

## **Use of Hercon Verbenone Flakes to Prevent Engraver Bark Beetle (*Ips* spp.) Colonization of Ponderosa Pine Slash**

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**Team Members: Chris Hayes, UA Research Specialist; Joel McMillin and John Anhold, US Forest Service, Forest Health Protection;**

### **Location:**

This experiment will take place on the Arizona State Lands/NAU Centennial Forest

### **Critical Issue:**

The Healthy Forests Restoration Act of 2003 (HFRA) and the 2001 National Fire Plan supports large increases in acres of ponderosa pine forest, in the southwest, to be treated with thinning to reduce fire risk; restore forest ecosystem function; and reduce insect and disease risk. The majority of trees removed are in smaller diameter classes that have no viable commercial market at present. Consequently, the most commonly used disposal method is placing slash in piles at the site, which are eventually burned after the wood has dried. Pine engraver beetles (*Ips* spp.) are widely distributed in North America; they preferentially colonize weakened or recently killed small diameter (5-20 cm) trees, but they can also damage healthy host trees under appropriate conditions (Kegley et al. 1997). If slash piles are created during the period when pine engraver beetles are flying in search of new host material, they can be very attractive to the beetles because the recently killed small diameter trees provide optimal conditions for brood production. Thus, slash piles can become an important pest management concern (DeGomez and Loomis 2005, Six et al. 2002). Therefore, we need answers as to how to carry out necessary silvicultural practices (thinning), without encouraging bark beetles outbreaks.

Anti-aggregation pheromones have proven successful in the management of Douglas-fir and spruce bark beetles. Research has shown that *Ips pini* can be repelled with the anti-aggregation pheromone, verbenone (Miller and Borden 2000). In addition, in 2005 we conducted a preliminary study in which we treated slash piles with 100 g of Hercon verbenone flakes. We found a significant difference in the number of bark beetle offspring exit holes, 1.3/450cm<sup>2</sup> vs. 1.6/450cm<sup>2</sup>. This difference was statistically significant but was not deemed as operationally significant. This proposed study will attempt to find a level of verbenone that will reduce the number of exist holes to <0.25/450cm<sup>2</sup>.

### **Inputs:**

#### *Project Methods*

We will use a completely randomized block experimental design with 10 blocks (i.e., replications). The sample unit is a conventional slash pile (ca. 1.5 m diameter by 1.0 m high) consisting of 20-30 bolts. Each of the 10 blocks will have five treatments arranged randomly in a pentagon fashion: 1) control (untreated slash pile); 2) verbenone 100 g; 3) verbenone 200 g; 4) verbenone 400 g; and 5) verbenone 600 g. The distance between two adjacent slash piles will be at least 50 m. Slash piles will be created in May 2006 and immediately treated with the appropriate pheromone treatment. After that, the flight of pine engraver beetles will be monitored

with commercial pheromones and funnel traps. We have 4 years of data that indicates the major *Ips* species flight will likely occur in mid to late June. Treatment efficacy will be assessed by collecting two sample bolts from each slash pile and determining the total number of P<sub>1</sub> (first or parent generation) *Ips* beetle attacks, gallery lengths, and the total number of F<sub>1</sub> (next generation) beetle emergence holes.

Verbenone is delivered as a flake (laminated PVC controlled release dispenser 1/8" x 1/8" to be applied with a hand held fertilizer spreader). The extremely small size of the verbenone flakes ensure that they will virtually disappear from human sight when applied. Verbenone has an LD 50 of 250mg/kg and carries a CAUTION warning on the label. The label indicates that "waste resulting from this product may be discarded in a approved landfill" and that the empty bags may be "placed in the trash".

Little is known as to whether the flakes are picked up by wildlife. USFS has allowed this material to be aerially applied in California under the direction of Dr. Nancy Gillette with the USFS Pacific Southwest Research Station. The verbenone within the flakes will breakdown within 6 to 8 weeks so they should not pose a hazard when the slash piles are burned 12 months after application. This material has a low toxicity. Therefore, we do not anticipate needing to warn the public of its use.

Since verbenone is an anti-aggregation pheromone for the mountain pine beetle, we do not expect to attract bark beetles to the area. Thus, we do not expect to see any probability of spillover onto trees near the treated slash piles. Verbenone should not be confused with cis-verbenol which is a bark beetle aggregation pheromone.

### *Duration of Study*

The study will be conducted from May – September 2005; however the laboratory work (mainly dissecting logs to count the number of beetle attacks and emergence holes, and measuring the length of galleries) could extend to mid October; complete analysis of the data by September 30, 2006; final project report submitted to UA IPM Program by November 30, 2007; manuscript writing will be finished by the end of March 2007.

### *Staff Involvement and Timeline*

- Create the slash piles and apply the verbenone: 4 people (1 research technician and 3 student technicians) 40 hours each (160 total hours). **May 2006**
- Monitor beetle attacks on the slash piles: 2 people (1 research technician and 1 student technician) once per week, 8 hours each, for 10-12 weeks (192 total hours). **May to Aug 2006**
- Collect and dissect 100 logs: 2 people (student technician) 20 hours per week for 3 weeks (120 total hours). **Aug to Sept 2006**
- Data analysis: 1 person (research technician) 40 hours. **Sept 2006**
- Extension bulletin preparation: 1 person (extension specialist) 80 hours. **Oct 2006 to March 2007**
- Journal of Economic Entomology manuscript preparation: 2 people (extension specialist and research technician) 120 hours. **Oct 2006 to March 2007**

### **Budget**

We are requesting \$7680 from UA Cooperative Extension IPM Program to conduct this project.

<b>ACTIVITY</b>	<b>IPM GRANT</b>	<b>UA FOREST HEALTH</b>
Create slash piles	\$2000	
Monitor piles	2880	
Log dissection	1200	
Data analysis	800	
Extension bulletin		\$3400
Journal manuscript		3750
Travel	500	
Misc. field supplies (saw supplies, gloves, verbenone, spreader, hatchets, bags, etc.)	300	300
<b>TOTALS</b>	<b>\$7680</b>	<b>\$7450</b>

#### **Outputs:**

Expected outputs include a University of Arizona Extension Bulletin and a journal article, tentatively in the Journal of Economic Entomology. Results will be presented at the Western Forest Insect Worker Conference, Bark Beetle Technical Working Group. In addition, we will collaborate with US Forest Service FHP entomologist Joel McMillin and John Anhold. They will be responsible for transferring information to other federal personnel. The principal investigator will be responsible for transferring guidelines to private and non-federal municipal land managers. Also, our findings will be passed on in a timely manner through local, regional, and national scientific meetings.

#### **Expected Outcomes and Impacts:**

This project will provide guidelines for the use of new verbenone release device technology in the reduction of pine engraver attacks on slash piles. Benefits will include a potential reduction in the level of bark beetle tree mortality associated with WUI fuel reduction and forest health restoration treatments; and a furthering of our knowledge of insect-chemical interactions.

#### **Evaluation:**

Success will be measured by the completion of a final report that establishes a verbenone application rate that will significantly reduced pine engraver attacks on slash piles. Written guidelines will be developed to reduce engraver beetle attack on slash piles, and the final report will be used as a template for a scientific journal manuscript. Long term success will be measured through implementation, by land owners, of our bark beetle slash guidelines and verbenone treatment. This project should help to increase awareness of this problem; a problem that is just now beginning to be acknowledged by forest managers.

#### **References:**

- DeGomez, T. and B. Loomis. 2005. Firewood and Bark Beetles in the Southwest. University of Arizona, College of Agriculture and Life Sciences Bulletin, AZ1370. Tucson, Arizona.
- Kegley, J. K., R. L. Livingston, and K. E. Gibson. 1997. Pine engraver, *Ips pini* (Say), in the western United States. USDA For. Serv. For. Insect Dis. Leaflet 122, Washington, D.C.
- Miller, D.R. and J.H Borden. 2000. Pheromone interruption of pine engraver, *Ips pini*, by pheromones of mountain pine beetle, *Dendroctonus ponderosae*, (Coleoptera: Scolitidae). J. Entomol. Soc. Brit. Columbia 97:57-65.
- Six, D.L., M. Meer, T.H. DeLuca, and P. Kolb. 2002. Pine engraver (*Ips pini*) colonization of logging residues created using alternative slash management systems in Western Montana. Journal of Applied Forestry 17(2): 96-100.