

Field Guide for Managing Poison Hemlock in the Southwest



Cover Photos

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Poison hemlock (*Conium maculatum* L.)

Carrot family (Apiaceae)

Poison hemlock is reported as invasive in Arizona and is listed as a noxious weed in New Mexico. This field guide serves as the U.S. Forest Service's recommendations for management of poison hemlock in forests, woodlands, and rangelands associated with its Southwestern Region. The Southwestern Region covers Arizona and New Mexico, which together have 11 national forests. The Region also includes four national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

Description

Poison hemlock (synonyms: poison parsley, carrot fern, spotted hemlock) is a highly toxic, introduced weed that can be fatally mistaken for edible wild parsnip. Native to Eurasia and northern Africa, it is common in the eastern United States and is spreading in Western States. The leaf features of poison hemlock distinguish it from water hemlock and giant hogweed.

Growth Characteristics

- Winter annual or biennial, herbaceous, broadleaf plant growing erect 3 to 8 feet tall.
- Early growth stage is a large rosette; stem and flowers develop during the second year.
- Stems are green with purple spots; ribbed, freely branched, hollow and without hair.
- Leaves are triangular (8 to 16 inches), lacey, fern-like, more finely divided and smaller than giant hogweed; leaf veins end at the tips of teeth, not at notches like water hemlock.
- Small, white flowers have five parts; occur in umbrella-like clusters during June to August.
- Fleshy, tuber-like, white taproot; smells like cow parsnip and looks like wild carrot. However, parsnip has palmate leaves and wild carrot has hair on its stem and leaves.
- Reproduces solely via seed; seeds are 1/8 inches long, barrel shaped, ribbed and look similar to anise. One plant may produce up to 30,000 seeds that

remain viable for 3 to 6 years.

- Poison hemlock has a rank, cat urine-like odor that is especially noticeable in midsummer or when leaves are crushed.

Ecology

Impacts/threats

Poison hemlock is a lethal plant with toxins mostly concentrated in the seed, lower stem, and roots. Even small portions accidentally consumed can result in respiratory paralysis, coma, and death if treatment is not administered within 3 hours of ingestion. Poison hemlock reduces the availability of quality forage for cattle and horses, contaminates haying operations, degrades wildlife habitat, reduces flora and fauna species diversity, and decreases land value.

Location

This weed prefers moist, shaded habitats subject to frequent disturbance such as those found along riparian woodlands, streambanks, and ditchbanks. Once established, it can migrate to drier upland sites. It may invade pastures, rangeland, along the perimeter of cultivated fields, and roadsides.

Spread

Most seed germinates wherever it falls near the parent plant, thereby contributing to stand density. Seed is easily dispersed by water, humans, birds, and rodents; it is also spread over long distances by adhering to surfaces and undercarriages of road vehicles and road maintenance equipment.

Invasive Features

Flower stems of poison hemlock persist through the winter, thereby allowing a long seed dispersal period (from September through February). Germination requirements are not specific; new plants may propagate any month of the year. Its long taproot allows access to deeper soil moisture. Prolific seed production coupled with high germination rates and 3-year seed viability make this weed highly competitive.

Management

Early detection and management of small populations before they can expand into larger populations is extremely important for poison hemlock control. Due to copious seed production and a high germination rate, unmanaged small populations may grow quickly and become more difficult to eradicate. Small, isolated infestations on otherwise healthy sites should be given high priority for treatment. Perimeters of infestations should be treated first and then worked toward the center. Regardless of the approach followed, it must be recognized that poison hemlock cannot be effectively controlled within a single year or by using only one method. Complete control will likely require 3 to 6 years of repeated management methods. The following actions should be considered when planning an overall management approach:

- Healthy plant communities should be maintained to limit poison hemlock infestations.
- Detect, map, and eradicate new populations of poison hemlock as early as possible. Keep annual records of reported infestations.
- Implement monitoring and a followup treatment plan for missed plants and seedlings.
- Check hay and straw for presence of plant fragments or seed before using them in areas without poison hemlock; feed certified weed-free hay or pellets to horses in back-country areas.

Table 1 summarizes some management options for controlling poison hemlock under various situations. Choice of method(s) taken for poison hemlock control depends on numerous factors including the current land use and site condition; accessibility, terrain, and climate; poison hemlock density and degree of infestations; and nontarget flora and fauna present, etc. Other considerations include treatment effectiveness, cost, and the number of years needed to achieve control. More than one control method may be needed for each site.

Physical Control

Since poison hemlock reproduces solely via seed production, physical methods that destroy the top growth before flowering will reduce available seed. Methods that repeatedly stress and/or attack the root system are especially effective.

Manual Methods

Hoing, digging, cutting or grubbing are effective management options on smaller, isolated populations. If a weed eater is used, then cut before plants flower and repeat as necessary through the growing season. Poison hemlock causes some people to break out in a rash upon contact with skin; therefore, protective clothing (long pants, long-sleeved shirts, and gloves) should be worn when working in areas with this weed. Also, inhalation of plant particles should be minimized. Plant material should be bagged or piled and burned since it is highly toxic and could pose a danger to wildlife, livestock, and children.

Mechanical Methods

Mowing – Repeated mowing in localized situations can reduce poison hemlock seed production, stress its carbohydrate root reserves, and decrease its competitive ability with desirable grasses and forbs. A rotary mower is ideal for larger populations or a hand-held weed eater is sufficient for smaller populations. Plants should be clipped close to the ground in the spring, after bolting, but before seed set, and repeated again in late summer. Consecutive (3 to 5) years of mowing will likely be necessary to address seed bank reserves.

Tillage – In cultivated settings, poison hemlock is mainly found along the untilled field margins. Repeated tillage can be an effective control option, but may only be feasible in certain situations. Reseeding following tillage is highly recommended since poison hemlock is a pioneer species that will germinate rapidly from seed bank reserves following disturbance. Local conditions dictate when reseeded should be accomplished. Typically, desired grass and forb seed are planted in late summer or early autumn in Arizona and New Mexico. Areas with suitable terrain should be tilled at

Table 1. Management options*

Site	Physical Methods	Cultural Methods	Biological Methods	Chemical Methods
Roadsides, fence lines, or noncrop areas	Mow close to the ground multiple times during growth season. Combine mowing with an autumn herbicide application.	Clean machinery following activity in infested areas. Train road crews to identify and report infestations.	Hemlock moth/leaf rolling caterpillar may be naturally present; however, it is not a USDA-approved biological control agent.	For ground application, use ATV, truck mounted, or tractor pulled spraying equipment. Wash under vehicle after application to prevent spread.
Rangelands, pastures, or riparian corridors	Use repeat tillage only in areas to be reseeded. Combine with herbicide spraying. Prescribed burn only as part of a combined method.	Use certified weed-free seed and hay. Avoid driving directly through infestation. Reseed with plants that are desirable and will compete.	Avoid grazing infested pastures during the early spring when poison hemlock is the primary green forage.	For extensive and dense infestations, use ground or aerial broadcast spraying. For sparse infestations, use backpack spraying or hollow-stem injection.
Wilderness, other natural areas, and/or small infestations	Hand remove or cut before flowers develop; removal of the whole root is not necessary. Pile or remove debris.	After passing through infested areas, inspect and remove any seed from animals, clothing, and vehicles.	Same as above.	Use backpack or hand-held sprayers to spot treat plants.

* Choice of a particular management option must be in compliance with existing regulations for land resource.

3-week intervals with a plow or disc to a depth of at least 4 inches beginning when poison hemlock is in the rosette or early bolt stage in spring. *If using machinery to manage poison hemlock, equipment should be cleaned to prevent the movement of seeds or root fragments to uninfested areas.*

Prescribed Fire

Little research has been conducted with regard to prescribed burning as a management option for poison hemlock. Considering the moist environment preferred by the plant and the limited dried fuel produced in these areas, it is assumed that fire is not likely to produce enough heat to destroy hemlock fruit and seeds. However, fire can be used as a debris disposal means.

Cultural Control

Prevention, early detection, and plant removal are critical for preventing poison hemlock establishment. Land managers, the local public, and road crews should be educated as to how to identify nonnative noxious species so they can help report all suspected infestations. Vehicles,

humans, and livestock should be discouraged from traveling through infested areas; and a program to check and remove seeds from vehicles and livestock should be implemented to help stop dispersal. If possible, weed screens should be used on irrigation water intakes in infested areas to prevent seed transportation in irrigation canals.

Biological Control

Grazing

Poison hemlock contains eight known alkaloids, including coniine and coniceine that are extremely toxic to humans, livestock, and wildlife. Pigs are the most susceptible to poison hemlock, followed by cattle, then horses, sheep, and goats. Livestock should not be grazed on infested pastures during the early spring when poison hemlock is one of the primary green forage plants. Livestock are more likely to consume poison hemlock via contaminated hay. Consuming adequate quantities can result in striated muscle paralysis that begins in the legs and progresses upward until asphyxia occurs.

Classical Biological Control

The Hemlock moth (*Agonopterix alstroemeriana*) has been approved by USDA for use in controlling poison hemlock in the United States. The moth feeds solely upon poison hemlock. It was introduced from Europe and has naturally established in numerous western states including California, Utah, Colorado, Idaho, Oregon and mesic areas of Washington. This caterpillar (also known as the hemlock moth) feeds on leaves, buds, stem, flowers, and immature seeds in the spring and early summer. Adult moths emerge in the summer and feed on leaves. Concerns that this herbivorous caterpillar may cause poison hemlock to produce increased amounts of toxic alkaloids have hindered the approval process for its use as a biological control agent.

Chemical Control

Herbicides are an effective and economical way to manage poison hemlock. However, new populations often return within a few years of spraying from seed that is still abundant in the soil. Anticipate the need to monitor and use followup herbicide applications for several years to deplete the seed bank and attain long-term control.

All herbicides recommended in table 2 will control emerged poison hemlock when properly applied. Phenoxy herbicides such as 2,4-D (amine or ester formulations), 2,4-DB, or MCPA are effective when sprayed (all at 1 to 2 lb ai/acre) in spring on newly emerged seedlings in open areas away from water. Care should be taken when using 2,4-D alone or in combination as it has a restricted use designation in New Mexico. Other selective herbicides to consider include dicamba (alone or in combination with 2,4-D) or aminopyralid in combination with metsulfuron. These herbicides are most effective when sprayed during the rosette stage in either spring or fall. For poison hemlock growing on streambanks or near the water's edge, consider using the Rodeo formulation of glyphosate or the Habitat formulation of imazapyr as these products have approved aquatic labels. Both of these herbicides are nonselective; therefore, precaution should be taken if nontarget plants (including woody species) need to be protected. Glyphosate

and imazapyr are best used in a spot spray or else in a nonselective spraying situation with no desirable plants growing beneath the weeds. Each herbicide product listed in table 2 will have different requirements and restrictions according to the label. Read and understand the label prior to any application. Consult the registrant if you have questions or need further detail.

Herbicides may be applied in several ways including backpack, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. For sparse populations, one person or a small team can spray poison hemlock using an individual plant treatment (IPT) approach. Plants may be spot sprayed by wetting the foliage and stems without dripping using an adjustable spray nozzle attached to a hand-held or backpack sprayer. Or, a hollow-stem injection approach may be used, as described upon the glyphosate label.

Reseeding an area following herbicide treatment can improve long-term control by increasing competition with poison hemlock. In areas where reseeding is planned, glyphosate can be broadcast sprayed for site preparation. Glyphosate is most effective when applied sequentially at about 1 month intervals during the summer, coupled with a fall grass seeding. Make the first application in early summer (June or July) and the second about a month later, provided green shoots are present. Sow perennial grass seed in late autumn as a dormant seeding (i.e., grass seedlings will not emerge until the following spring).

Control Strategies

Because each treatment situation is unique, the strategy adopted for managing poison hemlock must involve careful planning. Persistence and a long-term commitment is a must for poison hemlock control. Treated areas should be monitored periodically and measures taken to control missed plants and newly emerged seedlings. It is also important to monitor the return of desirable native plant species.

Experience with integrated methods for controlling poison

Table 2. Herbicide recommendations

Common Chemical Name (active ingredient)	Product Example ¹	Product Example Rate per Acre (broadcast)	Backpack Sprayer Treatment Using Product Example ²	Time of Application	Remarks
2,4-D ester or amine formulations ³	several manufacturers	1–2 pounds ai per acre	3%	Spring in seedling to early growth stage.	2,4-D is selective for many broadleaf species but will not harm most grasses. 2,4-D is formulated in different strengths depending on the manufacturer. Read and follow label mixing directions.
Aminopyralid + metsulfuron methyl	Opensight, Chaparral	2.5–3.3 ounces per acre	NA	Spring or fall.	A selective granule herbicide for use on noncropland, rights-of-way, nonirrigation ditchbanks, natural areas, and grazed areas in and around these sites.
Dicamba	several manufacturers	2–4 quarts	1–3%	Same as above.	Selective; affects many broadleaf species but will not harm most grasses.
Dicamba + 2,4-D ³	Weedmaster	2–4 pints	0.7% + 0.5% NIS ⁴	Seedling to rosette stage.	Selective with a broad spectrum; may affect some sensitive pasture grasses such as bentgrass and legumes such as alfalfa. Not for use near water.
Metsulfuron methyl	Escort	3 ounces per acre	1 gram per gallon	Early spring or late fall (at bud/bloom or rosette stages).	Selective; not for use on irrigation ditches or near waterways. Best used during warm, moist conditions; activity may be delayed during cold, dry conditions. Use 0.25% v/v NIS ⁴ .
Glyphosate	RoundUp, Rodeo	RoundUp: 1.3–2.7 quarts Rodeo: 2.25–3.75 quarts	RoundUp: 1–1.5% Rodeo: 0.75–1.5%	At rosette stage.	Nonselective; not soil active. Rodeo is registered for aquatic use. Glyphosate may be used for hollow-stem injections; for RoundUp, inject 5 ml of a 5% solution into hollow stem for individual plant treatment; see label for details.
Imazapyr	Habitat, Arsenal	Habitat: 2 pints + adjuvant Arsenal: 2–3 pints + adjuvant	0.75–1.5%	Preemergence to rosette stage.	Nonselective; slightly persistent; amino acid synthesis inhibitor. Habitat is registered for aquatic use. See label for adjuvant options. In addition to overspray, death or injury of nontarget plants may occur from root transfer of imazapyr between intertwined root systems.

¹ Trade names for products are provided for example purposes only, and other products with the same active ingredient(s) may be available. Individual product labels should be examined for specific information and appropriate use with poison hemlock.

² Herbicide/water ratio - As an example, a gallon of spray water with a 3 percent mixture is made by adding a sufficient volume of water to 4 ounces of liquid herbicide until a volume of 1 gallon is reached ($4 \text{ oz/gal} \div 128 \text{ oz/gal} = 0.03$ or 3 percent).

³ 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator's license is required for purchase and use.

⁴ NIS is an abbreviation for nonionic surfactant, an additive commonly recommended by herbicide labels for postemergent foliar herbicide application.

hemlock is limited. As is the case in managing most weed infested areas, integration of techniques such as mowing and herbicide should be beneficial since the impacts of combined control measures are often cumulative. Integrating revegetation through broadcast seeding or a no-till drill to increase competitive pressure on poison hemlock should always be considered where feasible.

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Suggested Web Sites

For information on invasive species:

<http://www.invasivespeciesinfo.gov/>

<http://www.invasive.org/weedus/index.html>

For information about calibrating spray equipment:

NMSU Cooperative Extension Service Guide

A-613 Sprayer Calibration at http://aces.nmsu.edu/pubs/_a/A-613.pdf

Herbicide labels online:

<http://www.cdms.net/LabelsMsds/LMDefault.aspx>

**For more information
or other field guides, contact:**

USDA Forest Service
Southwestern Region
Forest Health
333 Broadway Blvd., SE
Albuquerque, NM 87102

Or visit:

<http://www.fs.usda.gov/main/r3/forest-grasslandhealth/invasivespecies>

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