41st Annual
WESTERN PECAN GROWERS ASSOCIATION
Conference Proceedings

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Las Cruces, New Mexico

The Annual

Western Pecan Growers Association Conference

WPGA Pecan Show

Pecan Food Fantasy

And

Pecan Trade and Equipment Show

sponsored jointly by

New Mexico State University
Cooperative Extension Service
in cooperation with
Western Pecan Growers Association

2007
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Nematodes (in Pecan)

Stephen H. Thomas and Jacqueline M. Trojan

Department of Entomology, Plant Pathology and Weed Science
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Fortunately for most western pecan producers, damage due to plant-parasitic nematodes is relatively uncommon compared to other orchard crops like peach, apple and citrus. At present, the pecan root-knot nematode (PRKN, *Meloidogyne partityla*) causes the most serious damage to pecan, although the pest potential of ring nematodes (*Mesocriconema* species) is also being considered. PRKN juveniles invade young pecan roots causing certain root cells to become greatly enlarged and serve as feeding sites for the nematode throughout the remainder of its life. As the cells and parasite enlarge, roots form gall-like "knots", internal tissue becomes distorted and the ability of roots to absorb and transport water and nutrients declines. The enlarged cells, known as "giant cells", signal the tree to divert products from photosynthesis away from other parts of the tree to be used instead as food by the PRKN parasite. Redirected photosynthates and reduced root function can result in above-ground symptoms similar to zinc deficiency or mouse-ear, and can cause dieback of new growth.

The known hosts of PRKN are pecan, walnut and hickory, limiting nematode survival to native trees or orchards. In regions where native hosts do not occur, introduction of the pest is likely to result from human activity (infected nursery stock; infested soil adhering to farm implements). PRKN has been confirmed from commercial orchards in AZ, GA, NM, OK, and TX, and from nurseries in FL and TX (Fig. 1). Several root-knot nematode species that are common agricultural pests in annual and perennial crops in the western U.S. have been reported to infect pecan, but studies conducted at NMSU found that none of the NM populations of these pests could reproduce on pecan (Table 1). Only PRKN reproduced consistently on pecan.

During fall and winter of 2005/2006 a survey was conducted to determine the incidence of PRKN in NM. In work supported by USDA APHIS, NMDA, and NM Agricultural Experiment Station soil samples were collected from 15-20% of the commercial pecan acreage in each county. Plant-parasitic nematode populations were determined from 155 orchards, of which only 11 were found to contain root-knot nematodes (Table 2). Of the 11 orchards infested with root-knot nematodes, DNA analysis has confirmed that one orchard is infested with PRKN and tests are underway on nematodes from the remaining 10 orchards. Results from the survey indicate that the incidence of PRKN infestation in commercial orchards in NM appears low.

Most reported efforts to manage PRKN in infested orchards throughout the United States have been unsuccessful, likely due in part to when the nematode reproduces. Studies conducted at NMSU found that unlike other root-knot nematodes, most PRKN reproduction occurs over an extended period during fall and winter, instead of during late spring and summer (Fig. 2). Infective PRKN juveniles have been recovered from soil around roots of trees in December and January when other root-knot nematodes are dormant. At present, PRKN does not appear to be a widespread problem and the best pest management strategy is to avoid additional PRKN introductions into uninfested orchards.

Table 1. Susceptibility of three pecan rootstocks to five species of root-knot nematodes that affect agricultural production in New Mexico.

Nematode species from NM:	Pecan cultivar (nematode eggs/gram dry root)		
	Burkett	Riverside	Western Schley
Columbia root-knot nematode (*Meloidogyne chitwoodi*)	0	0	0
Northern root-knot nematode (*Meloidogyne hapla*)	0	0	0
Southern or cotton RKN (*Meloidogyne incognita*)	0	0	0
Javanese root-knot nematode (*Meloidogyne javanica*)	0	0	0
Pecan root-knot nematode (*Meloidogyne partityla*)	55,628	37,026	77,549

Duration of study = 270 days; recovery of fewer than 90 eggs per root system was attributed to microbivorous nematodes and not recorded.

Table 2. New Mexico pecan orchards infested with selected genera of plant-parasitic nematodes, 2005/2006.

County	Samples per county		Number of orchards infested		
	Orchards	Acres	*Meloidogyne*	*Mesocriconema*	*Pratylenchus*
Chaves	21	610	5	5	10
Dona Ana	99	4,056	5	66	27
Eddy	13	422	0	4	1
Lea	7	264	1	3	4
Luna	7	207	0	3	0
Otero	6	299	0	4	1
Sierra	2	82	0	0	0
Total	**155**	**5,940**	**11**	**85**	**43**
Total acres infested	---	---	**139**	**1,411**	**704**

Reports of *Meloidogyne partityla*

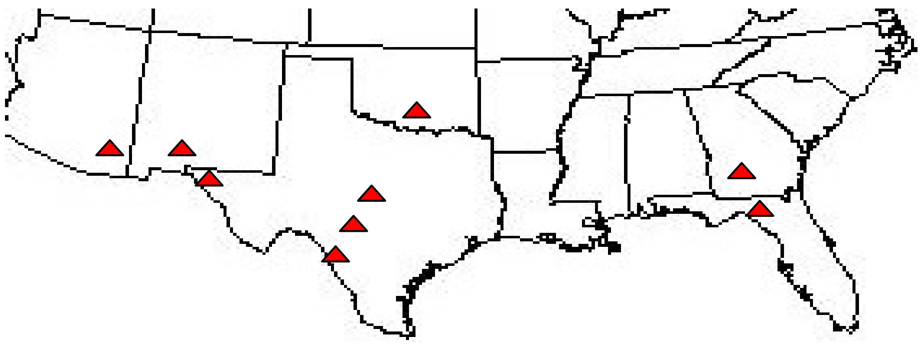

Fig. 1. Confirmed locations of pecan orchards known to be infested with *Meloidogyne partityla,* July, 2005. (Compilation of results from various published reports and confirmed, unpublished samples submitted for identification by producers.)

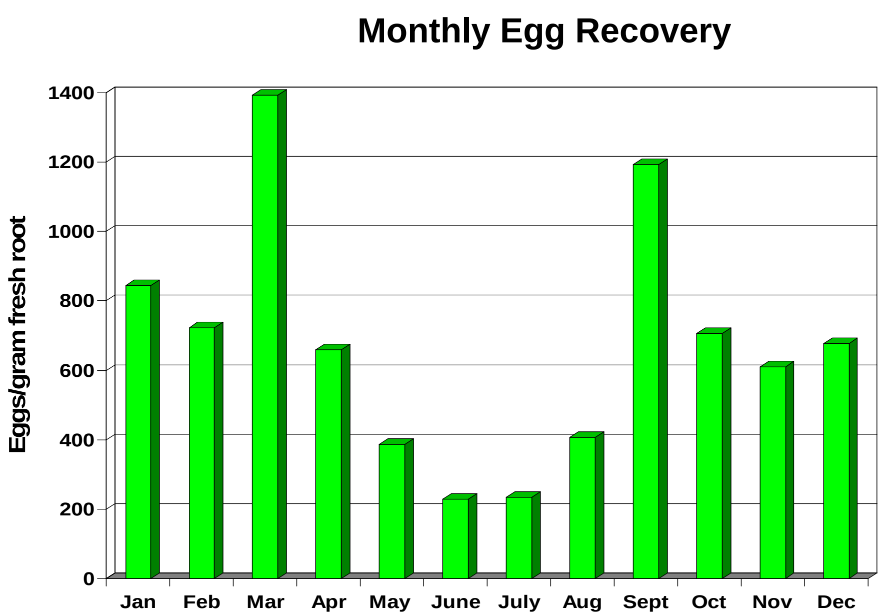

Fig. 2. Average monthly recovery of *Meloidogyne partityla* eggs from roots of pecan trees in Dona Ana County, NM between February 2001 and June 2005.

UTILIZING VOLUNTEER PECAN PRODUCERS TO MONITOR FIRST GENERATION PECAN NUT CASEBEARER, *Acrobasis nuxvorella Neunzig*

Bill Ree, Extension Program Specialist - IPM (Pecan)
Texas Cooperative Extension

As all pecan producers in Texas know, the pecan nut casebearer, PNC is considered the most important nut feeding insect of pecan and monitoring and management of this insect is a must to produce an economic crop. With the commercial availability of the pecan nut casebearer pheromone trap in 1997, producers had a tool to monitor real time PNC activity in their orchard. Information on PNC pheromone traps and PNC biology and monitoring are always presented during county pecan field days.

In 2002 at the request of a county agent wanting to do something more for PNC in his county, a project was developed to use volunteer pecan producers to monitor PNC activity with pheromone traps. In 2002 this PNC monitoring project was started in the tri-county area of Victoria, DeWitt and Lavaca counties located in the southern and coastal area of Texas.

For the project, county agents were to recruit 3 to 5 volunteer pecan producers across their respective county to monitor first generation pecan nut casebearer with pheromone traps. For the initial project 10 producers were recruited and all volunteers were provide with 6 traps (deploy 3 with 3 reserve) and lures and given training on trap monitoring and reporting. In turn, these producers were to monitor traps catches and report trap data and the first observed events of first trap catch, first egg lay and first nut entry to their respective county Extension Agent. County agents then used this information in their mass media programs, to alert other producers in their county, to help answer phone calls concerning casebearer activity and to locate an orchard for impromptu scouting field day.

At the end of the first generation monitoring period, volunteer producers and their respective county agent met to discuss and evaluate the program. As an acknowledgment for their work and time these volunteers were recognized at the following tri-county spring pecan field day and present with caps designating them as “Master Pecan Scouts”

In 2003 through an IPM grant from the Texas Department of Agriculture, six additional counties were added to the project and all volunteer producers were provided with 8 traps and lures, a 10x hand lens, tally meter, data sheets and a copy of the Texas “Field Guide to the Insects and Mites Associated with Pecan”. All volunteer producers received training on monitoring and scouting for PNC activity. By 2005,14 counties were participating in the project across the state with a total of 40+ volunteers.

In 2006 a pecan nut casebearer prediction map was developed by Dr. Marvin Harris from trap data supplied by volunteer producers. This map was made available to producers and county Extension agents, via direct emails and a posting on the Texas Pecan IPM website http://pecankernel.tamu.edu in order to provide producers with an advanced warning on the predicted time of the start of nut entry. This project will continue in 2007.

Effect of Insecticide Applications Directed at the Control of Pecan Nut Casebearer on Blackmargined Aphid Population Dynamics

Olivia Carver, Sr. Research Assistant and Brad Lewis, College Assistant Professor
New Mexico State University

INTRODUCTION: Approximately 80% of the New Mexico pecan acres are treated annually with insecticides to control at least one of three pecan nut casebearer, (*Acrobasis nuxvorella*), (PNC) generations. Orchard managers consider many factors when deciding which insecticide to use in their PNC management program. Factors include efficacy, costs, mammalian toxicity, residual, application method and spectrum of control. Recently the direct impact of insecticide applications on beneficial populations and their indirect impact on other pest populations has been an increasingly important consideration in insecticide selection. Orchard managers now have the choice of using either broad-spectrum insecticides that control PNC and negatively impact beneficial populations, or narrow spectrum insecticides which primarily affects PNC larvae with a reduced impact on beneficial populations.

METHODS: This two year study was initiated in 2003 and conducted to quantify the direct impact of narrow or broad spectrum insecticides, used to control PNC larvae in western pecans, on beneficial populations and indirectly their impact on blackmargined aphid, (*Monellia caryella*), population dynamics. A 100 acre commercial pecan orchard located south of Las Cruces, NM was used for the study. Treatments consisted of narrow-spectrum insecticides (tebufenozide) and a broad-spectrum insecticide (lamda-cyhalothrin) foliar applied and timed to control each of three PNC generations each year. An untreated check (UTC) was included in the study. For the remainder of this summary, treatments will be referred to as narrow or broad spectrum, and UTC. Common names will be used for arthropod species. A randomized complete block was used as the experimental design with each treatment replicated four times. Minimum plot size was six acres with applications made using a commercial 1000 gallon air blast sprayer. Insecticide treatments were applied at labeled rates. Data was collected weekly or biweekly and consisted of: aphids per leaf (visual field counts); adult and larval stages of major beneficials (bucket collection); and beneficial eggs (visual field counts). Yield and premature leaf abscission data were also collected but will not be presented in this summary. Data associated with insecticide applications directed at second generation PNC will also not be presented in this summary.

2003 RESULTS: Insecticide applications directed at 1st generation PNC larvae were made 28 May. Total lacewing, (*Chrysopa* spp.), population (adults + larvae) densities were 0 per terminal for narrow-spectrum, .3 for broad-spectrum, .8 for UTC treated plots prior to applications. Following applications, lacewing populations continued to increase and peaked at 5.8, 11.5 and 9.0 per terminal for narrow-, broad-spectrum and UTC treated plots respectively at 22 DAA. Lacewing populations decreased to less than 4 per terminal prior to insecticide applications directed at 2nd generation PNC. Total lady beetle, (*Hippodamia convergens* and *Olla-v-nigrum*), populations (adults + larvae) increased from an average of .25 per terminal prior to insecticide applications, to a maximum of 8.8, 6.5, and 12.3 for narrow-, broad-spectrum, and UTC at 22-27 DAA. Lady beetle populations ranged from 3.3 to 8.0 per terminal prior to insecticide applications directed at second generation PNC. Blackmargined aphid populations (immature form, BMA-I) averaged less than 2 per leaf prior to application for all treatments. At 17-19 days-after-application (DAA), BMA-I populations increased to a maximum of 30 for narrow- and 44 for broad-spectrum treated plots, and 27 per leaf for the check. BMA-I populations decreased to less than five per leaf in all treatments at 27 DAA.

Insecticide applications directed at 3rd generation PNC larvae were made 6 September. Prior to insecticide applications, total lacewing populations were measured at 0, .3, and .8 per terminal for broad-, narrow-spectrum, and UTC. Lacewing populations increased to an average of 1.3 per terminal for narrow-spectrum treated, and .8 and 1.8 for broad-spectrum and UTC respectively at 11 DAA. At 39 DAA, lacewing populations were measured at 9.3, 6.8, and 3.8 per terminal for narrow-, broad-spectrum, and UTC treated plots. Lady beetle populations were measured at 0 per terminal narrow- and broad-spectrum insecticide treated plots and .3 for the UTC prior to insecticide applications directed at 3rd generation PNC larvae. At 18 DAA, ladybeetle populations began increasing and peaked at 6.0, 2, and 5.5 at 39-46 DAA. BMA-I populations were measured at less than 1 per leaf in all treatments prior to insecticide applications directed at 3rd generation PNC. Aphid populations increased to an average of 6 and 1.5 per leaf for narrow- and broad-spectrum treated plots, and 3.6 for the UTC at 11 DAA. BMA-I populations peaked for all treatments at 24 DAA at 44 and 24 for narrow- and broad-spectrum treated plots and 52 for the UTC. At 54 DAA (29 October), evaluations were terminated with narrow- and broad-spectrum treated plots averaging 17 and 8 aphids per leaf respectively, and 22 for the UTC.

2004 RESULTS: Insecticide applications directed at 1st generation PNC larvae were made 21 May. Total lacewing population densities were measured at 0 per terminal for narrow- and broad-spectrum insecticide treated plots and .3 for the UTC plots. Following insecticide treatments, lacewing populations remained at or below .3 per terminal in all plots until 28 DAA. Lacewing populations began increasing at 28 DAA and peaked at 2.3, 1.8 and 1.8 per terminal for narrow-, broad-spectrum, and UTC plots at 32 DAA. Lady beetle populations, prior to insecticide application directed at first generation PNC, were measured at 0 per terminal for narrow-spectrum treated and check plots, and .3 per terminal for broad-spectrum insecticide treated plots. At 13 DAA, lady beetle populations peaked at .8 and .3 per terminal for the broad-spectrum treated and UTC plots respectively. Lady beetle populations peaked in the narrow-spectrum treated plots at .3 per terminal at 28 DAA. BMA-I averaged less than 1 per leaf prior to application in all treatments. BMA-I populations remained at less than 1 per leaf from application until 47 DAA when populations increased to a maximum of 4 for narrow-spectrum, 5 for broad-spectrum, and 3 per leaf for the check.

Insecticide applications directed at 3rd generation PNC larvae were made 3 September. Prior to insecticide applications, average total lacewing populations were measured at .3 for narrow- and broad-spectrum treatments, and 0 per terminal for the UTC. Lacewing populations remained below .8 per terminal for all treatments through 39 DAA. From 39 through 62 DAA, lacewing populations increased to a peak of 1.5, 2.5 and 1.7 for narrow-, broad-spectrum and UTC treatments respectively. Lady beetle populations were measured at 2.5 and .5 per terminal for the narrow- and broad-spectrum treated plots, and .8 per terminal for the UTC prior to insecticide applications directed at 3rd generation PNC larvae. Following insecticide applications, lady beetle populations ranged from 0-.5 in all plots for the remainder of the study (62 DAA). BMA-I populations were measured at less than 1 per leaf in all treatments prior to insecticide applications directed at 3rd generation PNC. BMA-1 populations increased and peaked at 18.7 per leaf in the broad-spectrum insecticide treatment at 42 DAA, and 1.4 and 1.2 in the narrow-spectrum and UTC treatments respectively at 62 DAA.

SUMMARY: Results indicate that regardless of insecticide spectrum, insecticide applications directed at controlling the three generations of PNC did not negatively impact primary aphid predator population densities several weeks after applications. Impact of insecticide applications on primary aphid predator populations immediately following applications was hard to determine due to their low population densities at the time of applications. Generally, blackmargined aphid population densities increased faster and to higher levels in broad-spectrum insecticide treated plots than narrow-spectrum treated plots, although economic threshold levels of aphids were exceeded in all treatments, for several evaluation periods, regardless of insecticide spectrum.

Pecan Bacterial Leaf Scorch

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New Mexico State University

Pecan bacterial leaf scorch (PBLS) is a disease caused by the bacterium, *Xylella fastidiosa*. The disease was first identified in Louisiana in 2000 when *Xylella fastidiosa* was proven to be the causal agent of a leaf scorch malady, then known as fungal leaf scorch, which was previously thought to be caused by several different species of fungi.

Xylella fastidiosa is a xylem-limited, fastidious bacterium which is transmitted from plant to plant by xylem feeding insects. The bacterium lives as an endophyte, causing no harm, in many plant species; however in some plants the bacterium can become a pathogen resulting in adverse effects on the plant. For example, the bacterium is well known as the causal agent for several significant diseases including Pierce's disease of grapevines, alfalfa dwarf disease, almond leaf scorch, phony peach disease, oleander leaf scorch, periwinkle wilt, bacterial scorch of shade trees and citrus variegated chlorosis.

Xylella fastidiosa is native to the southeastern United States and has been causing disease in California grape vineyards since the late 1800's. Prior to 2006, diseases caused by *Xylella* had been identified in all of the southern United States with the exception of New Mexico. In 2006, the bacterium was found infecting chitalpa, an ornamental landscape tree, and grapevines in New Mexico. To date, the bacterium has ***not*** been found infecting pecans in this state.

Disease in susceptible host plants is believed to be caused by the colonization of the xylem by the bacteria and toxin production. These activities are thought to cause disruption of xylem function such that water and nutrient movement in infected plants is impaired. Symptoms of diseases caused by this bacterium, therefore, resemble symptoms associated with water and nutrient stress, such as leaf scorch (necrosis), chlorosis and reduced growth. Symptoms of pecan bacterial leaf scorch begin as necrosis at the tip or margin of affected leaflets and progress toward the midrib. Necrosis is often seen first on the older leaflets at the base of a rachis. As the disease progresses, younger leaflets are affected. Eventually, infected leaves pre-maturely drop from the tree. A three year study in Louisiana showed pecan trees infected with *Xylella fastidiosa* produce fewer leaflets (58%) and have reduced nut weight (16%) compared to unaffected trees. PBLS is a progressive, chronic disease, therefore, the long-term effects on infected trees is unknown.

Several different strains (subspecies) of the bacterium have been identified. Some of these strains appear to be fairly host specific while other strains have a wide host range and are capable of infecting many different types of plants. As a subspecies, the strains found in New Mexico are most similar to other grape infecting strains. Researchers in Louisiana are currently working to identify the subspecies of the bacterium infecting pecans in that state. Additionally, scientists at New Mexico State University are conducting research to determine if the strains currently found in New Mexico can move from chitalpa and/or grapes to pecans and other host species.

Insect vectors of *Xylella fastidiosa* potentially include all sucking insects that feed in the xylem. Leafhoppers, most notably sharpshooters, and spittlebugs are the most efficient vectors. One of the most important vectors of the disease in grapes is the glassy-winged sharpshooter (*Homalodisca vitripennis*). The introduction of this pest into California resulted in a resurgence of Pierce's disease and epidemic losses in grape vineyards in the 1990's and early 2000's. At this time, the glassy-winged sharpshooter has not been found in New Mexico. Other known vectors of the disease, the blue-green sharpshooter (*Graphocephala atropunctata*) and the smoke tree sharpshooter (*Homalodisca lacerata*), have been found in isolated locations in very small numbers in recent state surveys. These two sharpshooter species are not known to be established in New Mexico. There are some other sharpshooter species native to New Mexico that could potentially serve as vectors for the disease; however the association of these species with the occurrence of the disease in chitalpa and grapes has not been established. The introduction of the glassy-winged sharpshooter into New Mexico potentially posses a high risk for the movement of the bacterium from landscape trees and grapes to other agronomic crops. As such, state conducted for this pest and other sharpshooters are continuing.

There is no formal control program established for *Xylella fastidiosa* in pecans. Reducing the stress of the trees by using good management practices may help in reducing the severity of the disease; however removal of infected trees may be warranted especially if only one or a few trees are infected. There is evidence to show that pecan cultivars vary in susceptibility to the disease, however no cultivars have been identified as resistant. Additionally, most cultivars commonly grown in New Mexico have not been evaluated. Eliminating potential vectors by use of insecticides is also recommended as a preventative control measure.

Risk Evaluation for New Mexico Pecans

There are no limiting climatic factors that would inhibit this bacterium from establishing in New Mexico. In 2006, the bacterium was found in established chitalpa trees and grapevines in New Mexico. At the time of publication, the most efficient vectors of the disease are not known to be in the state; however, other xylem feeding insects with a transient ability to transmit to bacterium are present in New Mexico. The direct threat of *Xylella* in chitalpa and grapes to pecans is unknown. At this point, it is not known if the strain of the bacterium found in chitalpa will infect pecans. Even if the strain is able to cross-infect, the ultimate risk to pecans remains low until an efficient vector that would move naturally from chitalpa and/or grapes to pecans, is identified.

Regional Pesticide Regulations

Bonnie M. Rabe
Interim Director
Ag & Environmental Services Division
Las Cruces, NM 88003

Many issues will be occurring on the national level in relation to pesticide regulation which will affect not only growers and producers but anyone using pesticides. EPA, as the lead federal agency regulating pesticides, is considering regulation revisions which when finalized, will change current requirements for applicator licensing and training, label language and restrictions, and product availability. The presentation will briefly address and indicate where information can be found on the proposed federal program changes in the areas outlined below.

EPA is contemplating revising federal pesticide applicator certification and training regulations. These are the requirements used to determine the competency of an individual to apply restricted use pesticides. States use these requirements to determine what information will be included in the examinations applicators are required to pass in order to be licensed. The examinations must include questions to determine that the applicator has the knowledge of basic pesticide safety, environmental protection, understanding the label and properly application. Known in shorthand as EPA's 171 regulations in reference to the number the regulation has been assigned in the U.S. Code of Federal Regulations (40 CFR 171), the current federal certification requirements were first adopted in the mid-1970s and have changed very little in the last 30 plus years. Most, if not all, state pesticide applicator certification and training requirements far exceed the current federal requirements. EPA is looking as expansion of requirements in the following general areas:

- Expanding the scope of certification & training regulations to any occupational user (janitors, golf course maintenance crews, school employees, and others using even general use pesticides),
- Revising competency requirements (training vs. exams if now require all occupational users, documentation, etc.),
- Standardizing exam requirements (allow easier procedure for state reciprocity),
- Tightening the definition of "Under the Direct Supervision,
- Setting minimum age for pesticide applicators (18),
- Revising recertification requirements (continuing education requirements) and,
- Changes to the current worker protection standard (more specific training and documentation for workers and handlers).

EPA has also implemented their Endangered Species Protection Program, which includes the addition of a label statement to any product which may have an adverse affect on an endangered species. The label statement will refer the user to a website to see what if any restrictions may be in place based upon the location of the application. An example will be shown as to how the online program can be accessed and utilized by applicators.

Many currently registered pesticides are undergoing re-registration to determine if the older pesticides meet today's standards for toxicity, safety, environmental protection, and other standards which newly registered pesticides must meet. As the older pesticides are evaluated for their risk, it has been determined for some that certain or all of the current uses pose too much of a risk to allow their continued use. Many pesticides are having uses removed, restricted, or all products which contain that pesticide are cancelled. In some cases the evaluation of the risk is based an overall assessment rather than consideration of factors for specific uses based on amounts, type of application, or other factors which may have less of a risk. It is important for producers to participate in the registration decision process by knowing they can provide public comments which then must be considered in EPA's decision making. While this may not prevent a pesticide from being removed from the market, it can allow for further use for a limited time until alternatives are available. This is especially important for many of New Mexico's producers trying to control pests using products which have no alternatives available. This presentation will provide information on how to access and provide comments for pesticides under re-registration.

Another important issue of consideration in EPA's registration decisions, is the occurrence of misuse of a product. If a product is shown to have a high level of misuse, this can cause those uses to be removed from a label. NMDA conducts routine inspections of pesticide use, including checking records, equipment, and storage so we can document that products are used safely and according to the label, thus answering the question why am I inspected?

Pecan Handling Procedures: Inshell Containers

Endorsed on April 21, 2006 by the

National Pecan Shellers Association Board of Directors

Dear Growers, Accumulators, Brokers, Shellers:

Growing awareness of allergens and the importance of avoiding cross contact between tree nuts and other known allergens has prompted pecan handlers across the nation to make appropriate changes in their facilities and the way they hold, ship, receive, store and process pecans. As part of their commitment to deliver safe, delicious, properly-labeled pecan products to the consumer, members of the National Pecan Shellers Association need the cooperation of the entire distribution channel – growers, accumulators, cleaning plants and processors.

Through NPSA, a "Container Awareness Task Force" with industry-wide representation has been established. Serving on the Task Force are:

Shellers:	**Marty Harrell, Harrell Nut Co. (Chairman)** **Lalo Soria, John B. Sanfilippo & Sons** **Bob Whaley, Whaley Pecan Co.**
Accumulators:	**J.B. Easterlin, Easterlin Pecan Co.** **Geoff Hamil, Renfroe Pecan Co.** **Ron Cannon, BL Pecan Co.**
Growers:	**David Salopek, Salopek Farms** **Tom Stevenson, Schermer Pecan Co.**

With guidance from the task force, the NPSA Board of Directors has endorsed the following Association policy related to pecan handling procedures:

Beginning with 2006 crop, inshell pecans must be held, shipped, stored and received in pecan-dedicated containers (paper, cardboard, polypropylene, burlap sacks, bags, boxes or totes). Containers that have been used for any purpose other than the transportation and storage of pecans will no longer be accepted.

Thank you for your cooperation. If you have any questions, please contact Vickie Mabry at NPSA Headquarters at 404/252-3663.

Homer Henson **Louisville Pecan** *Chairman, NPSA*	**Jasper Sanfilippo, Jr** **John B. Sanfilippo & Son** *Vice Chairman, NPSA*	**Helen Watts** **Young Pecan** *Secretary, NPSA*	**Marty Harrell** **Harrell Pecan** *Treasurer, NPSA*	**Bill Summers** **Golden Kernel Pecan** *Past Chair*

SOIL ZINC APPLICATION FOR SOUTHWESTERN PECAN

Jim Walworth[1], Andrew Pond[1], Humberto Nuñez[1], Bruce Wood[2], and Mike Kilby[3]

[1]Department of Soil, Water and Environmental Science, University of Arizona, Tucson, AZ
[2]USDA Southeastern Fruit and Tree Nut Research Laboratory, Byron, GA
[3]Department of Plant Sciences, University of Arizona, Tucson, AZ

Pecan trees grown in the alkaline soils of the southwestern United States are prone to zinc deficiency unless supplemental zinc is regularly applied. Standard treatment involves multiple foliar zinc applications. Soil zinc application would provide several advantages. A field study was initiated in 2005 with three soil zinc treatments: no zinc (control), $ZnSO_4$ (66 lb/a Zn), or ZnEDTA (17 lb/a Zn) were applied one time in March, 2005 in bands seven inches deep and four feet on both sides of the tree row. 2005 mid-season zinc concentrations in leaves from upper branches, but not those from lower branches, were increased by soil application of ZnEDTA. In 2005 and 2006 zinc in leaves from ZnEDTA treated trees was higher than those from untreated trees on six out of fourteen sampling dates. In both 2005 and 2006 specific leaf area was unaffected by zinc treatment. Nut yield was also not affected by soil zinc applications.

Nitrogen Fertilizers

Dr. Richard Heerema

There are 14 essential mineral nutrients for plants. Although deficiencies in any one of these elements can cause pecan tree performance to suffer, a great deal of emphasis has been placed on nitrogen (N) nutrition because pecan trees require N in greater quantities than any of the other minerals and N is more likely to limit orchard profitability than any other nutrient. Pecan trees use N to "build" the proteins needed to conduct numerous important biological processes in the plant, including photosynthesis.

Nitrogen is available to pecan trees in two different forms: ammonium (NH_4^+) and nitrate (NO_3^-). In pecan orchards, substantial amounts of applied N fertilizers are lost to the environment before they can be taken up by the trees. The nitrate form can be easily lost through leaching or runoff in water and, furthermore, can be lost to the atmosphere through denitrification, conversion to N_2 and N_2O gases. Under some conditions, ammonium may be lost through volatilization as ammonia gas. If not volatilized or taken up by roots, ammonium is quickly converted to nitrate and may then be lost through leaching or denitrification.

Such inefficiencies in N fertilizer use represent a considerable financial loss to a pecan grower. There are, however, some factors to consider which may affect the N use efficiency of an orchard:

1.) Soil Characteristics.

- *Soil Texture.* Anoxic conditions, which may occur in poorly drained, heavy soils, promote losses of N through denitrification. On the other hand, in light, sandier soils nitrates are especially prone to leaching. For any soil type, but particularly if your orchard has extreme soil textures, these losses can be minimized through careful water management so that neither waterlogging nor percolation of irrigation water past the root zone occurs regularly.
- *Soil pH.* Greater ammonia volatilization occurs in calcareous and alkaline soils, such as are found in most western pecan orchards. These N losses may be curtailed on such soils either by use of only nitrate-based N fertilizers or by prompt incorporation of ammonium or ammonium-producing (urea) fertilizers.

2.) Rate and Timing of Nitrogen Fertilizer Applications.

- *Over-fertilization.* Over-fertilization increases the likelihood that N fertilizers will be lost to the environment. Over-fertilization may be avoided by performing annual leaf tissue analysis and adjusting annual fertilizer application rates such that leaf N concentrations do not exceed the recommended level (3.0% for NM and AZ).
- *Split Applications.* Loss of N to the environment can theoretically be reduced by applying fertilizers in two or more separate applications timed to the tree's two periods of highest N demand- the grand period of shoot growth in the spring and the period of kernel fill in the fall. A note of caution: for young, non-bearing orchards, avoid applying N fertilizers after June.

What About Nickel?

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Nickel (Ni) is a little known essential plant nutrient. It is an essential pico-nutrient for most plant species. Such species possess a very low Ni requirement (0.01-100 ppb based on plant dry matter). Because almost all soils contain considerable Ni, these low-Ni requiring species rarely experience Ni problems. Such plants typically mobilize and transport organic nitrogen (N) as either amides or amino acids.

Pecan is an example of a second N-transporting class of plants. Such plants transport considerable N as ureides, in addition to amides and amino acids. These species have a relatively high Ni requirement, partly because of the key role played by Ni in the activation of enzymes associated with ureide metabolism, but also for activation of at least two other branch-point enzymes key to primary plant metabolism. Thus, for pecan and other such species, Ni is a micro-nutrient required at micro-gram concentrations. Pecan's low critical Ni requirement appears to be roughly 0.9 ppm (dry weight basis) with regards to visual morphological symptoms, but is probably about 2-3 ppm with regards to physiological disruptions (i.e., hidden hunger). Pecan has a high Ni tolerance, being about 50-60 ppm dry weight. It is currently thought that tissue levels of 3-5 ppm likely meets tree Ni requirements.

Good Ni status is critical during a) early spring when trees are utilizing N reserve pools to meet the growth demands of an expanding canopy, and b) in the autumn when N is being remobilized from foliage to N storage pools within the tree. It appears that early spring Ni status is most critical. It is possible for July-August leaf analyses to show good leaf Ni concentration, yet Ni is physiologically deficient in trees during the first few weeks of canopy expansion. This physiological deficiency in Ni can be caused by several factors, some of which are: a) high soil pH, b) dry and/or cool spring soils, c) damaged feeder roots, d) excessive soil Zn, Cu, Fe, Mn, Ca, or Mn, and e) excessive tissue concentrations of Zn, Cu, Fe, Mn, Ca, or Mn. While there is plenty of Ni in soils of essentially all pecan orchards, the above factors can still lead to Ni deficiency.

Recent research indicates that the "hidden hunger" form of Ni deficiency is far more common in pecan orchards than previously suspected. While this Ni deficiency is generally short lived, occurring only during the first 3-5 weeks after bud break, it potentially has considerable impact on long-term orchard profitability via effects on canopy leaf area, leaf photoassimilation efficiency, and the trees ability to optimize storage pools of key non-metals (such carbon, nitrogen, sulfur, phosphorus, and boron). Pecan trees rely on highly reduced organic forms of non-metals to store energy and to provide basic building blocks for all aspects of tree growth and development. Additionally, the role of Ni in N metabolism indicates that good Ni nutrition is required if orchard usage of applied N is to be optimized. This means that intensively managed orchards receiving a lot of nitrogen may potentially benefit from attention to Ni management.

It currently appears that most intensively managed commercial pecan orchards in the U.S. and Mexico likely experience a transitory Ni deficiency during early spring as leaf canopies expand. In mild cases of physiological deficiency, a single timely foliar spray (50 – 100 ppm solution of Ni) of Ni (can be tank-mixed with Zn) about 2 weeks after bud break generally satisfies metabolic needs. In moderate cases, timely application of Ni foliar sprays just after the parachute stage of bud break and again after 2-3 weeks satisfies tree needs. In the relatively rare cases of severe Ni deficiency (where mouse-ear symptoms are apparent), trees should initially receive a spray during October and 2 sprays again in early spring. Circumstantial evidence indicates that most commercial pecan orchards exhibit at least a mild, but transitory, Ni deficiency during canopy development during early spring.

INCORPORATION OF PECAN WOOD CHIPS/SHREDS

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Mechanical pruning of pecan orchards is increasingly common. In many orchards at least some of the trees are pruned annually. Until recently, the waste generated (an estimated 11,000 tons in Doña Ana County) was usually burned. However, environmental restrictions will eventually eliminate or severely curtail this practice. Other disposal methods are not economically feasible. Chipping/shredding and soil incorporation of prunings may be an alternative disposal method if nutrient immobilization is not a problem. Also, the organic matter in wood chips and the decomposition process may improve other soil properties.

We investigated the effects of wood chip incorporation on soil properties with an emphasis on nutrient availability. Our objectives were to determine if incorporation of pecan wood chips would affect the availability of nutrients (particularly nitrogen) and other soil properties. Pecan wood chips (approximately 0.1 - 0.3 inches in diameter by 1-4 inches long) were incorporated (4 inches) into a silty clay soil at rates of 0, 4,000, 8,000, 12000, and 16,000 dry pounds/acre in May or June 2002, 2003, and 2004. Some plots received N (ammonium sulfate) at a rate of 0, 13.6, 27.2, 41.7, and 54.4 pounds/acre to adjust the C:N ratio of trimmings to 30:1.

Wood chip incorporation did not affect soil inorganic nitrogen, regardless of application rate or number of applications. When ammonium sulfate was added to balance the C:N ratio, soil inorganic nitrogen increased with the rate of wood chip application, also indicating nitrogen immobilization did not occur. Soil available phosphorus, available potassium, pH, and soluble salts were not significantly affected following one, two, or three wood chip applications or at any rate of application. Soil organic matter, moisture content, and aggregate stability increased at the higher application rates and with repeated applications. In two orchards where wood chips were incorporated, neither soil nitrogen nor leaf nitrogen were reduced by wood chip incorporation.

Our results show that for the rates of application and size of wood chips incorporated, soil incorporation of wood chips is a sound management practice. If incorporated in the late winter/spring, those wood chips remaining at harvest will be pliable and present no problem during mechanical harvest. Pecan farmers can safely incorporate pecan chips/shreds without additional nitrogen fertilization. With repeated applications, soil physical properties may improve. Very small wood chips could potentially immobilize nitrogen if incorporated at high rates as has been reported in California. Thus the size of wood chips is important.

Winter Chilling in Pecan

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Pecan trees, like most temperate fruit species, exist under a physiologically mandated rest period. This rest period, also called dormancy, helps to regulate the timing of budbreak. The start of dormancy generally begins in late summer when shoot growth stops and apical dominance ceases. Amling and Amling (1980) stated that rest is a growth-inhibiting physiological condition that can develop internally in buds. The rest period can be satisfied by the exposure of buds to periods of cold temperatures. Temperature, as well as hormones such as abscissic acid largely control the activity of the buds along with light intensity and day length (Nesbitt, 2002). The hormone levels that induce dormancy dissipate during the process of chilling accumulation which generally occurs when temperatures are below 45 EF, but above 32EF. After the required number of chilling hours have been met (and this varies among cultivars and genotypes), an accumulation of heat over time will activate the buds and growth will begin again. The in-between period when chilling has been satisfied, but heat accumulation has not been met, is known as quiescence.

Budbreak during the spring is closely associated with the chilling requirement. Trees with a long chilling requirement will normally begin growth later than trees with a short chilling requirement. Budbreak regulation by heating and chilling is an evolutionary survival mechanism derived through adaptation resulting in pecan being native throughout a large area of the United States. In cold winter regions the high chilling received in the winter enables buds to break with minimum heating in the springtime. Growth commences within a short period of time, thus increasing the probability that the fruiting cycle will be completed within the abbreviated growing season associated with cold areas.

Conversely, pecans are one of the most adapted plants to the southern U.S. because they have a relatively low chill hour requirement, but a high heat unit requirement. However, there are some cultivars that break bud very early which increases the danger of bud damage to spring frost (Nesbitt 2002). The lack of a mandated chilling requirement contributes to pecan's survival in regions with little or no chilling (Sparks, 2003). In these cases, the dormant period is prolonged in the absence of chilling temperatures; however, a deficiency of chilling temperatures can delay foliation, increase fruit drop, and reduce yield when pecans are grown in warm climates that lack sufficient chilling hours (Smith, 1994). The need for greater heat unit accumulating temperatures delays budbreak and minimizes the chance of damage from late spring freezes (Smith et al. 1992). The mechanism of increased heat unit accumulation is evident in the southern U.S., where pecan is one of the last deciduous tree species to breakbud in the spring (Sparks 2005).

Budbreak in pecans is described as being under the interaction of chilling and heat accumulation. Problems begin when sufficient heat is accumulated for the re-initiation of growth, leading to budbreak, in early spring when the chance of cold weather and damaging frost conditions has not yet passed. The typical continental climate that exists in the Southwest, with wildly fluctuating winter temperatures, can pose a threat to those pecan trees that awaken from their quiescent phase and initiate budbreak because the heat requirement has been satisfied.

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The El Niño Winter of 2006/07 ??

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The winter of 2006/07 was supposed to be an "El Niño winter" which typically brings abundant moisture and less extreme temperatures to the Southwest. As we approach the back stretch of the season, most observers agree that the winter has been rather dry and marked by several outbreaks of extremely cold weather. El Niño is actually one phase of an ocean-atmosphere interaction that occurs in the tropical Pacific Ocean known as the El Niño Southern Oscillation, or ENSO for short. ENSO has two well publicized phases: the warm phase known as El Niño and the cold phase referred to as La Niña. The terms warm and cold refer to changes in sea surface temperature (relative to normal) in the tropical Pacific Ocean off the coast of South America. When ENSO shifts into the warm, El Niño phase, winters in the Southwest tend to be wet. Dry winters typically prevail during the cool or La Niña phase. This presentation will provide some basic background on ENSO and the weather conditions that typically occur during various phases of ENSO. The presentation will then describe how this winter's weather compared with typical El Niño conditions and conclude with a discussion of how the winter of 2006/07 may impact production related issues such as water supply, chill accumulation, and spring weather conditions.

A Dust Abatement Device for Harvest

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A prototype device was designed and tested by USDA and New Mexico State University researchers to reduce nuisance dust emissions during nut harvesting. The main goal of the project was to develop a device that could be retrofitted to the many harvesters already in service in the nut producing regions of the US. The device (fig. 1) was based on a flow-through cyclone design. Air and debris from the harvester fan enter a tangential inlet duct. Due to the cyclone shape, the gas flow spirals down the main tube of the device, forcing debris outward to collide with the outer wall. An abrupt expansion near the end of the device again forces the debris outward and out of the air flow, while the cleaned air exits the exit tube.

The device was designed to easily attach to the harvester fan outlet (fig. 2). To reduce back pressure on the fan, the main tube was sized to have the same cross-sectional area as the fan outlet. To minimize overhang of the device outside the footprint of the harvester and thus reduce possible contact with the trees, the overall size (80-in. long x 30-in. wide) of the collection device was an important design consideration.

Collection performance tests were conducted in a commercial orchard. The debris captured by the device were dropped into a large bag for weighing and particle size analyses. Results from the tests showed that the device captured about 77 lb of debris per minute (table 1). This was estimated to be about 27% of the total material in the windrow, including nuts, which is within the range of reported gross-yield foreign-matter content for pecans (Rains et al., 2002). From visual inspection, it appeared that the device captured most of the large debris that normally would be blown to the side of the harvester (fig. 3). Pressure measurements showed that the device had a pressure drop of about 5 in. of water, which would likely reduce the total airflow capacity of the harvester fan as normally the fan exits to the atmosphere with negligible back pressure. However, tests at different fan speeds showed that adequate airflow rates could still be achieved to harvest pecans.

These preliminary tests of a dust abatement device for nut harvesters showed significant potential in that the prototype device could capture a large portion of the debris from windrowed pecans. Further analyses and testing will include sieve analyses to determine particle size of debris captured, testing of a small scale prototype to determine collection efficiency and the effects of configuration changes, and longer duration full-size testing with a debris dropper instead of a sample collection bag.

Acknowledgement

The authors would like to thank Clayshulte Farms, Mesilla, New Mexico for generously providing equipment, a test site, and labor, and for sharing their knowledge and experience without which this project would not have been possible.

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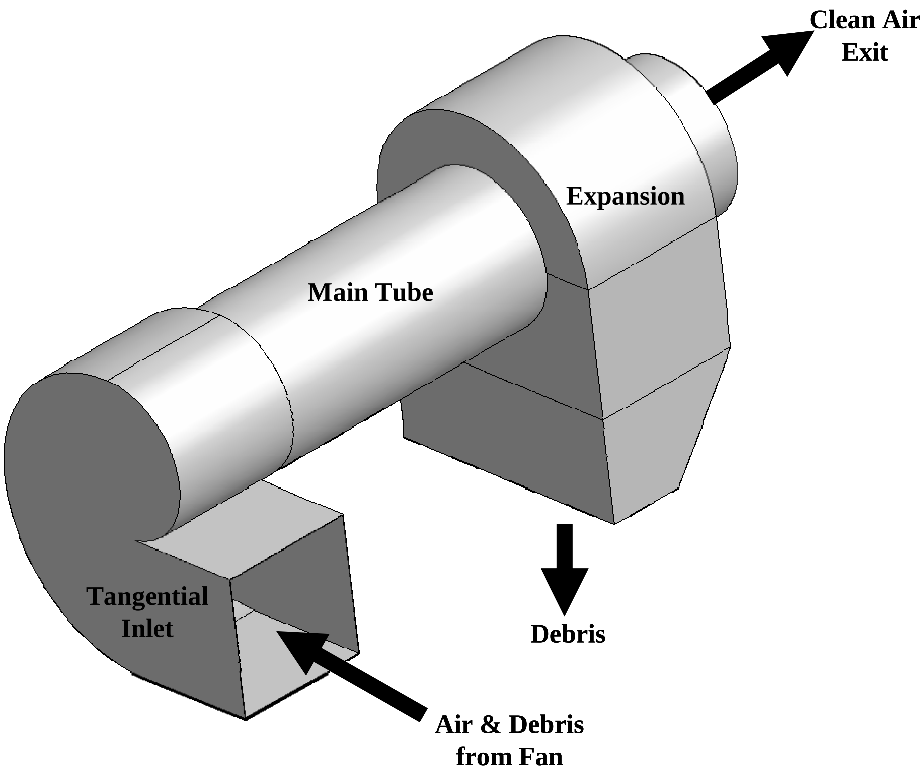

Figure 1. Diagram of dust abatement device.

Figure 2. Dust abatement device installed on harvester

Figure 3. Harvesting with (left) and without (right) experimental abatement device.

Table 1. Field data from prototype test.

Run No.	Time (s)	Sample Collected (lb)	Capture Rate (lb/min)	% of Windrow Captured
1	143	117	49	---
2	48	75	94	21
3	60	72.5	73	25
4	40	75.5	113	31
5	131	119	55	32
Average	84	92	77	27

The “Pecanigator”

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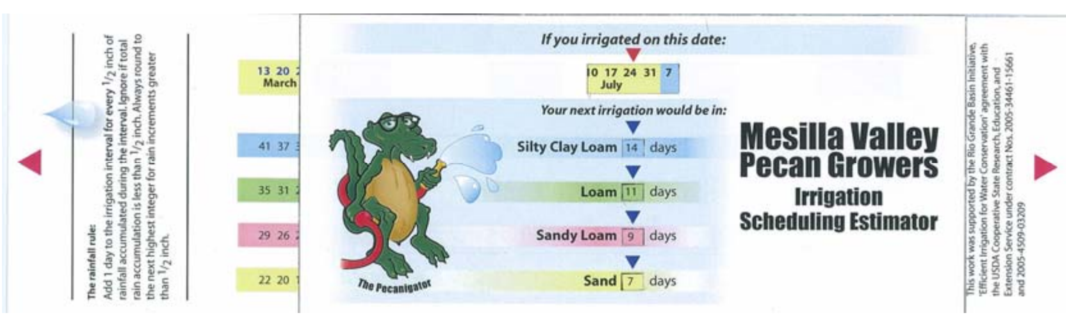
Water management is arguably one of the most critical components of crop production in irrigated systems. This is especially true of high value crops, such as pecans.
If insufficient water is applied or the timing of the application is late, growers could lose money from reduced yield or quality, especially during the nut filling stage late in the growing season.

Growers typically use crop condition, soil moisture sensors, or the calendar to schedule irrigation. Few growers use computer-based tools to estimate crop water use and schedule irrigation. A recent study of growers in the Mesilla Valley indicated most growers irrigate later than recommended based on soil moisture or weather data. Late or skipped irrigations reduce grower yields up to 600 lb/ac.

While most growers have computers and access to the internet, few use the computer for crop management decisions. This is true not only for New Mexico growers, but also US growers in general. Thus, growers were reluctant to use the New Mexico Climate Center pecan irrigation scheduling tool recently. The objective of this work is to describe a hand-held irrigation estimator for pecan orchards in the Mesilla Valley (Figure 1). The ‘Pecanigator’ is not designed to replace experience, only augment. Furthermore, growers with variable soils may need to interpolate between soil type shown on the ‘Pecanigator’.

Figure 1. The ‘Pecanigator’ illustrating when to schedule the next irrigation for four soil types following the irrigation of July 24. The ‘Pecanigator’ is established based long-term weather data and soils characteristics of the Mesilla Valley. It is designed for flood irrigation orchards. Other tools are needed for sprinkler irrigated orchards.



Areas of Growth or Decline in the Southeastern Pecan Industry

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Pecan production has a rich history in the southeastern United States. Pecans are grown commercially in seven states throughout the southeast, with the bulk produced in Georgia, Alabama, and Louisiana (Table 1). Over the last 10 years, a variety of factors have led to a general decline in production and a state of flux in pecan acreage throughout much of this area., with each state suffering from its own set of problems.

The Southeast has one of the country's most rapidly growing human populations. Population growth was 20% from 1970 to 1980, 13.4% from 1980 to 1990, and an estimated 10%-19% for the 1990's (U.S. Bureau of the Census 1994). Land development is said to be seven times that of population growth. The continued growth of the human population and changes in the way humans interact with the landscape present a challenge to pecan production and agriculture in general.

Much of Alabama’s pecan production lies in the highly vulnerable region along the Gulf of Mexico. This area is vulnerable to hurricane damage as well as an even greater threat, commercial development. According to the census of agriculture, Alabama pecan acreage declined from 26,817 acres to 22,266 acres from 1997-2002. This represents a loss of 4551 acres. Much of this loss was due to commercial development pressure in the Gulf coast region, making it difficult for pecan producers to justify keeping the land in production. Pecan orchards have sold in this area for as much as $40,000 per acre. Since the latest census in 2002, Alabama’s pecan industry has also suffered devastating losses in production and acreage to tropical storms and hurricanes, particularly Hurricane Ivan, at the end of the 2004 growing season. This has led to a further decline of the industry in Alabama.

If Alabama pecan production is to continue to thrive, it is expected that much of the pecan acreage would shift from the Gulf Coast to the Wiregrass region of SE Alabama, where peanut growers are searching for alternatives and processing and marketing infrastructure is located in nearby Albany, GA.

Georgia’s pecan industry has had to deal with many of the same pressures as that of Alabama; however, to a lesser degree at this point. The traditional pecan production areas of the state lie in southwestern Georgia, primarily centered around Albany, GA. This is where the state’s pecan industry was born in the early 1900’s as a result of failed land schemes. Currently, Georgia’s pecan acreage is 142, 477 acres.

Although approximately 40% of Georgia's pecan production comes from a three county area surrounding Albany, development pressure in this area is extremely high. As a result many orchards are lost when the land becomes too commercially valuable to justify a willingness of the owner to keep it in agricultural production. This development pressure and new plantings in other areas of the state have led to net acreage losses in the traditional pecan production area, while net gains in pecan acreage have occurred in other areas of the state, particularly in south central and southeastern Georgia. This acreage increase in non-traditional areas of the state have absorbed the acreage loss, resulting in a net gain of 410 acres of pecans in Georgia from 1997-2005.

While most of the net losses to Georgia's pecan acreage have occurred in counties with over 3000 acres of pecans, most of the net gains have occurred in counties with between 500-3000 acres of pecans. This potentially indicates an increase in the number of smaller (<100 acres) orchards. There have been numerous plantings of new orchards of varying sizes across the state within the last 5 years.

Although pecan acreage has fluctuated only slightly around 140,000 acres in Georgia, there has been a general trend toward declining production since the early to mid 1990's (Figure 1). This results from a variety of factors, including heavy disease pressure, drought, extended periods of cloud clover, tropical storms, and over-crowded orchards. Although growers cannot control environmental factors, many are in the process of improving their production practices through better disease management, thinning of overcrowded orchards, elimination of non-productive varieties, enhancement of irrigation systems, incorporation of fruit thinning into their management plans, and more efficient nutrient management.

Table 1. Pecan Production in the Southeastern United States, 2005.

Alabama:	4,000,000 lbs
Florida:	1,00,000 lbs
Georgia:	80,000,000 lbs
Louisiana:	5,000,000 lbs
Mississippi:	1,000,000 lbs
North Carolina:	2,000,000 lbs
South Carolina:	2,200,000 lbs

Figure 1. Georgia pecan production and acreage, 1999-2005.

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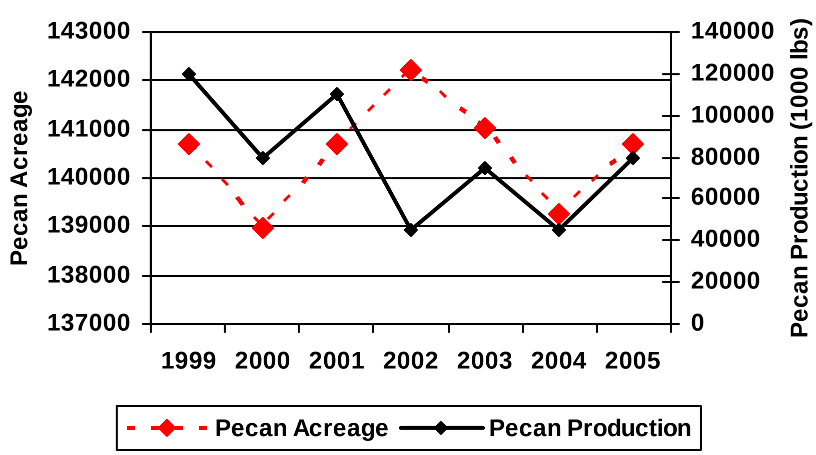

Trends in the Western Pecan Growing Area

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The fastest growing areas of the US pecan industry are the western states of California, Arizona, and New Mexico. The planted acreage has almost doubled in the last couple of decades. Some of these areas have a history of growing pecans for close to 100 years while others have a more recent, short history. Many factors, both singularly and combined, have affected the growth and expansion of the pecan industry. The orchard development in the western United States has taken place in cycles; once in the late 1970's/early 1980's, again in the 1990's, and again in recent years. Government financial/tax regulations, declining row crop prices, US storm weather patterns, pest management factors, new marketing strategies, weak direct foreign competition, new pecan research information, and strong grower support have helped in different ways to grow the western pecan industry.

Economic Input / Output Modeling for New Mexico Pecans

Jay M. Lillywhite and Jim Libbin

The United States is the world's leader in pecan production. While exact numbers for world production are unknown, it is estimated that the U.S. producers 75% of the world's pecans. New Mexico plays an important role in U.S. pecan production. Similarly, pecan production and the pecan industry play an important role in New Mexico agriculture and New Mexico's rural economy. This presentation briefly describes New Mexico's pecan production industry and provides economic impact estimates of pecan production on the state's economy. Economic impacts are estimated using input-output.

Pecan production ranks fourth among New Mexico's agricultural products in cash receipts (behind milk, cattle and calves, and hay). In 2002 New Mexico had 1,740 pecan orchards incorporating 37,763 acres. Doña Ana County leads the state with approximately 68% of the state's pecan orchards and acreage. It is likely that growth in pecan production will continue in the state, at least in the near future, as 12% of the state's pecan trees are at a nonbearing age and have yet to be included in production figures (USDA – NASS 2005).

To estimate the total impact of pecan production on the state's economy, three effects must be estimated: direct effects, indirect effects, and induced effects. Direct effects are estimates of dollar impacts to the economy resulting from the inputs purchased by businesses within the sector (such as value of fertilizer purchased by a pecan producer from a local fertilizer company). Indirect effects are impacts to the economy as the result of input suppliers purchasing inputs from other sectors within the economy (fertilizer company purchasing additional manufacturing equipment because the company has sold additional product to pecan producers). Finally, induced effects are the value of increased spending by households resulting from increased incomes generated through the direct and indirect effects (employee of a fertilizer company whose job is indirectly affected by pecan production, who purchases a new car at a local car dealership).

In 2003, the value of pecans harvested from New Mexico orchards was estimated at $70,400,000. This direct effect was augmented with additional indirect and induced effects of $32,103,688, and $23,868,376, respectively. The total effect of pecan production on the state's economy was estimated at $126,372,065. Table 1 shows a detailed breakdown of the sector's effects. Additional impacts from the pecan processing sector are also being estimated.

Table 1. Economic Impacts of Pecan Industry on New Mexico's Economy, 2003.

Sector / Industry	Direct Effects	Indirect Effects	Induced Effects	Total Effects
Agriculture	$ 70,400,000	$ 8,554,381	$ 216,609	$ 79,170,992
Mining		2,904,018	462,066	3,366,085
Construction		642,962	397,666	1,040,629
Manufacturing		7,953,530	1,542,844	9,496,373
Transportation, Communications, & Utilities		3,575,300	2,249,677	5,824,977
Retail and wholesale trade		3,396,082	5,513,851	8,909,933
Finance, insurance, & real estate		2,577,453	5,487,756	8,065,210
Services		2,242,820	7,363,063	8,065,883
Government		257,141	572,887	9,605,883
Other			61,956	830,028
Total	$ 70,400,000	$ 32,103,688	$ 23,868,376	$ 126,372,065

Water Supply Outlook for Pecan Producers in the Southwestern United States

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Water is one of many inputs into the production of pecans, but it is absolutely necessary. While wet and drought cycles produce great variability in surface water supplies in the southwestern United States, water resources developers and users have developed infrastructure for surface water storage and regulation, as well as conjunctive use of surface water and groundwater, to provide an adequate water supply for permanent high-value crops, such as pecans.

The reliability of the water supply for pecan producers is affected both by hydrologic limitation – drought and storage/aquifer limits – and institutional constraints – water rights. This presentation examines the hydrologic and institutional aspects of the water supply available for agricultural producers on the Rio Grande in New Mexico and Texas, the Pecos in New Mexico, and the Colorado River in Arizona.

Orchard Floor Management

Brian Blain
Visalia, CA
WPGA Conference March 6, 2007

Pecans are a relatively new crop to California when compared to other nut crops including Almonds, Walnuts & Pistachios. Orchard floor management differs considerably throughout the nut growing areas of the state. Surprisingly, the practices differ more by growing area, than by crop. This paper will discuss the management practices we have found successful in the San Joaquin Valley, which is the southernmost pecan growing area of the state.

Most pecans are grown in deep alluvial soils that have resulted from centuries of erosion from the Sierra Nevada Mountains. As a result of these deposits, the land in the most productive soils is only moderately level, requiring leveling to allow for flood irrigation. The older nut and fruit orchards planted up until the late 1970's were all flood irrigated with either basins or furrows. All of our pecan orchards were planted in the 1970's on land that had already been leveled for flood irrigation of preceding crops.

To accomplish adequate water penetration, most orchards are leveled to one half tenth fall, or less, in the direction of water flow down the tree row. In the other direction, perpendicular to the water flow, there is usually excessive side fall requiring permanent borders down every tree row. These borders are kept weed free with the use of pre-emergence herbicides applied during the wet winter months. The width of these irrigation "checks" is usually 20 to 40 feet wide and ¼ mile long or less. Water is supplied to every check or tree row by means of a buried low pressure pipeline with valves at each row.

The San Joaquin Valley of California is unique to pecans due to the lack of any rainfall during the summer months. All the precipitation occurs during the months of October through April, and can range from as little as 4" to as much as 15". Unfortunately, this rain occurs during harvest in most years making it difficult to get into the orchard. To help in this regard, pecan growers throughout the state have maintained a sod culture in the orchard year round. The middles of these checks or flood basins are flail mowed or chem-mowed on a regular basis to minimize the competition for water and nutrients. During wet harvest seasons the sod allows harvest equipment an adequate footing without causing excessive compaction, and during the summer months aids in water penetration.

Our irrigation technique is best described as "alternate row irrigation" since we irrigate every-other check at the same time and then repeat a week or so later on the alternate check. This provides the same amount of water per season, but increases the frequency to minimize short term water stress. This is especially helpful in the lighter soils with poor water holding ability, assuring that one side or the other of every tree row will have adequate moisture, while the adjacent side of the tree is dry enough to allow for spraying, mowing etc.

Orchard Floor Management

Sammie Singh Jr.
La Mesa, NM
WPGA Conference March 6, 2007

Preparing the pecan ground floor for optimal harvest condition in a timely effort is important to maximize production while improvement of quality is not far behind. When you have different soil profiles you have to take all precautionary measures to minimize soil compaction. Laser level should be used each time you break ground before bud break.

Young trees, ages 5 to 7, can be disked during the growing season from April to June. By July, you need to run a scraper. The best leveling scraper and original design is Agri Plane. The rest are copy cats.

With older trees you can start to use a leveling sprayer in March when the ground is at it's driest conditions before bud break. Starting early floor prepping will get those early hardy weeds that are hard to control if they get too big.

All season weed control will minimize water and fertilizer loss. I use a flare mower with a steel roller, which helps pack cracks and fills small holes. Using herbicides like Roundup Max will reduce compact and cost operations. Both flare mowers and a chemical weed control are needed to maximize the harvester's picking ability.

You can have all the necessary factors right, water, fertilizing, level land, soil type and pruning light, but if your pruning techniques and timing are off, you are missing the boat. Large growers use hedger and topping machines that are high maintenance. Small growers use man lifts like, Weldcraft and do selective pruning. I use the peach or bowel figurations with a spiral dimensions. I also try to put limbs evenly around like a circle. A 60% sun, 40% shade is what you are trying to achieve. If you have 40% sun, 60% shade in your orchard, you need pruning badly.

When orchard floor is set right, equal water and fertilizer is disbursed evenly through out the selective blocks and a maximum yield per acre will be achieved by knowing you have a packed tight orchard floor and a nutritionally balanced and pruned tree.

One year is all you need to know if your practice needs improvement or is on target. An off year is probably a good time to correct what may be a bad practice or to try a new one.

Thank you.

Orchard Floor Management

Jay B. Glover
Tularosa, New Mexico
WPGA Conference March 6, 2007

Orchard floor management is preformed to accomplish two main goals: Facilitate a thorough harvest and allow water and fertilizer to be effectively applied and absorbed. At Glover Farms, irrigation is accomplished using two different methods. Hard set sprinklers and underground drip.

In sprinkler orchards, water penetration is critical. Many growers achieve consistent water penetration by maintaining a ground cover such as grass. This keeps the top soil from becoming tightly packed. We chose to not maintain a ground cover for two reasons. First we are pumping water from a depth of approximately 300 feet. This makes irrigation expensive, and we feel that it is more economical to not have a ground cover competing with trees for water. Secondly, our experience is that we can harvest quicker by moving pecans on bare ground instead of moving nuts through a ground cover.

In drip orchards, surface water penetration is not an issue since the drip lines are subsurface. In these orchards, floors are maintained for harvest purposes only.

Methods used to maintain orchard floors include: ripping; occasional disking; rolling (Schimeiser), and chemical and mechanical mowing. Sprinkler orchards are ripped and rolled every other year, while drip orchards are only “reworked” when floor conditions deteriorate to a point that harvest cannot be completed effectively.

Orchard Floor Management

Glen Honaker
Fort Stockton, Texas
WPGA Conference March 6, 2007

1. Floor leveled either mechanically or using laser to desired grade to accommodate irrigation method.

2. Construct containment borders in three rows to eliminate side fall and control irrigation.

3. Annual maintenance of orchard floor

    a. Disc floor to depth of 3-4 inches in order to incorporate fertilizer and mulch. Discing provides material to level inconsistencies in floor.

    b. Smooth with land plane to level and pack the orchard floor.

    c. Weed control throughout irrigation season accomplished using rotary mowers between tree rows and herbicide to control weeds in the tree rows.

4. Harvest preparation of orchard floor consists of scalping existing vegetation using flail mowers.

Orchard Floor Management

Kyle Brookshier
Van Horn, Texas
WPGA Conference March 6, 2007

I. Differences in Orchards
- **A. Furrow Irrigation**
- **B. Drip Irrigation**
- **C. Flood Irrigation**

II. Spring Preparation
- **A. Furrow**
- **B. Drip**
- **C. Flood**

III. Fall Preparation - Furrow Only

IV. Conclusion

Poster

Evaluating Pecan Water Use through Remote Sensing

**Dr. Z. Samani, Dr. Salim Bawazir, M. Bleiweiss, Dr. R.K. Skaggs *(Corresponding Author)*,
Vien Tran, Graduate Student, Aldo Pinon, Graduate Student**

Pecans are a major agricultural crop in New Mexico. Currently there are more than 30,000 acres of pecan in the Mesilla Valley consuming more than one third of the annual diversion. The hundreds of pecan orchards scattered across the Valley consist of various field sizes and various stages of tree growth. The variability in field size as well as the stage of growth affects the amount of water which is applied as well as the amount of water actually consumed by the crop. Remote sensing technology is being used to identify pecan orchards, and calculate the spatial and temporal variability of pecan tree evapotranspiration (ET). The spatial distribution of pecan ET is used to identify current water use, irrigation efficiency and the maximum possible water use and yield by pecan orchards once the young orchards reach full maturity.

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