

**WRITTEN FINDINGS OF THE
WASHINGTON STATE NOXIOUS WEED CONTROL BOARD
(May 2006)**

Scientific Name: **Foeniculum vulgare P. Miller**

Synonyms: *Foeniculum foeniculum* (L.) Karst.
 Anethum foeniculum
 Foeniculum officinale

Common Name: Common Fennel, Sweet Fennel, Sweet Anise, Anise

Family: Apiaceae

Legal Status: Proposed as a Class B Weed for 2007 Noxious Weed List, **with the exception of bulbing fennel, *F. vulgare* var. *azoricum*.**

Description and Variation:

Because common fennel has been used as a garden, culinary, and medicinal plant, there are many cultivars and varieties, and infraspecific taxonomy differs among sources (*e.g.*, USDA, NRSC, 2005; USDA, ARS, GRIN, 2004; Mabberley, 2000; IPK Gatersleben, 2002). According to the USDA GRIN Taxonomy for Plants, there are two subspecies of *F. vulgare*: subsp. *vulgare* and *piperatum* (Ucria) Cout. Within subspecies *vulgare*, there are three varieties: *vulgare*; *dulce* (Mill.) Batt; and *azoricum* (Mill.) Thell.

Both *F. vulgare* vars. *vulgare* (common or bitter fennel) and *dulce* (sweet fennel) are grown commercially for their foliage, which is used as an herb, and for its seeds, which are used as a culinary spice and from which essential oils are collected (Charles et al., 1993). The fruits in at least *dulce* are larger than those in *azoricum* (Mabberley, 2000), and the leaf bases are not swollen (Griffiths, 1995). There are numerous garden cultivars of common fennel including Bronze fennel, *F. vulgare* 'Purpurea', whose bronze-purple hued foliage makes it a popular garden ornamental.

F. vulgare var. *azoricum* is commonly known as Florence, finocchio, or bulbing fennel and is cultivated primarily as a vegetable. The leaf petioles are swollen and fleshy, forming a bulbous base that can be blanched or eaten raw and has an anise flavor. Although this variety is grown as a vegetable, the foliage is also aromatic and could be a conceivable substitute for sweet fennel (Charles et al., 1993). There are many cultivars of Florence fennel. In a study investigating the essential oil constituents of both the bulb and foliage of Florence fennel, 16 commercially available cultivars were used. Florence fennel is a biennial, at least when grown in the Pacific Northwest (Teachout-Teashon, 2005) and does not appear to be invasive.

It would appear that the nonbulbous invasive fennel, at least in California, is *F. vulgare* subsp. *vulgare* var. *vulgare* (Jennifer Erskine, pers. comm.); however, in Washington State, there have also been sightings of what appear to be non-bulbing garden cultivar escapees, which are either vars. *vulgare* or *dulce* but definitely not *azoricum*. Henceforth in this publication, common fennel, *F. vulgare*, refers to the var. *vulgare*.

Common fennel, *Foeniculum vulgare*, is an aromatic perennial or biennial plant used worldwide for culinary, gardening, and medicinal purposes. The stem can reach a height of 1-2 meters (though it reached heights of 10 feet on Santa Cruz Island, California [Klinger, 2000]) and is glabrous (smooth and hairless), glaucous (covered with a waxy coating, giving it a bluish-green tinge), soft, and hollow, with longitudinal lines or furrows. Mature plants have a large, deep taproot.

The leaf blades are triangular ovate, 10-60 cm long and 30-40cm wide. The leaves are finely dissected into linear or filiform segments between 1-4 cm long and less than 1 cm wide. The leafstalks are inflated and broad, particularly where they attach to the stem base, and the petioles have a 7-14 cm long sheath clasping the stem.

Each plant can produce numerous umbellate flowers, about 10 cm in diameter. Each flower head consists of 15-40 flower stalks, 1-4 cm long, that radiate from the flower peduncle (stem) like the spokes of a wagon wheel. Flowers are asepalous, with yellow petals, five small stamens, and an inferior ovary with two short styles.

Each fruit is 3.5-4.0mm in length and contains two seeds. Seeds have prominent ribs and are slightly flattened laterally. All parts of the plant are strongly aromatic and even seedlings have the anise odor when crushed.

Economic Importance:

Detrimental: Where established, common fennel can form dense stands that outcompete native plants, thereby reducing native plant richness and also habitat quality. For example, biomass of *F. vulgare* only provides seasonal cover for the rare, endemic California fox on Santa Cruz Island, as opposed to the year-round cover provided by the native chaparral being displaced by the fennel (H. Swarks, pers. com.). In areas such as southern California, fennel invasions can alter such plant communities as “grasslands, coastal scrub, riparian and wetlands” (Klinger, 2000). Once it has established in areas, it is difficult to control, due to its strong competitive abilities and persistent seed bank.

Beneficial: *F. vulgare* and its numerous cultivars are used as garden ornamentals, due to their tall heights, attractive foliage. The flowers attract many insects, and the plant is the primary host for the eastern black swallowtail butterfly in Virginia (Dombrowski and Mills, 1996). Sweet fennel, *F. vulgare* var. *dulce* is cultivated for its seeds, used as a culinary spice and essential oil, used in cosmetics, pharmaceuticals, etc. (Charles, et al., 1993). Florence fennel, *F. vulgare* var. *azoricum*, is cultivated as a vegetable for its enlarged leaf base and aromatic foliage.

Habitat: *Foeniculum vulgare* is typically found in disturbed sites such as roadsides, embankments, and vacant lots; however, it is also readily colonizes grasslands, scrub-shrub, savannas, and banks along estuaries, freshwater wetlands, and streams, particularly in California (BBL, 2004). Although found in soils ranging from pH 4.8-8.4, it seems to prefer more acidic soil (Klinger, 2000). In the Northwest Region (9), common fennel is a facultative upland species, i.e., the likelihood of it being sampled in non-wetlands is 67%-99%) (USDA, NRCS, 2005).

Geographic Distribution: *F. vulgare* is native to Mediterranean and temperate regions in Africa (Algeria, Egypt, Libya, Morocco, and Tunisia), Asia (Afghanistan, Iran, Israel, Jordan, Lebanon,

Pakistan, Syria, and Turkey), and Europe (Albania, Bulgaria, France, Greece, Italy, Portugal, Spain, and Yugoslavia) (USDA, ARS, GRIN, 2004).

History: *Foeniculum vulgare* has naturalized in temperate and tropical regions worldwide, including Great Britain, South Africa, Australia, New Zealand, Mexico, Central America, South America, Cape Verde, and Micronesia (USDA, ARS, GRIN, 2004). In Australia it is a weed of roadsides and wastelands and has also invaded disturbed, calcareous wetlands (Hussey et al., 1997). Common fennel is naturalizing on limestone soils in the United Kingdom, particularly on coastal chalk cliffs (Grieve, 2005). It is widespread in US, except for the Northern Plain States and Colorado, New Hampshire and Vermont, Indiana, Oklahoma, Arkansas, Mississippi, and Alabama (USDA, NRCS, 2005).

In Washington State, the distribution of *F. vulgare* is still limited, although some populations appear to be expanding. Wild populations have been detected in Orcas and San Juan Islands in San Juan County; Anacortes and Mount Vernon in Skagit County; King County; Port Townsend in Jefferson County; and in several sites throughout Thurston County.

Growth and Development: According to Klinger (2000), *F. vulgare* typically begins to grow slowly in mid-winter in southern California. In summer, the growth rate increases and peaks in mid to late summer. Flowering begins in early May, and seed production can occur between May and early November. Seeds can germinate any time throughout the year in southern California, but they can also remain viable in the soil for many years.

Reproduction: Common fennel reproduces through seed and also through root crown (Klinger, 2000). While one fennel plant can turn out thousands of seeds its first year, the seed output can increase by a hundredfold the second year (Erskine Ogden, 2004, as cited in Erskine Ogden and Rejmánek, 2005). There are many mechanisms for seed dispersal, including birds, rodents, water, clothing, dirt transported in boots, tires, etc. Such high seed yield can result in a persistent seed bank (Klinger, 2000).

Response to Herbicide: Spraying can substantially reduce *F. vulgare* cover; however a combination of burning followed by spraying appears to effectively eradicate the fennel (Klinger and Bretton, as cited in Rice, 2005). Late spring appears to be an ideal time to apply herbicide, at least in southern California, because the fennel has reached maximum biomass production and native herbaceous annuals have already set seed (Erskine Ogden and Rejmánek, 2005). Cutting without removing biomass prior to spraying may be counterproductive because the harvested plant material can shield living tissue from the herbicide (Brenton and Klinger, 2002)

Please refer to the PNW Weed Management Handbook, available online at <http://weeds.ippc.orst.edu/pnw/weeds> for specific herbicide instructions.

Response to Cultural Methods: Burning as a stand-alone treatment does not appear to reduce *F. vulgare* cover (Klinger and Bretton, 2000, as cited in Rice, 2005).

Response to Mechanical Methods: Harvesting aboveground biomass of common fennel can be counter-productive because the taproots can regenerate new shoots; however, repeated harvesting

between short intervals may deplete below ground energy reserves (Klinger, 2000) Caution should be taken to mechanically harvest the plants when they are not in flower, otherwise the physical removal of the plants will facilitate seed dispersal (Klinger, 2000).

Biocontrol Potentials: Introduced herbivores such as sheep and cattle did appear to suppress growth of common fennel on Santa Cruz Island, but using livestock animals as biocontrol does not have much potential and may hasten the plant's spread (Klinger, 2000).

Rationale for Listing:

Foeniculum vulgare is currently on the California Exotic Pest Plant Council's List A-1, designated for pest plants that are most invasive and are widespread. According to the Plant Conservation Alliance, *F. vulgare* is regarded as invasive to Washington State, Oregon, California, Hawaii, and Virginia (Swearingen, 2005). In Virginia, it is considered a "Moderately Invasive" Species in Piedmont and Coastal regions, meaning that it "may have minor influences on ecosystem processes, alter plant community composition, and affect community structure in at least one layer", particularly in disturbed areas (VDCR, 2003).

Because *Foeniculum vulgare* poses a threat to Washington's endangered, native grasslands, is difficult to control once established, and is still limited in distribution, it is being proposed as a Class B Noxious Weed for 2007. Designated areas will be determined by the Noxious Weed Committee once sufficient data regarding the distribution of *F. vulgare* are available.



Britton, N.L., and A. Brown. 1913. *Illustrated flora of the northern states and Canada*. Vol. 2: 643. Courtesy of Kentucky Native Plant Society. Scanned by Omnitek Inc. Usage Guidelines.



Common fennel growing along roadside in Thurston County



Harvest of Florence fennel at Nash Huber 's organic farm, Sequim, WA. **This variety would be exempt from the listing.** Note the enlarged stem bases, called bulbs. Picture courtesy Scott Vlaun/Seeds of Change



Common fennel plant (note lack of bulbous base) growing along roadside.

Picture courtesy Thurston County

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