



Western Waterhemlock in the Pacific Northwest

A PACIFIC NORTHWEST EXTENSION PUBLICATION • PNW109

Introduction

Western waterhemlock (*Cicuta douglasii*) is also known as wild parsnip, poison parsnip, Douglas waterhemlock, cowbane, beaver poison, and *Cicuta*. It is a native herbaceous forb in the Apiaceae (carrot) family that grows throughout much of the Pacific Northwest and in wet places along streams, irrigation ditches, and sloughs in the western United States and Canada. It is usually considered a perennial; however, it is more correctly classified as a biennial because it does not produce seed until its second year of growth.

Western waterhemlock is the most poisonous plant in North America. All plant parts are toxic, with the fleshy rootstock and roots being the most poisonous; a piece of root no larger than a walnut can kill a mature cow. These plants are most toxic in the spring and fall, but even dried plants, such as those contaminating hay or silage, retain their toxicity.

Identification

The fact that western waterhemlock only grows in wet areas is helpful for identifying it. Western waterhemlock grows from 2 to 8 feet tall, depending on its location (i.e., smaller statures correspond to higher elevations). Stems are hollow, smooth, and pale green (Figure 1). Unlike other members of the Apiaceae (formerly known as the Umbelliferae) family, the mature plant has a crown of finger-like roots that extend up to 10 inches horizontally or vertically just below the soil surface. These roots resemble artichoke tubers or poorly-shaped sweet potatoes. The bulbous structures are hollow except for several partitions that form distinct chambers, which give a corrugated or ribbed appearance to the cut lower stem and root (Figure 2). The distance between partitions is about 1/4 inch or less, depending on the plant's age and growth stage. The cut root exudes a yellow, oily, sweet-smelling liquid, and if immersed in water, an oily, soapy film will form on the water surface (Mulligan 1980).

The leaves of western waterhemlock are arranged like a feather, dividing 1–3 times into narrow-toothed and lance-shaped leaflets that are 1–4 inches long (Figure 3). The



Figure 1. Hollow stems of western waterhemlock. Photo by G.D. Carr.



Figure 2. Root of western waterhemlock. Photo by Rich Old, XID Services.



Figure 3. Leaves of western waterhemlock. Photo by J.M. DiTomaso, University of California-Davis, Bugwood.org.



Figure 4. Western waterhemlock leaf venation. Photo by Rich Old, XID Services.

leaflet veins run from the midrib to the notches along the leaf edges and then branch to the teeth-like tips (Figure 4). In contrast, almost all other plants with similar leaves have small veins running from a large central vein directly to the ends of the sawtoothed edges on the leaf margins.

Western waterhemlock produces small white flowers in double umbrella-like arrangements from 2 to 5 inches in diameter, imparting a lace-like appearance to the cluster (Figure 5). There can be 15–20 flower clusters on a single plant, borne on branches at or near the top of the plant. Blooms last from June to September. The seeds are about 1/12 inch long, egg or kidney-shaped, with corky ridges that are somewhat flattened on the sides.



Figure 5. Western waterhemlock flower cluster. Photo by Bud Kovalchik.

Similar Plants

Other species of *Cicuta*, including bulb-bearing waterhemlock (*C. bulbifera*) and spotted waterhemlock (*C. maculata*), grow only occasionally in the Pacific Northwest. Bulb-bearing waterhemlock differs from western waterhemlock in that it has bulbils in its upper leaf axils (Figure 6), while spotted waterhemlock is often shorter than western waterhemlock and has purple-streaked stems. The spotted waterhemlock *bolanderi* variety often inhabits salt marshes. Like western waterhemlock, both bulb-bearing waterhemlock and spotted waterhemlock are highly toxic.

Poison hemlock (*Conium maculatum*) is another toxic plant that displays white flowers in an umbrella-shaped arrangement. It is considered an invasive weed throughout most of North America, and is commonly seen along roadsides. This plant can sometimes be found cohabitating with western waterhemlock. One definitive difference between the two species is that poison hemlock shows spotting on the stems throughout the plant.

Seven other genera of plants belonging to the family Apiaceae are somewhat similar in appearance to western waterhemlock, although these are useful, non-toxic forage plants: 1) *Heraclium lanatum* or cow parsnip, 2) *Sium suave* or water parsnip, 3) *Angelica* spp., 4) *Osmorhiza* or



Figure 6. Bulbils in the upper leaf axils of bulb-bearing waterhemlock. Photo by Matthew L. Wagner, University of Wisconsin-Stevens Point.



















	Mature plant (i)	Flower (ii)	Stem (iii)
Western waterhemlock (A)			
Bulb-bearing waterhemlock (B)			
Spotted waterhemlock (C)			
Poison hemlock (D)			
Cow parsnip (E)			
Water parsnip (F)			

Figure 7. Western waterhemlock and look-alike plant species. A–D represent toxic plants, while E–K represent non-toxic plants. Photos Ai and Aii by Bud Kovalchi; Aiii by Brad Kelley; Bi, Bii, and Biii by Louis-M. Landry; Ci, Cii, and Ciii by Karan A. Rawlins, University of Georgia; Di, Dii, Diii, Ei, and Eii by Rich Old, XID Services; Eiii by Ben Legler; Fi, Fii, and Fiii by Mary Ellen Harte.


	Mature plant (i)	Flower (ii)	Stem (iii)
Angelica (G)			
Sweet cicely (H)			
Wild parsnip (I)			
Wild carrot (J)			
Water parsley (K)			

Figure 7 (continued). Western waterhemlock and look-alike plant species. A–D represent toxic plants, while E–K represent non-toxic plants. Photos Gi, Gii, Giii, Hi, and Hii by Mary Ellen Harte; Hiii by Walter Siegmund; Ii by Linda Haugen, USDA Forest Service; Iii and Jiii by Ohio State Weed Lab Archive; Iiii by Leslie J. Mehrhoff, University of Connecticut; Ji by Chris Evans, Illinois Wildlife Action Plan; Jii by Rob Routledge, Sault College; and Ki, Kii, and Kiii by Ben Legler, University of Washington Herbarium.

sweet cicely, 5) *Pastinaca sativa* or wild parsnip, 6) *Daucus carota*, wild carrot or Queen Anne's lace, and 7) *Oenanthe sarmentosa* or water parsley, (Royer and Dickerson 1999).

Because the hazardous species are commonly confused with the desirable species, it is important to distinguish between them. To assist with identification, Figure 7 lists the flower and stem similarities and differences for these toxic (A–D) and non-toxic (E–K) look-alike plants.

The best way to avoid livestock losses from western waterhemlock poisoning is to keep enough desirable forage growing on grazing or pasture land. Barn lots, lanes, irrigation ditches, and other heavily grazed areas should be kept free of this weed. Areas known to be infested with western waterhemlock, especially in the early spring, need to be strictly avoided by using fencing or by moving livestock. Similarly, it is critical when constructing ditches or clearing land to avoid exposing the toxic roots of the western hemlock, which then can be more easily ingested by livestock.

Dispersal

Western waterhemlock reproduces from seed and vegetatively through overwintering root structures. Seeds from plants growing along irrigation canals can be transported by water or mud to other locations and can remain viable in soil for up to 3 years. Western waterhemlock can also be spread by living rootstock in flood and irrigation water. The roots pull up easily from wet ground and are typically scattered by land leveling and cleaning, or ditch construction. Most crop habitats do not favor establishment and growth of western waterhemlock; therefore, it seldom contaminates agricultural crops.

Toxicity

Western waterhemlock can be a threat when growing in locations where livestock and people have easy access to it. Cicutoxin, an unsaturated alcohol with a pungent parsnip-like odor, is a toxic compound in the tissues of western waterhemlock that attacks the nervous system if ingested (Schep et al. 2009). The roots are the most toxic part of the waterhemlock plant, so never use the same knife for cutting its roots and food preparation; any residue on the blade could result in human poisoning. Children have reportedly fatally mistaken the sweet-smelling roots for something edible. Death can also occur from making peashooters and whistles out of the hollow stems of this plant.

Most livestock deaths from western waterhemlock occur in the early spring because the plant is among the first to emerge (Panter et al. 2011b). However, the death of poisoned livestock is often mistakenly attributed to other causes. Although new growth is only slightly toxic, the moist and soft soil makes it easier for animals to pull up and ingest the roots. Most losses are encountered among cattle, but horses, sheep, and swine are sometimes killed (Panter et al. 2011a).

Symptoms resulting from cicutoxin ingestion are similar in livestock and humans, and the toxic effects are rapid and severe. Early symptoms of poisoning are excessive saliva-

tion followed by loss of muscular control. Affected animals walk stiffly, sway, and may collapse. They often froth and quiver at the mouth and nose. Violent convulsions, clamping of the jaws, grating of the teeth, rapid kicking, and sometimes stiffening of the legs follow. The animal's pulse becomes weak and rapid, and breathing becomes labored and irregular. Convulsions are intermittent and increase in violence in fatal cases (Muenscher 1975).

Death typically occurs during a seizure due to suffocation or after a seizure due to respiratory arrest. Sometimes livestock die within 15 minutes after ingesting western waterhemlock, but ordinarily this is 3–4 hours. Occasionally, when animals ingest only a small quantity of aboveground plant parts, they will show symptoms of poisoning for several days and then recover. However, even small amounts of the plant's root are fatal, and death follows more frequently than not. Poisoning from eating the roots can occur from plants removed from the ground for as long as 3 years.

Death can be prevented by controlling seizures with injected barbiturates, but intervention must occur soon after signs of poisoning become evident. In cases of western waterhemlock poisoning in humans, first induce vomiting to remove as much of the toxin as possible, and then seek medical assistance immediately.

Management

The best way to avoid livestock losses from western waterhemlock poisoning is to keep enough desirable forage growing on grazing or pasture land. Make sure that barn lots, lanes, irrigation ditches, and other heavily grazed areas are free of this plant. Either move livestock or fence them out of areas known to be infested with western waterhemlock, especially in the early spring. Similarly, it is critical when constructing ditches or clearing land to avoid exposing the toxic roots of the western hemlock, which then can be more easily ingested by livestock.

No biological control agents for western waterhemlock are presently known. Pulling up or digging scattered plants out of moist soil can be an effective means of control, but you will also need to burn extracted plants to prevent livestock consumption. Always wear gloves and protective clothing when handling these plants. If feasible, drain wet areas where this toxic weed thrives to help with long-term control.

Chemical control options for western waterhemlock include 2,4-D and MCPA at a rate of 2 pounds of acid equivalent per acre (ae/acre). Treat plants during the bud-to-early-bloom growth stage to achieve the best control. Because the leaves and stems of this plant increase in palatability immediately following an herbicide application, animals must be kept away from treated plants for at least 3 weeks. Chemical treatment of western waterhemlock may require repeated applications to deplete the seed bank.

Herbicides sprayed within 50 feet of a water body can pose significant environmental hazards. Contact your state department of ecology to ensure that any and all necessary permits have been obtained. Contact your local weed con-

trol authority for specific herbicide recommendations.

Refer to the *Pacific Northwest Weed Management Handbook* for specific herbicide recommendations that target western waterhemlock. This handbook is available from Extension offices in Washington, Oregon, and Idaho; the companion website is at <http://pnwhandbooks.org/weed/>. Consult herbicide labels for specific livestock grazing restrictions.

References

Muenschler, W.C. 1975. *Poisonous Plants of the United States*. New York: Macmillan Publishing.

Mulligan, G.A. 1980. The Genus *Cicuta* in North America. *Canadian Journal of Botany* 58(16): 1755-1767.

Panter, K.E., D.R. Gardner, B.L. Stegelmeier, K.D. Welch, and D. Holstege. 2011a. Water Hemlock Poisoning in Cattle: Ingestion of Immature *Cicuta maculate* Seed as the Probable Cause. *Toxicon* 57(1): 157-161. <http://www.sciencedirect.com/science/article/pii/S0041010110004058#>.

Panter, K.E., M.H. Ralphs, J.A. Pfister, D.R. Gardner, B.L. Stegelmeier, S.T. Lee, K.D. Welch, B.T. Green, T.Z. Davis, and D. Cook. 2011b. *Plants Poisonous to Livestock in the Western States*. USDA Agriculture Information Bulletin 415. <http://permanent.access.gpo.gov/gpo9389/PoisonousPlants.pdf>.

Royer, F. and R. Dickinson. 1999. *Weeds of the Northern U.S. and Canada*. Renton, WA: Lone Pine Publishing.

Schep, L.J., R.J. Slaughter, G. Becket, and D.M. Beasley. 2009. Poisoning Due to Water Hemlock. *Clinical Toxicology* 47(4): 270-278.

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Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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PNW109