



## Forest Management Strategies to Minimize the Impact of the Gypsy Moth

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### Where is it Found?

Gypsy moth is an exotic insect from Europe and was introduced into the United States in the mid 1800s near Boston Massachusetts. The moth spread throughout the Northeast and remained there until the 1930s. The following years saw rapid migration throughout the mid-Atlantic regions. By the 1990s, the moth was found throughout the northeast, mid-Atlantic regions, Michigan, and currently inhabits eastern Wisconsin. The rapid migration west is mainly due to wind and people inadvertently moving the caterpillars and egg masses on recreational vehicles, cars, nursery stock, firewood, and outdoor furniture.

### Impact on Your Trees

Gypsy moth defoliates mainly hardwood trees, although it does feed on some conifers. In pure conifer stands, defoliation is minimal; however, in hardwood – conifer mixtures some conifers can be severely defoliated.

The heaviest defoliation occurs from late June to early July. The tree will produce a second growth of foliage in mid-summer if two-thirds or more of the original foliage is lost. If the tree is defoliated before peak photosynthesis occurs, it must rely on remaining food reserves to produce the second growth of foliage. The additional stress placed on the tree when producing foliage for the second time, can lead to mortality of buds, twigs, and/or branches.

Site characteristics, such as landform, slope, and soil, also play a role in determining gypsy moth population and defoliation levels. Ridgetops, steep, south and west facing slopes and dry, sandy outwash plains are sites favored by gypsy moth. Trees growing on these sites are often crooked, low in vigor, and with deep fissures in the bark, all of which provide prime gypsy moth habitat. These preferred sites also increase the chance for outbreaks and larval dispersal to nearby stands.

In contrast, lower slopes and those with northerly and easterly aspects should experience minimal mortality during outbreaks as long as the preferred species are healthy and vigorous. These sites are characterized by straight, fast growing trees with smooth bark, healthy crowns, deep and fertile soils, and little drought stress...all of which increase the resistance to gypsy moth damage.

Trees can survive heavy gypsy moth defoliation if they have healthy crowns. Trees with crowns in good condition (less than 25% dead branches) have the lowest mortality rates after a gypsy moth defoliation. In contrast, trees with poor crowns, (more than 50% dead branches), suffer the greatest mortality.

### What Does the Gypsy Moth Eat?

#### The following tree species are *preferred* by the gypsy moth:

- Alder
- Aspen
- Birch, white
- Hawthorn
- Tamarack
- Witch hazel
- Apple
- Basswood
- Box elder
- Oaks
- Willow

#### The following tree species are eaten by the gypsy moth, but are *non-preferred*:

- Beech
- Birch, yellow
- Cherries
- Cottonwood
- Hemlock
- Ironwood
- Maples
- Spruces
- Birch, black
- Butternut
- Chestnut
- Elms
- Hickories
- Juniper
- Pines
- Walnut

#### The following tree species are *avoided* by the gypsy moth:

- Ash
- Cedar, red & white
- Locusts
- Pine, scotch
- Balsam fir
- Dogwoods
- Mountain maple

The effects of gypsy moth defoliation can make a tree susceptible to attack by other pests such as two-lined chestnut borer and shoe string root rot. Healthy trees can tolerate or resist these *secondary* attacks, while trees that are in poor health are at a higher risk.

## Your Management Options

There are three primary options available to manage a forest stand with gypsy moth in mind. They are:

- **No active forest management...** allowing the natural selection process and the resilience of the forest stand to determine the outcome of gypsy moth infestations.
- **Insecticide application...** in areas of high recreational use and occasionally in stands that have a large proportion of high value timber.
- **Active forest management...** to decrease the likelihood and severity of defoliation and to improve the vigor of forest stands thereby increasing tree survival following gypsy moth defoliation.

This publication is devoted to the latter option. Harvests and intermediate thinnings can be applied to reduce food quality and shelter for gypsy moth larvae and pupae. Intermediate thinnings, such as crop tree release, improve crown condition and vigor of the residual trees in the stand. The released trees will grow larger, more vigorous crowns that are more likely to survive defoliation.

## Management Prescriptions

### On Poor Sites...

1. Intermediate thinnings and selection harvests should help improve the vigor of residual trees to withstand gypsy moth defoliation.
2. Convert to conifer or non forest cover type, such as establishing a prairie.
3. Try to convert the stand to non-preferred species during the harvesting process.

### On Poor to Medium Sites...

Maintain less than 50% of the stand's basal area in gypsy moth preferred species.

### On Medium to Rich Sites...

1. Intermediate thinnings, such as crop tree release, can improve the crowns and vigor of preferred and non-preferred species and therefore improve their ability to survive defoliation. Favor dominant and co-dominant trees with straight stems, smooth bark, and healthy crowns.
2. Maintain healthy preferred and non-preferred species during the harvesting process to help limit gypsy moth population increases.

## Potential Gypsy Moth Damage...

- Defoliation levels of oaks and other preferred species will vary from light to severe during outbreaks. The majority of defoliated preferred species with poor crowns, dead branches, and low vigor will likely experience heavy mortality during outbreaks.
- Non-preferred species may be moderately affected by the gypsy moth during outbreaks when mixed with preferred species although the mortality rates should be low for healthy non-preferred species.
- Gypsy moth defoliation and mortality of preferred and non-preferred species on *rich sites* that are overstocked could possibly be severe during outbreaks if measures are not taken to improve tree health.

## Timing of Thinning...

- Stands that are **poor quality, overstocked, and/or contain overmature preferred species:** a thinning may be performed two or more years before or after a gypsy moth outbreak to remove the less vigorous trees.
- Stands that are **healthy, vigorous, and/or fully stocked:** a thinning may be performed one year before or after a gypsy moth outbreak to enhance the vigor of the residual stand.

## Regeneration Considerations...

- Seedlings and young trees, of oak and other preferred species, will have the highest defoliation and mortality rates during outbreaks.
- Stump sprouts of gypsy moth preferred species should be thinned to one stem per stump, in order to improve vigor and resistance.
- Gypsy moth usually has little impact on young pines in pure pine stands, while in hardwood – pine mixtures the impact on seedling and young pine trees could be severe.

### On All Sites...

1. Remove gypsy moth preferred species that are small and poor quality or girdle these trees to create wildlife snags. If girdling is used, make sure the crown and bole are not touching surrounding live trees.
2. Remove trees that could create a habitat for the gypsy moth such as trees with a large number of dead branches and rough and peeling bark.
3. In oak stands, increase the proportion and vigor of non-preferred species, such as maples, hickories, black cherry, and ash.
4. Encourage regeneration of non-preferred species.

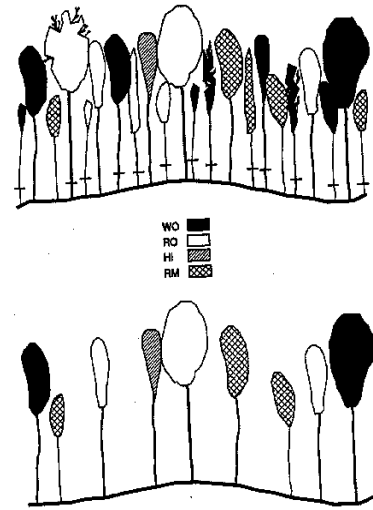


Figure 1. A thinning in an older stand...before and after the cut (WO = white oak, RO = red oak, HI = hickory, RM = red maple); from *USDA Forest Service, 1993*.

## Regional Concerns

### Southern Wisconsin Woodlots...

The woodlots in southern Wisconsin are often isolated by agricultural land. The isolation should help reduce the gypsy moth population because during the dispersal stage, if the larvae are dispersed onto agricultural land rather than a woodlot their likelihood of survival is extremely low since their preferred food is not available. This isolation can also lead to a wide variation in gypsy moth defoliation levels. For example, one woodlot may be severely defoliated while another nearby woodlot may have little or no defoliation.

### Central Sands of Wisconsin...

The large proportion of preferred species, especially scrub oak, that are low in vigor, crooked, and have deep bark fissure as well as site characteristics (dry, sandy, outwash) in the central sands will provide an abundant supply of food and habitat to the gypsy moth. These factors are expected to lead to heavy gypsy moth defoliation in this region as well as allowing its population to increase and disperse to other regions.

### The Driftless Area of Wisconsin...

The abundance of preferred species that are crooked, low in vigor, and with deep fissures in the bark as well as site characteristics (ridgetops with shallow, rocky soils, steep south and west facing slopes) in the Driftless area will provide abundant food and habitat for the gypsy moth. These factors are expected to promote heavy gypsy moth defoliation in this region. These factors will also allow its population to increase and disperse to higher quality sites (lower north and east facing slopes) in the region.

## Wildlife Considerations

1. Preferred species on ridgetops, steep south and west facing slopes, or sandy outwash plains can continue to be favored if management practices are implemented to improve tree condition. If egg masses are present, removing them may help reduce the gypsy moth population and dispersal.
2. Reduce the percentage of preferred species and create a savanna appearance in the openings.
3. Within high risk stands, increase the proportion of non-preferred species that will benefit wildlife and minimize defoliation (for example: hickory, walnut, ash, white pine, red cedar, and spruce).
4. Create a stratified structure for wildlife forage and cover. For example, on ridgetops, increases the white pine component; on mid slopes, increase the non-preferred hardwood and conifer species; and on lower slopes and bottoms, increase the non-preferred hardwoods and conifers as well as the shrubs.

## Landscape Consideration

1. The fragmentation of southern Wisconsin's forests may help manage gypsy moth populations because during the dispersal stage, the caterpillars are unlikely to survive in openings where no preferred food is available.
2. Where a single habitat type exists over large areas, a diverse arrangement of oak, maple, pine, and other non-preferred species can reduce the likelihood of damage by the gypsy moth as well as other defoliators.

3. Take full advantage of the available diversity of habitat types and current cover types across the landscape to reduce short term and long term pest threats.
4. Decrease the oak component and increase the conifer component on ridgetops and other susceptible sites in the central sands and Driftless area of Wisconsin.
5. Increase the percent of non-preferred species over the landscape to decrease the probability of population increases.



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