



FOREST AND WESTERN TENT CATERPILLARS

Insect Pest Management in Hybrid Poplars Series

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Forest and Western Tent Caterpillars

Malacosoma disstria Huber and *M. californicum pluviale* (Dyar)

(Lepidoptera: Lasiocampidae)

Introduction

Several web-spinning caterpillar species attack hybrid poplars in eastern Oregon and Washington. In addition to forest and western tent caterpillars, the fall webworm [*Hyphantria cunea* Drury (Lepidoptera: Erebidae)] is another serious defoliator. Our objective is to alert professional pest managers to potential threats these larvae pose to poplar biomass production. Management decisions should be based upon an accurate identification of the pest, knowledge of the pest's life history, monitoring their population, and having a management strategy to control these pests.

Taxonomy

Several tent caterpillar species (Lepidoptera: Lasiocampidae) are found in the western US. In addition to the forest tent caterpillar, *Malacosoma disstria* Huber, found throughout the hardwood forests of the entire US and southern Canada, several others have more limited west coast ranges. Generically these can be grouped as the western tent caterpillar, *M. californicum*, which includes multiple subspecies. Ciesla and Ragenovich (2008) identified six subspecies. *Malacosoma californicum californicum* (Dyar), *M. californicum ambisimile* (Dyar), and *M. californicum recenseo* (Dyar) can be found in local populations within California. *M. californicum pluviale* (Dyar), known as the northern tent caterpillar, is found in the Pacific Northwest and southern Canada. *M. californicum lutescens* is a Great Plains species that extends west to Montana, and *M. californicum fragile* is found in the southwest US. This information sheet will address just two species: the forest tent caterpillar, *M. disstria*, and the western tent caterpillar, *M. californicum pluviale*.

Hosts

Forest tent caterpillars attack most deciduous trees. In their northern range, forest tent caterpillars attack poplar, aspen, willow, birch, cherry, ash, basswood, oak, red alder, elm, hawthorn, and sugar maple. Additional hosts in southern states include water tupelo, sweetgum, and swamp blackgum. Species not attacked include conifers, sycamore, and red maple (Batzer and Morris 1981). Western tent caterpillars attack poplars, willow, red alder, crabapple, ash, birch, hazel, hawthorne, choke cherry, multiple woody shrub hosts, and California oaks and madrone (Ciesla and Ragenovich 2008).

Range

Forest tent caterpillar are found throughout the US and Canada where deciduous hardwood trees grow (Furniss and Carolin 1977). Western tent caterpillars have been collected in Oregon, Washington, and southern Idaho (Ciesla and Ragenovich 2008).

Life History

Forest tent caterpillars and western tent caterpillars are both univoltine, having just one generation per year throughout their range. Egg masses containing overwintering larvae are found on smaller branches, completely surrounding the diameter of the twig. Each larva hatches within its eggshell, but overwinters as a pharate larva, meaning a fully formed larva still within the eggshell (Ciesla and Ragenovich 2008). Larvae then emerge from these egg masses as the twig swells the following spring. In the Pacific Northwest, larvae hatch in late April or early May. Larvae feed in aggregations but do not form extremely large webbed tents like other members of this family (other tent-making caterpillars). Both *M. disstria* and *M. californicum pluviale* do spin copious amounts of silk, marking their trails to food sources and creating silken-mats on large branches or the trunk where they congregate to molt or rest (Meeker 2013). *M. californicum pluviale* does spin small web tents that become larger as larvae grow (Ciesla and Ragenovich 2008). Both *M. disstria* and *M. californicum pluviale* have five larval instars. The ultimate instar (Figure 1) starts a wandering stage in search of a suitable pupation site (Figure 2). Larval development through all five instars is rapid (30–42 days) and pupation may require an additional 12–18 days. Adult moths emerge in late July and early August and mate, and the females lay egg masses on small branches or twigs.



Figure 1. Single late instar forest tent caterpillar (Photo taken by R.A. Rodstrom).



Figure 2. Aggregation of forest tent caterpillars migrating down the bole of a poplar tree (Photo taken by R.A. Rodstrom).

Damage

Populations of forest tent caterpillars will increase year after year, and without control measures, large sections of natural forest have been defoliated. There are numerous reports of cyclic outbreaks of forest tent caterpillar in the eastern US and eastern Canada (Cooke and Lorenzetti 2006). In its northern range, these cycles can be 9–13 years apart. Myers (1993) suggested caterpillar outbreaks can collapse due to viruses infections or through parasitoid attacks.

Biological Control

Larval (maggot) depositing female parasitic flies, *Sarcophaga aldrichi* Parker in the North and *S. houghi* Aldrich in the South, attack spun cocoons of *M. disstria* (Witter and Kulman 1972; Witter et al. 1975). The developing maggot kills and consumes the host pupa. Batzer and Morris (1981) attributed *S. aldrichi* to the termination of outbreaks of the caterpillars in aspen forests in northern states. *Itopectis conquisitor* (Say) is an important ichneumonid wasp parasitoid of the pupal stage. Parasitization, up to 20% by five species of egg wasps, has been recorded in Alabama. Predatory beetles, ants, true bugs, spiders, birds, and small animals feed on caterpillars and pupae (Batzer and Morris 1981).

Two important parasitoids of the western tent caterpillars are: *Tetrastichus malacosoma* Girault (Hymenoptera: Eulophidae), which attacks the egg masses, and *Habrobracon xanthonotus* (Ashmead) (Hymenoptera: Braconidae), which attacks the larvae (Ciesla and Ragenovich 2008). A tachinid fly is also very common. Adult flies lay visible white eggs on the outside of the caterpillar. Because the egg is lost when the caterpillar molts, visible eggs are an underestimate of the actual number of parasitoids present in the system.

Monitoring

Visual monitoring of poplar for areas of defoliation is the best way to detect and evaluate the risk of this pest. Traps baited with sex pheromone can be used to monitor tent caterpillar populations (Schmidt et al. 2003); however, male moths captured in pheromone-baited traps may not be proportional to population numbers in outbreak situations (Evensen et al. 2015). Male moths fly up-wind to locate the source of the sex pheromone, but the females do not disperse; thus, the larval pest population occurs where the females are located rather than where the males are captured.

Management

Robison and Raffa (1997) distinguish between poplar clones that are considered high, intermediate, and low food quality for forest tent caterpillars. As an example of clone parentage influencing the feeding of *M. disstria*, there was a high preference for clones with *P. euramericana*, an intermediate preference for clones with *P. maximowiczii*, and a low preference for clones with *P. balsamifera* (Ralph 2012). Food quality can be the effect of polyphenol oxidase expression in foliage (Wang and Constabel 2004).

Early larvae can spin silk and balloon (using their silk as a sail to disperse by wind) off a non-preferred plant in search of a more preferred plant (Robison and Raffa 1994).

An insect growth regulator Dimilin (diflubenzuron) can be used to target populations of early instar tent caterpillar larvae. If larvae have developed to the final instar, use Steward (indoxacarb) according to label instructions. Other insecticides include Conserve (spinosad) and Coragen (chlorantraniliprole).

Tent caterpillar populations can be controlled by spraying organophosphate insecticides (chlorpyrifos, dimethoate, or malathion—Special Local Needs registration for malathion use OR-080024 and WA-960004), a carbamate (carbaryl), or synthetic pyrethroids (cyhalothrin or permethrin) according to labelled instructions. Currently, Oregon and Washington have registered the use of all these insecticides to protect tree pulp/wood production.

References

- Batzer, H.O., and R.C. Morris. 1981. Forest Insect and Disease Leaflet #9, [Forest and Tree Health Publications](#).
- Ciesla, W.M., and I.R. Ragenovich. 2008. Western Tent Caterpillar. Forest Insect and Disease Leaflet 119. U.S. Department of Agriculture, Forest Service.
- Cooke, B.J., and F. Lorenzetti. 2006. The Dynamics of Forest Tent Caterpillar Outbreaks in Quebec, Canada. *Forest Ecology and Management* 226: 110–121.
- Evenden, M.L., B.A. Mori, K.D. Sjostrom, and J. Roland. 2015. Forest Tent Caterpillar, *Malacosoma disstria* (Lepidoptera: Lasiocampidae), Mate-Finding Behavior is Greatest at Intermediate Population Densities: Implications for Interpretation of Moth Capture in Pheromone-Baited Traps. *Frontiers in Ecology and Evolution* 3(78): 1–11.
- Furniss, R.L., and V.M. Carolin. 1977. Western Forest Insects. U.S. Department of Agriculture, Forest Service, Miscellaneous Publication 1339.
- Meeker, J.R. 2013. Forest Tent Caterpillar. University of Florida, Featured Creatures, EENY-184, [DPI Entomology Circular #385](#).
- Myers, J.H. 1993. Population Outbreaks in Forest Lepidoptera. *American Scientist* 81: 240–251.
- Ralph, M. 2012. The Feeding Preferences, Behaviors and Performances of the Forest Tent Caterpillar *Malacosoma disstria* Huber (Lepidoptera: Lasiocampidae) when Introduced to Sixteen Hybrid Poplars, *Populus* spp. MSc. Thesis, University of Quebec-Montreal.
- Robison, D.J., and K.F. Raffa. 1994. Characteristic of Hybrid Poplar Clones for Resistance to the Forest Tent Caterpillar. *Forest Science* 40: 686–714.
- Robison, D.J., and K.F. Raffa. 1997. Effects of Constitutive and Inducible Traits of Hybrid Poplars on Forest Tent Caterpillar Feeding and Population Ecology. *Forest Science* 43: 252–267.
- Schmidt, B.C., J. Roland, and D. Wakarchuk. 2003. Evaluation of Synthetic Pheromones for Monitoring Forest Tent Caterpillar (Lepidoptera: Lasiocampidae) Populations. *Environmental Entomology* 32: 214–219.
- Wang, J., and C.P. Constabel. 2004. Polyphenol Oxidase Overexpression in Transgenic *Populus* Enhances Resistance to Herbivory by Forest Tent Caterpillar (*Malacosoma disstria*). *Planta* 220: 87–96.
- Witter, J.A., and H.M. Kulman. 1972. A Review of the Parasites and Predators of Tent Caterpillars (*Malacosoma* spp.) in North America. University of Minnesota Agricultural Experiment Station Technical Bulletin 289: 48.
- Witter, J.A., W.J. Mattson, Jr., and H.M. Kulman. 1975. Numerical Analysis of a Forest Tent Caterpillar (Lepidoptera: Lasiocampidae) Outbreak in Northern Minnesota. *Canadian Entomologist* 107: 837–854.

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Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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