

# POLYETHYLENE TARPING OF ELM FIREWOOD TO PREVENT ELM BARK BEETLE FLIGHT

by Joseph H. Krawczyk, Charles J. Kostichka, Gayle L. Worf, and Daniel L. Mahr<sup>1</sup>

**Abstract.** Elm firewood storage in urban areas often conflicts with Dutch elm disease control efforts because of the biological hazard associated with elm bark beetle emergence. To demonstrate that polyethylene coverings form an effective barrier against elm bark beetle flight, an elm firewood demonstration program was initiated in Madison, Wisconsin on April 6, 1981. Fourteen, one-half cord, elm firewood piles were covered and sealed with either clear, four or six mil polyethylene, or black, six mil polyethylene or left uncovered. Results showed that clear, six mil polyethylene effectively prevented elm bark beetle flight and as an added benefit also lowered wood moisture content more than black polyethylene covered piles and uncovered piles. Homeowners who use elm wood for fuel should be encouraged to cover the wood with clear, six mil polyethylene during the period of bark beetle activity.

Due to the rising cost of fossil fuels, homeowners have sought alternative methods of heating their homes. The most commonly used alternative in Wisconsin is wood and this is reflected in the fact that 25% of the households in Wisconsin use wood to heat their homes (Wisconsin Department of Natural Resources Survey 1980). Urban firewood users often have limited access to wood sources, so any available source is sought. The advance of Dutch elm disease in urban areas has resulted in diseased elm wood becoming available as a potential urban firewood. However, most municipalities have ordinances prohibiting the use of elm as firewood because of the biological hazard associated with it. Elm wood harbors the Dutch elm disease fungus and elm bark beetle and when this wood is improperly stored by homeowners as firewood, municipal Dutch elm disease efforts are hindered.

This project was undertaken to evaluate and demonstrate the value of polyethylene coverings as a technique for eliminating the biological hazard posed by elm firewood use in urban areas. The primary objective was to assess the effectiveness of different polyethylene tarp colors and thicknesses as a barrier to elm bark beetle escape. The effect of different polyethylene

coverings on elm firewood moisture content was also examined.

## Materials & Methods

During the spring and summer of 1981, an elm firewood demonstration program was conducted at the University of Wisconsin-Madison Charmany Experimental Farm in Madison, Wisconsin. A preliminary evaluation had been conducted there in 1980 which helped guide the program.

Dutch elm disease infected and European bark beetle infested American elms, *Ulmus americana*, removed by the Dane County, Wisconsin Highway department and the City of Madison, Wisconsin Forestry Department were brought to the project site in April and again in July. The bark on all trees was intact. Within ten days of delivery the wood was cut into 16-inch lengths, split with a hydraulic wood splitter, and stacked into 64-cubic foot piles which measured 4'x4'x4' (Figure 1). The stacked piles were treated in the following manner:

- 1) Covered with clear polyethylene plastic, six mil thickness (four repetitions)
- 2) Covered with clear polyethylene plastic, four mil thickness (one repetition)
- 3) Covered with clear polyethylene plastic, four mil thickness, and then covered with snow fencing to simulate partial shade (one repetition)
- 4) Covered with black polyethylene plastic, six mil thickness (four repetitions)
- 5) Not covered, to serve as controls (three repetitions)

The wood piles were held in place by steel posts (Figure 1) and to prevent the polyethylene tarps from ripping on the sharp edges of the wood piles and support posts, the top of each wood pile was covered with a sheet of six mil clear polyethylene that draped the sides of the pile by

<sup>1</sup>Elm Wood Utilization Specialist, Wisconsin Department of Natural Resources, and former Dutch Elm Disease Coordinator, Plant Pathologist and Entomologist, University of Wisconsin, Madison, Wisconsin, respectively.

12 inches. Each pile was then covered with a polyethylene tarp that was large enough to cover the entire pile and also leave 12-18 inches of excess plastic on the bottom edge. This excess plastic was used to completely seal the wood pile.

Two methods of sealing were used. The first method involved trenching around the wood pile and then back-filling the trench over the excess plastic. The second method involved placing sand bags on top of the excess plastic so that the entire pile was sealed (Figure 2).

In each pile three firewood sticks were randomly selected and a one-cubic inch sample was taken from each stick in order to determine the moisture content of the wood before covering. Wood moisture content was determined by the oven-drying method. The sticks were marked with an aluminum tag to facilitate relocation.

## Results

Neither the clear nor the black six mil polyethylene films deteriorated during the project period. However, the four mil polyethylene film did rip on both wood piles that were covered with it.

European elm bark beetles, *Scolytus multistriatis* (Marsh.), succeeded in chewing holes and escaping through the black polyethylene but not the clear (Figure 3).

Under the tarps that did not rip, both dead and living elm bark beetles were usually found congregated at the top of the wood piles (Figure 4).

The piles covered with black and clear six mil polyethylene did not differ greatly in average moisture content after 183 days (Table 1, piles A, B, E, and F). However, both treatments dried the wood more than air drying (controls) during the same period (Table 1, piles K and F).

The four mil clear polyethylene treatment that was in full sun (pile I) lowered the moisture content of the wood more than the four mil clear polyethylene treatment that was under partial shade (pile J).

The moisture content of the wood piles that were covered with clear, six mil polyethylene for 69 days (piles G and H) was lower than the moisture content of the wood piles that were covered with black, six mil polyethylene for 91 days (piles C and D). Both treatments lowered the moisture content of the wood more than the con-

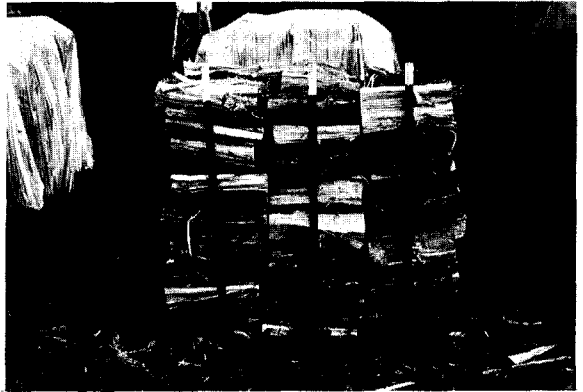


Figure 1. One-half cord, elm firewood piles were covered either with clear or black polyethylene tarps or left uncovered. All woodpiles were supported by snow fence posts.



Figure 2. Two possible methods of sealing woodpiles are shown here; placing sandbags or concrete blocks on the excess polyethylene.



Figure 3. Elm bark beetle "escape" holes were noticed in the black polyethylene tarps wherever the tarps were pulled taut.



Figure 4. Both living and dead elm bark beetles were found congregated at the top of the woodpiles.

Table 1. Comparison of wood moisture content before and after covering with different plastic tarps.

Treatment	Date	Duration	Moisture Content (%)			
			Initial	Final	Net Change	Average Change
<b>Black plastic, six mil</b>						
Pile A	4/6/81-10/6/81	183 days	29.9	16.6	-13.3	
Pile B	4/6/81-10/6/81	183 days	37.2	15.6	-21.6	-17.5
Pile C	7/7/81-10/6/81	91 days	24.8	22.6	- 2.2	- 0.6
Pile D	7/7/81-10/6/81	91 days	26.0	27.0	+ 1.0	
<b>Clear plastic, six mil</b>						
Pile E	4/6/81-10/6/81	183 days	33.7	8.0	-25.7	
Pile F	4/6/81-10/6/81	183 days	25.6	16.0	- 9.6	-17.7
Pile G	7/29/81-10/6/81	69 days	26.3	17.6	- 8.7	- 5.5
Pile H	7/29/81-10/6/81	69 days	21.0	18.6	- 2.4	
<b>Clear plastic, four mil</b>						
Pile I	7/7/81-10/6/81	91 days	35.0	16.3	-18.7	
<b>Clear plastic, four mil partial shade</b>						
Pile J	7/7/81-10/6/81	91 days	27.6	33.3	+ 5.7	
<b>Control*</b>						
Pile K	4/6/81-10/6/81	183 days	28.3	17.3	-11.0	
Pile L	4/6/81-10/6/81	183 days	23.3	17.6	- 5.7	- 8.3
Pile M	7/29/81-10/6/81	69 days	26.6	27.0	+ 0.4	

\*No plastic covering

trol treatment (pile M).

### Discussion

In order for polyethylene tarping to serve as an effective barrier against elm bark beetle emergence, it must remain intact throughout the period of bark beetle activity. The results of this

demonstration have shown that six mil polyethylene withstands Wisconsin spring and summer weather conditions better than four mil polyethylene. By using six mil polyethylene, urban firewood users can be assured of an effective barrier against bark beetle emergence during the period of bark beetle activity.

Emerging elm bark beetles are attracted to light, and for this reason, care must be taken to prevent damage to black polyethylene tarps. Any hole in a black polyethylene tarp will allow light penetration which will attract bark beetles to the opening, thus allowing them to escape. This can be avoided by using clear, six mil polyethylene.

At the end of the project period, a close inspection of the polyethylene tarps revealed that elm bark beetles had chewed their way through the black, six mil polyethylene. These "escape" holes were noted where the polyethylene had been pulled taut over the pile support posts (Figure 3). It appears that stretching the polyethylene allows light penetration which attracts the bark beetles to the lighter areas where they chew their way through the polyethylene. Using clear, six mil polyethylene alleviates this problem.

The average reduction in wood moisture content was greater in the black and clear polyethylene treatments than the controls. The exception to this was the clear, four mil polyethylene treatment with simulated partial shade, where moisture content increased. It appears that if urban firewood users are to use elm for fuel, the wood piles should be tarped because this process prevents elm bark beetles from "escaping" and also lowers wood moisture content.

The wood piles should receive full sunlight and

the top of the tarp should be peaked to allow moisture that condenses to run down the sides of the polyethylene and into the soil.

### **Conclusions and Recommendations**

This demonstration has shown that clear, six mil polyethylene film forms an effective barrier against elm bark beetle emergence because of its superior weathering abilities and also because of total light penetration throughout the pile. Though clear polyethylene is only slightly better than black polyethylene in reducing wood moisture content, clear polyethylene should be used because holes in the polyethylene will not attract bark beetles to that point of escape.

Though covering elm firewood piles with polyethylene film lowers wood moisture content and inhibits bark beetle escape, the treatment does not kill mature elm bark beetles or larvae. If the wood is covered for a short duration and/or the bark remains intact, homeowners in Wisconsin who use elm for firewood should strive to burn the wood by April 15th of the following year, debark it or recover it before bark beetle activity begins in mid-to-late April.

*Wisconsin Department of Natural Resources  
Madison, Wisconsin*