Perennial Pepperweed

Foreign invader in California's wildlands

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Mark Renz[1], Carl E. Bell[2], Cheryl Wilen[3] and Joseph M. DiTomaso[1]
[1] UC Davis; [2] UCCE Imperial County; [3] UCIPM/UCCE San Diego County

What is it?

Perennial pepperweed (*Lepidium latifolium)* is a herbaceous plant in the mustard family. Plants survive several years and produce very thick, monospecific stands, especially in moist areas such as wetlands and along rivers and creeks. Perennial pepperweed has other common names, including tall whitetop, perennial peppercress, ironweed, perennial peppergrass, and broad-leaved pepperweed. Botanically it has also been called *Cardaria latifolia*.

seedling

Plants start from seed or pieces of perennial root. In early spring, the plant emerges from these perennial roots as a rosette, a growth form in which the leaves spread radially from the stem and stay very close to the ground. Later in the spring, the rosette will produce a flowering shoot. These shoots grow 2 to 5 feet tall and begin to flower in late spring in the Central Valley and later in more mountainous regions. Leaves are elongated, about 1 to 2 inches wide and 4 to 12 inches long. These leaves lack hairs, have either smooth or slightly toothed margins and are grey-green in color.

basal rosette

Perennial pepperweed is often confused with hoary cress (whitetop.) Plants can be discerned by comparing the leaf attachment to the stem. Hoary cress leaves clasp the stem while perennial pepperweed leaves do not.

Hoary cress

Perennial pepperweed

Semi-woody crown and perennial roots of perennial pepperweed

Each shoot will produce thousands of small, white, cross-shaped flowers. Each flower results in one small seed capsule containing two seeds. A thick infestation of perennial pepperweed has been estimated to produce over 6 billion seed per acre. These seed are apparently short-lived in the field and do not appear to germinate well, but may still contribute to the spread of perennial pepperweed to new locations.

Perennial pepperweed creates an extensive perennial root system that reaches depths greater than 10 feet in the soil to reach the water table. This underground system becomes established early in the life of the plant and can persist for several years. The roots spread laterally from the parent plant up to 10 feet per year.

Where is it from?

Perennial pepperweed is native to an area extending from southeastern Europe to southwestern Asia. It is common in disturbed sites throughout Europe.

The genus *Lepidium* is fairly large with about 175 species worldwide. In California there are 15 native species and 5 introduced species, including perennial pepperweed.

How did it get here?

The exact origin of this species in the U.S. is unknown, but it is widespread along the east coast of the U.S. The first recorded sighting of perennial pepperweed in California was in 1936 on a ranch in Stanislaus County. It was also grown as a cut flower crop in parts of California. In recent years, it is thought to be spreading in contaminated hay or straw bales. The perennial roots can also float downstream to establish new infestations.

If allowed to persist perennial pepperweed can create large, dense infestations in a wide range of habitats. These infestations are extremely competitive and as a result few plant species can establish within these stands.

Where is it now?

Today, perennial pepperweed is a weed problem in all of the 48 contiguous states except Arizona. In California, only the very wettest areas of the northwest coast and the driest areas of the Lower Colorado River Desert are not currently infested with perennial pepperweed. Infestations are also reported in Canada, Mexico, and Australia.

Perennial pepperweed can survive in a wide variety of habitats, from open areas in coniferous forests at elevations over 9000 feet to coastal marshes at sea level. Infestations are often found along roadsides, in hay fields, and in disturbed soils. The preferred habitat is a wetland, especially in saline or alkaline soil. Perennial pepperweed thrives best in a Mediterranean climate characteristic to most of California.

Why is it a problem?

Perennial pepperweed has invaded thousands of acres of natural habitat, especially riparian zones, throughout California and other western states. It is also an agricultural weed, infesting thousands of acres of rangeland, grass pasture, hay and row crops. Perennial pepperweed root fragments or seed are often transported when hay or straw are used to feed horses or mules in backcountry areas or used as mulch in natural areas. Once introduced from seed or root fragments, perennial pepperweed can rapidly occupy disturbed sites.

Due to the perennial nature of these roots, plants can regenerate from small root fragments. This is believed to be the most common method of dispersal of perennial pepperweed.

Over time, this invasive plant will eventually displace the native plant community. Loss of the native vegetation generally leads to a decrease in nesting sites for birds and habitat for native rodents, reptiles, and mammals. Native trees, such as willow and cottonwood, do not establish well in the thick stands of perennial pepperweed. Furthermore, dense stands along a section of stream or riverbank do not adequately bind soil, thus resulting in increased erosion during floods.

Perennial pepperweed also acts as a "salt pump," bringing salts from deep in the soil up through the roots and depositing them on the soil surface. The increased soil salinity further inhibits growth of existing native plants or prevents them from re-establishing in an infested area. Left uncontrolled, perennial pepperweed will completely transform native habitats to more saline areas dominated by salt-tolerant non-native species.

Perennial pepperweed readily invades riparian areas and prevents the establishment or regeneration of native trees and herbaceous plant species.

What can be done to control perennial pepperweed?

This weed has proven to be very difficult to control, especially in sensitive wetland ecosystems. Maximum efforts should be made to prevent moving perennial pepperweed to uninfested sites and to eradicate small invasions before they become established. Sites with new perennial pepperweed infestations, or ones likely to be invaded should be monitored frequently. A visit to the site in early spring is recommended because pepperweed is typically one of the first plants to emerge from winter dormancy and the rosette stage is easy to recognize. Another visit in late summer is suggested to look for senesced stems, flowers, and for new rosettes produced by spreading roots.

Perennial pepperweed is frequently found lining rivers and ditchbanks. These areas are very important and if allowed to persist, can allow root fragments and seeds to be transported downstream and potentially establish new infestations.

When infestations are spotty and scattered, the best approach is to first kill the outlying populations to prevent spread and then work towards the center or origin of the invasion. Plants in outlying areas are younger and should be easier to kill. Control of invasive plants should use an integrated approach combining a variety of methods. The most effective control strategies for perennial pepperweed have been combinations of chemical and mechanical methods. Because perennial pepperweed has numerous relatives in California, including several rare species, no biological control agents have been developed.

Physical methods of weed control typically include burning, mowing, disking, and flooding. Burning is not effective for perennial pepperweed. Plants do not burn easily and the underground roots are unaffected and recover rapidly. Long-term flooding is effective, but only if the area is completely inundated for two growing seasons. Mowing or disking early in the season will reduce the leaf area of resprouts and decrease the number of seed set later in the season, but has limited long-term impact on perennial pepperweed. Disking can increase an infestation by cutting the roots into smaller pieces and spreading the fragments. Because perennial pepperweed often grows with native plants, mowing, disking, or the broadscale use of herbicides is difficult or impossible to do without causing damage to desirable plants.

Herbicides, especially when integrated with mechanical methods, are effective for controlling perennial pepperweed infestations. There are several herbicides available for use on perennial pepperweed, but there are restrictions on their use in specific environments. Since the legal requirements associated with herbicide use are important and these tend to change frequently, specific recommendations are not included in this document. The resources in Table 1 list the most current information on herbicides used to control perennial pepperweed. As a general guideline to herbicides it is important to use the recommended dosage of the herbicide at the optimum time of the year. Applying herbicide to resprouts is typically more effective than spraying mature plants. Care should be taken to avoid damage to non-target plants.

Growth habit of an isolated perennial pepperweed plant

Resources for more detailed information on perennial pepperweed, especially in regard to recommended control practices, are available at the following websites:

- **UC Weed Research & Information Center** (http://wric.ucdavis.edu)
- **California Invasive Plant Council** (http://www.cal-ipc.org)
- **The Nature Conservancy** (http://tncinvasives.ucdavis.edu)

Table 1. Herbicide control options for perennial pepperweed. Applications should be made to plants in the flower bud to early flowering stage. If incorporating mowing, mow plants early in the season (bolting to flower bud stage) and then allow plants to resprout before making applications. For specific information regarding these products please consult the label.

Herbicide	Site	Restrictions	Effectiveness
Telar® (chlorsulfuron)	Noncrop industrial	Selective herbicide (will not harm most grasses), do not apply near water.	Excellent control for 1-2 years
Arsenal®/Chopper®/Habitat® (imazapyr)	Forestry	Nonselective herbicide, do not apply near water. Habitat for areas near/in aquatic sites.	Excellent control for 1-2 years. Treated areas typically remain void of any vegetation for 1-2 years after treatment.
Stalker (imazapyr)	Noncrop industrial	Nonselective herbicide, do not apply near water.	Excellent control for 1-2 years. Treated areas typically remain void of any vegetation for 1-2 years after treatment.
Roundup® and others (glyphosate)	Wildlands	Nonselective herbicide. Rodeo for areas near/in aquatic sites.	Effective unless infestation is dense. If dense, mow area and apply to resprouting plants.
Rodeo® and others (glyphosate)	Aquatic	Nonselective herbicide. Rodeo for areas near/in aquatic sites.	Effective unless infestation is dense. If dense, mow area and apply to resprouting plants.
Weedar 64® (2,4-D)	Wildlands and Aquatic	Selective herbicide (will not harm grasses)	Somewhat effective unless infestation is dense. If dense, mow area and apply to resprouting plants.

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products that are not mentioned.

WARNING ON THE USE OF CHEMICALS

Pesticides are poisonous. Always read and carefully follow all precautions and safety recommendations given on the container label. Store all chemicals in the original labeled containers in a locked cabinet or shed, away from food or feeds, and out of the reach of children, unauthorized persons, pets, and livestock.

Confine chemicals to the property being treated. Avoid drift onto neighboring properties, especially gardens containing fruits or vegetables ready to be picked.

Do not place containers containing pesticide in the trash nor pour pesticides down sink or toilet. Either use the pesticide according to the label or take unwanted pesticides to a Household Hazardous Waste Collection site. Contact your county agricultural commissioner for additional information on safe container disposal and for the location of the Hazardous Waste Collection site nearest you. Dispose of empty containers by following label directions. Never reuse or burn the containers or dispose of them in such a manner that they may contaminate water supplies or natural waterways.

UC **WEED** Research & Information Center
UC Davis ■ Dept. of Plant Sciences ■ One Shields Avenue, MS4 ■ Davis, CA 95616
(530) 752-1748 ■ http://wric.ucdavis.edu ■ wric@ucdavis.edu