Cynara cardunculus **System:** Terrestrial

Kingdom	Phylum	Class	Order	Family
Plantae	Magnoliophyta	Magnoliopsida	Asterales	Asteraceae

Common name

Artischocke (German), artichaut commun (French), Scottish thistle (English), wild cardoon (English), cynara (English), Scotch thistle (English), globe artichoke (English), artichoke thistle (English), Spanish thistle artichoke (English), wild artichoke (English), cardoon (English), cardon d'Espagne (French), Kardone (German), alcachofa (Spanish), alcachofra (Portuguese), alcaucil (Spanish), cardo de comer (Spanish), cardo (Portuguese), cardo (Spanish), Gemüseartischocke (German)

Synonym

Cynara cardunculus , L. var. *altilis*
Cynara cardunculus , L. var. *eu-cardunculus* Hayek
Cynara cardunculus , L. var. *ferocissima* Lowe
Cynara cardunculus , L. var. *hortensis* Brotero
Cynara cardunculus , L. var. *inermis*
Cynara cardunculus , L. var. *sativa*Brotero
Cynara cardunculus , L. var. *sativa* Moris
Cynara cardunculus , L. var. *scolymus*
Cynara cardunculus , L. *typica* Willkomm ex. Mariz
Cynara corsica , Viviani
Cynara esculenta
Cynara ferox , Tenore fide Steudel
Cynara horrida , Aiton
Cynara hortesis
Cynara scolymus , L. var. *hortensis*
Cynara scolymus , Linnaeus*Cynara scolymus* L. var. *major*
Cynara scolymus , L. var. *minor* Brotero
Cynara scolymus , L. var. *pungens* de Visiani
Cynara scolymus , L. var. *mutica* de Visiani
Cynara spinosissima , J. & C. Presl
Cynara sylvestris , de Lamarck
Cynara sylvestris , Lam. var. *spinosus* de Lamarck
Cynara sylvestris ,Lam. var. spinosus de Lamarck

Similar species

Summary

Artichoke thistle (*Cynara cardunculus*) is a large perennial herb native to the Mediterranean region of Europe. It grows rapidly and produces very deep roots, and forms large rosettes up to 1 m or more in diameter. It has invaded Australia, California and parts of South America where it is an aggressive weed, capable of forming dense, massive monospecific stands to the exclusion of all other plant species.

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Species Description
Cynara cardunculus is a perennial herb which reaches 1.1 to 1.8 m in height (Wiklund, 1992). It is often richly branched and produces a very deep perennial taproot from which the plant regenerates each year (Kelly & Pepper, 1996). The root crown can also produce multiple plants, serving as a form of asexual reproduction. *C. cardunculus* forms a rosette up to 1 m or more in diameter composed of very large leaves. Leaves are silky greyish-green on the upper surface and appear almost white on the under surface because of the dense mat of white hairs. Leaves are deeply divided, each lobe ending in a strong yellow spine (DAF, n.d.). In spring a tall, branching, flowering stem up to 2 m high is produced. One large, fragrant blue or purple flower forms at each branch apex. The flower heads consist of tubular florets surrounded by a series of rigid bracts (phyllaries) tipped with spines. Each plant may produce up to 50 heads. Seeds are brown to black, about 5 mm long with a smooth covering. Seeds are wind-dispersed, each with a “parachute” of feathery bristles (pappus) about 4 cm long (DAF, n.d.). Wild representatives of *C. cardunculus* may be distinguished from other *Cyanara* species by their deeply dissected leaves and many long spines (Wiklund, 1992).

Notes
Cynara cardunculus has been divided into two subspecies: the western morph is subsp. *flavescens*; the eastern morph is subsp. *cardunculus* (Wiklund, 1992). The subspecies differ mainly by a yellowish margin on the middle involucral bract (Wiklund, 1992). There are also a number of varieties of *C. cardunculus* including the cultivated artichoke var. *scolymus* (L.) Fiori, the wild artichoke var. *sylvestris* (Lam.) Fiori and the leafy cardoon var. *altilis* DC (Pignone & Sonnante, 2004).

Lifecycle Stages
Cynara cardunculus is a perennial herb that may have a lifecycle exceeding 10 years (Archontoulis *et al*., 2010). Seeds are set in summer, germinate in autumn and rapidly form a large flat rosette of leaves and a deep fibrous tap root (DAF, n.d.). Two phases of growth are distinguished which comprise a) vegetative stage which has a duration of approximately 220 days (from September to April) and b) the reproductive phase (duration 95 days; from May to August) (Archontoulis *et al*., 2010). In the northern hemisphere flowering occurs mainly in June and July, although flowering has been observed between May and August. In the southern hemisphere flowering has been observed between November to January (Wiklund, 1992).
The first set of rosette leaves normally dies off over the summer and new leaves are formed in the following autumn, which resprout from the perennial tap root (DAF, n.d.).

Uses
Cynara cardunculus can be used as forge in winter and spring, as a raw material in the paper pulp industry, and most importantly as a solid and liquid biofuel in the bio-energy sector in its native Mediterranean range (Curt *et al*., 2004). It requires little water, nitrogen fertilisers and agrochemicals due to its rapid growth and deep root system. It also improves soil characteristics and prevents erosion. Considering the modest inputs needed to grown *C. cardunculus* it may produce the cheapest biofuel compared to all other bio-energy crops known (Grammelis *et al*., 2008).
The bases of the phyllaries and the fleshy receptacle of *C. cardunculus* are edible. The petioles and roots may also be edible if properly prepared (Kelly & Pepper, 1996).
The artichoke has also been used for medicinal purposes (Adly, 1985 in Wiklund, 1992). It is a source of inulin, cynarin and silymarin (Curt *et al*., 2002 in Grammelis *et al*., 2008). The latter two are bitter-tasting compounds, which are found in the leaves, and improve liver and gall bladder function, and stimulate the secretion of digestive juices, especially bile, and lowers blood cholesterol levels (Grammelis *et al*., 2008).
Dried florets of artichoke thistle have been used to coagulate milk (Mathews, 1830 in Wiklund, 1992).

Habitat Description
In California *Cynara cardunculus* is a particularly problematic pest plant on poorly managed and overgrazed rangelands. It can also invade relatively undisturbed natural habitats such as coastal sage scrub, chaparral and riparian woodlands (Kelly & Pepper, 1996).
The species can tolerate harsh environments with high temperatures and water stress, even on thin and unproductive soils, due to its deep root system which may exceed 5 m in depth (Archontoulis *et al*., 2010). It appears to favour soils with a high clay content, but can also tolerate coarse-textured soils (Thomsen *et al*., 2004).

Reproduction
Although *C. cardunculus* reproduces vegetatively from the roots and crown of mature plants, the species is thought to spread primarily by seed (Marushia & Holt, 2006). The plant occasionally flowers in the first year, but usually not until the second summer (DAF, n.d.). Each plant produces from 1 to 50 inflorescences per rosette per year (Marushia & Holt, 2006). Flowers have strong fragrance and produce abundant nectar that attracts a wide variety of insects which carry out pollination (Foury, 1967 in Wiklund, 1992). Up to 600 achenes (seeds) are produced per inflorescence, which are equipped with a large pappus (Marushia & Holt, 2006) for dispersal via wind (Bowler, 2008). However, in contrast to most wind-dispersed plants *C. cardunculus* has larger seeds (20-60 mg) and the pappus often becomes detached before dispersal. (Parsons, 1973, Hillyard, 1985 in Marushia & Holt, 2006). Seeds travel further in non-vegetated sites (more than 40 m) compared to vegetated sites (less than 20m) where seeds become trapped by other plants (Marushia & Holt, 2006). However most seeds disperse within 3 m of source plants (Marushia & Holt, 2006).\r\n
Flowers and rosettes senesce in late summer; the perennial tap root persists and plants regenerate from this the following spring (Wiklund, 1996; Kelly & Pepper, 1996)

General Impacts
Competition: The artichoke thistle forms large monocultures where it constitutes 100% of the vegetation cover, completely excluding most other plant species. It has been known to reach densities of over 20,000 plants per acre (Kelly & Pepper, 1996). They produce large rosettes (up to 2 m diameter) and produce an expansive litter layer each year that exclude other plants via shading or mechanical impedance, or by production of allelochemicals. Seedlings of *C. cardunculus* have high tolerance for intraspecific competition, and will grow at high densities at the margins of adult rosettes. This is likely to be a factor allowing high density monocultures (Marushia & Holt, 2008). These large monocultures result in fragmentation of higher quality habitat (Kelly & Pepper, 1996). Native forbs are particularly vulnerable to competition with *C. cardunculus* (White & Holt, 2005).\r\n\r\n
Reduction of native biodiversity: Invasion of the fragile canyon ecosystem in California has led to reduction of populations of the endangered San Diego thorn mint (*Acanthimentha ilicifolia*). The absence of wildlife trails in artichoke monocultures indicates that infestations are an obstacle to wildlife movement (Kelly & Pepper, 1996). However Bowler (2008) report that some animals can utilise artichoke: squirrels and birds forage on seeds, it provides high perch sites for birds, and some hummingbird species have high nesting success on artichoke branches and leaves.\r\n
Agricultural: Artichoke thistle stands can become so thick that forage production and livestock movement are impeded (Thomsen *et al*., 2004).
Modification of nutrient regime: *C. cardunculus* produces greater aboveground biomass than native plants, which correspondingly increases midday ecosystem carbon assimilation and evapotranspiration rates. Additionally, litter quality and nitrogen content are increased in areas with *C. cardunculus*. The flow-on effects of such changes are unresolved but may affect carbon cycling, soil organic carbon quantities and increase soil respiration rates (Potts *et al*., 2008). *C. cardunculus* may also affect soil microbial communities and nutrient and water feedback cycles, although this has not yet been investigated (Potts *et al*., 2008).\r\n
Human health:The plant is reported to cause contact dermatitis in some people (Victoria Resources Online, 2009).

Management Info
Physical control: The artichoke thistle is large and has a perennial tap-root capable of regeneration, unless the entire root system has been destroyed. Thus attempts to control this plant by plowing, chaining, scraping and bulldozing are often unsuccessful (Kelly & Pepper, 1996). Mowing is unsuccessful as the shoot apical meristem is buried below the soil surface (White & Holt, 2005). However, intensive manual pulling by large numbers of people have been successful in parts of California (Thomsen *et al*., 2004).\r\n
Chemical control: Foliar application of 2% glyphosate (Round-Up, Monsanto) applied during the active growth period (January-July) was successful in controlling artichoke thistle in Los Peñasquitos Canyon Preserve, California. The herbicide should cover the plant's leaf surface to ensure adequate application. Young seedlings can be killed with one application. Most seedlings occur at or near the margins of adult plants; therefore, spraying a 1 m buffer zone around adults will increase the long-term effectiveness of an herbicide spray treatment by removing the majority of seedlings (Marushia & Holt, 2008). In larger plants the greatest success rate was achieved by applying herbicide while the flower stalk was bolting (Kelly & Pepper, 1996). In areas where spraying is not advisable due to sensitive habitat, herbicide can be brushed on uncut rosette leaves (Tallis & White, 2009).\r\n
Seeding:Once artichoke has been removed from a site, revegetation with natives is relatively straightforward, as artichoke stands rarely contain a large seedbank. Seeding with native plant species has been successful at a number of sites in California. However if glyphosphate was used a herbicide to eradicate artichoke, seeds should not be introduced for at least 1.5 months (Bowler, 2008). Because root competition strongly affects artichoke thistle, the ideal species for revegetation are those with rapidly developing root systems, and should include a combination of shallow and deep rooted species to maximise competition (White & Holt, 2005).\r\n
Biological control: Biocontrol is not an option due to the close phylogenetic relationship to the cultivated artichoke (*C. skolymus*) (Kelly & Pepper, 1996; Thomsen *et al*., 2004).

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ALIEN RANGE

[2] AUSTRALIA
[1] CHILE
[1] NEW ZEALAND
[1] SOUTH AMERICA
[1] UNITED KINGDOM
[1] CENTRAL AMERICA
[1] ECUADOR
[1] NORTHERN EUROPE
[1] SPAIN
[4] UNITED STATES

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Summary: Control of invasive non-native plants is a challenge to land managers worldwide. This challenge is magnified when non-natives plants invade rare plant habitat because the tools and techniques used to eradicate one species may negatively impact an adjacent protected species. As a means of developing a method of controlling artichoke thistle (Cynara cardunculus) growing on serpentine soils near San Jose, California, this experiment tested two different herbicides and two different application approaches. Our treatments included applying Roundup Pro registered or Transline registered by brushing herbicide on cut stems or uncut leaves. Our results showed that both herbicides and both application techniques were significantly effective at killing artichoke thistle during the 7-month experiment running from 2007-2008. This result suggests that land managers can use a less expensive herbicide (Roundup Pro registered) and apply it with a less time consuming method (brushing on uncut leaves) when controlling artichoke thistle in conditions unsuitable for spraying

General information

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