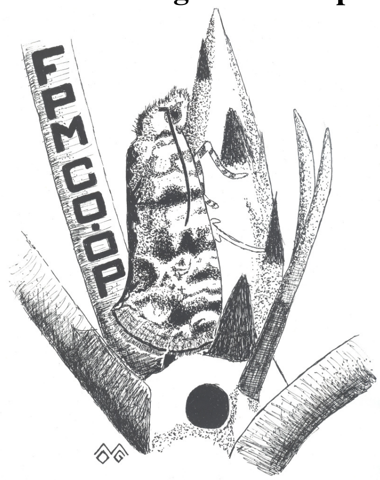
Progress **E**ducation **S**cience **T**echnology

Vol. 13 No. 1 May 2008

Quarterly Newsletter on Forest Pest Management Issues

Forest Pest Management Cooperative



Nantucket Pine Tip Moth, *Rhyacionia frustrana* (Comstock)

Texas Forest Service, Forest Pest Management,
P.O. Box 310, Lufkin, Texas 75902-0310

PEST is a quarterly newsletter that provides up-to-date information on existing forest pest problems, exotic pests, new pest management technology, and current pesticide registrations related to seed orchards and plantations. The newsletter focuses on, but is not limited to, issues occurring in the South (Texas to Florida to Virginia,).

****

Announcements:

Name Change and New Mission/Vision Statements – At the last WGFPMC Executive Committee meeting on April 2 & 3, 2008, Coop representatives voted to shorten the Coop's name to the "**Forest Pest Management Cooperative**" to better reflect that Coop activities extend across the South and in some cases across the nation.

"*The mission of the Forest Pest Management Cooperative (FPMC) is to conduct research on forest pest problems with emphasis on those pests that members deem important, develop pest management recommendations, and transfer information and technology to members.*"

Our Vision is: "*To be the primary source of information and solutions for the forest pest problems that members encounter.*"

****

Summary of 2007 WGFPMC Research Projects

In 2007, three primary research project areas – tip moth, leaf-cutting ant, and systemic injection - were continued from 2006. Summaries of the results from the systemic injection studies are presented below. Results from leaf-cutting ant control and tip moth impact, hazard-rating and control studies will be presented in the next *PEST* newsletter (June 2008).

Systemic Injection

Since 1996, the WGFPMC has been evaluating the potential of using systemic insecticide injections to protect pine seed orchard crops from coneworms and seed bugs. Two active ingredients, emamectin benzoate (EB) (Syngenta/Arborjet) and fipronil (FIP) (BASF) have been shown in several injection trials to be highly effective in reducing coneworm damage for extended periods and effective in preventing the colonization and mortality of injected trees by *Ips* engraver beetles and aggressive *Dendroctonus* species. Trials were continued in 2007 to test the efficacy of these chemicals against bark beetles. Additional trials were initiated in 2007 to evaluate different injection systems and test potential insecticides for seed bug protection in pine seed orchards.

Bark Beetle Trials

Eight separate trials were established in 2005 - 2007 to evaluate EB and FIP against:

1) ***Ips* engraver beetles** on **loblolly pine** in **TX**,
2 & 3) **Southern pine beetle (SPB)** on **loblolly pine** in **AL**,
4) **Western pine beetle (WPB)** on **ponderosa pine** in **CA**,
5 – 7) **Mountain pine beetle (MPB)** on **lodgepole pine** in **ID, BC & CO**, and
8) **Spruce beetle (SB)** on **Engelmann spruce** in **UT**.

The *Ips* trial evaluated the duration of EB at two rates applied in 2005; three rates of EB, FIP or nemadectin applied at different times of the year (Fall 2005 and Spring 2006); and three new formulations of FIP in 2007. The duration trial indicates that emamectin benzoate is effective against bark beetles 25 months after injection (Fig. 1)

Systemic Injections – Continued from Page 1

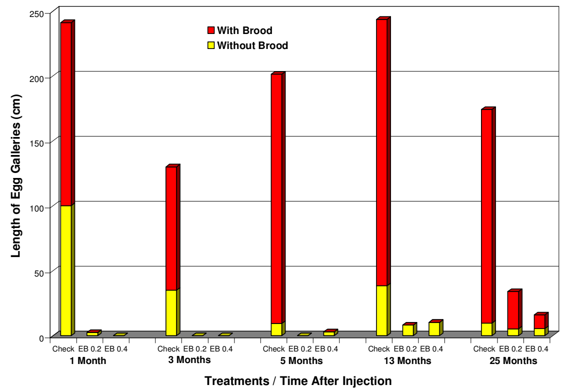


Figure 1. Effect of injection treatment in *Ips* engraver beetle attack success expressed as length of egg galleries with and without brood. EB = emamectin benzoate.

The timing and rate trial indicates that all injection treatments, particularly emamectin benzoate and nemadectin at higher rates, were highly effective in preventing the successful colonization of logs from treated trees 14 and 20 months after injection (Fig. 2).

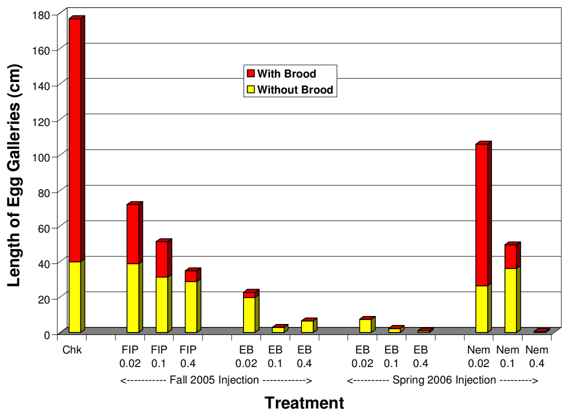


Figure 2. Effect of injection treatment in *Ips* engraver beetle attack success expressed as number of nuptial chambers with and without egg galleries. EB = emamectin benzoate; FIP = fipronil; NEM = nemadectin.

All fipronil formulations were highly and equally effective against *Ips* engraver beetles 5 months after injection (Fig. 3).

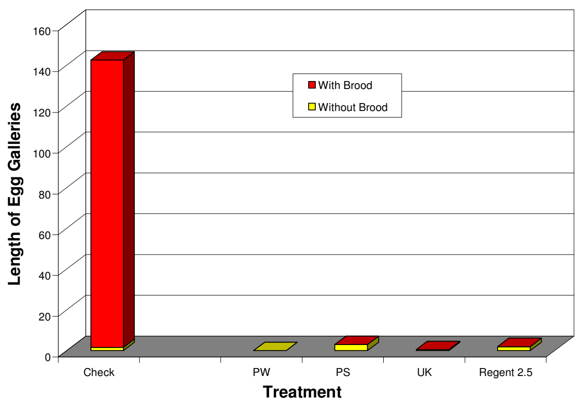


Figure 3. Effect of three new FIP injection treatments on *Ips* engraver beetle attack success expressed as number of nuptial chambers with and without egg galleries. FIP = fipronil.

In each of the SPB, WPB, MPB and SB trials, 60 trees were injected, 30 with each chemical. At the CA and ID sites, an additional 30 trees were sprayed with bifenthrin or carbaryl, respectively. Four to six weeks later, all trees (treated and untreated) in the SPB, WPB and MPB (ID) trials were baited with species-specific pheromones to induce beetle attack. SPB populations were sufficient to kill >60% of check trees in AL. However, the beetle attack levels on injected trees were markedly lower than those on untreated checks (Fig. 4 & 5).

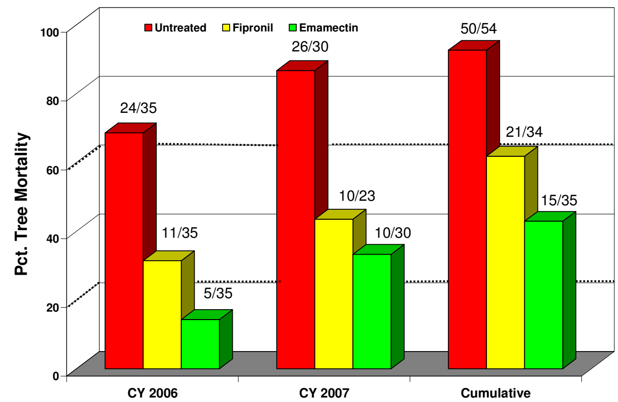


Figure 4. Effects of injection treatments on mortality of loblolly pine attacked by southern pine beetle in 2006 & 2007, Oakmulgee, R.D., Talladega N.F., AL.

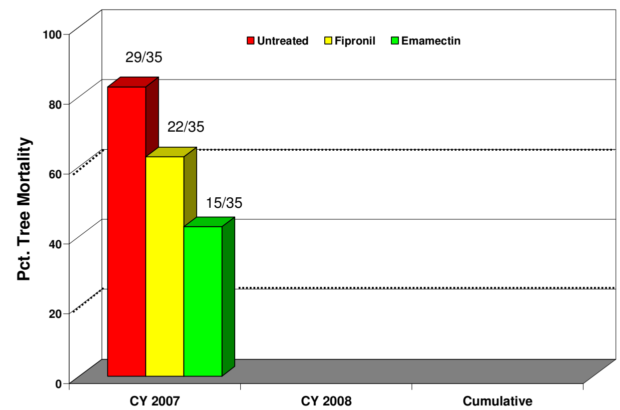


Figure 5. Effects of injection treatments on mortality of loblolly pine attacked by southern pine beetle in 2007, Bankhead, R.D., Bankhead N.F., AL.

A two year assessment of WPB attacks in CA indicates that 35% of the untreated trees died in 2005 and 2006 (Fig. 6). In contrast, 21% of the FIP-treated trees, 0% of EB-treated trees, and 0% of bifenthrin-sprayed trees are likely to die. Preliminary evaluations in 2007 indicate that both treatments are continuing to protect trees more than 24 months after injections. Final evaluations in ID and UT and preliminary evaluations in BC indicate that insufficient time and/or cold conditions prevented the

Continued on Page 3

Systemic Injections – Continued from Page 2

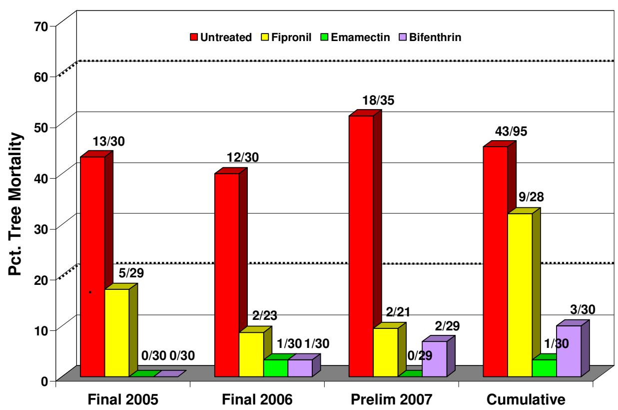


Figure 6. Effects of injection treatment on ponderosa pine mortality by western pine beetle (*Dendroctonus brevicomis*) as of October 2007, Calaveras Co., CA.

chemicals from fully circulating the trees. Subsequently, mortality of injected trees was similar to that of check trees at both locations. Final assessments will be made at the CA and BC sites in July 2008.

Injection System Evaluation

Seven injection systems (Mauget's capsule, Rainbow Treecare's M3, Arborsystem's Portle, Arborjet's Quick-jet and Tree IV and Sidewinder's backpack and Bug Buster) were evaluated for their ability to inject EB into pine based on 15 criteria related to loading, installing, injecting and safety. Four (Tree IV, Quick-jet, Portle and Sidewinder – backpack) of the seven systems were found capable of injecting the desired amount of EB into study trees and had the highest scores (Fig 7).

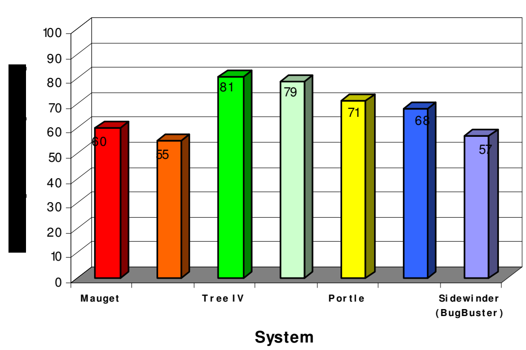


Figure 7. Rank score of seven injection systems based on 15 criteria.

Seed Orchard Trials

Two separate trials also were installed in 2007 to evaluate the efficacy of imidacloprid (Imid) and dinotefuran (Dino) alone or combined with EB or FIP for protection against seed bugs (primarily) and coneworm.

In a loblolly (AR) and slash (TX) pine seed orchard, 6 - 7 trees were injected with each chemical. At the TX site, an additional 7 trees were treated with a foliar spray in April and July. Survival was evaluated by counting cone and conelets first in April and again in August. All cones from each study tree were collected in the fall and evaluated for coneworm damage. Seeds were extracted from 10 cone samples, x-rayed to evaluate for seed bug damage, and tested for ability to germinate. Conelet survival was improved by Imid, Dino and/or EB injections but not cone survival. Both Imid and Dino alone and combined with EB and FIP significantly reduced seed bug damage compared to checks. Mean reductions ranged from 25 – 59% (Fig. 8). Seed germination was not affected by any injection treatment.

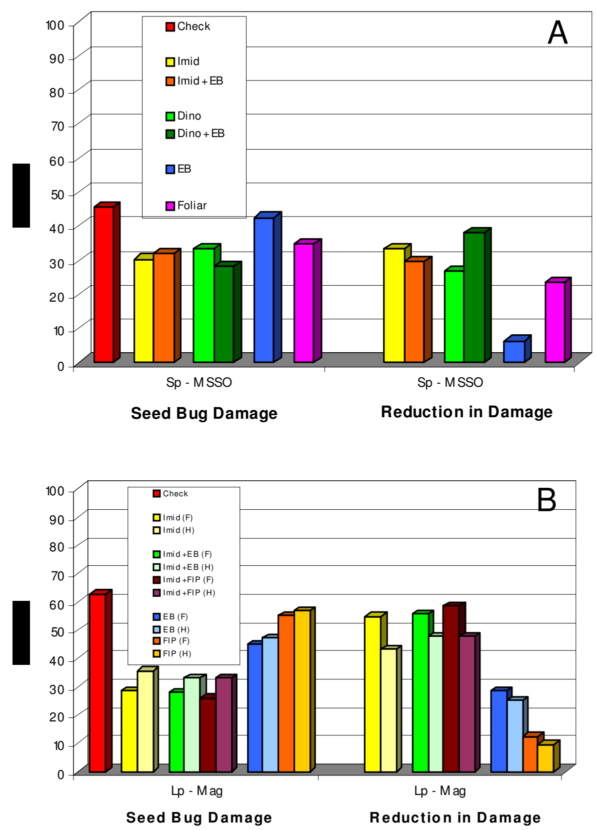


Figure 8. Percent seed bug (*Leptoglossus* and *Tetyra* spp.) damage and reduction in damage on TX slash pine (A) or AR loblolly pine (B) seed collected from trees injected with imidacloprid (Imid), dinotefuran (Dino), emamectin benzoate (EB) or fipronil (FIP) treatments, 2007.

All treatments containing an EB component, significantly reduced coneworm damage at the TX slash orchards in 2007; reductions ranged from 73 – 85% (Fig. 9A). In contrast, no treatments influenced coneworm damage at the AR Loblolly orchard (Fig. 9B).

Continued on Page 4

Systemic Injections – Continued from Page 3

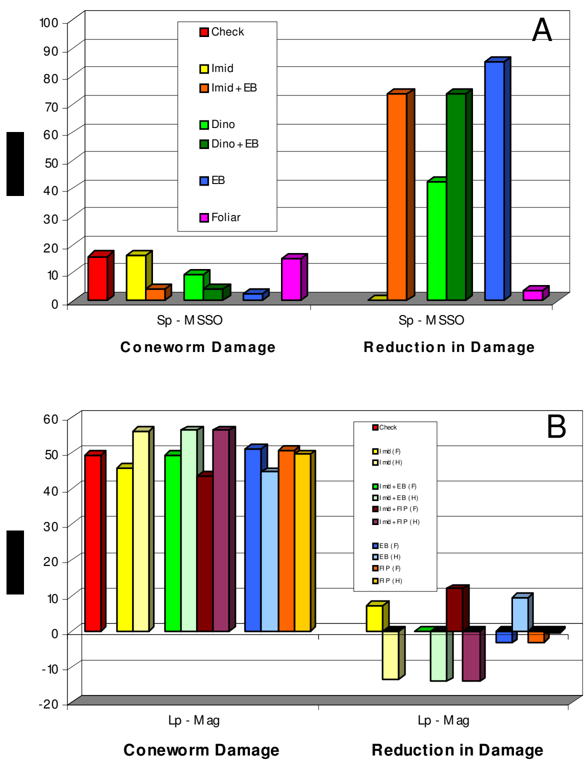


Figure 9. Percent coneworm (*Dioryctria* spp.) damage and reduction in damage on second-year TX slash pine (A) or AR loblolly pine (B) cones treated with injections of imidacloprid (Imid), dinotefuran (Dino), emamectin benzoate (EB) or fipronil (FIP) treatments, 2007.

The FPMC and other researchers are continuing to look at other potential markets including evaluating the potential of emamectin benzoate and fipronil for protection of acorn crops against acorn weevils and trees against gypsy moth, winter moth, emerald ash borer, and other forest pests. Because the new formulations of EB and FIP appear to be effective against both bark beetles and cone and seed insects, the FPMC is asking Syngenta/Arborjet and BASF to also include conifer seed orchard use on any registration package submitted to EPA.

Syngenta submitting its registration package for Tree-äge (EB) to EPA in December 2007. EPA may approve the full (Section 3) registration of this product as early as July 2008. In the mean time, several Great Lakes and Mid-Atlantic states (MI, IL, IN, WV, OH and PA) have requested and received approval for 24c (Special Local Need) registrations for use of EB against emerald ash borer.

BASF's three new formulations of fipronil showed good promise in a preliminary *Ips* trial in 2007. If all goes well, a request for registration may be submitted to EPA by 2010. Stay tuned.

Acknowledgements - We greatly appreciate the effort and support provided by:

Temple-Inland Forest Products (Emily Goodwin)
Texas Forest Service (Tom Byram, I.N. Brown, Jason Ellis)
U.S. Forest Service (Steve Clarke, Chris Fettig, Steve Munson, Carl Jorgensen)
Weyerhaeuser Co. (Steve Smith)

****

Thought You Might Be Interested to Know . . .

Several Companies Contributing to FPMC Research. Bayer Environmental Science, Research Triangle Park, NC, will be contributing $42,000 toward the evaluation of imidacloprid tablets for protection of pine seedlings against pine tip moth.

BASF Corporation, Research Triangle Park, NC, recently provided an additional $10,000 in research funds to the FPMC. The funds are to cover costs incurred as part of several fipronil-related research projects. In particular, the research is evaluating tree injections of fipronil for protection of pines against southern pine bark beetles and soil injection volumes for protection of pine seedlings against pine tip moth.

Fort Dodge Animal Health, Princeton, NJ, is contributing $3,000 toward the evaluation of nemadectin (an avermectin derivative) tree injections for protection of pines against southern pine bark beetles.

Coats Aloe International, Inc., Dallas, TX, has contributed $2,000 toward the evaluation of different aloe formulations for protection of seedlings against pine tip moth and pine logs against *Ips* engraver beetles.

Mauget, Arcadia, CA, will be contributing $8,000 toward the evaluation of abamectin for protection of pines against southern pine bark beetles.

Editor's Note: We thank all for their support of our projects.

Mycorrhiza – The Helpers Down Under: Mycorrhiza **-** is a Greek word meaning "fungus root." It is the symbiosis between plant roots and beneficial fungi, where the fungus and the host plant depend on each other for survival in natural ecosystems. Most land plants form some type of mycorrhiza with specialized soil fungus. The fungus form a fine network of fungus threads called hyphae that help the plant extract nutrients and water from the soil or the medium far beyond the bounds of the roots' capabilities and the plant provides the fungi the carbon (sugars) produced by photosynthesis.

There are three common kinds of mycorrhiza that are important for ornamental nursery crops and urban landscapes. These include the endomycorrhizae the fungus that produce vesicles and arbuscules inside plant roots. Vesicles are formed in some endomycorrhizae and are simply storage organs containing carbohydrates and also serve as reproductive structures. Arbuscules are characteristic of arbuscular mycorrhizae (AM) and are very finely branched internal structures that aid in nutrient exchange. Plants that have AM association include ferns, redwood, native grasses, legumes, bulbs, sweetgum, maple and yellow-poplar. Ectomycorrhiza (EM) is another common kind of mycorrhiza forming a sheath of fungal hyphae on the exterior of the absorbing roots. Most forest trees that have EM association include: pines, firs, hemlock, spruces, oaks, beech, ash, birch and some other tropical tree species. Plants that have both AM and EM include eucalyptus, willows, alder and poplar. Ericoids are special types of mycorrhiza that associate with ericaceous plants such as azalea, rhododendron, camellia, pieris, heather, and leucothoe roots. Mycorrhiza also has association with orchid plant roots.

Mycorrhizal fungi are involved with a wide variety of activities that benefit plant establishment and growth. These activities include:

- ❻ Enhancing nutrient uptake from soil or soilless medium, especially phosphorus.
- ❻ Enhancing plant water uptake.
- ❻ Increasing plant resistance to water stress (drought) in young seedlings.
- ❻ Detoxifying certain soils from toxins.
- ❻ Withstanding high temperatures or extreme acidity for young seedlings.
- ❻ Favoring the growth of beneficial bacteria in the root zone and help protecting the plant from root disease. Indirect but extremely important effects are the ones on root pathogens and soil structure. For example, ectomycorrhiza (EM) help exclude pathogens by surrounding the root and making it inaccessible. The EM and AM favor beneficial bacteria that are antagonistic to pathogens.
- ❻ Improving soil structure, the hyphae in the soil surrounding mycrorrhizal roots bind the soil together.

Colonization of mycorrhiza can be significantly affected by cultural factors such as pH, drainage and moisture, fertility, fumigation, pesticides, cover crops, shading and root pruning. Soil, substrate and water pH can limit the development of ectomycorrhizae in both bare-root and container nurseries. In addition, seedling lifting, storage, and planting practices in the landscape site have significant effects ectomycorrhizae retention on plant roots.

Inoculation of nursery plants with mycorrhiza produces plants that are "ready" to grow and sustain restored and landscape sites. These plants will have higher survival and fast growth than plants that are not inoculated. Although AM colonization is more effective than EM there is a strong negative influence of fertilizer addition on the subsequent colonization of roots. Additionally, mycorrhizal inoculation with fungi grown commercially in the laboratory to enhance growth of plants in the field has had mixed success. The fungi inoculated onto plants are 'weedy' species (especially for ectomycorrhizae) and quickly replaced by native species when mycorrhizal plants are planted in landscape and restoration sites.

One way to improve nursery plant mycorrhizal association in landscapes may be to inoculate nursery plant roots with naturally occurring-mycorrhiza collected from field soils. A research project was conducted in 2006 to test this idea by evaluating the use of naturally-occurring ericoid mycorrhizae in producing container-grown leucothoe and pieris under low and high fertilizer and water regimes. Research results showed that inoculated plants with naturally-occurring ericoid mycorrhiza had higher plant biomass when grown at low fertilizer and irrigation rates than non-inoculated plants. By increasing fertilizer rate, mycorrhizal colonization was reduced in leucothoe, but increased in pieris. Such information is very critical in designing and developing strategies in nutrient management of container nursery crops and in understanding the factors that critically affect the mycorrhizal association. (Source: Rutgers CES Plant & Pest Advisory, Nov. 8, 2007)

Laurel Wilt: In April, scientists with the USDA Forest Service Southern Research Station (SRS), Iowa State University, and the Florida Division of Forestry provided the first description of a fungus responsible for the wilt of redbay trees along the coasts of South Carolina, Georgia, and Florida. The fungus may also be responsible for wilts of other members of the laurel family, including sassafras, spicebush, and avocado.

Extensive mortality of redbay, an attractive evergreen tree common along the coasts of the southeastern United States, has been observed in South Carolina and Georgia since 2003. Though the wilt was at first attributed to drought, the cause was soon found to be a fungal pathogen inoculated by the exotic redbay ambrosia beetle, *Xyleborus glabratus*, a native to Southeast Asia that was first found in the area in 2002. Many ambrosia beetles carry species of fungi as food for their larvae and a previously undescribed fungus in the genus *Raffaelea* is a fungal symbiont of *X. glabratus*.

To determine if the fungus was the cause of the wilt, researchers inoculated redbay trees and containerized seedlings with the *Raffaelea* fungus; the plants died within 5 to 12 weeks. To connect fungus and beetle, they also exposed redbay seedlings to *X. glabratus* beetles; the ambrosia beetles tunneled into almost all of the plants, causing 70 percent of them to die. The researchers found the fungus in 91 percent of the beetle-attacked plants. The fungus, which is routinely isolated from the heads of *X. glabratus* ambrosia beetles, is apparently introduced into healthy redbay during beetle attacks on stems and branches.

Redbays are common along the Southeastern coast, and both residents and visitors are disturbed by the massive mortality. The fungus has also been associated with the death of other trees in the laurel family such as sassafras, pondberry and pondspice as well as spicebush and avocado, but not to red maple. The researchers concluded that there is reason to be concerned about the spread of the wilt to other members of the laurel family, which are common components in forests across the United States and other areas of the Americas. Evaluation of avocado indicates that it is also susceptible to laurel wilt, and the wilt has been found recently in avocado trees growing in a residential area of Jacksonville, Florida. (Source: USDA SRS, 4/4/08 via Chemically Speaking, April 2008).

Invasive Plants of the United States DVD and Website: A new exotic weed DVD is available at http://www.invasive.org/weedcd/. The project includes 219 invasive plant species in the United States. The focus of this DVD-ROM is to provide identification, ecology, and control information for invasive plants in the United States occurring in aquatic, wetland, forest, rangeland, desert, or prairie habitats. This product compiles information in recent publications from leaders in invasive species management in the United States, such as the USDA Forest Service, USDA APHIS PPQ, The Nature Conservancy, The Plant Conservation Alliance, The Southeast Exotic Pest Plant Council, and Invasive Plant Atlas of New England.

While this is not an official list of "invasive" plants throughout the United States, it includes Federal Noxious Weeds and those listed by state regulatory agencies, pest plant councils, and other organizations. Some of the plants on this list are often found in ornamental plantings and landscapes. In fact, many non-native plants introduced for horticultural and agricultural use now pose a serious ecological threat in the absence of their natural predators and control agents. This publication will aid landowners, foresters, resource managers, and the general public in becoming familiar with invasive plants in their area to help protect our environment from the economic and ecological impacts of these biological pollutants.

New Research Specialist – We would like to welcome Mrs. Billi Kavanagh to the FPMC as our new research specialist. After working 11 months as our seasonal technician, Billi was hired April 1st by the Texas Forest Service to work full time managing the many FPMC pine tip moth research projects. Billi can be contacted by phone: (936)-639-8170, cell: (936) 238-9311 or by e-mail: bkavanagh@tfs.tamu.edu.

Pesticide News

Permethrin Review. EPA is reviewing all permethrin registrations and conducting risk assessments. Among the concerns:

- EPA does not have adequate efficacy studies on pre-treated fabrics to support the efficacy claims of finished products. Thus, all finished pre-treated and wash-off data to support these claims must be generated by the registrants.
- Efficacy data to support outdoor residential misting system claims for mosquito control.
- Classify all wide area outdoor broadcast applications, including agricultural crops, golf courses, **nurseries,** and sod farm uses as Restricted Use.
- For termite pretreatment EPA is proposing the label read "The applicator must insure the treatment site is covered. The applicator can cover the soil him/herself or notify the contractor on the site that: 1) if the concrete slab cannot be poured over the treated soil within 24 hours of application the treated soil should be covered with a waterproof covering (such as polyethylene sheeting), and 2) that the contractor should cover the treated soil if precipitation occurs before the concrete slab is poured. Do not make on-grade applications when sustained wind speeds are above 10 mph (at application site) at nozzle end height."
- Most pretreatment intervals are being lengthened. For example, alfalfa from 14 to 30 days, peaches from 7 to 10 days, and cucurbits from As Needed to 7 days.
- Re-entry intervals have also been extended. Examples are for commercial/industrial lawns, recreational lawns, and ornamental and/or shade trees the REI is 12 hours. For cadavers and caskets the REI is to not allow children or pets on treated areas until surfaces are dry. (We did not make this one up.)
- For ground applications only, wind speed must be measured adjacent to the application site on the upwind side, immediately prior to application. A nozzle height of no more than 4 feet above the ground or canopy is allowed. (EPA Docket: EPA-HQ-OPP-2008-0385 via OK CES Pesticide Reports, April, 2008)

Sulfometuron-methyl (OUST) Review: EPA is conducting its risk assessment for sulfometuron-methyl. Among its findings are, EPA has no concerns over mammal, fish or avian toxicities for this herbicide. EPA does have major concerns about non-target terrestrial and aquatic plant exposure due to drift. The drift concerns are from aerial and ground spray droplets and from erosion. EPA is also concerned about existing label wording but has not suggested any changes – yet. (EPA-HQ-OPP-2008-0129 Docket via OK CES Pesticide Reports, April, 2008)

Confirm® 2F Needs Some Help. Dr. Alex Mangini, entomologist with the USDA Forest Service – Forest Health Protection, Pineville, LA, has for years been evaluating various chemicals for protection of cone crops against cone and seed insects in pine seed orchards. He recently evaluated Confirm® 2F (tebufenozide, Dow AgroScience) as an alternative to Mimic (tebufenozide) for control of coneworms at Plum Creek's Hebron orchard. Surprisingly, the 2007 results showed that Confirm® had no effect against coneworms. However, subsequent conversations between Alex Mangini and Dow AgroScience representatives revealed that unlike the Mimic, which contains an oil-based surfactant in the formulation, the Confirm® formulation does not contain this surfactant. This may explain the poor results in 2007. For applications in seed orchards (coneworms) and forest plantation (tip moth), Dow is recommending the use of a crop oil concentrate such as, Penetrator Plus and Agri-Dex (Helena), Pacer (Red River Specialties) Crop Oil Plus (Wilfarm) or Prime Oil (Terra). These products are composed of a blend of paraffinic-based petroleum oil (80 – 90%) and surfactants (10 -20%) and act to reduce surface tension and improves pesticide spread and penetration. Vegetable oil-based crop oil concentrates such as Cotton Oil Plus (Helena) and Prime Oil (Agriliance) also can be used to improve performance of Confirm®.

A New Option for Chinese Tallowtree Control: Chinese tallowtree is one of many invasive plants causing problems in the Southern United States. Several herbicide chemicals (glyphosate, triclopyr, picloram, dicamba, imazapyr) are registered for use on tallow but nearly all are non-selective and can not be aerially applied over mixed hardwood stands without affecting desirable species. Recently, EPA has approved the registration of a new herbicide, Clearcast™ (ammonium salts of imazamox, BASF Corp.) that has proven to be effective in TX, LA and SC trials to selectively eliminate chinese tallowtree. This product can be aerially applied at 32 – 64 oz/acre (48 - 64 oz/A for mature tallow). Established hardwoods have shown good tolerance to Clearcast™ treatments. Source: Harry Quicke, BASF (334-821-8801).

Pest Spotlight: Spider Mites on Conifers

Spider mites (family Teranychidae) are not insects but are more closely related to ticks and spiders. Their common name is derived from their ability to produce silk, which most species spin on host plants. Mites are tiny – about the size of the period at the end of this sentence. They can also be prolific, which is why infestations often go unnoticed until plants exhibit significant damage.

Hosts: Spider mites attack most species of trees and shrubs. Nursery seedlings, as well as Christmas trees, progeny test plantings and windbreak trees are particularly susceptible because they are often sprayed with insecticides that kill predators of spider mites. Pine, spruce, fir, juniper, pine, hemlock and white-cedar are often heavily attacked.

Some tree species are attacked by more than one species of spider mite. The most important species on nursery seedlings are the spruce mite (*Oligonychus ununguis*), the conifer spider mite (*O. coniferarum*), and the southern red mite (*O. ilicis*, photo above by Jim Baker).

Distribution: Mites are distributed nationwide across the range of their hosts.

Damage: Heavy infestations of spider mites cause reduced seedling growth, along with yellowing or browning of foliage (photo right by Don Grosman). Although most spider mite attacks do not cause tree mortality, they may predispose trees to attack by insects or fungi or to damage by adverse weather conditions.

Diagnosis: Foliage infested with spider mites may appear mottled, stippled, flecked or off-color. Conspicuous discoloration of needle bases is often the first sign of a problem. Infested trees may appear brownish-gray, and needle loss may occur. Look for mites, starting in May and continuing on a periodic basis, by sharply beating branches over white paper and examining the paper with a hand lens for reddish-brown mites. The minute sap feeders appear spider-like, they have two "teeth": projecting from a head that is attached directly to a globular body, and four pair of legs. You may also be able to see eggs with a hand lens, which appear as tiny, shiny red or brown balls laid singly on the twigs and needles. In heavy infestations, webbing also may be conspicuous.

Life Cycle: Spider mites usually overwinter as eggs in needle axils, under webbing on stems or branches, or under bud scales. Hatching occurs in the spring. The mites go through several stages before developing into adults. Depending on weather conditions, mites can complete their life cycle in 4 to 12 days. Each adult lays 40-50 eggs. There may be several generations in the spring and several more in the fall. Spider mites survive hot weather during the summer by remaining dormant in the egg stage.

Management: Biological - Spider mites have several natural enemies including lady beetles, predaceous mites and thrips and an anthrocorid bug. Cultural – During the growing season the foliage can be sprayed with water under pressure to dislodge mites and eggs. Chemical – Chemical control is generally recommended if you find an average of 5-10 mites per branch. If you find many eggs, a superior oil spray in early spring when the buds are still dormant (hard and resinous) will provide control. Otherwise, spray with a registered miticide in the spring and/or summer as soon as you find active mites in sufficient numbers to cause concern. Frequently, a second application 7-10 days later will be necessary unless the product is ovocidal. Early treatment, before populations build up, is most effective. Be aware that some chemical sprays are injurious to predatory mites.

References:

Cordell, C.E., et al. 1989. Forest Nursery Pests. USDA Forest Service Agricultural Handbook 680. p. 140-141.

Drooz, A.T. 1985. *Insects of Eastern Forests*. USDA Forest Service Miscellaneous Publication 1426. p 30.

Johnson, W.T., and Lyon, H.H. 1991. Insects That Feed on Trees and Shrubs. 2nd edition. Cornell University Press. p 118-119.

A Little Humor Goes a Long Way

Funny Instruction Label Some examples of why the human race has probably evolved as far as possible. These are actual instruction labels on consumer goods:

On Sears hair dryer:
Do not use while sleeping.
(Gee, that's the only time I have to work on my hair!)

In a bag of Fritos:
You could be a winner! No purchase necessary. Details inside.
(The shoplifter special!)

On a bar of Dial soap:
Directions: Use like regular soap.
(and that would be how?)

On some Swann frozen dinners:
Serving suggestion: Defrost.
(But it's 'just' a suggestion!)

On Tesco's Tiramisu dessert:
(printed on bottom of the box)
Do not turn upside down.
(Too late! You lose!)

On Marks & Spencer Bread Pudding:
Product will be hot after heating.
(Are you sure? Let's experiment.)

On packaging for a Rowenta iron:
Do not iron clothes on body.
(But wouldn't that save more time?)
(Whose body?)

On Boot's Children's cough medicine:
Do not drive car or operate machinery.
(We could do a lot to reduce the construction accidents if we just kept those 5 year olds off those fork lifts.)

On Nytol sleep aid:
Warning: may cause drowsiness.
(One would hope!)

On a Korean kitchen knife:
Warning: keep out of children.
(hmm...something must have gotten lost in the translation...)

On a string of Christmas lights:
For indoor or outdoor use only.
(As opposed to use in outer space.)

On a food processor:
Not to be used for the other use.
(Now I'm curious.)

On Sainsbury's peanuts:
Warning: contains nuts.
(but no peas?)

On an American Airlines packet of nuts:
Instructions: open packet, eat nuts.
(somebody got paid big bucks to write this one...)

On a Swedish chainsaw:
Do not attempt to stop chain with your hands.
(Raise your hand if you've tried this...)

On a child's Superman costume: Wearing of this garment does not enable you to fly.
(Oh go ahead! That's right, destroy a universal childhood belief.)

****