

# Integrated Weed Management in Pecan Orchards

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Weeds can present problems in pecan orchards, as in many cropping systems. Weeds compete with trees for water, light, and nutrients; however, the effects of this competition vary throughout the life of the tree. In newly planted pecan orchards, weed competition can decrease tree survival and severely retard growth. In established orchards, weeds have a less direct effect on tree health or nut production, but they do interfere with harvesting operations and can serve as a refuge for insects and/or rodents that will influence the quality and quantity of the crop, as well as the health of the tree. Furthermore, weeds in orchard floors can provide a source of seed contamination and harbor diseases and insect pests that could affect other crops planted nearby. These effects help illustrate the need to consider weed control as part of an overall pecan orchard management program.

## WEED CLASSIFICATION AND IDENTIFICATION

The first step to weed management is to correctly identify the weeds present in the orchard since weed management techniques can be species-specific. Weeds can be identified using resources such as weed identification books, websites, Cooperative Extension Service publications (<https://aces.nmsu.edu/pubs/>), and county Extension agents (<https://aces.nmsu.edu/county/>). It is important to know the name of a weed, as well as the life cycle and reproductive capacity of that plant, in order to make sound management decisions. Keep in mind that common names of plants can vary by location, or the same name may refer to multiple different species. Cross-referencing





weeds by their scientific (Latin) names can help ensure that you're dealing with the weed you think you are. Accurate information on the biology and life cycle of the weeds can help growers apply weed management techniques more effectively, based on the susceptibility of the species. Weeds are often more susceptible to management techniques during specific stages of their development. Some of the common weeds found in New Mexico pecan orchards are listed in Table 1. Weeds, including grasses, sedges, and broadleaves, are categorized based on their life cycle (a process including germination, vegetative growth, flowering, seed set, and death) into the following categories:

### **Annuals**

Annual plants germinate and complete their life cycles within one year. These weeds spread and reproduce only through seed production.

**Summer annuals** germinate in the spring and/or early summer and complete their life cycles in the fall.

**Winter annuals** germinate in the fall and/or winter and complete their life cycles the following spring.

### **Biennials**

Biennial plants require two years to complete their life cycles. They spread and reproduce by seed production only.

### **Perennials**

Perennial plants live more than two years. They reproduce by seed and vegetative reproductive structures, such as root buds, rhizomes, crowns, tillers, tubers, stolons, or bulbs.

**Simple perennials** survive season to season through recurring taproot systems, but spread only by seed and have no normal means of spreading vegetatively. However, if the roots of some species are cut or broken, each

piece could send out roots and stems to form a new plant.

**Creeping perennials** reproduce not only by seed but also by vegetative reproductive structures such as rhizomes and stolons.

## **WEED MANAGEMENT OPTIONS**

There are five general weed management strategies: preventive, cultural, mechanical, biological, and chemical management. In pecan orchards, weed management can be categorized into two stages: the first is during site preparation/pre-planting and the second is in established orchards (both bearing and non-bearing trees). In each situation, successful weed management requires

an integrated approach that utilizes a combination of several strategies (preventive, cultural, mechanical, biological, and chemical) for weed control. In an integrated approach, growers can exploit the benefits of all methods of control and be more effective and sustainable in their weed management.

### **Preventive Weed Management**

Preventive management keeps weeds from establishing within the orchard in the first place. Strategies such as managing weeds in the fencerow or along ditches, controlling weeds before they set seed, and taking time to remove weeds from harvesting equipment when going from field to field help to reduce the potential spread of weeds. Furthermore, preventive management also requires continuous monitoring of the orchard for weed problems. Removing weeds the first time they are noticed prevents them from setting seed, giving very effective control results. The cost of control increases with the size of the weed patch, so it is best to control small infestations early and before they become large infestations. Preventive management is particularly important when dealing with perennial weeds because they are notoriously difficult to control, have the ability to spread underground, and are spread by cultivation.

### **Mechanical Control**

Mechanical management removes weeds by physical means such as disks, spring tooth harrows, orchard knives, and mowers. Cultivation is best described as a nonselective control option that is particularly effective for annual weed control. The disadvantages of mechanical control include the following:

- It is difficult to control weeds near the trees without possible injury to trees or roots.
- Cultivation tends to create favorable conditions for the

<b>Table 1. Some of the Common Weeds Associated with Orchard Floors</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Class</b>
<b>Annuals</b>		
<b>Summer Annuals</b>		
Barnyardgrass	<i>Echinochloa crus-galli</i>	Grass
Junglerice	<i>Echinochloa colona</i>	Grass
Marestail	<i>Conyza canadensis</i>	Broadleaf
Pigweed	<i>Amaranthus</i> spp.	Broadleaf
Sandbur	<i>Cenchrus</i> spp.	Grass
Sprangletop	<i>Leptochloa chinensis</i>	Grass
Foxtail	<i>Setaria</i> spp.	Grass
Kochia	<i>Bassia scoparia</i>	Broadleaf
Morning glory	<i>Ipomoea</i> spp.	Broadleaf
Russian thistle	<i>Salsola iberica</i>	Broadleaf
Southwestern cupgrass	<i>Eriochloa acuminata</i>	Grass
<b>Winter Annuals</b>		
Downy brome	<i>Bromus tectorum</i>	Grass
London rocket	<i>Sisymbrium irio</i>	Broadleaf
Shepherdspurse	<i>Capsella bursa-pastoris</i>	Broadleaf
Flixweed	<i>Descurainia sophia</i>	Broadleaf
Rescuegrass	<i>Bromus catharticus</i>	Grass
Tansymustard	<i>Descurainia pinnata</i>	Broadleaf
<b>Biennials</b>		
Common mallow	<i>Malva neglecta</i>	Broadleaf
Musk thistle	<i>Carduus nutans</i>	Broadleaf
<b>Perennials</b>		
<b>Simple Perennials</b>		
Curly dock	<i>Rumex crispus</i>	Broadleaf
Dandelion	<i>Taraxacum officinale</i>	Broadleaf
<b>Creeping Perennials</b>		
Bermudagrass	<i>Cynodon dactylon</i>	Grass
Johnsongrass	<i>Sorghum halepense</i>	Grass
Silverleaf nightshade	<i>Solanum elaeagnifolium</i>	Broadleaf
Field bindweed	<i>Convolvulus arvensis</i>	Broadleaf
Texas blueweed	<i>Helianthus ciliaris</i>	Broadleaf
Yellow nutsedge	<i>Cyperus esculentus</i>	Sedge
Purple nutsedge	<i>Cyperus rotundus</i>	Sedge



germination of weed seeds near the soil surface and can bring up new seeds from deeper in the soil profile.

- Cultivation aids in the dispersal of perennial weeds by breaking up their underground vegetative systems and spreading them throughout the orchard.
- Cultivation could also lead to soil degradation via structure loss and compaction.

### **Biological Control**

This control method uses living organisms, such as insects and pathogens, to manage weeds. The use of biological weed control agents has had greater success on rangelands and pastures than on agronomic crops. Periodic grazing of the orchard floor might be considered a biological control option that could work against some weeds.

### **Cultural Control**

The central theme of cultural weed management is to reduce weed seed germination with practices such as water and nutrient placements and using cover vegetation. These practices reduce the availability of essential elements such as water, nutrients, and light to weed seeds and thereby reduce their germination. For example, orchards with aboveground or belowground drip irrigations systems experience far lower weed pressure than flood-irrigated orchards. Also, in young flood-irrigated orchards, borders can be raised near the tree rows so that the row middles are not completely watered, which could reduce the weed pressure within the row.

Healthy orchard floor covers can better outcompete germinating weed seeds, which helps to suppress weed pressure. This is achieved by keeping a vegetation-free zone in the tree rows or around each tree while cover vegetation is maintained in non-treated areas of the orchards (Figure 1). Recommended cover vegetations that could tolerate moving, flooding, and traffic fall into two categories: grasses (either resident or planted grass species) and legumes (e.g., clover and vetch species). The vegetation-free zones reduce the possible competition of the trees with the weeds and cover vegetation and decrease the possible damage from rodents during the dormant season. The vegetation alleys between the tree rows reduce the intensity of chemical and mechanical weed management practices in the orchards since only the vegetation-free zones require intensive weed control. Additionally, as long as the cover vegetation remains healthy, it should limit weed seed germination within the alleys and, over time, reduce the overall weed seed bank in the orchard. Other benefits associated with the use of vegetation alleys between the tree rows include improved soil aeration and permeability, increased soil organic matter (and, in the case of legume cover crops, possibly increased nitrogen availability), decreased soil erosion, and easier movement of equipment through the orchard during wet conditions. Leaving a strip of vegetation between the rows may support beneficial insects as well. These beneficial insects can help reduce pest insect populations in the orchard.

Another cultural practice for weed management is the use of natural or synthetic mulches to prevent weed seed germination. Mulching is an effective management option if the mulch layer is thick enough during the growing season to prevent germination of weed seeds. However, the effectiveness of mulching could be influenced by cultural practices. For example, in furrow-irrigated fields, mulching might not be an effective option since water pressure could cause an uneven distribution of the mulch layer throughout the fields.

### Chemical Control

Chemical management uses herbicides to control weeds. Herbicides vary greatly in their modes of action and in their target species, so appropriate selection is critical to successful outcomes. Some herbicides must be applied to the soil before weeds have germinated and emerged from the soil (preplant or preemergence) and may require some form of incorporation (either mechanical or water), while others are applied after the weeds have already emerged and are growing actively (postemergence).

Table 2 shows a list of currently registered herbicides for pecan in New Mexico, their Weed Science Society of America (WSSA) grouping, and some information regarding their usage. Be sure to read, understand, and follow the label instructions when using any pesticide. Pay particular attention to information such as timing of application, rates of application, harvest restrictions, orchard characteristics (e.g., soil type), and types of weeds controlled (Figure 2). Many times an herbicide's poor performance or nonperformance can be traced to improper use and failure to follow label directions. Particular herbicides may be labeled for non-bearing trees only, bearing trees only, or for both non-bearing and bearing trees.

When using chemical control, growers must be aware that repetitive use of a single herbicide or of a particular herbicide group with the same site of action could select for herbicide-resistant weeds. To avoid selecting for resistance, make sure to rotate herbicides with different groups or sites of action, and do not make more than two consecutive applications of herbicides from the same group against the same weed. If possible, combine herbicides based on the label directions. Mixing two or more herbicides from different herbicide groups can delay or prevent the development of herbicide resistance in weeds and dramatically increase the spectrum of weed control since no single herbicide controls all weeds commonly found in pecan.

If you have been relying on one particular herbicide or herbicide group (Table 2) for several years and notice that some weed species that were effectively controlled

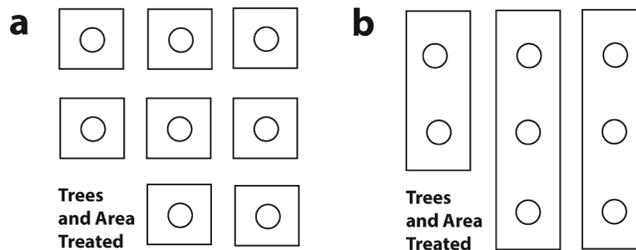


Figure 1. Use of vegetation-free zones around trees (a) and in the three rows (b).

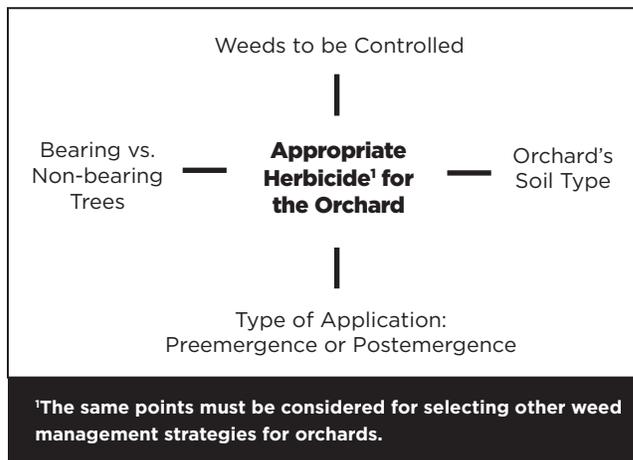


Figure 2. Points to consider in selecting the appropriate herbicides in pecan orchards.

in past seasons are now abundant, or that some species are now present that you have not dealt with before, this could be an indication that an herbicide-resistant biotype or a shift in weed species has developed.

### Glyphosate (Roundup) Resistance in Palmer Amaranth (*Amaranthus palmeri*) Populations from Pecan Orchards

In New Mexico, resistance to glyphosate has been confirmed in some Palmer amaranth populations from pecan orchards. However, diagnostic tests at New Mexico State University have shown that the resistant populations can be controlled by herbicides from alternative herbicide groups. Therefore, it is important that growers do not rely only on glyphosate for weed management in pecan orchards. The use of herbicides from different herbicide groups will not only control glyphosate-resistant species and their spread throughout the non-infested areas (if they exist) but will also prevent or delay any further development of resistance in existing weed populations.

<b>Table 2. Herbicides for Use in New Mexico Pecan Orchards<sup>a</sup></b>		
<b>Common Name/ WSSA Grouping<sup>b</sup></b>	<b>Example of Trade Name<sup>c</sup>/EPA Registration No</b>	<b>Application and Remarks<sup>d</sup></b>
Carfentrazone-ethyl/ Group 14	Aim EC/279-3241	<p><b>Rate:</b> 2 fl oz Aim EC/acre (0.031 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> For control of susceptible broadleaf weeds (see label for listing).</p> <p><b>Remarks:</b> Aim EC may be mixed with other herbicides that have preemergence or postemergence activity for broader-spectrum weed control. Do not apply more than 2 fl oz per acre per application.</p>
Flumioxazin/ Group 14	Chateau WDG/59639-119	<p><b>Rate:</b> 6–12 oz Chateau/acre (0.19–0.38 lb ai/acre)  <b>Time:</b> Preemergence and postemergence  <b>Weeds:</b> Control of susceptible broadleaf and grass weeds (see label).</p> <p><b>Remarks:</b> Do not apply after bud break through final harvest unless using shielded application equipment and the applicator can ensure that spray drift will not occur. Do not apply to trees established less than one year. Do not harvest within 60 days of application. The addition of an adjuvant enhances the activity of the herbicide on emerged weeds.</p>
Napropamide/ Group 15	Devrinol 50DF/70506-36	<p><b>Rate:</b> 8 lb Devrinol 50DF/acre (4 lb ai/acre), with an additional 8 lb application being labeled for season-long control. Do not apply more than 16 lb per acre per crop cycle.</p> <p><b>Time:</b> Preemergence and incorporated within 24 hours</p> <p><b>Weeds:</b> Will control many annual grasses and broadleaf weeds, including barnyardgrass, foxtail, Mexican and red sprangletop, pigweed, sandbur, south-western cupgrass, witchgrass, and others.</p> <p><b>Remarks:</b> Apply to a weed-free soil surface. May be applied to newly planted or established trees. Does not control established weeds.</p>
Fluazifop-P-butyl/ Group 1	Fusilade DX/100- 1070	<p><b>Rate:</b> 16–24 fl oz Fusilade/acre (0.25–0.375 lb ai/acre)  <b>Time:</b> Postemergence</p> <p><b>Weeds:</b> Will control only annual and perennial grasses. Will not control broadleaf weeds or sedge species.</p> <p><b>Remarks:</b> Labeled for bearing and non-bearing pecans. Always add either a crop oil concentrate at 1% or nonionic surfactant at 0.25% finished spray volume. Repeat applications will be needed to control perennial grasses. Apply as a directed postemergence application in the interspaces and around the bases of trees, avoiding contact with foliage. Do not harvest within 30 days of application. Do not graze treated areas.</p>

<b>Common Name/ WSSA Grouping<sup>b</sup></b>	<b>Example of Trade Name<sup>c</sup>/EPA Registration No</b>	<b>Application and Remarks<sup>d</sup></b>
Isoxaben/Group 21	Gallery 75DF/ 62719-145	<p><b>Rate:</b> 0.66–1.33 lb Gallery/acre (0.5–1 lb ai/acre) <b>Time:</b> Preemergence</p> <p><b>Weeds:</b> Has a broad-spectrum label; controls several broadleaf plants and suppresses grass species. Weeds controlled include common ragweed, common purslane, henbit, lambsquarters, pigweed, prickly lettuce, prostrate knotweed, prostrate spurge, and others. Suppressed grasses include crabgrass, foxtail, and goosegrass.</p> <p><b>Remarks:</b> Strictly a preemergence herbicide and will not control emerged weeds. Do not apply through any type of irrigation system. Labeled only for non-bearing trees.</p>
Oxyfluorfen/Group 14	Goaltender/ 62719-447	<p><b>Rate (broadcast application):</b> Preemergence: 2.5–3 pt Goaltender/acre (1.25–1.5 lb ai/acre) Postemergence: 1–3 pt Goaltender/acre (0.5–1.5 lb ai/acre) <b>Time:</b> Preemergence and postemergence.</p> <p><b>Weeds:</b> Will control several broadleaf weeds, including annual morning glory, annual sowthistle, common cocklebur, common purslane, London rocket, prickly lettuce, pigweed, and others.</p> <p><b>Remarks:</b> Labeled for control of weeds prior to bud swell. Do not use if bud swell occurs. For postemergence applications, add a nonionic surfactant at a rate of 2 pt/100 gal total spray mixture. Refer to label for application rate as it relates to weed species. Goaltender can be tank mixed with other herbicides such as Devrinol, Gramoxone Extra, Karmex, Roundup, Solicam, or Surflan.</p>
Paraquat dichloride/ Group 22	Gramoxone SL 2.0/ 100-1431	<p><b>Rate:</b> 2.5–4 pt Gramoxone SL 2.0/acre (0.625–1 lb ai/acre) <b>Time:</b> Postemergence</p> <p><b>Weeds:</b> Annual broadleaf and grass weeds. Will suppress top growth of perennial weeds.</p> <p><b>Remarks:</b> Gramoxone is a restricted use pesticide and requires certification to purchase and use. Always add a nonionic surfactant at the rate of 1–2 pt/100 gal total spray solution. Thorough coverage is required for control because this is a contact herbicide. Repeat applications may be necessary. Do not allow spray to come in contact with foliage or stems. Do not graze livestock in treated areas. May be tank mixed with Devrinol, Goal, Karmex, Solicam, and Surflan.</p>

<b>Common Name/ WSSA Grouping<sup>b</sup></b>	<b>Example of Trade Name<sup>c</sup>/EPA Registration No</b>	<b>Application and Remarks<sup>d</sup></b>
Diuron/Group 7	Gramoxone SL 2.0/ 100-1431	<p><b>Rate:</b> 2.5–4 pt Gramoxone SL 2.0/acre (0.625–1 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Annual broadleaf and grass weeds. Will suppress top growth of perennial weeds.</p> <p><b>Remarks:</b> Gramoxone is a restricted use pesticide and requires certification to purchase and use. Always add a nonionic surfactant at the rate of 1–2 pt/100 gal total spray solution. Thorough coverage is required for control because this is a contact herbicide. Repeat applications may be necessary. Do not allow spray to come in contact with foliage or stems. Do not graze livestock in treated areas. May be tank mixed with Devrinol, Goal, Karmex, Solicam, and Surflan.</p>
Diuron/Group 7	Karmex DF/ 66222-51	<p><b>Rate:</b> 2–4 lb Karmex/acre (1.6–3.2 lb ai/acre)  <b>Time:</b> Preemergence or early postemergence</p> <p><b>Weeds:</b> Will control several grass and broadleaf weed species, including annual morning glory, common purslane, kochia, lambsquarters, pigweed, shepherdspurse, tansymustard, and others.</p> <p><b>Remarks:</b> Use only in orchards where trees have been established for at least 3 years and on soils with at least 0.5% organic matter. Do not use on eroded areas where subsoil or roots are exposed, on trees that are diseased or lacking in vigor, or on trees planted in irrigation furrows because injury may result.</p>
Rimsulfuron/Group 2	Matrix FNV/352-671	<p><b>Rate:</b> 4 oz Matrix/acre (0.06 lb ai/acre)  <b>Time:</b> Postemergence and preemergence  <b>Weeds:</b> Controls certain broadleaf weeds and grasses.</p> <p><b>Remarks:</b> Pre-harvest interval of 14 days. Best results are obtained when soil is moist at the time of application.</p>
Penoxsulam/Group 2	Pindar/62719-603	<p><b>Rate:</b> 1–2 fl oz Pindar/acre (0.016-0.03 lb ai/acre)  <b>Time:</b> Preemergence and postemergence  <b>Weeds:</b> Annual broadleaf weeds.</p> <p><b>Remarks:</b> Do not apply Pindar to trees established less than 9 months after transplanting. Pindar should be tank mixed with an approved labeled adjuvant or postemergence herbicide (such as glyphosate, glufosinate, or paraquat) for the best control of emerged weeds. Pindar should be tank mixed with approved preemergence herbicides (such as Goaltender, Gallery, Prowl H20, Surflan, or Chateau) for the best preemergence control of susceptible weeds and to broaden the spectrum of overall weed control. Pre-harvest interval of 60 days.</p>

Table 2. Herbicides for Use in New Mexico Pecan Orchards <sup>a</sup> (Cont.)		
Common Name/ WSSA Grouping <sup>b</sup>	Example of Trade Name <sup>c</sup> /EPA Registration No	Application and Remarks <sup>d</sup>
Sethoxydim/Group 1	Poast/7969-58	<p><b>Rate:</b> 1–2.5 pt Poast/acre (0.2–0.5 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Will control annual and perennial grasses.</p> <p><b>Remarks:</b> Poast is labeled for non-bearing and bearing trees. Refer to the label for the timing and use rate for individual grass species. Pre-harvest interval of 15 days. Always use a crop oil concentrate at a rate of 2 pt/acre.</p>
Pendimethalin/ Group 3	Prowl H2O/241-418	<p><b>Rate:</b> 2–6.3 qt Prowl/acre (1.9–6 lb ai/acre)  <b>Time:</b> Preemergence  <b>Weeds:</b> Controls most annual grasses and certain broadleaf weeds as they germinate.</p> <p><b>Remarks:</b> Prowl H2O is labeled for non-bearing and bearing trees. Pre-harvest interval of 60 days. Do not apply more than 6.3 qt of Prowl H2O per acre per year. Do not graze livestock in treated orchards.</p>
Glufosinate-ammonium/Group 10	Rely 280/264-829	<p><b>Rate:</b> 82–246 fl oz Rely 280/acre (1.5–4.5 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Controls a broad spectrum of emerged annual grasses and broadleaf weeds. Will also control certain woody species.</p> <p><b>Remarks:</b> Thorough coverage is required for control because this is a contact herbicide. Rely 280 can be tank mixed with Chateau, Goaltender, Surflan, Soilcam, and many other herbicides in this list. For mixing recommendations, refer to the label of each herbicide.</p>
Glyphosate/Group 9	Roundup PowerMax/ 524-549	<p><b>Rate:</b> 0.7–3.3 qt Roundup/acre (0.9625–4.5375 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Will control most grasses and broadleaf weeds, including troublesome perennial weeds.</p> <p><b>Remarks:</b> Rates of application depend on weed species and stage of growth. Refer to label for information regarding the control of selected weeds. Roundup is labeled for weed control in site preparation stages, prior to transplant establishment, and in established orchards. Applications can be made using boom equipment, CDA, shielded applicators, hand-held or high-volume wands, lances or orchard guns, or wiper equipment, except as directed in the label. Extreme care must be exercised to avoid contact of herbicide solution, spray, drift, or mist with foliage or green bark of trunks, branches, suckers, fruit, or other parts of pecan trees because injury can occur. Allow a minimum of 3 days between last application and harvest of the crop. In New Mexico, resistance to Roundup has been confirmed in some Palmer amaranth populations in pecan orchards; therefore, growers must not rely solely on Roundup (glyphosate) for their weed control.</p>

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Halosulfuron-methyl/ Group 2	Sandea/ 81880-18-10163	<p><b>Rate:</b> 0.66–1.66 oz Sandea/acre (0.031–0.061 lb ai/acre)  <b>Time:</b> Preemergence and postemergence  <b>Weeds:</b> Controls certain broadleaf weeds and nutsedges.</p> <p><b>Remarks:</b> Use only in orchards where trees have been established for at least 12 months. Use a maximum of 1 oz Sandea/acre in soils classified as sands, loamy sands, and sandy loams. Refer to label for more specific directions on soil types and rates. Allow a minimum of 1 day between last application and harvest of the crop.</p>
Pelargonic acid/ Group 27	Scythe/ 62719-529	<p><b>Rate:</b> 75–200 gal Scythe/acre (315–840 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Provides burndown of both annual and perennial broadleaf weeds and grasses.</p> <p><b>Remarks:</b> Scythe is a contact herbicide; therefore, thorough coverage is required for control. Contact of herbicide with the foliage and green bark must be avoided.</p>
Clethodim/Group 1	Select 2 EC/59639-3	<p><b>Rate:</b> 6–8 fl oz Select/acre (0.09375–0.125 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Annual and perennial grasses.</p> <p><b>Remarks:</b> Select 2 EC is only registered for use in non-bearing pecan trees. Non-bearing trees are trees that will not bear nuts for at least 1 year following Select 2 EC application.</p>
Norflurazon/ Group 12	Solicam DF/ 61842-41	<p><b>Rate:</b> 1.25–5 lb Solicam/acre (1–4 lb ai/acre)  <b>Time:</b> Preemergence  <b>Weeds:</b> Will control several weeds, including barnyardgrass, common purslane, crabgrass, feather fingergrass, flixweed, London rocket, puncturevine, Russian thistle, sandbur, southwestern cupgrass, sowthistle, and witchgrass. It will suppress lambsquarters, marestalk, pigweed, purple nutsedge, and silverleaf nightshade.</p> <p><b>Remarks:</b> Application rate depends on soil texture. Be sure to refer to the label for the rate needed for the soil situation in the orchard. Solicam can be applied to bearing trees, and non-bearing trees must be established at least 18 months before use. Do not graze livestock on treated areas. Do not harvest nuts within 60 days of last application.</p>
Oryzalin/Group 3	Surflan A.S./ 70506-43	<p><b>Rate:</b> 2–6 qt Surflan/acre (2–6 lb ai/acre)  <b>Time:</b> Preemergence  <b>Weeds:</b> Will control several weeds, including barnyardgrass, crabgrass, cupgrass, foxtail, goosegrass, junglerice, lambsquarters, pigweed, prostrate knotweed, puncturevine, sandbur, and others.</p> <p><b>Remarks:</b> Labeled for bearing and non-bearing trees. Moisture is required to move the herbicide into the soil and activate it. Can be tank mixed with several herbicides, such as Gramoxone Extra, Princep, and Roundup. When considering a tank mix, be sure to study the labels of both products carefully to meet the requirements of both herbicides.</p>

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Common Name/ WSSA Grouping <sup>b</sup>	Example of Trade Name <sup>c</sup> /EPA Registration No	Application and Remarks <sup>d</sup>
Trifluralin/Group 3	Treflan 4 EC/ 5905-532	<p><b>Rate:</b> 1–4 pt Treflan 4 EC/acre (0.5–2 lb ai/acre)  <b>Time:</b> Preemergence and incorporated  <b>Weeds:</b> Will control several weeds, including barnyardgrass, bromegrass, crabgrass, foxtail, henbit, junglerice, knotweed, kochia, lambsquarters, puncturevine, purslane, Russian thistle, sandbur, stinkgrass, and others.</p> <p><b>Remarks:</b> Refer to label for more specific directions on rates. Must be mechanically incorporated to be effective. Do not try to water-incorporate into the orchard soil since poor weed control will result. Do not apply within 60 days of harvest. Other formulations of Treflan include MTF, SEC, and TR-10. Refer to the labels of each of these products for application rates.</p>
2,4-Dichlorophenoxy-acetic acid/Group 4	Unison/5905-542	<p><b>Rate:</b> 0.6–1.15 gal Unison/acre (1.425 lb ai/acre)  <b>Time:</b> Postemergence  <b>Weeds:</b> Will control broadleaf weeds.</p> <p><b>Remarks:</b> Unison is a restricted use pesticide in the state of New Mexico and requires certification to purchase and use. Refer to label for application rate as it relates band or spot treatments. Apply as a directed; spray onto the weeds to the point of run-off when weeds are young and actively growing. Do not harvest nuts within 60 days of last application. Limited to 2 applications per crop cycle.</p>

<sup>a</sup>The list is current as of December 2018; however, labels change frequently, and the herbicide's current label should be reviewed for the most recent conditions or restrictions before it is used. Read all labels carefully and comply with their site-use directions. For the very latest label information on a given herbicide, contact the manufacturer, Extension services in your area (<https://aces.nmsu.edu/county>), or the company or distributor that sells the product.

<sup>b</sup>Herbicide groupings follow the Weed Science Society of America's (WSSA) nationally accepted grouping. The grouping is based on the modes of action of herbicides. For effective herbicide resistance management, it is imperative to rotate or mix the herbicides from different groups.

<sup>c</sup>Other trade names of the above-mentioned active ingredients alone or in combination may be available in the market.

<sup>d</sup>Be sure to have the orchard well in mind when considering the use of an herbicide. Take the time to read and understand herbicide labels before purchasing them. After purchasing a product, follow the label directions when making the application. It is also important to calibrate the application equipment; take time to determine the correct sprayer output and determine the uniformity of the equipment. For more information, contact your county Extension office.

## REFERENCES

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*The pesticide recommendations in this publication are provided only as a guide. The authors and New Mexico State University assume no liability resulting from their use. Please be aware that pesticide labels and registration can change at any time; by law, it is the applicator's responsibility to use pesticides ONLY according to the directions on the current label. Use pesticides selectively and carefully and follow recommended procedures for the safe storage and disposal of surplus pesticides and containers.*

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