
PERENNIAL PEPPERWEED

Integrated Pest Management for Home Gardeners and Landscape Professionals

Perennial pepperweed (*Lepidium latifolium*) (Figure 1), an introduced plant from southeastern Europe and Asia, is invasive throughout the western United States. It can establish in a wide range of environments and is a common problem in flood plains, irrigation structures, pastures, wetlands, riparian areas, roadsides, and residential sites (Figure 2). Recent surveys identify perennial pepperweed as a weed problem in nearly all of California, and both the California Department of Food and Agriculture (CDFA) and California Invasive Plant Council (Cal-IPC) list it as a noxious weed of great ecological concern. Populations form dense monocultures that are easily spread by root fragments and seed. Perennial pepperweed has many common names including tall whitetop, perennial peppergrass, and broad-leaved pepperweed.



Figure 1. Mature plant of perennial pepperweed, *Lepidium latifolium*.



Figure 2. Infestation of perennial pepperweed.



Figure 3. Woody crown and roots.



Figure 4. Flower of perennial pepperweed.

IDENTIFICATION

Perennial pepperweed is a member of the mustard family, Brassicaceae. Stems range from 2 feet to over 4 feet tall. Mature plants have numerous erect, semi-woody stems that originate from large, interconnected roots. Roots are long, minimally branched, and enlarged at the soil surface forming a semi-woody crown (Figure 3). The foliage is smooth and green to gray-green in color. Rosette leaves are ovate to oblong with smooth to slightly toothed margins on long stalks. Rosette leaves are about 4 to 11 inches long and 1 to 3 inches wide. Stem leaves attach directly to the base of the plant, are shaped like a lance with smooth to toothed margins, and become smaller toward the top of the stem. Small, white flowers form dense clusters arranged in panicles at the tip of each stem (Figure 4). Perennial pepperweed is often confused with hoary cress (*Cardaria draba*),

also called whitetop. However, unlike the taller perennial pepperweed, hoary cress stems are less than 3 ft tall and have leaves that clasp the stem and lack an obvious stalk.

LIFE CYCLE

Perennial pepperweed is a long-lived herbaceous perennial that thrives in seasonally wet areas or areas with a high water table. Perennial pepperweed is typically found invading fine-texture, saline/sodic soils, although populations can establish and persist on coarse-textured, alluvial soils. Plants reproduce from perennial roots or seed (Figure 5). In early spring, new shoots emerge from root buds forming low-growing rosettes (Figure 6). Plants remain in the rosette stage for several weeks before developing a flowering stem. Flowering typically begins in late spring with mature seed being



Figure 5. Fruit (left) and seeds of perennial pepperweed.



Figure 6. Basal rosette of perennial pepperweed, *Lepidium latifolium*.

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produced by mid-summer. After seed production, flowering shoots die back, although rosettes can emerge again in fall and persist through winter in frost-free areas. Dead stems are slow to decay and accumulate over time forming dense thickets that prevent growth of desirable species. Perennial pepperweed is a prolific seed producer. Laboratory tests suggest seeds germinate readily with fluctuating temperatures and adequate moisture; however, seeds do not appear to remain viable in the soil for extended periods.

Established perennial pepperweed plants develop an extensive root system capable of storing large amounts of energy. Root segments also produce random buds capable of generating new shoots. Perennial pepperweed's root system is the foundation of its competitiveness and the major target of control efforts.

IMPACT

Perennial pepperweed can rapidly form large, dense stands that displace desirable vegetation. Populations easily spread along waterways and can infest entire stream corridors, riparian areas, or irrigation structures. Flooded streams often wash away roots growing along the streambank; however, new infestations can develop downstream. Once established, perennial pepperweed is persistent and difficult to control in crops, natural areas, and ornamental plantings. Perennial pepperweed reduces forage quality in hay or pasture.

MANAGEMENT IN ORNAMENTAL PLANTINGS AND HOME LANDSCAPES

Prevention is the best management strategy for avoiding problems with perennial pepperweed in and around home landscapes. If perennial pepperweed is found growing in landscaped areas, immediately control the plant before it can spread. Pulling plants (try and remove as much of the root as possible) is an effective way of controlling a few scattered plants growing within landscaped areas. Use of glyphosate (Roundup and other products) is an

other option, but care must be taken to avoid injuring nearby desirable plants. Large populations of perennial pepperweed are unusual in landscape areas, unless new housing or commercial developments have been built on infested land.

To control perennial pepperweed infestations apply glyphosate to the entire infestation before landscaping newly developed areas. It takes a few weeks for the herbicide to translocate (move) to the roots. After the initial herbicide treatment, carry out any necessary soil preparation activities. An additional 2 to 6 months wait period is required before seeding or transplanting desired vegetation to allow any remaining pepperweed to resprout so it can be treated again. Once perennial pepperweed ceases to resprout, apply landscape fabric or mulch and transplant closely spaced herbaceous plants to prevent invasion. If resprouts grow through or around mulch barriers, hand pull or spot treat them with glyphosate. Turf is a suitable ground cover for preventing reinvasion of perennial pepperweed. A frequent mowing schedule and common herbicide (2, 4-D) used for turf management should inhibit perennial pepperweed establishment.

MANAGEMENT IN PASTURES, RANGELAND, RIGHTS-OF-WAY, AND CROPS

Established perennial pepperweed populations are difficult to control and require multiple years of intensive management. Suppressing the extensive root system is critical for successful control. A management program should include prevention, monitoring, and treatment of small satellite populations before plants develop extensive roots. If large populations exist, focus management on containing the infestation and preventing further spread to surrounding areas.

Prevention

Prevention is the foundation of any weed management program. Techniques that prevent perennial pepperweed establishment save time and

resources in the future. Perennial pepperweed root fragments or seed have been found in straw, hay bales, mulch, and crop seed; be sure that these items are free of weed seed and propagules before applying them to an area. Periodic surveys of property lines, roadsides, waterways, and riparian corridors help detect new infestations before they become well established. If construction or soil disturbance occurs in infested areas, make sure root fragments and seed are not transported to other sites. Always clean vehicles, machinery, and clothing after visiting infested areas. If livestock graze perennial pepperweed, hold the animals in closely monitored paddocks for several days to allow seed to pass through their digestive system before transporting them to new areas.

Cultural Control

Establishing and maintaining competitive perennial vegetation can dramatically slow the introduction and spread of perennial pepperweed. Vigorous sod-forming grasses, alfalfa, or cropping systems with annual tillage help prevent perennial pepperweed introduction and establishment in agricultural areas. Closely spaced plantings of herbaceous perennials, shade trees, and/or fabric or plastic mulches can help prevent its introduction in ornamentals.

Hand Pulling, Tillage, and Tarping.

Seedlings are easily controlled by hand pulling or tillage, but these techniques do not control established plants because shoots quickly resprout from the vast root reserves. Root segments as small as 1 inch are capable of producing new shoots. Perennial pepperweed is less affected by tarping and solarization than annual species due to its large perennial root structure. Research with tarping has been inconsistent. The best control with tarping was obtained using thick, black plastic secured over the infested area for two growing seasons. Mowing and tilling the site before tarping can improve control compared with mowing and tarping alone. It is important to extend the plastic tarp at least 10 feet on all sides of the infested area as creeping roots can spread laterally up

to 10 feet. Tent solarization can be used to kill seeds and roots after hand pulling if disposal of pulled plants is not possible.

Mowing and Burning. Mowing and burning are not effective in reducing perennial pepperweed stands, but they are helpful in removing accumulated thatch. Perennial pepperweed thatch burns best in winter or spring under dry conditions before initiation of spring growth. Mowing breaks old stems into small fragments and helps prevent shading of favorable species. Mowing also stimulates perennial pepperweed plants to resprout and produce new growth. Combining mowing with herbicides has been shown to be an effective control strategy. For best results, mow plants at the flower bud stage and apply herbicides to resprouting shoots once they have reached the flower bud stage.

Revegetation. Establishing desirable vegetation in disturbed areas is crucial to managing perennial pepperweed and preventing future weed problems. Because perennial pepperweed is very competitive, seed or transplant desirable vegetation after dense perennial pepperweed stands are controlled. Choose vigorous, fast growing plant species that are adapted to the site. Perennial grasses are a good choice for natural areas and pastures. Grasses are tolerant of some selective herbicides used for perennial pepperweed control and over time form a thick sod that prevents future weed establishment. In pastures, promote grass expansion and vigor with fertilization and grazing management.

Chemical Control

Several postemergent herbicides control perennial pepperweed, but repeat applications are usually necessary for several years to treat resprouting

shoots and seedlings. Extended control with herbicides is greatly enhanced by establishing competitive vegetation at the site. In areas with a dense buildup of thatch, mow or burn old shoots before applying herbicides.

Herbicide application timing is critical. Herbicides work best when applied at the flower bud stage and worst at the rosette or early bolting stage. Because plant phenology differs between location and year, regularly observe infested areas in spring and begin applying herbicides when flower buds appear. If herbicide cannot be applied at the flower bud stage, mow plants and apply the herbicide to regrowth. With seedlings, apply herbicides as soon as possible to prevent plants from producing new lateral shoots from the root. Herbicide choice depends on label restrictions, land use objectives, and cost. See Table 1 for a summary of effective herbicide choices.

Table 1. Summary of Herbicides Available to Control Perennial Pepperweed in Rangeland, Pasture, Rights-of-Way, and Crop Situations. (Most products are NOT for use in home gardens and residential landscapes.)

Herbicide (trade name)	Site	Rate*	Efficacy	Comments
chlorsulfuron (Telar)	rangeland, pasture, noncrop areas	0.75-1.5 oz a.i.	Most effective herbicide; provides 1-3 years of over 90% control.	Has soil residual activity. Selectively controls many broadleaf plants. Do not apply near sensitive crops or water. Add a nonionic surfactant.
2, 4-D ester or amine (several names)	rangeland, pasture, noncrop areas, ditches	1-2 lb a.e.	Yearly applications required for 2 or more years to control established stands. Provides between 50-70% control one year after treatment.	Inexpensive. Selectively controls broadleaf plants. Multiple applications necessary because plants often resprout after treatment. Do not apply near sensitive broadleaf plants. Add a nonionic surfactant.
glyphosate (Roundup, Rodeo, Aquamaster, and others)	rangeland, pasture, crops, ditches, aquatic sites, wetlands, riparian areas, noncrop areas	2-3 lb a.e./a.i.	Variable results. Provides between 40-85% control one year after treatment. Repeat applications needed to control established stands.	Nonselective. If thatch is dense, mow and apply to resprouting plants. Good treatment if reseeding after application. Add a nonionic surfactant.
imazamox (Raptor)	alfalfa, "Clearfield" crops (see label)	0.046 lb a.i.	Provides good season-long suppression. One application per year needed to control established plants.	Has soil residual activity. Apply to spring rosettes in crops. Controls several broadleaf and annual grass species. Add methylated seed oil and nitrogen fertilizer.
imazapyr (Stalker, Arsenal, Habitat)	noncrop areas, fence rows, highway rights-of-way, specified aquatic sites	consult label	Provides between 85-95% control one year after treatment.	Has soil residual activity. Nonselective at rates applied. Controls most grasses and some broadleaf plants. Do not use in rangeland or pasture.
imazethapyr (Pursuit)	alfalfa, edible legumes (see label)	0.093 lb a.i.	Provides season-long suppression in alfalfa. Repeat applications needed to control established plants.	Has soil residual activity. Apply to fall or spring rosettes in crops. Add methylated seed oil and nitrogen fertilizer for postemergence control.

* a.i. = active ingredient; a.e. = acid equivalent

REFERENCES

UC Weed Research and Information Center: available online at <http://wric.ucdavis.edu/>.

Hutchinson, R. A. and J. H. Viers. 2011. Tarping as an Alternative for Perennial Pepperweed (*Lepidium latifolium*) Control. *Invasive Plant Science and Management*, January-March, 4(1):66-72.

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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.

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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.

Pesticides applied in your home and landscape can move and contaminate creeks, rivers, and oceans. 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 or pour pesticides down the 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 Household 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.

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