. *quamash*
Plant Symbol = CAQUQ

Contributed By: USDA NRCS National Plant Data Center & Corvallis (OR) Plant Materials Center

Brother Alfred Brousseau

Alternative Names
Leichtlin's camas, large camas, *Camassia leichtlinii* ssp. *suksdorfii*.

Warning: Death camas (*Zigadenus venenosus*) can be confused with edible camas bulbs and is toxic. Be sure of your identification of camas bulbs before eating them!

Uses
Ethnobotanic: Camas was and continues to be one of the most important "root" foods of western North

American indigenous peoples, from southwestern British Columbia to Montana, and south to California (Kuhnlein and Turner 1991). The part of the plant that was relished is actually a bulb. Camas was used by Northwest Coast peoples, the Coast Salish of Vancouver Island, western Washington groups, Squamish, Sechelt, Comox, and Kwak-waka'wakw of the British Columbia coast. Camas was considered to be one of the most important bulbs to local California natives. The Maidu particularly valued great camas.

Except for choice varieties of dried salmon, no other food item was more widely traded (Gunther 1973). People traveled great distances to harvest the bulbs and there is some suggestion that plants were dispersed beyond their range by transplanting (Turner and Efrat 1982; Turner et al. 1983). To the Nez Perce people, camas is still the most important root in trade, and trading is traditionally impossible without camas bulbs (Harbinger 1964). Dried camas is the most expensive form of camas, with baked and then raw camas being less expensive. At marriage trades, the girl's family gives roots in corn husk bags. At funeral trades, camas roots are given to friends and relatives by the widow. The Nez Perce traded camas roots with the Warm Springs, Umatilla, Cayuse, Walla Walla, Nespelem, Yakama, Crows, and Flatheads.

The bulbs were usually dug after flowering, in summer, although some peoples dug them in spring. Harvesting the bulbs traditionally took weeks or months among the Nez Perce. Each family group "owned" its own camping spot and harvesting spot. These were passed down in families from generation to generation. Turf was lifted out systematically in small sections and then replaced after only larger bulbs had been removed. The bulbs were dug with a pointed digging stick. Bulbs were broken up and replanted. Annual controlled burning was used to maintain an open prairie-like habitat for optimum camas production. Areas were harvested only every few years.

Traditionally, camas bulbs were almost always pit-cooked. Within the past 100 years, camas bulbs have also been cooked by stovetop methods (Turner and Kuhnlein 1983). The bulbs are allowed to cook for

24-36 hours when pit-cooked (Turner and Bell 1971). It is probable that lengthy cooking is necessary for maximum conversion of the inulin in *Camassia* to fructose. The sweetness of cooked camas gave it utility as a sweetener and enhancer of other foods. Before sugar, European traders introduced molasses, and honey. Sweetening agents were in short supply among native peoples, and camas was highly valued in this capacity. Sometimes other foods, such as the rhizomes of springbank clover (*Trifolium wormskioldii*) and the roots of Pacific silverweed (*Potentilla anserina* ssp. *pacifica*) were cooked with the camas bulbs. The Kalapuyan of the Willamette Valley in Oregon used to flavor camas with tarweed (*Madia elegans*). Bulbs don't keep well fresh. They were cooked or sun-dried and stored for later use. Sometimes camas bulbs were pressed flat and made into camas cakes the size of biscuits before being dried (Turner et al. 1983). Dried bulbs were re-constituted by soaking in water, usually overnight.

Many of the traditional camas gathering sites, such as Weippe Prairie and Camas Prairie in Idaho and the Willamette Valley in Oregon, have been converted to agriculture. The average size of a camas patch needed to feed a five person family was 2.7 ha (Thoms 1989). Camas roots are hard to find now. Restoration of camas prairies and access to camas bulbs are priorities of many Indian people. At one time, "When camas was in bloom in wet meadows, the flowers grow so thickly that they look like a blue lake" (Murphey 1959:14).

Camas stalks and leaves were used for making mattresses. It was sometimes used in place of grass when baking camas in pits. Camas is used by the Nez Perce as a cough medicine. It is boiled, and the juice is strained and mixed with honey.

Ornamental: Horticulturally, this plant is used for cut flowers, beds, borders, ground cover, rock gardens, and prairie restoration.

Wildlife: Elk, deer, and moose reportedly graze camas early in the spring (Craighead, Craighead, and Davis 1963). Gophers eat camas and move the bulbs to another area where they sprout and grow the next year (Watson 1988). Indian women in Oregon's Umpqua Valley robbed camas bulbs from gopher caches (Piper 1916). Herbivorous insects also eat camas leaves.

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status, such as, state noxious status and wetland indicator values.

Description

General: Lily Family (Liliaceae). Great camas or Leichtlin's camas (*Camassia quamash* spp. *quamash*) is a liliaceous, perennial herb that grows from an edible bulb. The plant can grow from 24-48 inches (60-120 cm) tall. Leaves are long and narrow, grass-like, and emerge from the base. The inflorescence is a spike-like cluster borne on a leafless stem that is held above the leaves. Camas flowers are creamy-white to deep blue-violet; they have 6 tepals, 6 stamens, and 3 stigmas. The white form is considered to be native only to the Umpqua Valley of Oregon. Great camas differs from common camas (*Camassia quamash* ssp. *breviflora*) in the following ways: the flowers are regular, with tepals that twist together after anthesis and remain over the ovary; anthers are dull yellow to violet; the plant is larger, with longer flower stalks and bigger bulbs; and there is a fine, waxy powder on the leaves. The seeds are usually larger as well. The fruits are barrel-shaped to three-angled capsules, splitting into three parts to release many black, angled seeds.

Distribution

Great camas grows in wet meadows, woods, prairies, moist hillsides, and streamside areas. Camas habitat is often ephemeral, and dries up by late spring. Great camas grows from south Vancouver Island to northern California, from the coast to the Cascade and Sierra Nevada Mountains at elevations below 10,800 feet (3300 meters). This sub-species does not extend east of the Cascades. In British Columbia, great camas is restricted to wet flats, ditches, and moist rocky areas on southern Vancouver Island and the adjacent Gulf Islands. Great camas blooms in late April to late June. Common and great camas often grow together. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Establishment

Great camas can be propagated from seeds or bulbs; shade tolerance, moisture requirement, and preferred planting depth may differ among specific phenotypes. Great camas is frequently found in areas with soil moisture persisting throughout most of the growing season. Its preferred habitat includes shady environments, such as those that occur along riparian zones or under moderately dense deciduous forest canopies in western Oregon. However, it can be found in more open habitats elsewhere within its natural range. The two camas sub-species are generally found in the same environments. The bulbs

of great camas can be substantially larger in size and deeper in the soil than common camas, and sometimes grow 16 inches or more below the surface. Bulb depth appears limited by shallow water tables, anoxic conditions, or restrictive layers. The occasional occurrence of a large, thick root beneath a bulb may aid in re-locating or re-establishing it at a greater depth. Plants require irrigation or moist soil conditions to become established. Great camas can be difficult to establish in California.

Live Plant (Bulb) Collections

Great camas is readily established by transplanting wild or commercially grown bulbs. Wild harvests should be restricted to salvage sites with appropriate approvals or permits. Due to loss of wetland habitat throughout the United States, harvesting plants from the wild is rarely appropriate or legal except under salvage situations. Use of bulbs or seeds from local nurseries or greenhouses is strongly recommended.

The best time to excavate bulbs is from early summer through mid-fall. This is the "quiescent" period that follows seed maturation, foliar senescence, and development of the daughter bulb. However, commercial bulb harvest takes place when the leaves are still green and must be done carefully to avoid damage. The bulb tunic or covering is very thin (De Hertogh and Le Nard 1993). Given that camas commonly occupies sites high in silt and clay that dry out in summer, windows for digging are often narrow. There is a brief period when soils are moist after flowering in the spring; the next time to harvest is in the fall after the rains begin. Store the bulbs in a dry, dark, cool, well ventilated place in a potting medium such as dry peat moss, similar to recommendations for fall planted/spring flowering bulbs (such as daffodils and tulips). Keep the bulbs from completely drying out and transport or store at 63-68° F (De Hertogh, Noone, and Lutman 1990). Common camas reproduces vegetatively by offset bulblets (De Hertogh et. al. 1993). However, much less than one percent of a wild population may produce offsets and bulbs may be stimulated to do so only as the result of a wound (Thoms 1989).

Plant camas outdoors in the fall or early winter, when soils are moist enough to dig and prevailing soil temperatures are cool. This is generally below 60°F. Fall planting allows for better root development and fulfillment of any chilling requirement for flowering (De Hertogh et. al. 1993). Bulbs, bulblets, and offsets can be utilized. However, if flowering is desired the following spring, bulbs must be of sufficient age (3-5 years old with 3-4 bulb leaves or scales) and size (Thoms 1989). Bulb leaves are laminate concentric layers that comprise much of the bulb, reminiscent of an onion. Bulbs with just two bulb leaves never flower, those with three routinely flower, and those with four almost always flower. Older bulbs will be found deeper in the ground, and bulbs which flower will probably be at least 0.6-0.8 inch (1.5-2.0 cm) wide (Thoms 1989). In the commercial bulb trade, the minimum size for export and thus flowering is a circumference of 2.4 inches (6 cm) (De Hertogh and Le Nard 1993).

The larger the bulb the greater the planting depth can be. Planting depth ranges from 0.5-1 inches for 1-2 year old bulblets up to 4-6 inches for mature bulbs (as measured to their base). Larger bulbs (1.5 inches in diameter or greater) can be planted deeper (8-10 inches) if drainage is appropriate. Commercial production involves planting from October to November in well drained soil of pH 6-7 with at least 2% organic matter, covering with at least 3 inches of soil above the bulb "nose", applying 2 inches of straw mulch, fertilizing with 7-14-28 fertilizer four weeks after planting, and harvesting in July (De Hertogh, Noone and Lutman 1990). Keep the camas bed damp until it gets warm. Once plants senesce after flowering, stop watering so seeds form and bulbs cure. Suggested spacing for flower beds and naturalized landscapes vary from 3-4 inches apart (8-10 per sq. ft.) to 6-8 inches apart. Other publications recommend 6-8 bulbs every 12 inches for outdoor gardens. A dense "natural" stand may have 9 plants/sq. ft. (100/sq. meter) or more (Thoms 1989). It may be necessary to bury bulbs with a protective wire mesh to prevent herbivory. The mesh needs to be coarse enough to allow shoots to grow through (De Hertogh et. al. 1993).

Seed Collections

Great camas propagates easily from seed. It can be collected as soon as the pods mature (turn light brown) or split open to reveal the mature black seeds. Pods ripen from late May- July depending on latitude, longitude, moisture conditions, or elevation. Dry seeds can be stored frozen or in a cool, dry place prior to planting.

Camas seed requires 42-100 days of cold temperatures (34-40°F) under moist stratification for maximum germination (90-100%), (Emery 1988, Guerrant and Raven 1995, Deno 1993, Northway pers. comm. 1998, Thoms 1989). "Moist stratification" means placement of seeds which are "imbibed", or have soaked up water, in layers of a moist medium at cool temperatures to allow for after-ripening. Germination also requires cool conditions and can occur in the dark (Northway pers. comm.

1998). The alternative is to plant seed outdoors in the fall (Sept-Oct). One-leafed, grass-like seedlings will emerge in February or March under suitable conditions. Seedlings require moisture through the spring growing period to survive. Warm temperatures during seedling development can be lethal.

Suggested site preparation methods and seeding rates for wetland revegetation are not well known, but a broadcast rate of 20 live seeds/sq. ft. for both *Camassia* sub-species resulted in poor to good seedling counts the following spring (0-10 or more seedlings/sq. ft.) (Darris, pers. comm., 1999). Seedling success was dependent on weed competition, hydrology, type of disturbance, mulch, erosion, or other factors. Camas seedlings were inhibited by dense stands of live grass such as *Lolium multiflorum*. However, seedlings appeared to benefit when grown in the mulch of native grass (*Deschampsia cespitosa*), at least on well-drained, stable, slightly higher ground (*Ibid*). In areas with wet, mild winters, soil scarification for shallow seed coverage or just constant moisture from irrigation or winter rains can result in good germination. At least one grower sows seed directly on the soil surface in the fall (Robinson pers. comm. 1999). However, other growers have found that a 1-2 inch covering of organic mulch is required during the first growing season to protect the tiny bulblet from exposure to dry soil, surface cracking, and extreme temperatures. Sawdust or a chemically killed dense stand of grass works well (Watson pers. comm. 1999). Seeds deeper than 0.4-0.8 inch (1-2 cm) will not germinate successfully (Watson 1988).

Seeds per pound: *Camassia quamash* ssp. *quamasa* – 72,000 (+/- 10,000)

Management

Camas is favored as forage by deer so fencing or repellents may be useful, particularly during the first growing season. Consistent soil moisture is required every spring, but the soil can be allowed to dry out soon after the pods mature or the leaves senesce (dry up and turn brown). Moderate soil nutrient levels are beneficial. In natural settings, minor soil disturbance (loosening, surface scarification) adjacent to existing specimens may enhance natural regeneration by seed. Late summer field burning (where and when permitted) may improve stand vigor, reduce competition from brush and certain weeds, and aid in regeneration. For optimal bulb development, avoid mowing or grazing more than lightly, if at all, even during foliar senescence. Individual plants may live 15-20 years.

Traditional Resource Management (TRM) was often intensive, to the point of being considered "semi-agricultural" by some. According to Dr. Nancy Turner, TRM included the following:

- Ownership, demarcation, and inheritance of beds or patches,
- Clearing of rock, brush, and weedy vegetation,
- Harvesting bulbs after seeds were produced, during specific times of the year,
- Periodic field burning in summer after digging,
- In some cases, sod removal then bulb removal followed by sod replacement,
- Digging or "cultivation" to keep the soil loose,
- "Selective breeding" by transplanting "better" bulbs to the beds,
- Sustainable harvest techniques, including partial, selective harvests and incidental or planned promotion of camas colonization and reproduction, and
- Death camas bulbs (*Zigadenus venenosus*) were removed, so they wouldn't accidentally be mistaken for the edible camas bulbs.

Cultivars, Improved and Selected Materials (and area of origin)

Cultivars of Leichtlin's camas are widely available in the flower bulb industry. One cultivar, *Camassia leichtlinii* 'Alba', is white (or bluish-white), while 'Caerulea' has light blue flowers, and 'Plena' has double greenish yellow blooms (Brenzel 1995). 'Blauwe Donau' is described as having sea-lavender-violet flowers and lilac anthers. 'Lady Eve Price' has campanula-violet flowers with each segment having a darker colored methyl-violet central stripe. 'Semiplena' has large, semi-double, creamy-white flowers. The botanical variety or subspecies *suksdorfii* has blue to violet flowers (Royal General Bulbgrower's Association 1991).

Contact your local Natural Resources Conservation Service (formerly Soil Conservation Service) office for more information. Look in the phone book under "United States Government." The Natural Resources Conservation Service will be listed under the subheading "Department of Agriculture."

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