John A Schenk

CONE AND SEED INSECT NEWSLETTER[1/]

February 1982

1. General

(Dix, USFS, RMFRES, Lincoln, NB)

During 1981, the entomology portion of the USDA Forest Service's shelterbelt research project at Bottineau, North Dakota was moved to Lincoln, Nebraska. We are now part of the multidiscipline research project entitled "Protection and Improvement of Trees in the Great Plains." Our unit is responsible for reducing the detrimental effects of diseases and insects, to select adapted tree species and to develop genetically improved seed for Great Plains tree plantings. Our new address is Rocky Mountain Forest and Range Experiment Station, Forestry Sciences Laboratory, East Campus, University of Nebraska, Lincoln, Nebraska 68583.

(Averill, USFS, FPM, Anchorage, AK)

I am transferring from Region Ten as Group Leader FPM, to Region Two, Denver, where I will be in charge of the Entomology Group under George Downing.

(Schenk, Univ. of Idaho, Moscow, ID)

No new personnel as yet; John O. Johnsen completed his M.S. (a summary of his work is included in the Damage section of this newsletter), and he accepted a position with the Federal Land Bank in western Washington. Titles of proposed projects include:

a. Influence of defoliation intensity by larch casebearer on cone production of western larch and seed losses to insects. (Reviewed and awaiting funding).

b. Influence of prescribed burning in ponderosa pine stands on cone and seed losses to insects and tree mortality by bark beetles (Reviewed and awaiting funding. This project is an intensification of Johnsen's previous work).

c. The economic and silvicultural impact of cone and seed insects in seed production areas and natural stands of Douglas-fir. (Extensively reviewed and under rewrite).

1/ Contributions submitted by persons working with cone and seed insects and assembled by R. Scott Cameron, Texas Forest Service, Lufkin, TX. This unpublished information cannot be cited without the contributor's approval.

(Dale, USFS, FPM, San Francisco, CA)

While on annual leave, I participated in the cone and seed insect workshop, XVII World Congress of the International Union of Forestry Research Organizations, Kyoto, Japan.

I plan to examine cones and seeds of Afghanistan pine at the Chico Tree Improvement Center for damage caused by Leptoglossus occidentalis. There is a substantial population in the plantation and the climate favors activity for much of the year. Afghanistan pine may be a new host record for L. occidentalis. I have not checked.

(Dewey, USFS, FPM, Missoula, MT)

Cone production through-out the Region was extremely light in 1981 but the outlook for 1982 is good. Douglas-fir samples collected from several locations in central Montana last fall had large numbers of cone buds. Crop status for other species is unknown.

(Weatherby, USFS, FPM, Pineville, LA)

During 1982, Forest Pest Management (USDA - Forest Service, Alexandria Field Office) will begin the first phase of a planned 2-year special project entitled "Seed Orchard Pest Population Monitoring and the Incorporation of Pest Management Practices into a Cone and Seed Inventory-Monitoring System." The current pest management strategy in southern pine seed orchards consists of a preventative spray schedule which is usually based on historical records. The major flaw with this approach is that it is not responsive to conditions during the current growing season. This special project is intended to develop a pest management program which will utilize the latest pest monitoring techniques to provide damage predictions. These damage predictions will be incorporated into a computerized cone and seed inventory-monitoring system. This combined system should help the orchard manager choose appropriate suppression recommendations that are responsive to current conditions at his/her orchard.

Cooperating orchards will be selected such that each orchard is located on a different isotherm. Scouts will follow a regular circuit beginning at the orchard located on the isotherm with the highest thermal accumulation and ending at the orchard located on the isotherm with the lowest thermal accumulation. When pests are detected in an orchard with the highest thermal accumulation, "Pest Alerts" will be made to orchards with lower thermal accumulations. This procedure should warn the orchard manager of potential pest problems prior to experiencing losses. Orchard managers who are not directly involved as project cooperators will be able to contact the Alexandria Field Office for periodic updates on potential pest problems. If you are interested in additional information concerning this project, contact Julie Weatherby (318/473/7296).

(Cameron, TFS, Lufkin, TX)

In September I received the Doctor of Science degree from Freiburg University in West Germany. My dissertation was entitled "Toward Insect Pest Management in Southern Pine Seed Orchards with Emphasis on the Biology of Tetyra bipunctata (Hem., Pentatomidae) and the Pheromone of Diotyctria clarioralis (Lep., Pyralidae)." Much of the cone and seed insect research supported by the Texas Forest Service from 1977 through 1980 was reported in this dissertation which has been published in its entirety as TFS Publication 126.

2. Biology

(Cameron, TFS, Lufkin, TX)

The seasonal flight periods of coneworm moths, (Dioryctria spp.) have been monitored with light traps from 1976 through 1981. Numbers of moths caught in light traps have varied greatly between years and collection sites, but the seasonal flight patterns were similar between sites within years.

Methods of rearing blister coneworm (D. clarioralis) larvae on the elm spanworm artificial diet were established as part of a study to identify the blister coneworm pheromone. Through laboratory and field studies the primary components of the pheromone have been identified. Many loblolly pine coneworm (D. merkeli) males also were caught in field traps baited with the same synthetic pheromone blends most attractive to blister coneworm males. Field tests are planned for 1982 to further refine the blister coneworm pheromone mixture.

3. Damage

(Averill, USFS, FPM, Anchorage, AK)

Seed damage from all causes was down this year based on seed submitted to the State Forestry nursery at Palmer. No quantitative data was collected however.

(Dale, USFS, FPM, San Francisco, CA)

Cone crops generally were poor throughout California for all tree species. In those local situations where cones were sufficiently abundant for collection, damage from insects frequently was moderate to heavy and often sufficiently severe to preclude collection. In particular, red fir cone crops in the southern Sierra Nevada Mountains were severely damaged. The tree breeding program at Badger Hill, Eldorado National Forest, was hindered by heavy cone and seed losses in both Douglas-fir and ponderosa pine.

(Schenk, University of Idaho, Moscow, ID)

The following is a summary of John O. Johnsen's as yet unpublished M.S. thesis (June 1981) on the influence of a prescribed burn on ponderosa pine (PP) cone and seed production and losses to insects.

A prescribed understory burn of moderate intensity was applied to a 64 ha PP stand with the objective of reducing fuel and seed bed preparation. The squared sum of conelets and cones on 8 branchlets throughout the crowns of 41 wind-thrown PP were regressed against the total conelets and cones/tree. This model provided an accurate means of estimating conelet and cone production/standing tree (r^2 = 0.92 and 0.93, respectively). Conelet production declined from an average of 1.68/branchlet in 1979 to 0.40 in 1980. Nevertheless, 1980 conelet production on trees in burned plots significantly ($p < .05$) exceeded production in unburned plots.

The light cone crop that matured in 1979 suffered about 97% loss to Conophthorus ponderosae Hopk. The 1980 cone crop reflected the previous year's prolific conelet production. The number of mature, uninfested 1980 cones did not differ significantly ($p<.05$) between burned and unburned plots. The numbers of cones infested by the cone beetle also did not differ significantly ($p < .05$) between burned and unburned plots, although cone losses amounted to 7.5% and 13.4%, respectively.

The length of infested cones differed significantly ($p< .05$) between treatments. Thus, larger cones were available in burned plots at the time of beetle attack; however, there was no significant ($p < .61$) difference in the numbers of teneral adults between treatments.

No significant relationships were found between direct effects of fire (e.g., crown or bole scorch) and conelet and cone production or insect-caused damage. Previous studies have shown an initial increase of available N following burning. The differences in cone production observed in this study may have been a reflection of that phenomenon.

(Andrews and Ragenovich, USFS, FPM, Albuquerque, NM)

U.S. Forest Service entomologists in New Mexico sampled cone lots coming into the Albuquerque Tree Nursery to determine what insect damage was occurring and what percent of the seed was lost as a result of insects. Lots included cones from ponderosa pine, Douglas-fir, spruce, white fir, and pinyon pine. A sample was taken from each cone lot coming into the nursery. Sample cones were dried and the seed extracted and X-rayed. A total of 22 lots was sampled. In 16 of the lots, 15% or less of the total seed was damaged by insects. A

Douglas-fir lot had the most damage, with 55% attributed to insects. Cydia sp. was responsible for most insect damage, and Megastigmus sp. second.

In addition, a study done in cooperation with John Schmid of the Rocky Mountain Forest and Range Experiment Station and Mike Wagner of Northern Arizona University, to determine the impact of insects on second-year ponderosa pines in Arizona, was concluded. In one location, 80% of the total seed was damaged or destroyed by insects. In the remaining three locations, insects accounted for damage to less than 17% of total seed. Conophthorus ponderosae Hopkins and Megastigmus albifrons Walker were the primary insects causing damage. Other insects associated with the cones and seeds were: Cydia sp., Dioryctria sp., and Smicronyx imbricatus Casey. Some information was also collected on insect biology.

4. Control[2/]

(Wilkinson, Univ. of Florida, Gainesville, FA)

Two graduate students, Alex Bustillo and Kerry Sweeley, are continuing research on the use of Trichogramma wasps for control of Dioryctria in seed orchards. We finally have continuous rearing of D. amatella and D. ebeli on Vicki Fedde's elm spanworm diet (which does not have the contamination problems of other diets). We are also rearing Trichogramma sp., following the methods of Mark Houseweart in Maine. Efforts to construct mathematical models for these two processes are underway.

(Cameron, TFS, Lufkin, TX)

A study was conducted in Texas during 1981 to evaluate insect damage associated with several insecticide application schedules. Treatments included: 1) five hydraulic sprays of Guthion timed to coincide with seasonal oviposition periods of coneworms and seed bugs 2) four Guthion sprays coinciding with oviposition periods, 3) four Guthion sprays applied between oviposition perids, 4) Furadan applied in early February, 5) Furadan applied in late April and 6) a check (no treatment). Conelet and cone survival, percent coneworm damage among harvested cones, seed yields and seed quality from treated and check trees were monitored to evaluate the efficacy of the treatments. For most variables monitored, there were significant differences ($p<.05$) between the Guthion and the Furadan treatments, but not between the Furadan treatments and the check. Cone and seed survival did not differ significantly among the three Guthion treatments.

2/ Ambush, FMC Speedsprayer, Furadan, Guthion, Imidan, Orthene and Pydrin are registered trademarks although not indicated as such in the text or tables.

(Nord and DeBarr, USFS, SEFES, Athens, GA)

Pydrin is now registered for use in southern pine seed orchards. The proposed label and supporting data sailed through the EPA in three weeks (somewhat of a modern record) and the following label was approved on Oct. 8, 1981.

Crop	Insects	Dosage Pydrin 2.4 EC	Further Use Instructions
Southern pine seed orchards	Coneworms Seedbugs	11 fl. oz/100 gals. water (0.025% dilution by wt.) for high volume sprayers	Apply first application within 1 wk. of female flower closure or peak pollen flight for webbing coneworm control. For other coneworms and seedbugs, apply first applic. within 30 days following female flower closure. Repeat applic. at intervals of 4 wks, but do not exceed 2.4 lb. AI/ac/yr.
		3.5 pts/100 gals. water (0.125% dilution by wt.) for low volume sprayers	
		0.75 lbs. AI/ac/ applic. in not less than 10 gals. of water for aerial applic.	Apply approx. 5-10 gals. of the 0.025% dilution per tree with high volume sprayers. With low volume sprayers apply 100 gals. of the 0.125% dilution per acre.
			Do not graze or harvest cover crop. Avoid contact with open water.

The amount of active ingredient/ac/yr was limited to 2.4 lb. because the rate approaches the highest rate tested for environmental impact.

The generation of efficacy, phytotoxicity, and non-target organisms data required to convince ourselves and the EPA of Pydrin's effectiveness and safety was due to the excellent cooperation of the many scientists, technicians, and seed orchard managers involved. The tests were coordinated and installed by entomologists with the U.S. Forest Service (Forest Insect Research--Nord and DeBarr--and Forest Pest Management--Barber, Overgaard, Weatherby, Taylor and Drake), Mississippi State University (Neel), the Texas Forest Service (Cameron), and Union Camp Corp, (Godbee). Also involved in the non-target organisms evaluations were a toxicologist (Hastings), microbiologist (Jones), and a soil scientist (Jorgensen) in the Southeastern Station. Design of field and pilot tests and methods of analysis were developed by USFS statisticians (Bhattacharyya and Ryan). Field tests and aerial pilot tests were conducted in N.C., S.C., Ga., Ala., Miss., La., and Texas at five industrial orchards--Crown-Zellerback (Adams), Georgia Kraft (Arnold), Union Camp (Zoerb and

Taylor), Scott Paper Co. (Hathcock), and Weyerhaeuser Co. (Sossaman); two state orchards-- Louisiana-Beauregard (Davis) and Texas Magnolia Springs (Long); and three Federal orchards-- Francis Marion (Buckles), Erambert (Showalter), and Stuart (Wilmore). Many thanks to all of the above mentioned people and their technicians and organizations for their fine cooperation and a job well done.

(Nord and DeBarr, USFS, SEFES, Athens, GA)

Three field tests were conducted in S.C., Ga., and La. to establish minimum effective rates of Ambush for control of coneworms and seed bugs. Cooperators conducting field tests are listed below.

Orchard	Type of Application	Cooperator	Entomologists in charge and affiliation
Georgia Putnam Co.	hydraulic	Georgia Kraft (B. Arnold)	J. C. Nord, G. L. DeBarr U. S. Forest Service
S. Carol. Moncks Corner	mistblower	U. S. F. S. Francis Marion (O. Buckles)	J. C. Nord, G. L. DeBarr L. R. Barber, U. S. F. S.; Non-target data, J. Taylor and L. Drake, U. S. Forest Service
Louisiana Pollock	mistblower	U. S. F. S. Stuart (D. Wilmore)	J. Weatherby, U. S. Forest Service

Table 1 gives the treatments tested. Mistblower applications with FMC Speedsprayers (Model F757 CP) were made in S.C. and La. seed orchards. One hundred gallons/ac were applied to 1.6-2.0 acre blocks of loblolly pine. In the Ga. test, individual loblolly pine trees were sprayed to run-off with a hydraulic sprayer. Five to six applications were made at 4-week intervals beginning in April.

Ambush gave good control of Dioryctria spp. in the Ga. and S.C. tests. In the Ga. test, the middle and upper rates had significantly less damage than the lower rate and these rates of Ambush performed as well as the registered rate of Guthion. There was no difference in percent Dioryctria damage between rates of Ambush in S.C. Dioryctria disclusa damage in the Ga. test ranged from 0-2% of the crop in the Ambush treatments and it was 6.2% in the control. The differences between the Ambush treatments and control were significant. In La., Guthion was the best treatment but the Ambush treatments were similiar to the control in Dioryctria damage. Analyses of seed bug damage have not been completed. ICI will apply for registration of Ambush at the same rates as those of Pydrin; however, there may not be a restriction on amount/ac. Stauffer Chemical Co. will submit an Imidan label to the EPA for registration of Imidan 50% WP for control of seed bugs and coneworms in 1982. The rate will be .2-.3% AI for hydraulic sprays and 1.0-1.5% for mistblower application.

Table 1. Mean percent Dioryctria-damaged cones[1/] in field tests of insecticides, 1981.

Treatment (%AI)[2/]	Georgia		South Carolina		S.C. (Clone 9)		Louisiana	
	Damage	Control	Damage	Control	Damage	Control	Damage	Control
					- percent -			
Ambush .05 (.25)	1.7 a[3/]	88	-	-	-	-	8.1 b	36
Ambush .025 (.125)	3.3 a	76	0.4 a	89	2.6 a	92	12.0 c	6
Ambush .0125 (.0625)	6.1 b	56	0.9 a	74	4.3 a	86	11.3 bc	11
Guthion .18 (.9)	2.5 a	82	1.4[4/]	60	5.0[4/]	84	3.0 a	76
Control	14.0 c	-	3.5 b	-	31.2 b	-	12.7[4/]	-

1/ Not including D. disclusa damage. Formulations: Ambush 2E; Guthion 2F (Ga.), 2S (S. C. and La.).

2/ Hydraulic rate (mistblower rate).

3/ Any two means not having a letter in common are significantly different at the 5% level according to Duncan's New Multiple Range Test.

4/ This treatment not part of the experiment because it was not randomly assigned.

(Meso, USFS, FPM, Portland, OR)

We have been using Guthion at two of our Douglas-fir seed orchards during the past two years. Viable seed yield increase was 1.7% and 5.8% in 1980 and 11.8% in 1981. Spraying reduced Douglas-fir cone moth and fir coneworm impact, but Douglas-fir seed chalcid damage was unaffected. For some unexplained reason, Douglas-fir cone gall midge impact was much higher in the Guthion-treated cones.

A Special Local Need 24(C) Registration was obtained from the State of Oregon to use Orethene. This material is being tested in our Douglas-fir and western white pine seed orchards located in Oregon to manage cone and seed insect damage.

(Weatherby, USFS, FPM, Pineville, LA)

An aerial application pilot project for controlling cone and seed insects was conducted during 1980 and 1981 in a loblolly pine seed orchard (DeRidder, LA.) In 1980, Guthion (2 lb. AI/acre) and Pydrin (0.67 lb. AI/acre) were each applied by helicopter in five monthly applications (May-September) to individual five acre blocks. In 1981, the same blocks were treated by fixed wing. During both project years, the Guthion and the Pydrin treatments showed significantly less coneworm damage than the check treatments (as illustrated in the table below).

Treatment	Healthy	Coneworm		Other Damage
		Dead	Damaged	
		- percent -		
1980 - Helicopter				
Check	59	29 a[1/]	9	2
Guthion[2/]	79	14 b	4	2
Pydrin[3/]	80	14 b	4	1
1981 - Fixed wing				
Check	71	22 a[4/]	6	0
Guthion[2/]	88	9 b	1	1
Pydrin[3/]	88	9 b	2	0

1/ Means followed by the same letter are not significantly different at the .05 level of significance.
2/ 5 Sprays: 2 lbs. of AI/ac.
3/ 5 Sprays: .67 lbs. of AI/ac.
4/ Means followed by the same letter are not significantly different at the .01 level of significance.

Spray deposit data from the 1980 helicopter application indicated that 77% of the Guthion solution (10 gal/acre) and 43% of the Pydrin solution (10 gal/acre) were recovered within the orchard. The 1981 data suggest that the fixed wing applications probably resulted in slightly higher recovery rates.

(Shea, Haverty and Jenkins, USFS, SWFRES, Davis, CA)

In 1981 the synthetic pyrethroid, permethrin. was tested for its efficacy in protecting blister rust resistant western white pine cones from attack by Conophthorus monticolae. The test was conducted in the Sandpoint Seed Orchard, Sandpoint, Idaho. Ten trees, 7.5 to 15 m in height, were randomly assigned one of seven treatments from a population of 186 total trees. The rates were .25, .50, and 1.0 lb AI/100 gallons of water. The second treatment was applied 14 days following the first. All treatments were made with a Bean hydraulic sprayer during the early morning. Twenty-one days following the second treatment and after all attacks had occurred all cones on all trees were examined and counted as infested or uninfested.

ANOVA on the mean number of cones/tree by treatment revealed no significant difference in initial population of cones per treatment level (p= .05). Pairwise tests of differences with a 2X2 contingency table using a Chi-square statistic of p= .01 indicate that all treatments are different from each except the single 1 lb. treatment and the double .25 lb. treatment. The percent loss of cones (Fig. 1) by treatment ranged from 78% in the controls to 4.9% in the double 1 lb. treatment.

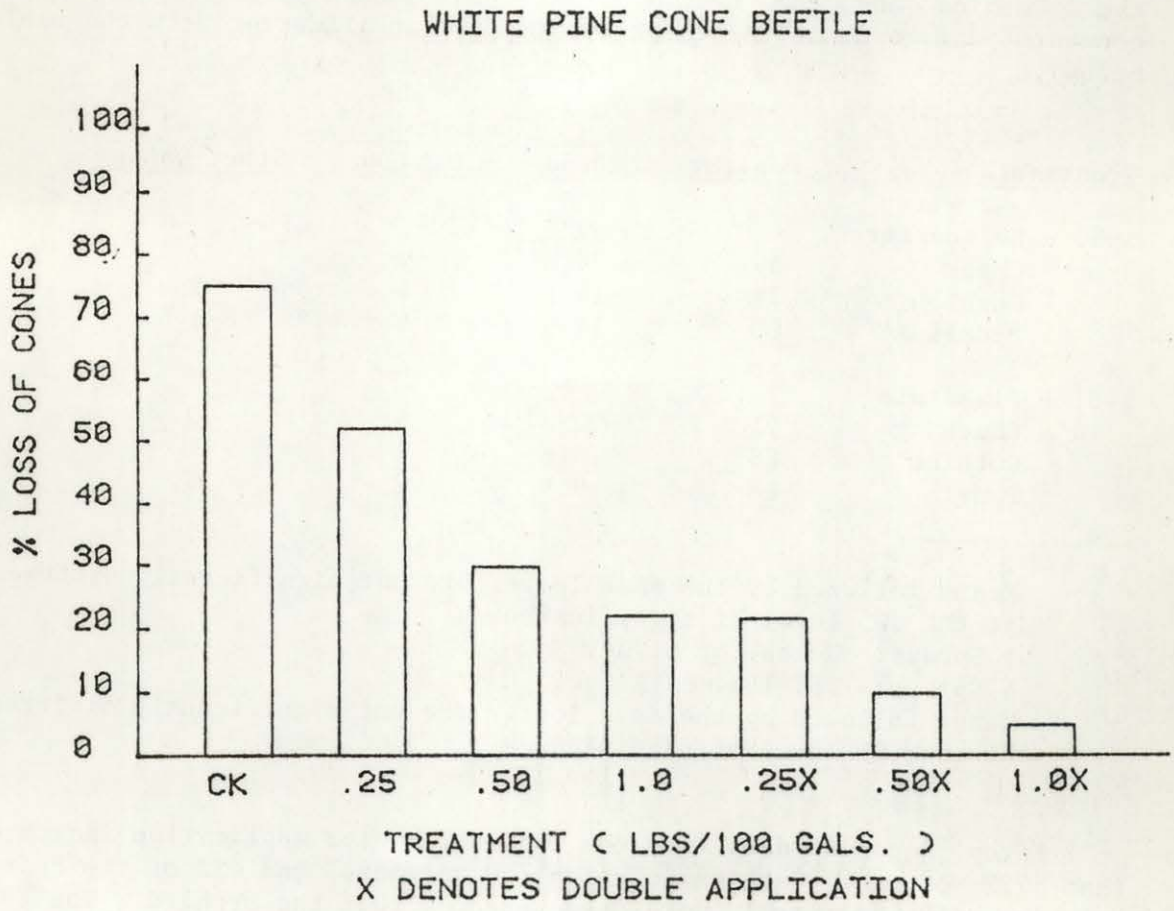

FIGURE 1.

5. Publications[3/]

Cameron, R. S. 1981. Toward insect pest management in southern pine seed orchards with emphasis on the biology of Tetyra bipunctata (Hem., Pentatomidae) and the pheromone of Dioryctria clarioralis (Lap., Pyralidae). Texas Forest Service Pub. 126. 149 p.

Dale, J. Wm. and C. L. Frank. 1981. Injecting Metasystox-R increases seed yields of large superior Douglas-firs by reducing losses caused by cone insects. U.S.D.A. Forest Service, Pacific Southwest Region, Forest Pest Mgmt. Rep. No. 81-33. 10 p. (Limited distribution will be submitted to an appropriate journal for publication.)

Dewey, J. E. and M. J. Jenkins. 1982. An evaluation of cone and seed insects in selected seed production areas in Region 1. U.S.D.A. Forest Service, Northern Region, Forest Pest Mgmt. Rep. No. 82.5.

Stipe, L. E. and A. K. Green. 1981. A multiple ground application of acephate and carbaryl for protection of Douglas-fir cones from western spruce budworm. U.S.D.A. Forest Service, Northern Region, Forest Pest Mgmt. Rep. No. 81-22.

3/ This list only includes publications submitted to the compiler and is not a comprehensive bibliography of papers on cone and seed insects published in 1981.