Artichoke thistle thrives on rangeland and can form an impenetrable livestock barrier.

'Escaped' artichokes are troublesome pests

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Cultivated artichokes can revert to a wild, hard-to-control thistle form

Artichoke thistle is a robust, rigidly spined perennial belonging to the sunflower family (Asteraceae). This weed, *Cynara cardunculus* L., is a member of the thistle tribe (Cynareae), a group that comprises some of California's most prominent rangeland weeds, including such genera as *Carduus, Centaurea, Cirsium* and *Onopordum.* Artichoke thistle is native to the Mediterranean region but occurs as an aggressive and troublesome weed in grazing lands of Australia, the pampas of South America, and over 150,000 acres of annual ranges in California. The generic name *Cynara* is derived from *kynos,* a Greek name for "dog," which refers to the spines on the flowering head that resemble a dog's tooth in some species; *cardunculus* is a Latin combination of *cardus,* meaning "thistle," and *unculus,* a diminutive suffix.

History

The recorded history of artichoke thistle as a weed on California rangelands dates back to the late 1800s. California botanist S.B. Parish wrote that it was "abundant and well established over a hillside pasture at Trujillo's Ranch on the road from Rincon to Smith's Mountains in San Diego County, 1897." In 1933, W.S. Ball described a very large and spreading infestation that had become established over some 70,000 acres on the hillsides of Solano, Contra Costa, and Napa counties. The heaviest infestations covered 4,000 acres in the hills above Benicia, where mature plants reportedly reached densities of up to 22,000 plants per acre.

Artichoke thistle stands became so thick that forage production and livestock movement were greatly diminished, prompting agricultural authorities to declare the tri-county infestation a special weed problem in the state. Control methods varied according to terrain and degree of infestation. A specially designed blade was developed for root-plowing with a tractor in large infestations. This produced satisfactory results in gentle terrain, particularly when followed by seeding of a grain crop. Manual labor was used extensively. Through the cooperation of the State Relief Administration, an artichoke thistle control camp was established in 1932 near Benicia. Concentrating on areas that were inaccessible to heavy equipment, an average of 100 men per day were employed to hand-grub in canyons, on steep hillsides, and along fence rows. Following intensive control measures with costs that often exceeded the value of the land, thistle infestations were reduced substantially.

A similar artichoke thistle outbreak also occurred in Orange County in the 1930s, affecting approximately 35,000 acres of rangeland. By 1953, infested "gross" acreage in Orange County was estimated at 65,000 acres. In those early years, one large ranch sprayed 200,000 gallons of diesel oil in a year. Later control operations made use of 2,4-D applied by airplanes and helicopters. In 1965, the

The wild and weedy *Cynara cardunculus* (left) is the progenitor of the domesticated globe artichoke. The cultivated plant can revert to the wild state if allowed to grow from seed. The "artichoke heart" is visible in the cross-section of a thistle head above.

California Department of Agriculture reported that southland acreages had been reduced considerably as a result of diligent control programs. Tracts of land that had been impenetrable were again open for livestock use.

The battle for control of this species in California is not over. Much effort is directed toward either suppressing it where thistle populations are large or eradicating incipient infestations. In Orange County, large infestations persist. Perhaps most notable are the extensive and exceedingly dense stands near San Juan Capistrano, where artichoke thistle sometimes dominates many acres of prime grazing lands. Some portions of land are so heavily infested that cattle grazing is no longer possible. One ranch in the area has made major efforts to reduce this weed in what is probably the largest private undertaking in California for controlling a noxious weed. During the spring when artichoke thistle is actively growing, up to 60 employees work nine-hour days, six days a week in control activities. Cowhands on horseback and in pickup trucks use sprayers, and workers also hand-chop thistles and place 2,4-D granular formulation on the crown of the plant. Where steep terrain is not prohibitive, discing is also an effective means of controlling plants.

Workers also spend time cleaning the thistle "down" from tools, machinery, and work areas after it has settled out from clouds of windblown material. This fluffy material (receptacle bristles and achene pappus) is released as the flowering head and the achenes (seeds) mature.

Cultivated close relatives

The initial establishment of artichoke thistle in some parts of California can be attributed to the introduction and cultivation of its close relatives, globe artichoke *(Cynara scolymus)* and cardoon *(C. cardunculus)*. In referring to the extensive spread of artichoke thistle on the South American pampas, Charles Darwin wrote that no cultivated plant has run wild on so enormous a scale as the cardoon. William Brewer, Asa Gray, and Sereno Watson did extensive botanical surveys in California from 1860 to 1864. Although they made no mention of where they observed the weedy artichoke, they reported that the globe artichoke was occasionally spontaneous and had probably escaped from cultivation. According to Ball in 1933, artichoke thistle was introduced to the Benicia area of Solano County in about 1880. It was probably brought by immigrants from southern Europe as cardoon or artichoke for their vegetable gardens. It escaped and slowly spread over the hill pastures near Benicia and into nearby grain fields. Other California botanists, such as Leroy Abrams in 1911 and Philip Munz in 1935, listed the cultivated artichoke as occasionally escaping from cultivation. Many of the early artichoke thistle infestations in the state probably originated in this fashion.

Botanists have been aware for some time that cardoon and globe artichokes are domesticated forms selected from their wild and weedy progenitors during centuries of cultivation. Cardoon must have been domesticated from the wild thistle very early in southeastern Europe; it was cultivated by the Greeks and Romans of antiquity. Globe artichoke was apparently selected out of cardoon varieties in medieval monastery gardens and is not found in the wild anywhere in the world.

While taxonomists have conventionally placed the cultivated and wild forms of *Cynara* into two species, *C. scolymus,* L. for globe artichoke, and *C. cardunculus* L. for cardoon and artichoke thistle, some taxonomists feel that they are one species, *C. cardunculus.* Recent studies by European researchers (D. Zohary and J. Basnizsky) support the idea that cardoon and globe artichoke are the same species but suggest that the Syrian artichoke, *C. syriaca* Boiss., also contributed to the genetic makeup of the cultivated artichoke. Hybridization studies with *C. scolymus, C. cardunculus,* and *C. syriaca* demonstrate that both wild species are interfertile with the cultivated artichoke. The different forms are thus not distinct species but rather a variable complex derived from wild populations.

When vegetatively propagated by division of their perennial crowns, cultivated varieties of cardoon and globe artichoke maintain their desirable edible proper-

The deep root system of the artichoke thistle provides carbohydrate reserves that favor regrowth of the plant following control treatments of the upper portions.

ties, but when grown from seed, they are quite variable and rarely of horticultural value. Indeed, some seedlings revert to the wild form, developing inch-long spines and stoutly pointed bracts, and as such are considered to be artichoke thistles. We have found populations of cardoon persisting from cultivation in which much seedling variation occurs, ranging from the typical spineless cardoon through a host of intermediate forms to outright artichoke thistles.

The three forms of *Cynara* may be separated as follows:

Bracts of flower head notched at the tip, a rudimentary spine in the notch; stems and foliage without spines ..... *C. scolymus* "globe artichoke"

Bracts of flower head tapering to a stout point; stems and foliage armed with stout spines, or spines absent

- Stems and foliage with small, weak spines, or none; spines at base of flower head absent ..... *C. cardunculus* "cardoon"
- Stems and foliage and base of flower head armed with stout inch-long spines ..... *C. cardunculus* "artichoke thistle"

Distribution and control

Artichoke thistle thrives on annual ranges with a coastal influence, but persistent populations have also become established away from the coast. The extent to which it might proliferate in noncoastal areas is not known, because on inland sites where it has been detected, control measures by county agricultural departments have effectively suppressed it. It appears to be favored in soils having a high clay content, but under some conditions it tolerates coarse-textured soils. In California, it has been most troublesome in areas with an extended history of cattle grazing.

Artichoke thistle behaves like other undesirable plants found on California rangelands. When a range is overutilized or unmanaged, unpalatable or spiny plants with weedy habits may increase. As selective grazers, animals first consume the most palatable species and avoid the less desirable plants. This tends to give the less desirable species a competitive advantage and allows them to increase, until they may eventually dominate a rangeland.

It is common for the bushy rosettes of artichoke thistle to attain diameters of 5 feet; shading thus suppresses the growth of annual grasses. Furthermore, under high densities, the layers of dried and decaying leaves form a blanketlike mulch that prevents annual grasses from establishing. At high densities, the upright spreading habit and spiny nature of the plant acts as a barrier to livestock movement.

Over the years, artichoke thistle has appeared in at least 31 California counties. Because artichoke thistle is designated an agricultural pest, county agricultural departments, state detection biologists, and others send distribution information and specimens to the California Department of Food and Agriculture botany laboratory for permanent record. Statewide, Contra Costa, Solano, and Orange counties have the greatest amount of infested land with over 95 percent of all artichoke thistle in the state. Santa Barbara has some locally dense stands, as does Camp Pendleton, San Diego County. In counties such as Alameda, Solano, and Napa, regular control work through county agricultural departments has kept artichoke thistle down to tolerable levels or has eliminated it entirely.

In many counties where artichoke thistle has not become widespread, eventual eradication is a realistic goal, provided detection and control work continues. Based on responses to a questionnaire by agricultural commissioners and county staff who have monitored and controlled this weed for many years, eradication appears feasible in the following counties:

Alameda	Monterey	Sonoma
Butte	Sacramento	Sutter
Calaveras	San Bernadino	Tulare
Colusa	San Mateo	Yolo
Lake	San Benito	Yuba
Marin	Shasta	

Ongoing detection and suppression of incipient populations are important in controlling this range weed. Herbicide treatments can eliminate small infestations and gradually reduce thistle densities in large infestations. Even when plants are prevented from producing seed, however, the seeds that were deposited at a site before a control program may remain viable in the soil for many years, so follow-up measures are required. Also, the root system is extensive, and the plant's carbohydrate reserves favor regrowth following various control treatments or as dormancy is broken.

Biological control of artichoke thistle is not feasible. Because globe artichoke, cardoon, and artichoke thistle are so closely related, it is highly unlikely that any potential biological agent could be restricted to just the weedy form of *Cynara cardunculus.*

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