How to Prevent Southern Pine Beetle Infestations

A guide to cost sharing thinning operations in East Texas

TEXAS A&M FOREST SERVICE

FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE

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Expanding southern pine beetle infestation on Indian Mounds Wilderness, Sabine County, Texas, 1993. (Cover photo and others by Ron Billings, Texas Forest Service)

How to Prevent Southern Pine Beetle Infestations

A Guide to Cost Sharing Thinning Operations in East Texas

Ronald Billings, L. Allen Smith and Michael Murphrey
Texas A&M Forest Service

Introduction

The southern pine beetle (SPB) is the most destructive pest of commercial pine forests in Texas. SPB infestations can be prevented by means of good forest management. Periodic thinning is one of the most useful tools for maintaining forest health and increasing stand resistance to SPB.

This circular describes why SPB is a major forest threat and discusses how to implement thinning as a prevention practice. Guidelines on how to apply for available federal cost shares to thin beetle-prone pine plantations also are included.

Figure 1: The "S"-shaped galleries beneath the bark of infested pines are characteristic of SPB.

About the southern pine beetle

The southern pine beetle, known by the scientific name *Dendroctonus frontalis*, is a forest insect that attacks and kills southern pines. Adult SPB are small beetles, about 1/8 inch long. They initiate attacks and lay eggs beneath the bark of pines weakened by overcrowding, flooding, drought, lightning, or other stress factors.

Infestations of this bark beetle can be identified by the distinctive "S"- shaped galleries the adult beetles make beneath the bark of infested pines (Fig. 1). The SPB has a rapid life cycle, developing from egg to adult beetle in 4-6 weeks in warm seasons and in 10-12 weeks when temperatures are cooler (Fig. 2). There may be 7 generations per year in Texas.

Figure 2: The life cycle of SPB consists of egg, larva, pupa, and new adult. Upon emergence from infested trees, the adult beetles fly in search of new host trees to attack.

Once an SPB infestation grows to more than 30 trees in size, the beetles are capable of killing even healthy pines as infestations expand (see photo on cover). During outbreak periods, which may occur every 6-10 years in Texas, multiple-tree infestations can expand over hundreds of acres, if not controlled.

Which pines are most susceptible?

The SPB prefers to attack loblolly or shortleaf pines older than 10 years of age, particularly those growing in unmanaged forests. Longleaf pine stands are less likely to be infested by SPB.

How to recognize a SPB-prone pine stand

A pine stand that has a basal area (a measure of stand density) greater than 120 square feet per acre and an average tree height of more than 50 feet is considered high hazard for SPB, particularly if it is growing on poorly-drained soils (Fig 3).

Basal area is simply the cross-sectional area in square feet taken up by an individual tree trunk at 4½ feet above ground; basal area per acre is the sum of these individual values for all the trees growing on one acre.

Crowded stands on poorly-drained, bottomland soils are more likely to be attacked by SPB than those on side slopes or ridges. Individual pine stands can be rated for SPB hazard using criteria of landform, stand basal area and tree height (see Table 1). Stands that are medium or high hazard for SPB are targets for thinning in SPB prevention programs.

Figure 3: Dense, unthinned pine stands are highly susceptible to SPB attacks.

Table 1: Hazard rating tables for SPB in Texas.

Landform = Ridge

Pine basal area (sq. ft/acre)	Tree height (feet) < 50	50-75	> 75
	SPB Hazard		
< 80	low	low	low
80-120	low	low	med
> 120	low	med	med
	< 7	7-12	>12
	Tree diameter (inches)		

Landform = Side slope or other terrain

Pine basal area (sq. ft/acre)	Tree height (Feet) < 50	50-75	> 75
	SPB Hazard		
< 80	low	low	low
80-120	low	med	med
>120	med	high	high
	<7	7-12	>12
	Tree diameter (inches)		

Landform = Bottom

Pine basal area (sq. ft/acre)	Tree height (feet) < 50	50-75	> 75
	SPB Hazard		
< 80	low	low	med
80-120	med	med	high
>120	med	high	high
	<7	7-12	>12
	Tree diameter (inches)		

How to prevent SPB infestations

The best approach for preventing the occurrence of SPB infestations and their subsequent spread is to implement good forest management. Pine stands often become overcrowded at age 8-12, resulting in reduced growth and increased susceptibility to insects and diseases.

Periodic thinning to reduce competition among trees is the most recommended method of SPB prevention (Fig.4). Rapidly-growing trees in thinned plantations are more vigorous and capable of resisting beetle infestation due to a copious flow of resin.

Young pine stands should be thinned to a basal area between 70 and 90 square feet per acre to maximize both volume production and resistance to bark beetle attack.

If a SPB infestation does occur in a thinned stand, it is less likely to grow beyond a few trees, due to the wider tree spacing, adverse conditions for beetle flight, and other factors. Additional recommendations for SPB prevention include the following:

- Avoid wounding trees during thinning operations.
- Eliminate lightning-struck, diseased and suppressed trees in thinning operations.
- Avoid prescribed burns in pine plantations less than 10 years of age.
- Plant a tree species that is adapted to the site.
- Plant pine seedlings at no more than 726/acre (6 x 10 foot spacing), to allow for seedling mortality and to aim for an optimal density of 500-600 trees/acre after the first year.
- Establish a diversity of stand ages and harvest pines before they become overmature.
- Maintain hardwood buffers where possible (e.g., streamside management zones).
- Plant longleaf pine on suitable sites.
- Control bark beetle infestations as soon as possible after detection.

Figure 4: The first thinning is recommended in dense pine stands at age 10-15 years to promote rapid growth and tree vigor, with subsequent thinning every 5-10 years until the mature stand is harvested.

Figure 5: A thinned pine stand not only attains saw-timber size sooner due to more rapid growth, but is more resistant to SPB and other pests.

When to thin

Naturally-regenerated stands sometimes have such a large number of trees that a precommercial thinning is advisable (Fig. 6). This is not usually necessary in properly established plantations where seedling spacing has been controlled and in-growth of natural regeneration is not excessive.

Precommercial thinning should be done as soon as overstocked conditions are identified, generally between 4 and 8 years of age.

Figure 6: Example of a precommercial thin.

In pulpwood stands, basal area stabilizes at 150 square feet per acre or higher. This density is too high to permit optimum diameter growth of crop trees. Commercial thinning should begin as soon as basal area exceeds 120 square feet per acre and trees are of sufficient diameter to sell for pulpwood, usually between 10-15 years of age.

Another method to determine when to thin is by observing the live crown ratio. The stand should be thinned when the live crown (portion of the tree with live branches) becomes less than 35–40% of the total tree height.

The goal of thinning is to reduce the stand basal area to between 70 and 90 square feet per acre as early and as often as practical. Keep only straight, healthy, vigorous, and evenly-spaced crop trees.

How to thin

Foresters consider site quality, species, age, tree size and vigor of a stand as well as stand density when prescribing a thinning. Often, they leave more basal area on good sites than on poor sites and more basal area in older stands than in younger ones. Location, markets, and type of logging equipment also influence the thinning prescription.

Row thinning is ideal for first thinning of plantations with a large number of stems per acre, in which access and maneuverability of machinery are limited.

Row thinning is done by removing an entire row at equal distances in the plantation. Removing every third, fourth or fifth row is a common thinning practice for both pre-commercial and commercial thinning operations.

Strip thinning or corridor thinning is used in natural stands or in plantations where distinct rows are not present. In strip thinning, all trees in a strip of a certain width are removed. The cut strip should be at least 15 feet wide to allow operation of machinery and should follow the contour. Strips of uncut trees should be 30-40 feet wide, depending on landowner objectives.

In an "**operator select**" thinning, the equipment operator decides which trees to remove and which to leave as thinning progresses. Experienced operators will thin the stand to a prescribed basal area and leave the best crop trees evenly spaced in the plantation. The consulting forester may have to closely supervise this type of thinning operation to ensure the desired result.

A **combination** of row or strip thinning and operator-select thinning to remove poorly-formed or suppressed trees from leave rows is commonly practiced.

Which counties are most beetle prone?

Certain counties in East Texas are more beetle prone than others, due to the spatial distribution and abundance of susceptible pine stands. The following 30 counties in East Texas are the most likely to support a SPB outbreak: **Anderson**, **Angelina, Bowie, Cass, Cherokee, Gregg, Hardin, Harris, Harrison, Houston, Jasper, Liberty, Marion, Montgomery, Nacogdoches, Newton, Orange, Panola, Polk, Rusk, Sabine, San Augustine, San Jacinto, Shelby, Smith, Trinity, Tyler**, **Upshur, Walker** and **Wood** counties.

Within these counties, individual grid blocks (18,000 acre units) have been rated for SPB hazard (Figure 8). These ratings were determined by evaluating the abundance of beetle-prone stands within each grid block, using digital aerial photos.

Cost shares available for SPB prevention

In 2003, the Texas A&M Forest Service **(**TFS) initiated a federal cost-share program to encourage private forest landowners to thin their dense pine stands and prevent future SPB infestations. These cost shares serve as an incentive to conduct thinning operations prior to the next SPB outbreak, despite poor market conditions for pulpwood.

Cost shares are available to forest landowners in the 30 counties listed above

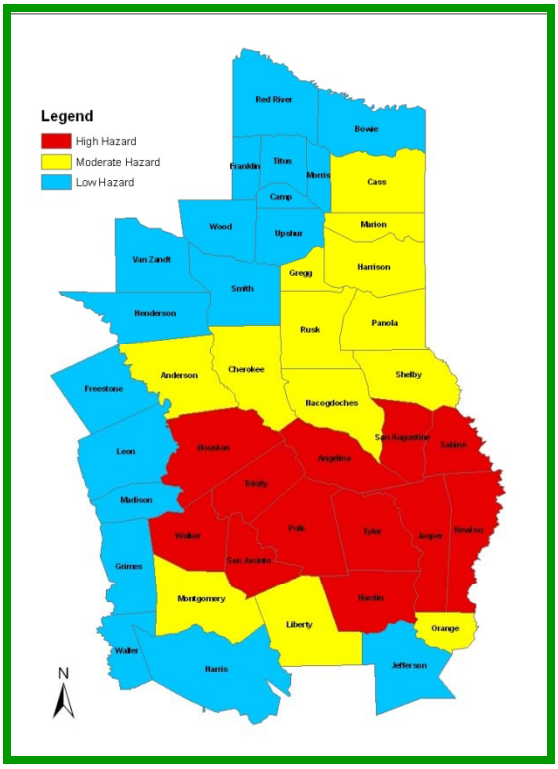


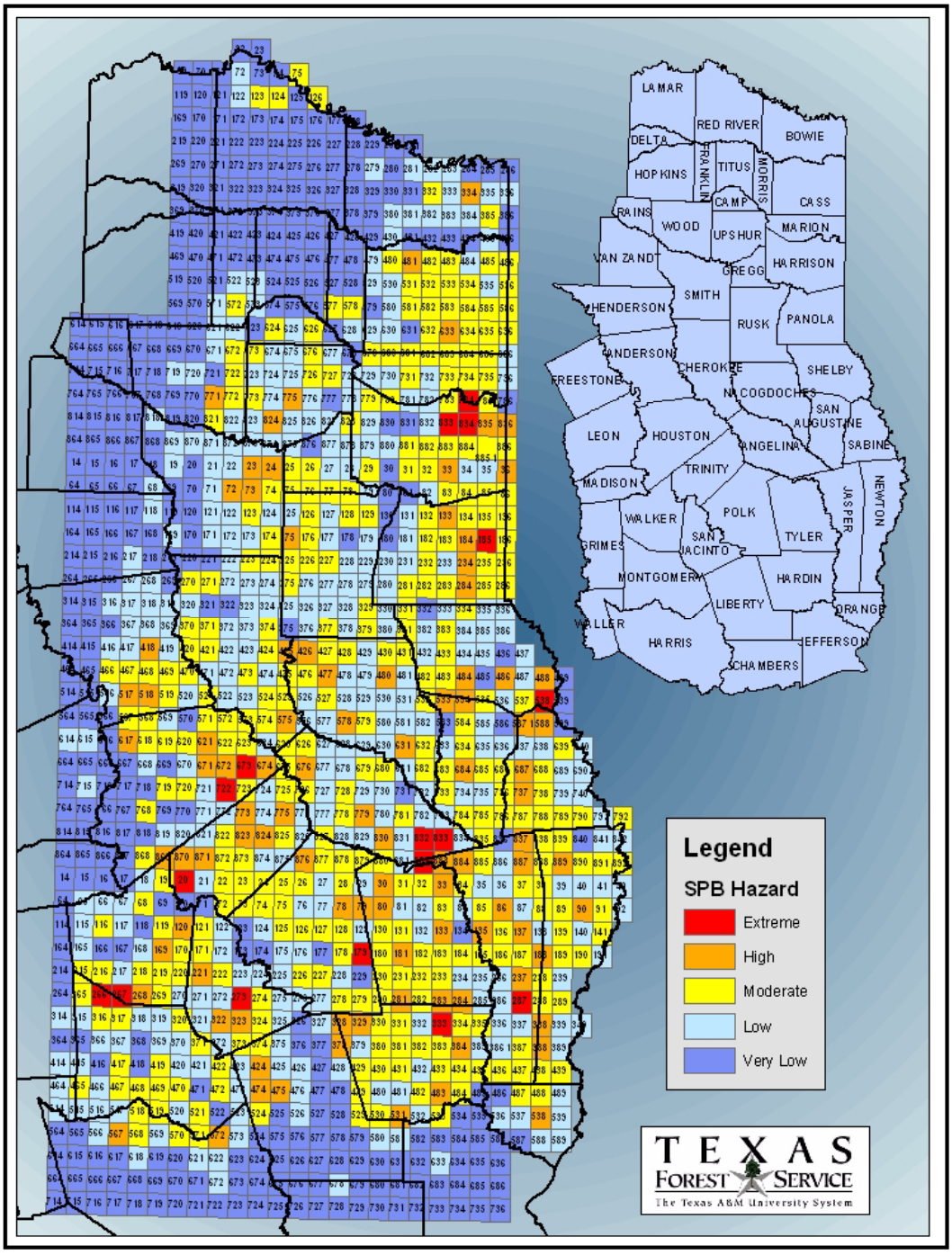
Figure 7: Map of East Texas showing SPB hazard by county.

Exclusively for for the first thinning of dense pulpwood-sized stands.

Federal cost share funds for SPB prevention are provided by the USDA Forest Service, Forest Health Protection and administered by TFS.

The availability of SPB cost shares in future years is contingent upon continued funding of the SPB Prevention Project by the USDA Forest Service.

Figure 8: Southern pine beetle grid block hazard map for East Texas. Each square equals 18,000 acres (one TFS grid block).



Cost shares for first thinning of merchantable pulpwood stands

To qualify for federal cost shares, merchantable pulpwood stands must rank as high hazard for SPB (see Table 1) and be located in one of the 30 beetle prone counties listed on page 5.

The cost share for the first thinning of pulpwood stands consists of a flat fee of $50/acre, plus 50% of the consulting forester's fee, up to $5/acre.

To fulfill the requirement for a cost share match, the landowner will only need to report tons of pulpwood removed. Using this figure, TFS will compute the harvesting cost (based on a state average of $18/ton) as the match for the $50 -$60/acre the landowner is to receive in cost shares. Most thinning operations yield at least 10 tons/acre, more than enough to cover the required match.

How to apply for SPB cost shares

To apply for federal cost shares for SPB prevention, the TFS or consulting forester submits the following documents to TFS headquarters in College Station:

- A SPB Application Form (Table 2), signed by the landowner and the TFS forester
- A description of the stand and a simple management plan (Table 3)
- Small-scale map showing the tract's location within the county (Fig. 9) and a larger-scale aerial image or map of the stand to be thinned (Fig.10).
- Landowner's tax information (W-9 form)

If approved, TFS will notify the landowner and consulting forester (if involved).

Thinning is to be conducted according to the prescribed management plan, with adherence to the state's "Best Management Practices."

Following treatment, the TFS forester will visit the tract to verify that thinning has been carried out according to the management plan.

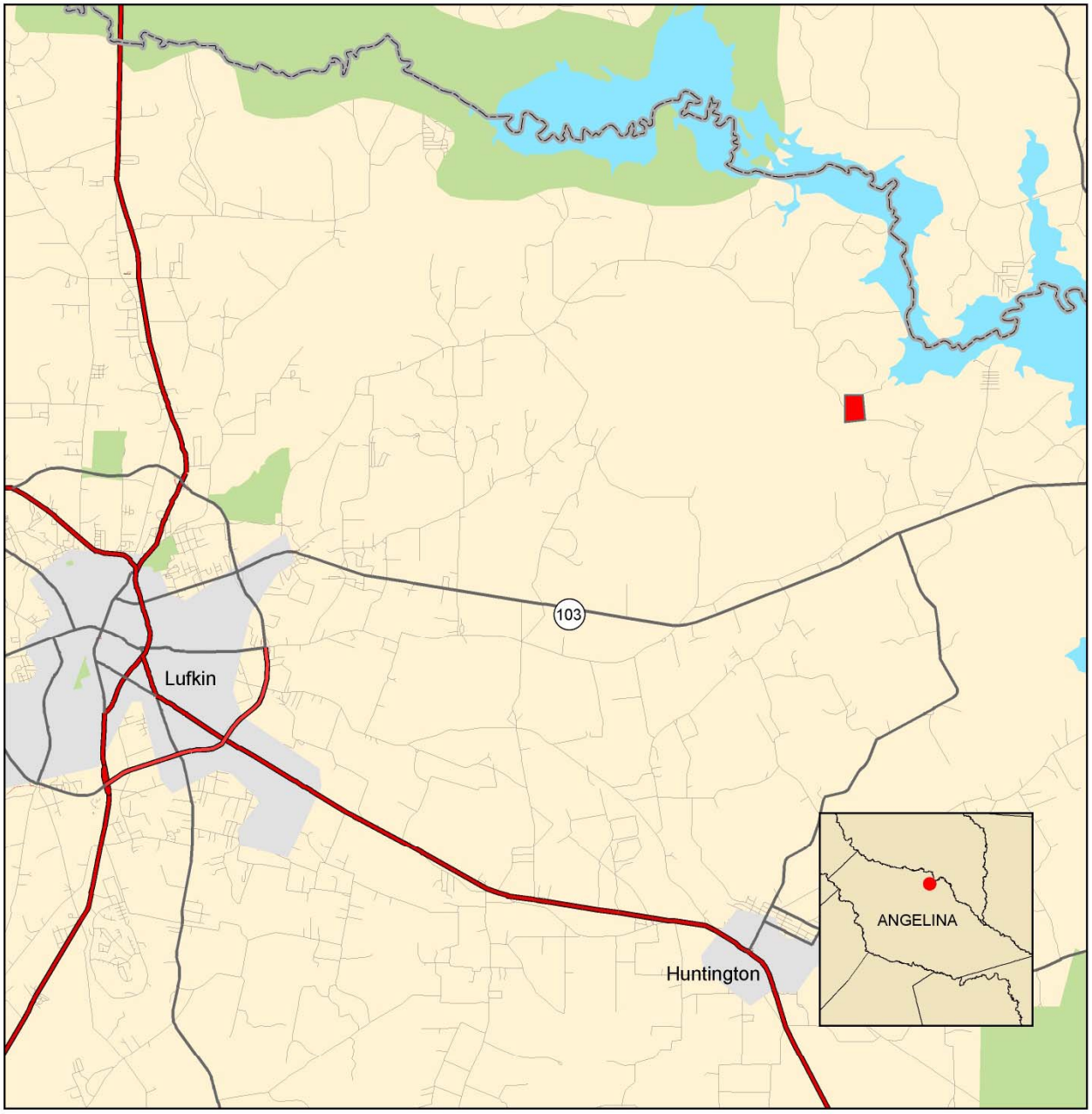
The landowner or forester then submits a completion summary (Table 2) documenting either actual costs (precommercial thinning) or tons of pulpwood removed (first thinning of pulpwood stands), together with a copy of the receipt for consulting forester services (if one was used).

The TFS reviews the claim and, upon approval, issues a reimbursement check to the landowner.

Figure 9

Tex Landowner

General Location Map--SPB Prevention



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The Texas A&M University System

Landowner	**Tex Landowner**
County	**Angelina**
Acres	**52**
Date Prepared	**January 2006**
Prepared by	**Tex Forester**
Source	**ESRI Streetmaps**

Figure 10

Tex Landowner

SPB Prevention Map

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0 500

Feet

TEXAS FOREST SERVICE
The Texas A&M University System

Landowner	**Tex Landowner**
County	**Angelina**
Acres	**52**
Date Prepared	**January 2006**
Prepared by	**Tex Forester**
Source	**1997 DOQQ**

Restrictions

Participation in the SPB cost-share program is subject to the following restrictions:

- Participating landowners, partnerships or trusts must own no more than 5,000 acres of timberland. The minimum tract size for cost sharing is 10 acres.
- Cost shares are only available for first thinnings of stands that contain at least 70% loblolly, shortleaf, or slash pines and rank as high hazard for SPB (see hazard tables on page 2).
- The tract to be thinned must be located in one of the 30 beetle-prone counties listed on page 5.
- Cost-shared thinning operations must reduce stand basal area to no more than 80 square feet per acre and adhere to Texas forestry "Best Management Practices" (BMPs).
- Once the SPB application has been approved, the landowner has 18 months to complete the thinning operation.
- If the thinning is not completed within 12 months, the landowner or consulting forester may apply for a 6-month extension (Table 5).
- Total cost shares must not exceed $5,000 /landowner, partnership or trust with two or more members per federal fiscal year (October 1 – September 30).
- The landowner is encouraged to maintain the thinned stand for a minimum of 5 years following thinning.
- Each approved tract is subject to inspection by state or federal crews before, during, and after thinning.

For more information

If you have questions or would like to apply for SPB prevention cost shares, contact the Texas A&M Forest Service office nearest you or one of the following program specialists:

Michael Murphrey

Texas A&M Forest Service
P. O. Box 310
Lufkin, TX 75902
Phone: (936) 639-8170
E-mail: mmurphrey@tfs.tamu.edu

Dr. Ronald Billings

Texas A&M Forest Service
200 Technology Way, Suite 1281
College Station, TX 77845
Phone: (979) 458-6650
E-mail: rbillings@tfs.tamu.edu

For more information on southern pine bark beetles, other forest pests, or forestry in general, visit the Texas A&M Forest Service web page at http://texasforestservice.tamu.edu.

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* Available on the Bugwood Network at http://www.barkbeetles.org/spb.html.

** Available upon request from the Texas A&M Forest Service.