# DRAFT WRITTEN FINDINGS OF
# THE WASHINGTON STATE NOXIOUS WEED CONTROL BOARD

SCIENTIFIC NAME: *Cirsium palustre*

SYNONYMS: *Carduus chailleti, Carduus laciniatus, Carduus palustris, Cirsium chailletii, Cirsium kochianum, Cirsium laciniatum, Cirsium lacteum, Cirsium palatinum, Cirsium parviflorum, Cnicus palustris, Cynara palustris*

COMMON NAMES: Swamp thistle, European marsh thistle, European swamp thistle

FAMILY: Daisy family, Asteraceae

LEGAL STATUS: Considered for Class A listing in Washington State

## DESCRIPTION AND VARIATION

### OVERALL HABIT:

*Cirsium palustre* is an herbaceous, facultative biennial or monocarpic perennial (Ballegaard & Warncke, 1985; Falińska, 1997), meaning it usually lives for 1 year as a rosette before flowering and dying in its second year, but some conditions may mean it can complete its lifecycle in 1 year, or in more than 2 years. It can grow to a height of 2 meters (Tohver, 1998).

Very tall marsh thistle.
Photo by Steve Chilton via Flickr

### STEMS:

Stems of *C. palustre* are stout, erect, and covered in dense, sharp spines, making them unpalatable to most herbivores. The stems can reach heights of 1–2 meters (2-7 feet) in favorable conditions. Stems are typically alate (winged) throughout their length, providing a greater surface area for photosynthesis. The stem color varies depending on environmental factors but is usually light green, often exhibiting anthocyanin pigments giving a reddish or purple coloration. Stem wings are lined with prickly spines that vary in size and density (Segarra-Moragues *et al.,* 2007).

Above: rosette, and bottom: flowers.
Photos by Thurman Johnson.

## LEAVES:

Basal leaves are produced in a rosette and can be up to 30 cm (1 foot) long, narrowly lanceolate, pinnatifid to pinnatisect (deeply lobed) with spiny margins (Segarra-Moragues *et al.,* 2007). Basal rosette leaves typically die as the flowering stem emerges. Stem leaves are progressively smaller upwards and strongly decurrent, forming prickly wings extending down the stem (Segarra-Moragues *et al.,* 2007). Leaves of *C. palustre* are highly variable depending on environmental conditions; those growing in shade have wider leaves with fewer spines than those growing in sunny locations (Pons, 1977).

## FLOWERS:

The flower heads of *C. palustre* are composed solely of tubular (disk) florets that are typically shades of purple and pink-purple. Small, white flowered variants of *C. palustre* are occasionally found in most of its range, often reaching higher proportions at mountain and coastal areas (Mogford, 1974). Intermediate color morphs also occur at these locations (Mogford, 1974). Heads of the *C. palustre* are approximately 1–2 cm wide and appear densely clustered (2–5 heads per branch, but occasionally up to 9) (Segarra-Moragues *et al.,* 2007). Whorls of bracts on the flowers of *C. palustre* are erect and have calluses on the tips; while bracts at the outer rows have spines at the tips (Segarra-Moragues *et al*., 2007).

## FRUITS/SEEDS:

*Cirsium palustre*, like most members of Asteraceae, has a dry fruit called a cypsela, which does not open to release the seed. The achenes (seeds) are brown to black, small (approximately 3 mm long), egg-shaped, with a feathery pappus composed of fine hairs for wind dispersal, like a dandelion seed. An average plant produces about 2000 seeds, although plants may produce many more under ideal growing conditions (Ramula, 2008).

## ROOTS:

Plants have a strong tap root and numerous lateral roots. The tap root can function as a storage root and can be extensive in its preferred habitats (Ballegaard & Warncke, 1985).

## SIMILAR SPECIES:

Creeping thistle, *Cirsium arvense*, looks very similar to marsh thistle, as they both grow clusters of relatively small (to other thistle species) purple, pink, or white flowers, similarly growing spines and winged stems, can reach similar heights, and habitats can overlap. Creeping thistle generally has slightly smaller, lighter-toned flowers, more slender spines, and can grow in dry habitats in addition to wet areas (Burke herbarium). Creeping thistle is a perennial, which primarily spreads with creeping rhizomes, and does not form large rosettes.

Hybrid creeping thistle and marsh thistle. Photo by J. R. Crellin

In fact, marsh and creeping thistles can hybridize to form *Cirsium x celakovskianum*. These hybrids have been documented in the UK and France, though can occur anywhere where both species exist (Flora of North America Online; Stace *et al.,* 2015). C. palustre can also hybridize with *Cirsium vulgare*, bull thistle, to produce *Cirsium x subspinuligerum* (Stace *et al.,* 2015).

## HABITAT:

Marsh thistle thrives in moist, alkaline, typically nitrogen rich environments. Moist meadows, forest edges, pastures, riversides, and bogs are preferred. They favor moist and seasonally flooded sites. *C. palustre* can shade but grows better in partial to full sun (Falińska, 1997; Ramula, 2008).

# BIOLOGY

## GROWTH AND DEVELOPMENT:

In its first year of growth, *C. palustre* invests in the development of a large rosette, which may persist for up to 5 years under limiting growing conditions, delaying reproduction. A rosette diameter exceeding 40 cm (15 inches) triggers the plant to send up a flowering stem, often in the second year. Growth rates of flowering plants are positively correlated with rosette diameter and plants are typically insensitive to low levels of grazing (Falińska, 1997). The species typically exhibits monocarpism, dying after a single flowering episode (Ballegaard and Warncke, 1985; Pons and During, 1987).

Growth rates can vary depending on habitat and resource availability. The development of *C. palustre* is impacted by changes in light intensity and the availability of water (Falińska, 1997; Pons, 1984). Seeds have a light requirement for germination (Pons, 1984). Plants are shade tolerant in the vegetative stage but not in the flowering stage (Pons, 1984).

## REPRODUCTION:

Although *C. palustre* is predominantly out-crossing, relying on insect pollination for seed production (van Leeuwen, 1981; Mogford, 1974), the species is self-compatible and may reproduce effectively via self-pollination or even apomictically (clonally, via seed). When deprived of insect pollination the resulting achenes tend to be larger and fewer, possibly increasing the likelihood of local seedling establishment (van Leeuwen, 1981). Selfed seeds are hypothesized to have a reduced viability rate compared to outcrossed seeds (Mogford, 1974).

Dispersal occurs primarily through windborne seeds that may be transported considerable distances from parent plants by winds and updraft convection, although it has been hypothesized that much of the seeds land within a short distance of parent plants (Ramula, 2008; Roberts and Chancellor, 1979). Seed dormancy varies within and among populations, but some seed germination may occur as early as autumn, while much of the seeds may remain dormant until the following spring, ensuring the colonization of newly created niches at the beginning of the growing season (Pons, 1984; Roberts and Chancellor, 2016).

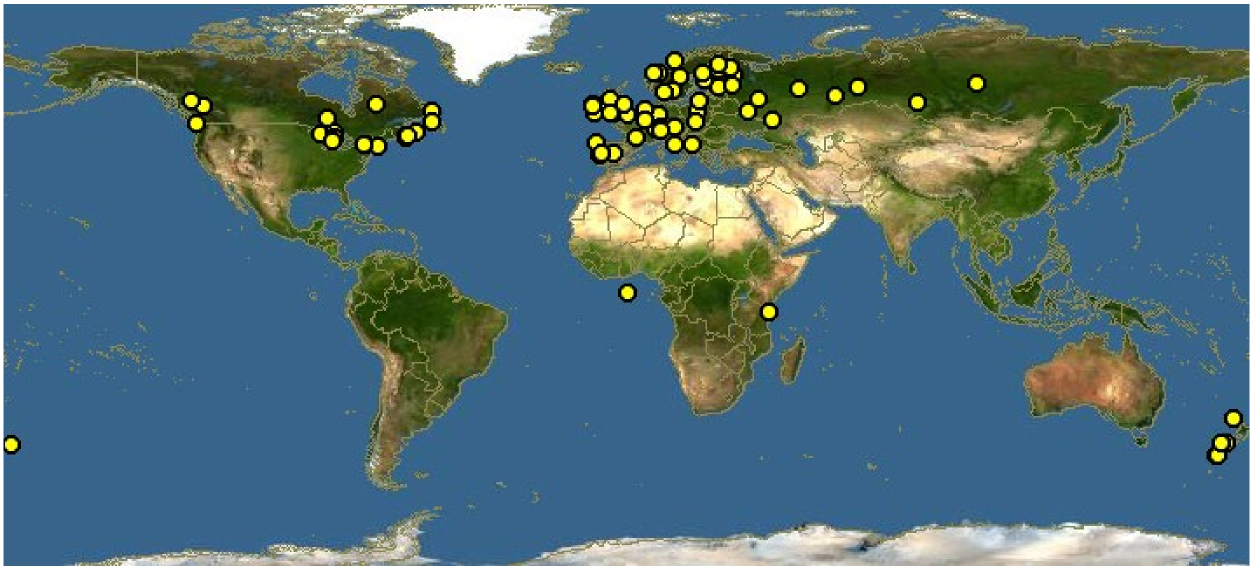
Seeds of *C. palustre* may remain viable for at least 5 years within soil banks but typically exhibit low rates of emergence, possibly owing to dormancy mechanisms, unfavorable microclimate within the soil bank or seedling predation, and those seeds situated deeper than 7.5 cm (3 inches) rarely produce seedlings, regardless of viability rates (Roberts and Chancellor, 2016; Pons and During, 1987).

Marsh thistle can hybridize with native *Cirsium arvense* (creeping thistle) (Flora of North America online) and other introduced species (Segarra-Moragues *et al.,* 2007; van Leeuwen, 1981).

## GEOGRAPHIC DISTRIBUTION:

## NATIVE DISTRIBUTION

*Cirsium palustre* is widespread in Europe, spanning from Iceland in the northwest to Western Siberia in the east and from the southern foothills of the Pyrenees in Spain in the South. Within this geographic region, it commonly occupies moist, acidic habitats like peatlands, damp meadows and woods, riparian zones, and roadside ditches, particularly at low and mid-altitudes. Its presence and persistence in disturbed environments (e.g. roadside ditch, agricultural landscapes) contribute to the dispersal of the species in regions near, but outside, its established range (Bures *et al.*, 2000; Groom, 2011).



Known populations, via DiscoverLife

## NON-NATIVE DISTRIBUTION

*C. palustre* has naturalized and demonstrated aggressive invasive tendencies primarily in temperate, cool-season regions of the Northeastern and upper Mid-Western USA, British Columbia, Ontario and Nova Scotia in Canada and portions of New Zealand, and its occurrence in new locations is becoming more widespread with time (nzflora).

## HISTORY:

Creeping thistle (*C. arvense*), which marsh thistle can hybridize with (Flora of North America Online), is one of Washington's oldest and most widespread noxious weeds, and was the subject of Washington's first noxious weed law, from 1881 (the earliest noxious weed law in the United States, before Washington was a state).

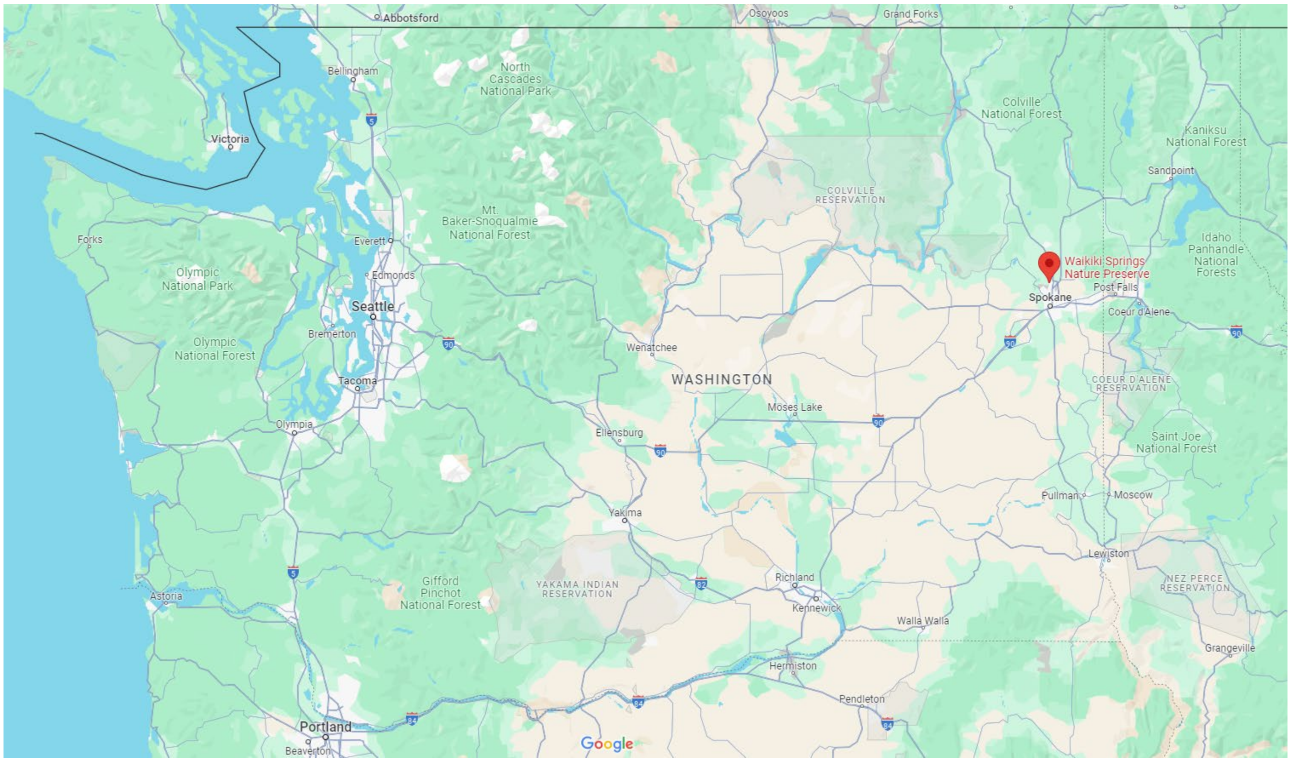
The oldest herbarium specimen of *C. palustre* collected on the West coast of North America was from British Columbia, in 1974 (Consortium of Pacific Northwest Herbaria).

## WASHINGTON:

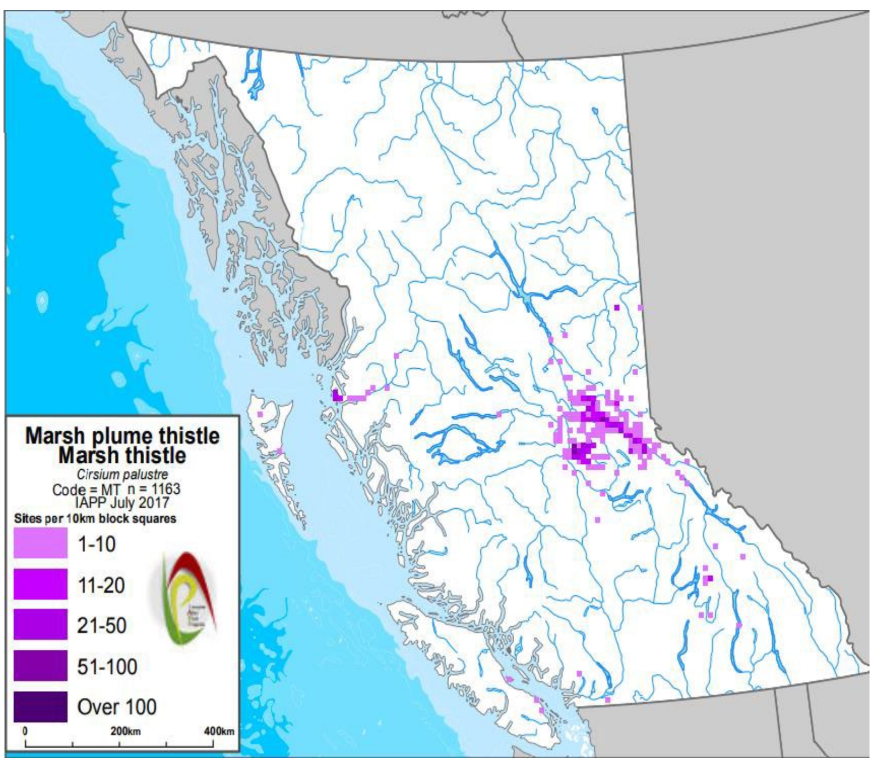
A 3 acre infestation is known to be on both sides of the Little Spokane River in Waikiki Springs Nature Reserve, in Spokane County (Thurman Johnson, 2024).

*C. palustre* may also be present in Whatcom, Island, and San Juan Counties, as there are known infestations in Southwest British Columbia, very close to the border with Washington (Thurman Johnson, 2024).

## NEARBY TO WASHINGTON:




Waikiki Springs Nature Reserve location, near Spokane, Washington




British Columbia populations, from
Invasive Species Council of British Columbia

### OREGON:

Marsh thistle is not known to be in Oregon.

### IDAHO:

Marsh thistle is not currently known to be in Idaho, though the Washington infestation near Spokane, is relatively close to the Idaho border, so it is possible that unknown infestations exist.

### BRITISH COLUMBIA:

There are many infestations of C. palustre in British Columbia, most in the cascades near the center of the province, but also several on throughout the rest of southern BC, including one very close to Whatcom County and several on Vancouver Island (Invasive Species Council of British Columbia).

### CALIFORNIA

*C. palustre* is not known to be in California.

### LISTINGS:

Wisconsin and New Hampshire (EddMaps) in the US, and on British Columbia's list in Canada (Invasive Species Council of British Columbia). Marsh thistle is known to be an invasive weed in New Zealand, though not on a regulatory list (nzflora).

## ECONOMIC AND ECOLOGICAL IMPORTANCE:

### DETRIMENTAL:

Infestations may potentially diminish forage and grazing output, contaminating cut hay, although, owing to its tendency to avoid nutrient poor sites its effect is unlikely to directly translate into decreased agricultural output in terms of cereal and other cash crop production. A major detrimental impact of the weed is that large infestations along roadways obstruct vision and complicate road maintenance. It also increases management costs (Hinchey *et al.,* 2013; Tohver, 1998).

Perhaps the greatest ecological concern of this invader lies in its rapid ability to occupy moist niches, displacing native species and reducing biodiversity. Dense thistle stands up to 2 meters tall often displace and potentially endanger other rarer native thistle species, herbaceous plants of comparable stature or lower and specialized wetland ecosystems. Dense stands can alter the fine fuel composition of ecosystems, potentially affecting fire regimes (Szadkowska et al., 2023). They may show allelopathic effects (Knoke, 2000).

### BENEFICIAL:

Previous research suggests that *C. palustre* contains components with potential for medicinal application and may provide benefit to beekeeping (Nazaruk, 2012). The presence of the rare, medicinal flavonoid, chrysoeriol, makes the plant promising as a raw material source for new


Marsh thistle infestation, photo by Ian Shackleford phytopharmaceuticals for humans and possibly livestock medications (Szadkowska *et al*., 2023).

*C. palustre* can provide significant volumes of pollen to bees during summer, when pollen and nectar resources are scarce (Somme *et al.,* 2015). The plants can create dense vegetation along shorelines and ditches, which minimizes bank erosion from water currents and runoff (Ramula, 2008;).

## CONTROL:

### MECHANICAL:

For small populations, hand pulling is feasible, but labor intensive, particularly when the plants are in young rosettes, prior to flowering. Care must be taken to remove the entire taproot to prevent re-sprouting. (Graeve, 2012).

Mowing can effectively suppress flowering, and hence prevent seed production, if performed before the end of June. Cutting in August will prevent seed maturation, limiting dispersal; however, plants cut in early summer will re-sprout, demanding at least a second mowing. This strategy can successfully reduce but may not fully eliminate established populations. The impact of a single mowing (at different timings) may vary with site, stand age and the timing of seasonal dormancy periods (Vogler *et al.,* 2013).

Cutting flowering stems can be a stop-gap measure for control (Graeve, 2012) but may not be sufficient to prevent regrowth.

Marsh thistle infestation, photo by Ian Shackleford

## CULTURAL:

Marsh thistle's predilection for moist environments can be managed through soil drainage, which significantly hinders, although does not eliminate colonization of sites subject to recurrent summer drought periods. Conversely, repeated soil disturbance, e.g. during routine tillage or grazing practices in agricultural ecosystems, will often promote emergence and subsequent expansion by stimulating those dormant seeds buried at deeper soil levels, where dormancy was enforced (Roberts and Chancellor, 2016).

## BIOLOGICAL:

The generalist thistle-feeding tortoise beetle, *Cassida rubiginosa*, while exhibiting high survivorship on *C. palustre*, is unlikely to control established populations, although its impact may be greater on immature rosettes or plants undergoing multiple environmental stress factors such as plant competition, drought and low-nutrient conditions. Seed production, but not plant size or growth rate is significantly, albeit slightly reduced at moderate infestation densities; heavier infestations may provide more impact on immature plant stages (Hettiarachchi *et al.,* 2018). *Pseudomonas* bacteria may be a promising option for control (Johnson *et al.,* 2012). Both these options require more research before release and are not currently approved as biocontrol agents in the United States.

## CHEMICAL:

Herbicides can effectively reduce marsh thistle. These should be applied when the rosettes are still small or before the development of flowering stalks. The ideal time for applying herbicide treatments (e.g. spot-applications in invaded native communities or broad applications in agricultural landscapes) is when thistle density is low or during an early invasion stage to ensure success while minimizing the costs and risks associated with herbicides. Herbicides are effective only when applied at certain timings and when combined with complementary controls that exploit the susceptibility of these biennial plants to density-independent processes early in the life cycle such as achene germination, rosette establishment and reproductive stalk formation (Hettiarachchi *et al.,* 2018; Graeve, 2012).

## RATIONALE FOR LISTING:

Marsh thistle is rapidly expanding in North America (Flora of North America) and shows a high potential for expansion in Washington State. Only 20 years are needed from first detection to being considered established (Cao *et al.*, 2018). The possibility of hybridization with *C. arvense*, and *C. palustre's* proclivity to at-risk habitats, like wetlands, combined with its growth height and monoculture-forming habits, could lead to massive impacts to agricultural and natural resources (Johnson, 2024).

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