

## Pecan Timelines

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### **Introduction**

These timelines have been created to give a general overview of pecan crop production and related worker activities, pesticide use, and key pests. They are intended to describe these activities and their relationships to pesticide applications, which take place in pecan orchards throughout the year. Use of this information is intended for documents such as worker risk assessments and pesticide benefits assessments. The timing of events described may vary due to such factors as geography, climate, and weather. Pesticide use information is current as of January 16, 2002.

Tables 1, 2, and 3 are timelines of crop events. These are divided into three sections showing stages of crop phenology, the timing of worker activities, and pest activity periods with related pesticide application timings. The horizontal bars in the timelines indicate the common timing of crop events for the entire growing region. Please refer to Tables 1, 2, and 3 to view the relationship between the various crop events that take place in the orchard.

### **Crop Production**

In 2000, the United States produced 206.6 million pounds of pecans, valued at about \$227 million, including both native stands and improved orchards. Georgia is the largest producer of pecans in a given year, followed by Texas and New Mexico. Together they produce the majority of pecans grown in the United States (USDA-NASS, 2001; Crop Profile for Pecans in GA, 2001).

Pecan, *Carya illinoensis*, is native to the southern regions of the United States where production includes harvest of both native stands and orchards of improved varieties. Native pecan trees are often found near rivers or streams, and are established through the natural spread of seed. Improved varieties, either originating from breeding or seedling selection programs, are grafted on to rootstocks and grown in orchard configuration. These have more uniform kernel quality and produce higher yields than native trees. Pecan is alternate bearing, meaning that crop production tends to alternate from high to low yields from year to year (Markle, 1998; Crop Profile for Pecans in TX, 2000; Crop Profile for Pecans in GA, 2001).

Due to differences in climate, crop practices, and pests, the major pecan growing states have been grouped into three regions. The East region extends from Virginia to Florida, and west to Louisiana. The Central region includes Texas, Oklahoma, and Kansas. Although the East and Central regions have similar practices, there are some differences in climate and pest pressures. Both regions have improved orchards and native stands of pecan trees, but the East has more orchard acreage whereas the Central region has a higher percentage of native trees. The West region includes west Texas, New Mexico, Arizona, and California. All pecan trees in the West are improved varieties that have been planted into orchards; there are no native stands. The West region has a different climate and different pest pressures than the East and Central regions (Herrera, "Historical," 2000; Herrera, personal communication, 2001; Wood, 2001; Crop Profiles). Other, more northern, states also produce some pecans but may not be included in these regions.

Pecan trees may reach a height of 100 feet and can live for over 80 years, with some native trees existing

for 200 to 300 years. Pecan orchards or stands may vary in size from 1 acre to over 2000 acres. Although the size of a cultivated pecan orchard varies, 10 to 50 acres is typical. Improved varieties are commonly planted with about 50 pecan trees in each acre with a spacing of 30 by 30 feet, but some areas are planted at a higher density (15 by 30 feet, with approximately 97 trees per acre) to attain heavy early production. As the trees crowd each other, they are either thinned out of the orchard or pruned. Trees are thinned over time until there are about 12 trees per acre spaced about 60 by 60 feet. Native stands are also thinned to maximize production by removing other vegetation and less productive pecan trees (Crop Profile for Pecans in GA, 2001; Crop Profile for Pecans in North Carolina, 1999; Crop Profile for Pecans in TX, 2000; TX Pecan Handbook, 1997, I - 19, IV - 3, XIII - 5 - 6; Sibbett, 2002).

Pecan trees are dormant during winter months, typically from January through March. In early spring, bud break occurs, followed by bloom and pollination, usually in May. Although pecan trees produce both male and female flowers, the flowers mature at different times, requiring cross-pollination. Presence of a variety whose bloom coincides with the main variety is required for adequate pollination. In the event that the flower maturation times overlap, cross-pollination is still preferred because self-pollination results in poor nut quantity. Pecan tends to drop flowers or nuts at three times during the year: in May, late June, and August. The drops may occur for several reasons, including unsuccessful pollination/fertilization, unfavorable conditions due to weather, or pests. Nut elongation and expansion occurs in the summer and the size of the nut is determined when the shell hardens. The kernel develops from late summer into the fall, which may take about six weeks. The shuck, the outer fleshy material covering the shell of the nut, splits after kernel maturity. Harvest occurs in mid to late fall, often after freezes have occurred that dry out the nuts. Timing of these events varies in different regions (TX Pecan Handbook, 1997, III-7; Herrera, "Growth," 2000; Sparks, 2001).

### **Worker Activities**

For optimal productivity, irrigation is required when there is not an adequate supply of natural moisture in the form of rain or high water table. Drip or micro-sprinkler irrigation, also known as low-volume irrigation, is a common method of irrigation. Low-volume irrigation may be used in areas of low water supply or uneven terrain. Fertilizer and other chemicals are often applied through this type of irrigation. However, low-volume systems are prone to clogging from weeds, ants, insects, microorganisms, and other materials. Large animals may disrupt the flow of water or damage the irrigation equipment when looking for water. In the West, flood or furrow irrigation is also used. Native stands grow near natural water supplies and have adequate moisture for growth, making irrigation unnecessary. Also, irrigation is difficult for native stands because of the random distribution of trees (Crop Profile for Pecans in GA, 2001; Crop Profile for Pecans in TX, 2000; TX Pecan Handbook, 1997, V-5-7).

Pruning and tree thinning are necessary to prevent crowding of the pecan trees, which can cause a greater incident of pecan scab, failure to produce quality nuts, and eventually cause limbs to die. Tree thinning is the removal of the whole tree from the orchard or stand, often accomplished by using a chain saw near the base of the tree and then grinding the remaining stump below the ground. Pruning is less common but several methods are being used. Mechanical hedging is a newer procedure used by some growers to allow light to reach the inner areas of the tree and to maintain lower limb health. Every few years, circular saw hedgers are used to cut the limbs to 10 feet from the tree, with either two or four sides of the tree being trimmed. Another procedure is dehorning, which involves cutting the tree to a 30 foot trunk, and reducing the limbs to stubs. This practice is used to rejuvenate trees. Production is lost for about 2 years before production gradually reoccurs. Removing large limbs from the trees may be practiced on widely spaced,

mature trees. Here, smaller limbs remain and light can penetrate further into the tree to increase production. Some growers may remove one limb every one to two years. Other grower may remove as many as thirty percent of the limbs, with the practice repeated every 5 years (TX Pecan Handbook, 1997, IV-5-7).

Orchard floor management, including tillage or non-tillage, is important for an efficient harvest, and influences other crop practices, such as irrigation and weed control. Debris, from pruning or broken limbs, may be removed near harvest to allow the equipment to work efficiently. Weed management commonly includes spraying herbicides down the tree row then mowing or tilling the rows middles. Mowing native or planted sod is popular as it allows equipment to enter the field under wet conditions, which cannot be done in tilled orchards. In native stands, livestock often grazes vegetation among trees. In young improved orchards, annual crops may be grown (Crop Profile for Pecans in TX, 2000; TX Pecan Handbook, 1997, VIII-1-2; Sibbett, 2001).

Pecan harvest, which occurs during mid to late fall, is mainly mechanized throughout the United States. For example, 98 percent of Texas pecans are harvested mechanically. Hydraulic shakers clamp to the tree and shake the tree to dislodge the nuts, which fall to the orchard floor. The nuts are then mechanically swept into windrows and picked up with a mechanical harvester. If the shaker does not have a sweeper to remove nuts from its path, then a laborer must rake nuts out of the way of the shaker to decrease losses. Also, at least two laborers must remove debris from the orchard floor after the shaker and before other pieces of equipment enter the row. In some orchards catch frames may be used to catch the nuts as they fall from the tree. The minimal hand harvesting that does occur involves knocking the pecans out of the tree with a pole and then hand picking the nuts off the orchard floor. Often some machinery is used when hand harvesting (Crop Profile for Pecans in TX, 2000; Crop Profile for Pecans in GA, 2001; TX Pecan Handbook, 1997, IX-1-4).

Pesticides may be applied to pecan trees by ground or aerially. Ground applications are usually done with air blast sprayers with the driver in a closed cab. An air blast sprayer can apply pesticides on up to 75 acres each day. Commonly, 100 gallons of spray solution is applied per acre although this number varies. An improved, nozzleless sprayer is being developed that uses less pesticide and can get a more even coverage of the tree. Aerial treatment is faster and useful when the soil is too wet for ground sprayers. This method is uncommon in Georgia, but is used for 30% of pesticide applications in Texas. Aerial applications do not provide as good of coverage as ground applications so is better suited for materials that do not need to make direct contact with the pest, such as protective fungicides. Both helicopters and fixed-wing aircrafts are used, and provide comparable level of control. In 1999, all pesticide applications were made by ground in California, but it should be noted that California does not have the same pest pressures as in other pecan growing areas (Crop Profile for Pecans in GA, 2001; Crop Profile for Pecans in TX, 2000; Weaver, 1998; TX Pecan Handbook, 1997, VII-35-41; Cal-DPR, 1999).

## **Pesticides**

Limited information is available on pesticide usage, however there are some pesticides that were generally used in 1999. Herbicides commonly used in pecans were glyphosate, oxyfluorfen, diuron, 2,4-D, and paraquat. Insecticides used were malathion, chlorpyrifos, dimethoate, imidacloprid, and carbaryl. Fungicides commonly used were triphenyltin hydroxide, propiconazole, fenbuconazole, and sulfur (USDA Ag Usage, 2000).

## **Insects**

Pecan weevil (*Curculio caryae*) is a primary pest of pecans late in the season, with adults often emerging from July through October. This pest is found in the East and Central regions. Adult weevils feed on young nuts, usually causing nuts to drop from the tree. Further damage occurs when eggs are oviposited into the nuts. The resulting larvae feed on the nuts through December. Larvae fall to the soil to pupate, where they stay for 2 to 3 years before emerging as adults. Harvesting early and destroying infested nuts helps reduce pecan weevil populations. Carbaryl is often used, with or without an organophosphate, in mid to late August. A repeat application may be necessary. No biological control methods were identified (Crop Profile for Pecans in GA, 2001; TX Pecan Handbook, 1997, VII-16-17).

Hickory shuckworm (*Cydia caryana*) is a serious pest of pecans from South Carolina to New Mexico. Efforts are being made to keep this pest from entering Arizona and California. A small, nocturnal moth, this pest attacks from nut formation until harvest. The hickory shuckworm lays eggs on the shuck. The larvae enter the shuck after hatching, where they feed either within the nut or, if the shell has hardened, within the shuck. Losses occur when damaged nuts drop from the tree. If larvae are feeding in the shuck, damage consists of a decline in shell quality. Damage to the vascular tissue in the shuck may cause improper nut development, and delayed nut maturity. Cultural control methods, such as removing and destroying old shucks in the orchard, may reduce infestations. No biological control methods were identified. Chemical control methods typically involve pyrethroids or organophosphates, although there are other insecticides available. Pesticide applications often occur in mid summer, when shell hardening occurs (English, 1998; Crop Profile for Pecans in GA, 2001).

Pecan nut casebearer (*Acrobasis nuxvorella*) is a widespread pest of pecans, occurring at some level in all regions, although not in Arizona or California. There are two to four generations a year, with the first generation causing the most damage. Between April and May, after overwintering on dormant buds, casebearer moths emerge and deposit eggs on nutlets. Larvae from this generation feed on the nutlets and leave frass and webbing on the nut. Each larva consumes 3 to 4 nuts over a 4 to 5 week period. The generations that occur in summer to fall cause less damage. The casebearer has many natural enemies, including *Trichogramma* wasps, but they are not effective at controlling casebearers. *Bacillus thuringiensis* (*Bt*) may be an effective biological control. No cultural controls were identified. Insecticides used to treat pecan nut casebearer include organophosphates, pyrethroids, carbaryl, and endosulfan (Knutson, 1998; Crop Profile for Pecans in KS, 2001).

Aphids, specifically black pecan (*Melanocallis caryaefoliae*) and yellow aphids, including both the yellow pecan (*Monelliopsis pecanis*) and black margined (*Monellia caryella*) aphids, are found throughout pecan growing regions. They are the only major pests in California. Yellow aphids are damaging in the spring and fall, whereas black pecan aphids are most damaging in the fall, although the population begins emerging in spring. Both types of aphid have more than one generation each year. Aphids damage pecans by extracting photosynthates from the tree, which decreases growth. During feeding, aphids produce honeydew on the leaves that is a medium for sooty mold fungus to form and decrease photosynthesis. Black pecan aphids have toxins that cause necrotic spots in the leaf and defoliation. Natural enemies, including lady beetles and lacewings, are often able to keep aphid populations low but not below economic levels. Systemic insecticides (carbamates and nicotinoids), pyrethroids, and organophosphates are some of the chemicals used to control aphids, although resistance is a concern. No cultural controls were identified (UC IPM Guidelines: Pecans, 2000; Crop Profile for Pecans in GA, 2001; TX Pecan Handbook, 1997, VII-12-13, 15-16).

Stink bugs and plant bugs, including southern green stink bugs (*Nezara viridula*) and leaf-footed bugs (*Leptoglossus phyllopus*), are a problem in the East region and occasionally in the Central region. After overwintering in debris, adult bugs deposit eggs on field crops or grass in the spring, with the nymphs remaining there until they are adults. Although there are four to five generations each year, the adult bugs cause the most damage beginning in late August and September. These true bugs damage pecans by feeding on developing nuts by piercing the shell with their mouth parts. Before shell hardening, these nuts drop from the tree. After shell hardening, the kernel forms black spots and develops a bitter taste. Organophosphates or zeta-cypermethrin are the insecticides typically used if population levels require chemical treatment. Typically weed control or insecticides that target other insect pests manage stink and plant bugs. Growers can also plant a “trap crop”, such as black-eyed peas. When this crop, a preferred host, becomes infested with stink and leaf-footed bugs, it is sprayed with an insecticide to kill them before they reach the pecans (Crop Profile for GA, 2001; Crop Profile for Pecans in NC, 1999; Crop Profile for Pecans in TX, 2000).

Other insect pests can also occur in pecan orchards and native stands, but are either less common or occur less frequently than other pests.

Walnut caterpillar (*Datana integerrima*) and fall webworm (*Hyphantria cunea*) are insect pests in the Central region. Walnut caterpillars feed on leaves in groups, leading to defoliation and losses in both yield and quality. Fall webworm, which may defoliate entire trees by feeding on the leaves, is characterized by the large white webs that house the caterpillars. *Bt* and several insecticides are available for control of both pests. No cultural controls were identified (Crop Profile for Pecans in KS, 2001).

Red imported fire ants (*Solenopsis invicta*) are a widespread problem in the southeast, including Texas and Georgia. Ants clog irrigation equipment, attack workers in the orchard, and disrupt aphid predators. The problem is worse in orchards using low-volume irrigation. Methods to control fire ants include insect growth regulators, juvenile hormones, or spraying chlorpyrifos on the ground or the tree trunk (Crop Profile for Pecans in TX, 2000; Crop Profile for Pecans in GA, 2001).

Pecan phylloxera (*Phylloxera devastatrix*) are present in some areas in the East and Central regions. The pest is very small and resembles an aphid. Pecan phylloxera forms galls on the tree, which can lead to plant stress, defoliation, and shoot/ limb loss. During normal thinning of native groves, if pecan phylloxera infested trees are removed, the problem can be alleviated. Insecticides are also available to control this pest (Crop Profile for Pecans in GA, 2001; Crop Profile for Pecans in KS, 2001).

Mites, particularly pecan leaf scorch mite (*Eotetranychus hicoriae*), a spider mite, cause damage late in the season in some areas. Leaves may become brown and fall from the tree. Chemicals are available to control this pest (Crop Profile for Pecans in GA, 2001).

Pecan twig girdler (*Oncideres cingulata*), a beetle, may attack pecan trees in the East region. In September, this pest girdles small branches and twigs, lays eggs in branches, which then fall off when blown by the wind. The branches serve to feed the larvae until they pupate in the soil. Removing branches from the orchard floor may reduce populations. No biological or chemical controls were identified (Crop Profile for Pecans in NC, 1999).

## **Diseases**

Pecan scab (caused by *Cladosporium caryigenum*) is a major pecan disease found in the East and Central growing regions. Pecan scab is a pest in moist areas and in years of abundant rainfall. It impacts the leaves, shoots, and developing nuts forming dark, black lesions. Damage that may result includes defoliation, nut drop, and poor kernel filling, leading to yield and quality loss. Weakened trees may produce a smaller crop the following year. Cultural control methods include planting resistant varieties for new orchards, or tillage to destroy infected material on the ground. Protectant fungicides are often applied 9 to 11 times in a season beginning in early April and lasting until about early August. There are several fungicides used to control pecan scab (Crop Profile for Pecans in GA, 2001; Weaver, 1998; Jones and Ritchie, 1999).

Other diseases affect specific areas or occasionally cause damage.

Powdery mildew (caused by *Microsphaera* spp.) is an occasional fungus that is more of a problem in young orchards than in older orchards. Young leaves and nuts become covered with a white powder that may cause defoliation or a decrease in photosynthesis. Damage also includes early shuck split and small shriveled nuts. Cultural practices that improve air circulation through pruning and the design of the layout of the tree rows, and planting the more resistant tree varieties aid in control. Fungicide applications made for scab often controls powdery mildew. In the West region, where there is not a problem with pecan scab, several fungicides are available for use (Crop Profile for Pecans in GA, 2001; Goldberg, 1998).

Zonate leaf spot (caused by *Cristulariella moricola*) may damage pecan trees during rainy summers in the East region. Leaves develop dark spots or concentric rings on the leaf and trees may become defoliated. No biological or cultural controls were identified, and there are currently no resistant varieties. Chemicals are available to control this disease. Benomyl was previously used for Zonate leaf spot control but is in the process of being voluntarily cancelled by the registrant (Crop Profile for Pecans in GA, 2001).

Stem-end blight (cause unknown), which may sometimes cause problems in Texas, can quickly kill nuts and is a serious problem when stink bugs are feeding on the nut. One application of a fungicide can usually control this disease. Typically, chemical applications for scab are effective on stem-end blight (Crop Profile for Pecans in TX, 2000).

Downy spot (caused by *Mycosphaerella caryigena*) occurs in the Eastern and Central regions. Leaves are the only part of the tree affected, with a possible reduction in photosynthesis and defoliation. This leads to reduced yields and decreased kernel quality. Fungicides are applied before pollination (Crop Profile for Pecans in GA, 2001; TX Pecan Handbook, 1997, VII-23-24).

Phymatotrichum root rot (caused by *Phymatotrichopsis omnivora*), also known as “Texas root rot” and “cotton root rot” is a serious disease in the Southwest. This soil borne fungus is common to Texas, New Mexico, and Arizona. Occurring in the summer and fall, this pest kills healthy root tissue and eventually trees. Soil treatments are available to control this disease (Sibbett, 2002; Goldberg, 1998).

Heart rot and wood rot (e.g., *Schizophyllum commune*) are fungal diseases that occasionally affect pecan trees in New Mexico. Wounds provide an opening for heart rot and wood rot fungi to enter. Mushrooms form and the tree may become unproductive or even die. Preventing wounds and correct pruning practices can control the disease (Goldberg, 1998).

## **Weeds**

Weeds are managed for an efficient mechanical harvest, to keep irrigation systems clear, and to prevent the weeds from competing with the tree for nutrients and water. Weeds may also serve as a habitat for diseases, insects, and rodents. A typical weed management practice is strip weed control. This practice incorporates herbicide use in a strip down tree rows with mowing or tillage in the row middles. This system is popular due to decreased herbicide use and a decrease in tree damage from mowing or tillage equipment.

Weeds should be scouted every month to see which weeds are not being controlled by current practices and to find new or difficult weed species. A pre-emergence herbicide, often sprayed in late February to early March, is applied in the tree rows to control summer annuals. Post-emergence herbicides (contact or systemic) should be sprayed as needed for perennial and/or annual weeds and near harvest. Some hand hoeing is done in limited situations. In row middles, tillage or mowing may be used to control the weeds. Tillage is beneficial for annual weed control, but may make perennial weed problems worse, cause soil compaction, and bring new weed seeds up to the soil surface. Mowing allows the grower to develop grass sod between the tree rows, which may serve as a habitat for beneficial insects, prevent erosion, and improve soil structure. Mowing or cultivation usually occurs in the spring, one to four times in the summer, and before harvest (Crop Profile for Pecans in NC, 1999; Mitchem and Parker, 1999; Crop Profile for Pecans in TX, 2000; Lee, 1994; Sibbett, 2001).

### **Vertebrate Pests**

Birds, particularly blue jays and crows, consume and damage pecans from shuck split to harvest. Squirrels consume the nuts from kernel development to harvest. Several methods may be used to manage vertebrate pests, such as vegetation removal, fencing, rapid harvest, scare devices, repellents, and the removal of the pest. Feral pigs and Javelina may also cause damage to pecan orchards in the Western region by “rooting” up soil and damaging irrigation systems (Ellis and Hudson, 2000; Sibbett, 2001).

### **Post Harvest**

Following harvest, pecans must be properly dried and stored to reduce insect and rodent damage, and prevent mold or deterioration in quality. This takes place just after pecans are harvested so they’ll be ready for marketing. Storage containers are often treated with an antioxidant before nuts are added to reduce rancidity. Refrigeration and proper humidity control is key to storing nuts, as lower temperatures allow the nuts to store for longer periods of time (TX Pecan Handbook, 1997, IX-13-15).

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**Table 1. General Timeline of Crop Stages, Worker Activities, and Key Pests in Pecans in the East Region (VA to FL, west to LA).<sup>1</sup>**

	Jan				Feb				March				April				May				June				July				August				Sept				Oct				Nov				Dec			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Crop Stage</b>																																																
Dormant																																																
Budbreak																																																
Pollination																																																
Nut elongation + expansion																																																
Shell hardening																																																
Kernel development																																																
Shuck split																																																
<b>Worker Activities</b>																																																
Irrigation																																																
Mowing																																																
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Pruning/Thinning																																																
<b>Insect Pests</b>																																																
Pecan Weevil																																																
Pecan nut casebearer																																																

	Jan				Feb				March				April				May				June				July				August				Sept				Oct				Nov				Dec							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Hickory shuckworm																																																				
Stink and plant bugs																																																				
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Typical fungicide app. <sup>2</sup>																																																				
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There are no specific target weeds for this crop.																																																				
Typical herbicide app. <sup>3</sup>																																																				

<sup>1</sup> The horizontal bars represent the usual range of time when the events may occur for the entire crop. These times are variable depending on variability in geography, climate, and weather.

<sup>2</sup> Additional fungicide applications may be needed through early August.

<sup>3</sup> Post-emergent spot sprays are not represented, and may need to be applied intermittently during the season.



**Table 2. General Timeline of Crop Stages, Worker Activities, and Key Pests in Pecans in the Central Region (TX, OK, KS).<sup>1</sup>**

	Jan				Feb				March				April				May				June				July				August				Sept				Oct				Nov				Dec																																																			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4																																																
<b>Crop Stage</b>																																																																																																
Dormant	■				■				■																																																																																							
Budbreak													■																																																																																			
Pollination																	■																																																																															
Nut elongation + expansion																					■				■				■																																																																			
Shell hardening																									■				■																																																																			
Kernel development																													■				■																																																															
Shuck split																																	■																																																															
<b>Worker Activities</b>																																																																																																
Irrigation													■				■				■				■				■																																																																			
Mowing																	■				■				■																																																																							
Harvest																																									■				■																																																			
Pruning/Thinning	■				■																																																																																											

	Jan				Feb				March				April				May				June				July				August				Sept				Oct				Nov				Dec						
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3
<b>Insect Pests</b>																																																			
Pecan Weevil																																																			
Pecan nut casebearer																																																			
Hickory shuckworm																																																			
Stink and plant bugs																																																			
Aphids																																																			
Typical insecticide app.																																																			
<b>Diseases</b>																																																			
Pecan scab																																																			
Downy spot																																																			
Stem-end blight																																																			
Typical fungicide app. <sup>2</sup>																																																			
<b>Weeds</b>																																																			
There are no specific target weeds for this crop.																																																			
Typical herbicide app. <sup>3</sup>																																																			

<sup>1</sup> The horizontal bars represent the usual range of time when the events may occur for the entire crop. These times are variable depending on variability in geography, climate, and weather.

<sup>2</sup> Additional fungicide applications may be needed through early August.

<sup>3</sup> Post-emergent spot sprays are not represented, and may need to be applied intermittently during the season.

**Table 3. General Timeline of Crop Stages, Worker Activities, and Key Pests in Pecans in the West Region (West TX, NM, AZ, CA).<sup>1</sup>**

	Jan				Feb				March				April				May				June				July				August				Sept				Oct				Nov				Dec																																															
Quarters	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4																																								
<b>Crop Stage</b>																																																																																												
Dormant	■				■				■																																																																																			
Budbreak													■																																																																															
Pollination																	■																																																																											
Nut elongation + expansion																					■				■				■																																																															
Shell hardening																									■				■																																																															
Kernel development																													■				■				■																																																							
Shuck split																																	■				■																																																							
<b>Worker Activities</b>																																																																																												
Irrigation									■																																																																																			
Mowing																	■																																																																											
Harvest																																					■				■																																																			
Pruning/Thinning	■				■																																																																																							

	Jan				Feb				March				April				May				June				July				August				Sept				Oct				Nov				Dec							
Quarters	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Insect Pests</b>																																																				
Hickory shuckworm-TX, NM																																																				
Pecan nut casebearer																																																				
Aphids																																																				
Typical insecticide app.																																																				
<b>Diseases</b>																																																				
There are no major diseases for pecans in the West region.																																																				
<b>Weeds</b>																																																				
There are no specific target weeds for this crop.																																																				
Typical herbicide app. <sup>2</sup>																																																				

<sup>1</sup> The horizontal bars represent the usual range of time when the events may occur for the entire crop. These times are variable depending on variability in geography, climate, and weather.

<sup>2</sup> Post-emergent spot sprays are not represented, and may need to be applied intermittently during the season.