

Mesquite Control in Arid Regions



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Mesquite is widely found across the southwest, stretching from east Texas, north into Oklahoma, south into Mexico, and westward through New Mexico and Arizona. In much of the eastern portion of this range honey mesquite (*Prosopis glandulosa var glandulosa*) is the dominant variety. In west Texas, often referred to as the Trans-Pecos, and across southern New Mexico, Torreyanna or western honey mesquite (*P. g. var torreyana*) is the principal variety. In Arizona a third variety (or subspecies) is found, velvet mesquite (*P. g. var velutina*).

Standard Guidelines for spraying mesquite

From the 1950s to the present a wealth of useful research and practical experience has been gained related to mesquite control by herbicide application. Many of the early guidelines for applying herbicides to mesquite that were first proposed nearly 50 years ago are still in use today. Plants like mesquite must be sprayed when the herbicides will best be translocated to the roots and basal meristem regions of the plant.

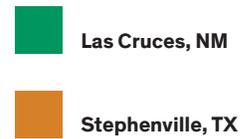
Timing of herbicide application has long been touted as the key to successful mesquite control. For aerial spraying the optimal time for honey mesquite control is about 45 to 90 day after bud break, with soil temperatures at a 12 to 18 inch depth being at least 75 F, and preferably above 80 F. Healthy dark green foliage is necessary to insure adequate herbicide absorption. It's long been recognized that mesquite should not be sprayed when more than 25% of foliage has been damaged by drought, insects, hail, or disease. Also, spraying should be avoided when recent rains have promoted new, light green leaf growth on twig tips. Ideally, the

foliage should be robust and a uniform dark green color at the time of herbicide application.

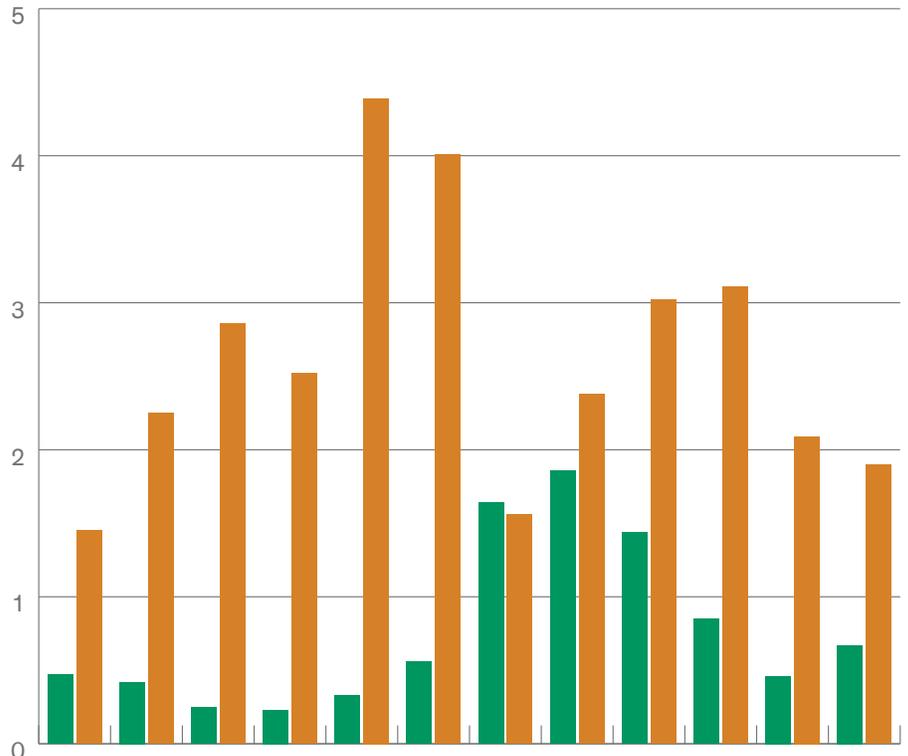
These guidelines work well in arid regions, provided sufficient winter and spring precipitation has been received to insure healthy mesquite growth at the time of spraying. When soil moisture is not limiting, then greater attention is given to spraying when soil temperatures and foliage growth are ideal. In southern New Mexico near average or greater precipitation (at least 2 to 3 inches and preferably more from January through May) has long been recommended as needed for reliable mesquite growth for spraying. When sufficient precipitation is received then the typical spray season occurs from late May through early July.

Importance of Rainfall in Arid Regions

These guidelines for spraying mesquite were largely developed with experience gained on honey mesquite in its eastern range (northern, central, and east TX, including most of the TX panhandle and portions of northeastern NM, and southern OK). Within this region rather dependable early spring rainfall occurs and allows honey mesquite to be suitable for spraying most years in the 45 to 90 day after bud break spray window. By comparison, as one moves west into the more arid Trans-Pecos region, and into southern New Mexico and Arizona the precipitation pattern changes. In this region the majority of precipitation occurs during a single time period (mid-July to early-October) when nearly 65%



Monthly rainfall pattern (inches) where honey mesquite occurs in the more mesic eastern region (Stephenville, TX) and rainfall in the arid region (Las Cruces, NM).



of rain is received from summer thunderstorms. The driest months of the year are usually from late fall (November) to early summer, with May and June being among the driest and hottest months of the year. The reality that early season precipitation may be limiting in arid regions cannot be overstated as roughly 6 out of every 10 years is droughty. This difference in rainfall timing and amount has led researchers to conclude that while the standard guidelines work well for honey mesquite in its eastern range, additional factors need to be taken into consideration before aerially applying herbicides to Torreyana and velvet mesquite in the western arid region.

How to decide when to spray in arid regions

Unquestionably, the often droughty early season precipitation pattern in the arid southwest complicates the decision making process for spraying mesquite. E.O Wooten, a noted Agriculturist, said after travelling across southern New Mexico nearly 100 years ago, “precipitation is always sparse and scanty and widely variable from year to year”. He went on to observe that predicting new annual plant growth (including mesquite) is frustrating because “summer will arrive without any heralding from spring”. (See “Factors affecting range management in New Mexico”, USDA Bull. 211, May 26, 1915).

A key to knowing when or when not to spray, especially within an environment having unpredictable rainfall, is having an appreciation that there is an optimal time or “application window” that will produce the best control results. This spray window may need to be adjusted within a season and, most likely will be different from year to year. One should never get locked into a particular date for

spraying. Rather one should closely watch how mesquite foliage matures in response to available soil moisture. The effects from insufficient early season soil moisture usually becomes obvious by the normal spray window (i.e. 45 to 90 days after bud break). Droughty mesquite foliage will be sparse, undersized and usually pale or yellow. Spraying is not recommended when early season drought conditions have reduced foliage growth by more than 25% of normal. It is best to wait another year or until soil moisture conditions have improved and healthy foliage is produced.

Just as with other arid land plants, mesquite responds quickly to available soil moisture. Thus, in certain early season drought years, there is still an opportunity for late season spraying. This occurs when precipitation is well below the January to May average (i.e. <2 inches) and mesquite leaf growth has been reduced by drought effects. With above average summer rains in July and August mesquite can recover quickly and produce healthy late season foliage needed for spraying. When mesquite foliage matures after summer rains the trained eye can see the difference. The mesquite canopy changes from a lighter new green leaf color (not quite ready) to a uniform dark green color (ready!). The transition from light to dark green foliage for the majority of mesquite in a given area may take 1 to 3 weeks after a major rainfall event. Once in the dark green phase spraying should take place in a finite window over the next 2 to 3 weeks.

New Mexico Mesquite Control, % Apparent Mortality by Year of Application

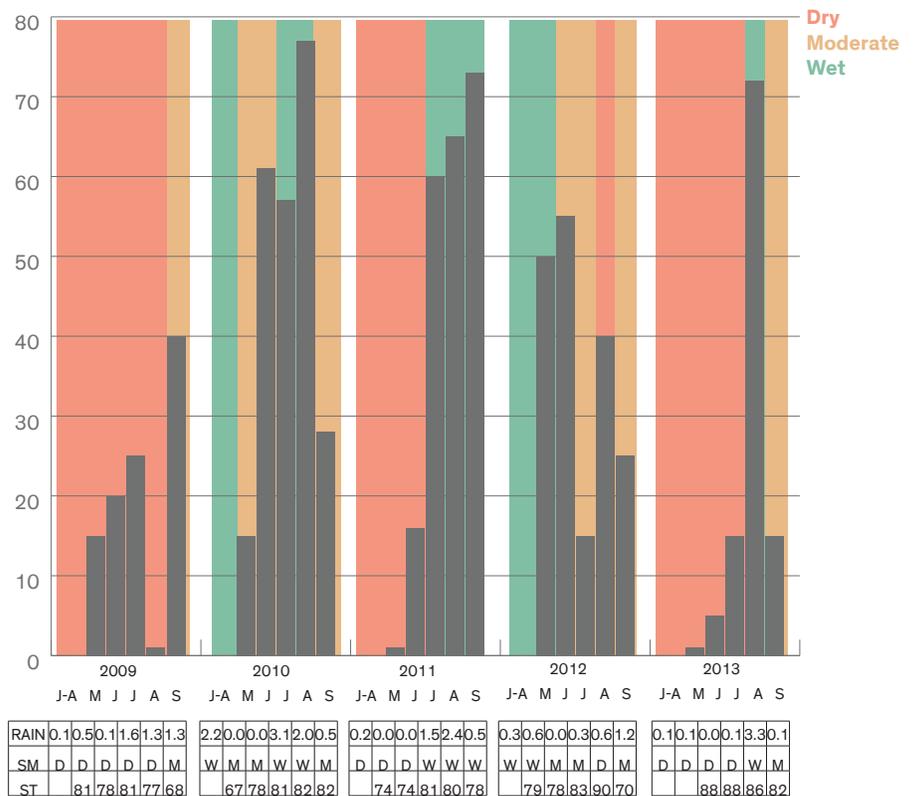


Figure 1: Mesquite mortality two years after monthly applications made in southern New Mexico from 2009-2013 summarized by year of application. Background colors indicate moisture conditions at time of spraying. Spraying conducted mid-month from May through September each year. Data chart below indicates previous 4 week rainfall (RAIN), Soil moisture conditions (SM) and soil temperature at 18 in. (ST) at time of spraying. Study conducted by Dr. Kirk McDaniel, New Mexico State University.

To illustrate how the “optimal spray window” can change through the growing season results from a 5-year study are presented in Figure 1. In this study, conducted in southern New Mexico, new mesquite was sprayed mid-month from May through September. In 2009, mesquite was drought stressed throughout most of the growing season and poor control resulted every month sprayed. In 2010 early season precipitation was above the needed 2 inch minimum (from Jan-May) and mesquite control was satisfactory when sprayed in June; and later summer rains enhanced mesquite control in July and August. Similarly, early season rains in 2012 were above average and mesquite control was good when sprayed in mid-June. However, sparse July and August rains and droughty soil led to poor late season mesquite control. In 2011 and 2013 conditions were again very dry in the early season and mesquite control was poor when sprayed in mid-June. Rains in July and August improved soil moisture conditions and allowed mesquite foliage to recover, resulting in good late season plant control.

Overall, spraying in mid-June (the preferred spray window) under mostly early season drought conditions produced satisfactory mesquite control in only 2 of 5 years (Figure 2). By comparison, better mesquite control occurred in 4 of 5 years when sprayed in mid-August with satisfactory summer rains. A major point of emphasis from this 5-year study is that the “best time” for spraying mesquite in this arid region is critically linked to recent soil moisture (or rainfall) events. Keeping a close eye on the weather and the quality of mesquite foliage is a must when deciding when to spray mesquite.

Consider mesquite size and shape when prioritizing areas to be sprayed

There are many factors to consider when deciding when and where to spray and one point often overlooked is the growth form or size of mesquite growing on an area. In general, as one moves from east to west across Texas and into the arid southwest, mesquite becomes shorter in stature; i.e. tree-like in the east and a lower growing shrub in the west. This change in growth form is partly because of variety differences but mostly in response to localized environmental conditions. Research has shown that taller mesquite with fewer main stems are easier to control than low growing multi-stemmed plants. This is because herbicide translocation is not as efficient when there is an imbalance in the root to shoot ratio. Tree-like mesquite is common in central Texas but in the arid region taller plants are mainly found in mesic areas, near arroyo’s or other water sources. The vast majority of mesquite found on the uplands of the arid southwest are low to intermediate in height and most are multi-stemmed.

As illustrated in Figure 3, the ease in mesquite root-kill comes from first treating taller plants and those with fewer stems. Shrubs that are low growing and highly multi-stemmed from the plant’s base are more difficult to control. A change in herbicide rate or combination of products is often recommended when treating different mesquite types.

New Mexico Mesquite Control, % Apparent Mortality by Month of Application

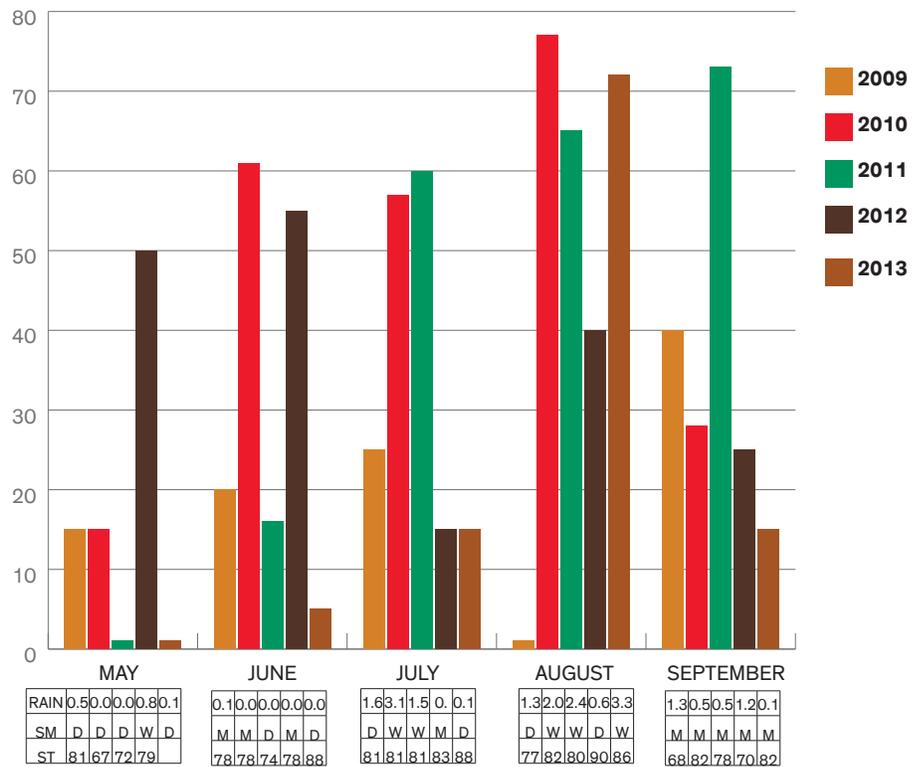
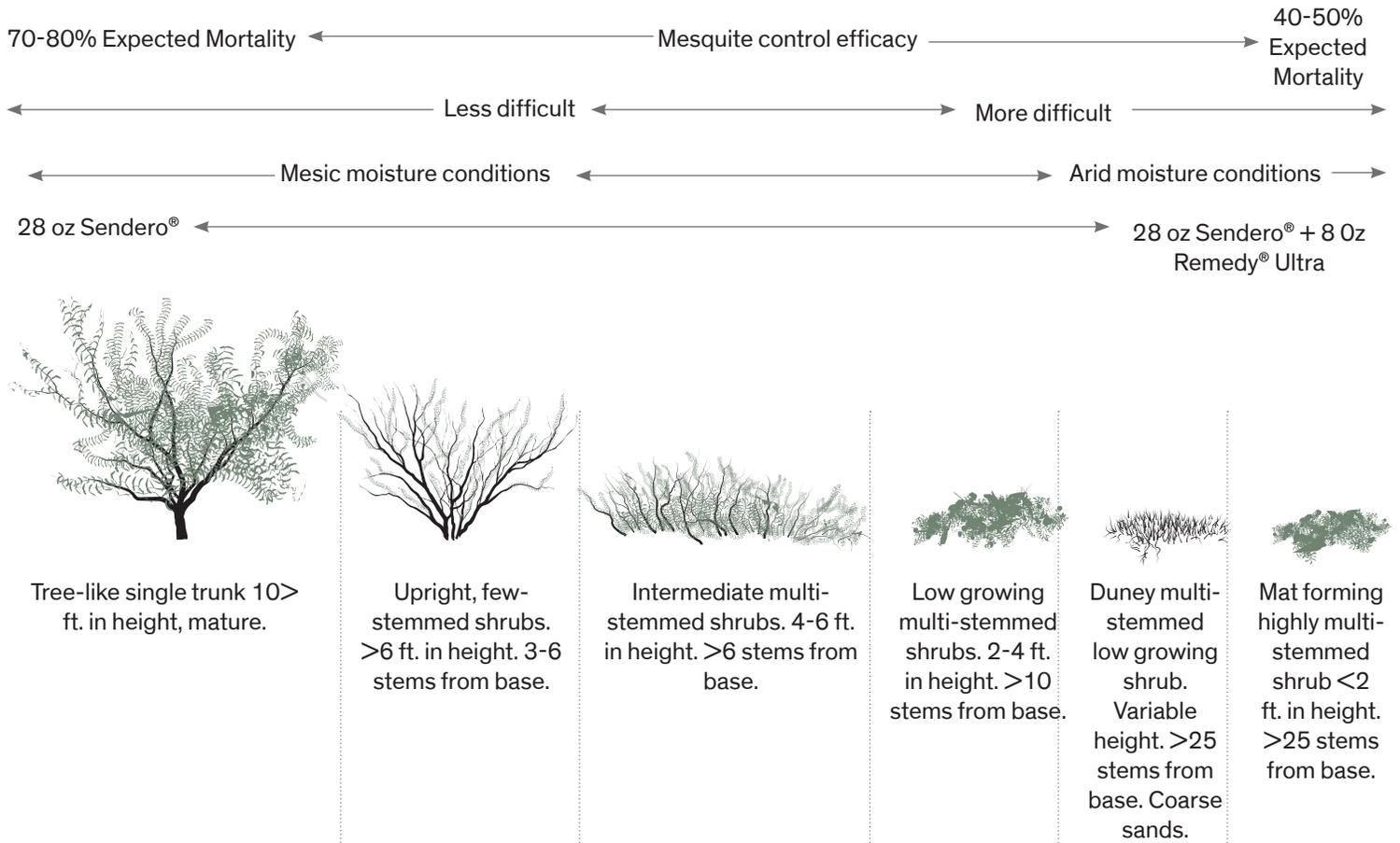


Figure 2: Mesquite mortality two years after monthly applications made in southern New Mexico from 2009-2013 summarized by month of application. Spraying conducted mid-month from May through September each year. Data chart below indicates previous 4 week rainfall (RAIN), Soil moisture conditions (SM) and soil temperature at 18 in. (ST) at time of spraying. Study conducted by Dr. Kirk McDaniel, New Mexico State University.

Figure 3:

Prosopis glandulosa Complex



Develop a long range plan for spraying in Arid Regions

Flexibility is a must when developing plans for spraying mesquite. This is especially true in the arid region where drought is a constant potential issue. For a single land owner it is often difficult to make quick and necessary changes or modifications to a spray plan. However, one must always be prepared to delay or alter a spray operation when necessary.

Logistically, when putting together a plan, multiple areas that might be suitable for mesquite spraying should be identified. The decision of whether or not to spray a particular site or pasture is made easier if several alternative areas can be considered. With today's GPS technology it is easy to generate maps (especially with help from agency conservationist) showing different areas or pastures that are potentially suitable for spraying. Once these areas are mapped, prioritize the preferred site(s) based on suitability for treatment after making an in-field assessment on mesquite condition.

Today, many large scale mesquite control projects in New Mexico and Arizona are being conducted in partnerships with private landowners and multiple land conservation agencies, such as the Bureau of Land Management, Natural Resources Conservation Service and Soil and Water Conservation Districts . The principle advantage to partnership programs is that spraying efforts can be coordinated among many participants so that cost can be minimized. Lower cost comes from cost-share programs and from contracting with aerial applicators for large scale work. These projects provide the added advantage of combining resources and conducting spray operations that give greater in-field flexibility.

Rate mesquite condition before spraying

A must before any spray operation is to conduct an in-field survey on all potential treatment areas. The survey should be made about a month before the anticipated spray date and, again, about 1 week before spraying. Below is a helpful checklist to evaluate mesquite condition prior to treatment at each specific location. Give top priority for spraying to those areas with the highest quality mesquite condition.

Summary

Mesquite control in arid environments can be challenging. Recent research suggests that timing and amount of precipitation plays a primary role in determining when mesquite might be most suitable for spraying. In general, rainfall conditions that produce uniform and healthy foliage at the time of spraying is a must for satisfactory mesquite control. An in-field survey evaluating mesquite foliage condition prior to and at the time of spraying should always be conducted before undertaking any spray operation. Mesquite stature or growth form influences herbicide activity and should always be considered when selecting areas for treatment and when making a herbicide choice. With more upright, few-stemmed mesquite trees and shrubs, Sendero at 28 oz of product per acre is the recommended treatment. For lower growing, multi-stemmed shrubby mesquite, a tank mix of 28 oz. of Sendero® herbicide plus 8 oz. of Remedy® Ultra herbicide is recommended.

MESQUITE CONDITION CHECKLIST – “RED FLAG”
indicates poor susceptibility to herbicide spray

Ranch _____ Date _____

Ecological Site _____ Pasture # _____

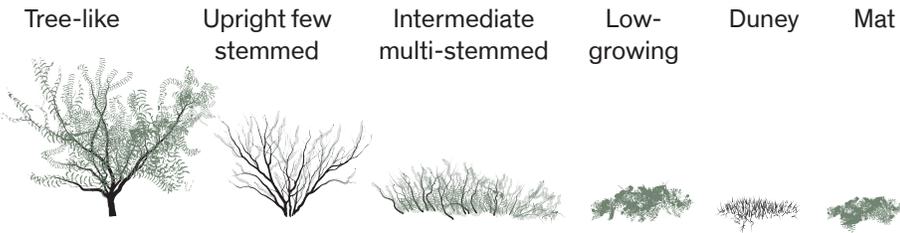
Soil temperature at 18 inches ____ F°

Soil type and depth _____

(i.e. deep sand, shallow clay loam, shallow rocky, etc.)

Estimated rainfall within previous week _____ inches Estimated rainfall within previous month _____ inches

Mesquite growth form. Circle one:



1. Current foliage condition as a percentage of “normal”

Foliage has been damaged, removed, or reduced by ____ % (If >25% **“RED FLAG”**)

(Circle appropriate agents that have caused foliage damage or reduced canopy volume):

 - a. INSECT and/or ANIMAL DAMAGE. Symptoms include: leaflets removed, leaves tied together by webs, stems girdled, insect frass on soil surface, and larvae under loose debris. Lower bark on branches and stems gnawed or removed by rabbits or rodents.
 - b. HAIL DAMAGE. Symptoms include: leaves on soil surface, foliage “ragged”.
 - c. FREEZE DAMAGE. Symptoms include: yellowing or chlorosis of leaflets and leaf drop.
 - d. DISEASE. Symptoms include: leaf chlorosis, orange dots on lower leaf surfaces, and leaf drop.
 - e. DROUGHT. Symptoms include: necrosis of leaf tips and margins, chlorotic leaves, pale green leaf color, or leaf drop.
 2. General foliage color (Circle appropriate color)
 - a. Dark green
 - b. Pea green **“RED FLAG”**
 - c. Intermediate green (Between dark green and pea green)
 3. Is there light or pea green foliage in upper tree canopies and on twig tips?

(Circle appropriate response.)

YES NO YES = “RED FLAG”
 4. Flower color if present. (Circle appropriate answer.)
 - a. Yellow
 - b. White **“RED FLAG”**
 - c. None
 5. Pod (bean) growth stage. (Circle appropriate answer.)
 - a. Not present
 - b. Green and less than fully elongated **“RED FLAG”**
 - c. Green but fully elongated
 - d. Ripe
 - e. Ripe and fallen
 6. Record notes and observations such as the percentage of the trees that appear “normal” and likely susceptible to broadcast sprays, and where these trees occur (in draws, along roads, in low-density mesquite areas, etc.).
- Record recommendation for spraying or delay.

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