



# Field Guide for Managing Whitetop in the Southwest



## Cover Photos

*Top left: Chris Evans, Illinois Wildlife Action Plan, Bugwood.org*

*Top right: Steve Dewey, Utah State University, Bugwood.org*

*Lower right: Chris Evans, River to River CWMA, Bugwood.org*

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# Whitetop (*Cardaria draba* (L.) Desv., formerly known as *Lepidium draba*)

Mustard family (Brassicaceae)

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Whitetop is listed as a noxious weed in Arizona and New Mexico. This field guide serves as the U.S. Forest Service's recommendations for management of whitetop 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 administers 4 national grasslands located in northeastern New Mexico, western Oklahoma, and the Texas panhandle.

## Description

Whitetop (synonyms: heart-podded hoary cress, hoary cardaria, whiteweed, peppergrass) is an introduced, creeping, perennial plant that grows up to 2 feet tall. It is similar in appearance to two closely related *Cardaria* species: *C. chalepensis* (lens-podded hoary cress) and *C. pubescens* (globe-podded hoary cress). These three exotics are members of the mustard family (Brassicaceae) and are often grouped together because they invade similar sites and are equally difficult to control. The primary distinguishing characteristic between these species is the type and shape of the fruit, which is an indehiscent (remaining closed at maturity) pod called a silicle. *C. draba* has heart-shaped pods that become flattened with prominent veins as they dry. *C. chalepensis* has oval or lens-shaped pods that do not become flattened and veins are not prominent. *C. pubescens* has globose, hairy purplish pods that remain inflated when dry.

## Growth Characteristics

- Herbaceous, broadleaved, perennial plant; typically grows 16 to 20 inches tall.
- Deep, long-lived taproots that store carbohydrates; extensive creeping root system.
- Plants have a gray-green, soft-hairy appearance; grayish stems grow upright or along ground without rooting at the nodes (procumbent); lower portion of plant tends to be hairier and have more leaves; branching occurs primarily in upper portion of plant.

- Leaves alternate; rosette leaves and basal leaves of mature plants taper to a petiole. When mature, lower leaves are long and slender; upper leaves are obovate with smooth to slightly toothed margins; arrowhead-like lobes of leaves clasp the stem; leaves covered with short, white hairs.
- Flat-topped inflorescence (corymb of racemes) has white 4-petaled flowers; flowers have 6 stamens; 1 pistil; sepals are green; petals are spoon-shaped.
- Indehiscent fruits are heart-shaped, 2-chambered silicles with a distinct beak (a persistent style) on the end opposite the notch; one ovoid, reddish-brown seed per chamber.

## Ecology

### Impacts/Threats

Whitetop produces low quality forage; dense infestations can crowd out desirable plants and reduce animal diversity. The foliage contains glucosinolates, which are toxic to cattle and decompose into allelopathic compounds that can impede germination and growth of desirable plants. Invasions of whitetop often occur in sensitive areas, which can limit control options.

### Site/Distribution

Although whitetop grows on soils ranging from moderately saline to acidic, it favors disturbed, unshaded areas with moderately moist, alkaline soils. Whitetop is widely distributed across the western U.S. and can be found along roadsides or irrigation ditches, and in rangeland meadows, sub-irrigated pastures, and hay fields.

### Spread

Seed is dispersed by water, wind, and animals; seed may move great distances as a contaminant in other types of seed. New shoots are commonly grown from root fragments that can be spread broadly in displaced soil, hay bales used for erosion control, or alfalfa hay. Seed or root fragments may adhere to surfaces and undercarriages of vehicles and road maintenance equipment.

## ***Invasive Features***

Whitetop is adaptable to a wide range of habitats. It produces up to 4,800 seeds per plant that are viable for up to 3 years in soil. In warmer climates, whitetop may produce several seed crops during a growing season. It also has a deep taproot and a creeping lateral root system. Large carbohydrate reserves within the roots enable shoots to emerge early and grow rapidly in the spring thereby allowing it to outcompete other species. Root fragments less than 1-inch long may re-sprout to form new shoots.

## **Management**

Due to the extensive creeping root system associated with whitetop, large populations of this species are a challenge to eradicate if not an impossibility once established. Components of a successful control program include repeated treatments, monitoring of treated areas, and measures taken to control missed plants, re-sprouts, and newly emerged seedlings. Combining control methods should always be considered in a long-term approach to control whitetop.

The following actions should be considered when planning an overall management approach:

- Maintain healthy plant communities to limit whitetop infestations. This may involve preventing excessive grazing and reseeding areas with desirable grasses and forbs after disturbance.
- Practice prevention and eradicate new populations of whitetop as early as possible.
- Use certified weed-free hay; use pellets to feed horses in backcountry areas.
- Periodically check areas where hay bales are used to control erosion or where soils have been imported for presence of whitetop.
- Combine mechanical, cultural, biological, and chemical methods for effective whitetop control.
- Implement annual monitoring and follow-up treatment for missed plants and seedlings.
- Detect, report, and map extensive infestations. Keep annual records of reported infestations.

Table 1 summarizes some management options for controlling whitetop under various situations. Further details on these management options are explained below. Choice of individual control method(s) for whitetop depends on many factors including the extent and density of infestation; current land use and site condition; accessibility, terrain, and microclimate; and nontarget flora and fauna present. Other considerations include treatment effectiveness, overall cost, and the number of years needed to achieve control. More than one control method may be needed for a particular site.

## **Physical Control**

Although labor intensive and costly, physical methods that are consistently and repeatedly used can be effective at controlling whitetop. Effectiveness of physical methods is usually improved when combined with herbicide control.

### ***Manual Methods***

**Hand removal** – Hand digging or grubbing may be feasible for small, isolated populations or for plants located in sensitive areas such as riparian corridors. Ideally, the entire root system should be dug out before the seed forms. Debris should be disposed of by burning piled plants or by bagging and then depositing the bags in a landfill.

### ***Mechanical Methods***

*When using machinery to manage whitetop, the equipment should be cleaned after use to prevent movement of seeds or root fragments into un-infested areas.*

**Mowing** – By itself, mowing is not recommended as it can contribute to further spread and increased densities of whitetop. In agronomic lands or areas with level ground where mowing is practical, cutting the weed in combination with later well-timed herbicide applications will improve control effectiveness. Mow whitetop early in the growth season when it is at flower bud stage. Allow the shoots to re-sprout and then apply herbicide when plants again reach flower bud stage. Mowing causes the plant to produce larger leaves that are perpendicular to the ground which gives better access of herbicide into the lower third of leaves. An alternative is to spray plants in late summer to early fall and then mow in the spring. New shoots will likely be produced, and repeat spraying is usually

**Table 1. Management options\***

Site	Physical Control	Cultural Control	Biological Control	Chemical Control
Roadsides, fence lines, or non-crop areas	Mow at late bud to early flower stage; apply herbicide to re-sprouts.  Remove small patches by hand pulling.	Use seed, mulch, and fill materials certified to be weed-free.  Clean machinery following activity in infested areas.  Train road crews and the public to identify and report infestations; map reported populations.	Biocontrol agents are currently unavailable.	Spray at bud to early flower stage.  For ground application, use truck-mounted or tractor-pulled spraying equipment. Wash under vehicle after application to prevent spread.
Rangelands, pastures, or riparian corridors	For seedlings, use initial deep cultivation followed by repeat cultivation at a 4 to 5-inch depth every 5 to 10 days during the growth season; repeat for 2 to 4 consecutive years.  Prescribed burning is NOT recommended.	Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas.  Monitor areas where soil was imported or hay bales were used for erosion control.  Reseed with competitive desirable plants.	Although slightly toxic to cattle, prescribed grazing with sheep or goats may be considered in combination with other methods. Closely manage grazing to prevent overuse of desirable species.  Biocontrol agents are currently unavailable.	For extensive and dense infestations, use ground or aerial broadcast spraying.  For sparse infestations, use backpack or hand-held sprayer.
Wilderness, other natural areas, and/or small infestations	Hand dig or grub small patches; remove as much of the root as possible; bag and dispose of debris appropriately.	Use seed and forage hay certified to be weed-free; use pellets for horses in backcountry areas.  Educate the public to identify and report infestations.  After passing through infested areas, inspect and remove any seed or root fragments from animals, clothing, and vehicles.	Same as above.	Use backpack or hand-held sprayers or use wick method for IPT.  Broadcast spraying may be used on thicker stands, if allowed.

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

necessary for further control.

**Tillage** – Cultivation is effective with seedlings and in areas where the population is not yet well established. Till plants below the depth of lateral and vertical roots, and plan to repeat cultivation shortly after new shoots emerge. This may require tillage that is needed every 10 to 15 days for 6 to 8 weeks during the growing season which may be followed by less frequent tillage. Speed of eradication depends upon timing and frequency of cultivation, and this practice usually has to be repeated for at least 2 consecutive years. Even infrequent cultivation before seed set can reduce whitetop infestation. Combining

tillage with well-timed herbicide use can further improve effectiveness.

**Prescribed Fire**

Since 75 percent of whitetop’s total biomass is below ground, populations rebound rapidly following fire. Therefore, this practice is not recommended as a control method. Burning is an acceptable means to dispose of plant debris.

**Flooding**

When feasible, flooding an area with 6 to 8 inches of water for 2 months can be an effective control method.

## **Cultural Control**

Prevention is key to controlling whitetop, and early detection and plant removal are critical for reducing its spread. Educating land managers, the local public, and others to identify nonnative noxious species is important so they can help report all suspected infestations. Weed screens for irrigation ditches should be considered as a means of preventing seed dispersal via waterways. Seed and materials used for mulch, forage, or fill should be certified to be weed-free; pellets may be used for horses in backcountry areas. Reseeding with desirable shrub and perennial grass species that are competitive with whitetop should be considered for areas not recovering naturally following suppression efforts.

## **Biological Control**

### ***Grazing***

Although palatability is low, goats and sheep will graze whitetop from the rosette stage until early flowering. Whitetop reportedly is toxic to cattle if consumed in great enough quantities, but livestock generally make very little use of this weed.

### ***Classical Biological Control***

Research is underway; however, there currently are no classical biocontrol agents (insects, pathogens, etc.) approved by USDA for management of whitetop.

## **Chemical Control**

Whitetop grows in many different crop and rangeland situations, which complicates the choice for best chemical control. Herbicides commonly used to control mustards generally work well on whitetop; but these chemicals often control a wide range of other broadleaf plants as well, some of which are desirable. For example, legumes such as alfalfa are sensitive to most herbicides that are effective with whitetop and could be lost if sprayed.

All herbicides recommended in table 2 will effectively control whitetop when properly applied. Aquatically approved formulations of glyphosate, imazapic, or imazapyr are acceptable for use in areas near water. Each herbicide product will have different requirements and restrictions according to the label. Read and understand the

label prior to any application. To prevent development of resistance in whitetop from repeated treatments, the label should be consulted for guidelines on rotating herbicide active ingredients. Consult the registrant if you have questions or need further detail.

### ***Herbicide Application***

In general, herbicide applications should be made during the flower bud stage to early flowering when carbohydrate root reserves are lowest. Chlorsulfuron or metsulfuron methyl provide effective whitetop control in noncropland areas, but timing is important. Spraying with these products should be done in early spring or preferably in the fall before winter dormancy. Ester or amine 2,4-D formulations provide fair to good control or suppression when sprayed in early spring.

Herbicides may be applied in several ways including wicks, backpack or hand-held sprayers, ATV or UTV sprayers, or conventional boom sprayers that are pulled or attached to a tractor or truck. Any equipment used to spray herbicide should be calibrated. For sparse populations, one person or a small team can spray or wick whitetop in an area using the individual plant treatment (IPT) method. Spray plants directly by wetting the foliage and stems to the point of dripping while using an adjustable spray nozzle attached to a hand-held or backpack sprayer.

To suppress whitetop in riparian areas while allowing desirable plant species to reestablish, wick individual plants with 100 percent solution of 2,4-D for several consecutive years. Where water is not present year-round, chlorsulfuron may be used as long as the herbicide has time to degrade in the soil before water returns.

## **Management Strategies**

Early detection and removal of new infestations soon after discovery is the most effective weed management strategy for whitetop control. Small or isolated infestations on otherwise healthy sites should be given high priority for treatment, followed by treatment of whitetop in passageways with a high potential for spread such as waterways and irrigation canals. In areas where whitetop has become well established, containment should be a management priority. Containment can be achieved

**Table 2. Herbicide recommendations**

Common Chemical Name (active ingredient)	Product Example <sup>1</sup>	Broadcast Treatment (rate per acre)	Spot Treatment (spray solution) <sup>2</sup>	Time of Application	Remarks
Chlorsulfuron	Telar XP	1 ounce	1–2%	Bud to early bloom.	Selective; safe for labeled grasses; provides 1–2 years control. Not for use near waterbodies. Use 0.25% v/v NIS <sup>3</sup> . If area is mowed before herbicide applied, lower rate is effective.
Metsulfuron methyl	Escort, Ally	0.75–1 ounce	1%	Same as above.	Selective; safe for most perennial grasses. Not for use near irrigation water. Add 0.25% v/v NIS <sup>3</sup> . May apply in fall if part of plant is still green.
Chlorsulfuron + metsulfuron	Cimarron Plus	1.25 ounces	1%	Same as above.	Broad spectrum; most broadleaved plants and certain grasses are susceptible; pre-emergent and post-emergent activity. Add 1/16% – 1/18% v/v NIS <sup>3</sup> ; 1 to 2 inches of rainfall is required after application to move herbicide into root zone.
Aminopyralid + metsulfuron	Chaparral	2.5–3.33 ounces	1%	Spring (rosette to bolt) or fall (seedling to rosette).	Broad spectrum; most broadleaved plants (including legumes and woody plants) and certain grasses are susceptible. Not for use near surface water. Tank mix with 2,4-D for bolt to early flower stages. Add 0.25% v/v NIS <sup>3</sup> .
Glyphosate	Rodeo, Roundup Pro [others available]	3 quarts Rodeo 4 quarts Roundup Pro	Rodeo: 0.75–2% + NIS <sup>3</sup> Roundup Pro: 2%	Flower bud stage.	Nonselective. Rodeo is labeled for use in or near aquatic areas. If infestation is dense, mow and then apply glyphosate when regrowth reaches flower bud stage.
2,4-D ester or amine <sup>4</sup>	several products available	2 quarts	1–5%	Before bud stage.	Selective; acceptable for use in/near aquatic areas. Apply annually for 2 years or more to control established stands. If infestation is dense, mow first and then spray regrowth.
Imazapyr	Arsenal, Habitat [others available]	2–3 pints	0.5–5%	Flower bud to flowering stage; apply to actively growing plant parts.	Nonselective; pre-emergent and post-emergent; broad-spectrum control. In addition to spray drift, nontarget plants may also be killed or injured by imazapyr through runoff, residue movement in soil, or root exudates from treated plants. Habitat is labeled for use near water. Add 0.25% v/v NIS for post-emergent use.
Imazapic	Plateau	12 fluid ounces	5%	Same as above.	Selective herbicide but may retard growth of some grasses. This herbicide is the preferred alternative to imazapyr if protection of desirable plants is needed.

<sup>1</sup> 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 whitetop.

<sup>2</sup> Spray solution is the herbicide/water ratio in a spray mix that may be used for spot treatment with backpack or hand-held sprayers. The amount of product applied during an annual growing season must not exceed the maximum application rate per acre as specified by the product label – refer to the product label for the site type and application.

<sup>3</sup> NIS is an abbreviation for nonionic surfactant, which is an additive commonly recommended for post-emergent foliar application of herbicides.

<sup>4</sup> 2,4-D is a restricted use pesticide in New Mexico only. A certified applicator’s license is required for purchase and use.

by managing the outside perimeter to prevent further spread.

Monitoring and follow-up applications after treatment are needed over a minimum of several years to attain long-term control. Monitoring should be conducted in early spring and late summer to find rosettes that form the leading edge of expanding infestations. To enhance long-term control, efforts should be made to encourage return of desirable plants such as shrubs and perennial grasses that will compete with whitetop for water, nutrients, and space.

Management of whitetop should involve careful planning and a long-term commitment, as persistence is a must for whitetop control. Whatever the management approach, control will likely require several consecutive years of treatment that uses an integrated approach. Since it is ordinarily useless to treat an area only one time without re-treatment, it is especially important to allocate sufficient resources to the area where control is attempted. After initial treatment, resources should also be available to respray or retreat the treated area as necessary.

## References and Further Information

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## **Suggested Web Sites**

CABI database:

<http://www.cabi.org/?page=1017&pid=2257&site=170>

For information on invasive species:

National Invasive Species Information Center

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

Invasive.Org

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

For information about calibrating spray equipment: NMSU Cooperative Extension Service Guide A-613, *Sprayer Calibration*. Available at [http://aces.nmsu.edu/pubs/\\_a/A-613.pdf](http://aces.nmsu.edu/pubs/_a/A-613.pdf)

Herbicide labels online:

<http://www.cdms.net/>

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**For more information or  
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USDA Forest Service  
Southwestern Region  
Forest Health  
333 Broadway Blvd., SE  
Albuquerque, NM 87102

**Or visit the Southwestern Region's  
website for invasive species:**

*<http://www.fs.usda.gov/goto/r3/invasivespecies>*



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