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Status of Gypsy Moth Populations at
Morristown National Historical Park

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ABSTRACT

Gypsy moth populations are sufficient to cause moderate defoliation at Fort Nonsense and heavy defoliation at Jockey Hollow. One aerial application of diflubenzuron or two aerial applications of Bacillus thuringiensis (B.t.) is recommended in these areas. No defoliation is anticipated at Washington Headquarters.

INTRODUCTION

On December 12, 1989, USDA Forest Service personnel conducted gypsy moth egg mass surveys at Morristown National Historical Park. The purpose of these surveys was to determine population densities and to assess the need for treatment in 1990.

METHODS

Gypsy moth survey plots were selected on the basis of availability of host species (oaks), areas of concern to resource managers, size of the area of concern, and availability of time. All surveys were done using the 5-minute walk method. This method consists of 2 persons casually walking along the same transect for a period of five minutes. During that time, all new egg masses observed by each person are counted. The counts are then averaged and the number of egg masses per acre (EM/A) is determined by applying the formula:

$$Y = 20.56X + 14.58^{1/}$$

where:

Y = egg masses per acre

X = average of egg mass counts

^{1/} Eggen, D.A., and Abrahamson, 1983. Estimating gypsy moth egg mass densities. State Univ. of NY, Coll. of Env. Sci. and Forestry, School of Forestry. Misc. Pub. No. 1 (ESF 80-002). 30p.

RESULTS

A total of 15 five-minute walks were conducted at Morristown National Historical Park (Figure 1). Park-wide egg mass densities ranged from 0-4887 and averaged 1287 EM/A (Table 1). Egg mass densities at Washington Headquarters, Fort Nonsense, and Jockey Hollow averaged 0, 343, and 1459 EM/A respectively.

DISCUSSION

Gypsy moth population levels are regulated by many physical and biological factors. These factors include the availability and suitability of food, site conditions, the incidence of natural control factors such as predators and parasites, inter- and intra-specific competition, weather effects, as well as many other factors that cannot be predicted at this time.

Criteria used to predict the degree of defoliation include evaluation of the defoliation history of the area in question, the number of egg masses/acre, size and condition of the egg masses, available preferred food, terrain characteristics, and risk of larval blow-in following egg hatch. Potential defoliation is categorized: light (1-30 percent); moderate (31-60 percent); and heavy/severe (61-100 percent).

The survey results indicate that gypsy moth populations are sufficient to cause moderate defoliation at Fort Nonsense and heavy defoliation at Jockey Hollow. No defoliation is anticipated at Washington Headquarters.

Three management options have been examined for managing gypsy moth populations at these sites. These options are offered based upon the following objectives: 1) protecting host tree foliage; 2) preventing tree mortality; and 3) reducing gypsy moth populations. Each is discussed below.

No Action Option

It is possible that gypsy moth populations could collapse of their own accord due to the presence of NPV (nucleopolyhedrosis virus). However, it is not possible to accurately assess the likelihood of such an event with the information on hand. In areas with defoliating level gypsy moth populations (greater than 250 egg masses per acre) viral epizootics generally manifest themselves after significant tree defoliation has already occurred. In areas where defoliation occurs, but where the trees do not need to refoliate, there probably is not any significant impact on the trees. At worst, there may be a reduction in the rate of growth during that season. However, in areas that are heavily defoliated, and where the trees must expend energy reserves to refoliate, significant impacts such as branch dieback and tree mortality may occur depending upon tree condition at the time of defoliation.

Trees at greatest risk are those that are presently stressed from other factors or events, such as: 1) past defoliation; 2) soil compaction from sidewalks, parking lots, machinery and/or heavy foot travel; 3) over maturity; 4) drought;

5) shock due to recent timber cutting; and 6) other insect or disease related problems.

Adopting the "no action" management option when gypsy moth populations are high (>250 egg masses/acre) means that the resource manager is willing to accept the resultant impacts in the event that natural population reductions do not occur.

Chemical Insecticide Option

The second option is to use a chemical insecticide to control gypsy moth populations. Diflubenzuron (DFB), sold under the tradename Dimilin®, is the most widely used chemical insecticide in State/Federal cooperative gypsy moth suppression projects in the Northeast. DFB is an insect growth regulator that disrupts the normal molting processes of immature larvae. The mode of action is to inhibit the formation of chitin, a necessary component of the cuticle, which causes the affected larvae to die during the molt following treatment. The method of uptake is primarily by ingestion, however, recent research has indicated the possibility of absorption through the cuticle as well. DFB is registered by the EPA for use in residential areas. It is toxic to aquatic invertebrates, and should not be directly applied to water or wetlands. DFB is available as a 25 percent wettable powder formulation, and the recommended application rate is 1-4 ounces per acre applied in one treatment. With proper application, foliage protection and population reduction of about 90 percent can be expected.

Microbial Insecticide Option

The third option is to apply a microbial insecticide. The only such insecticide currently available is the bacterium, Bacillus thuringiensis variety kurstaki (B.t.). This insecticide is produced by a number of manufacturers and has been used extensively in suppression projects throughout the Northeast both in forested and residential areas. B.t. acts specifically against lepidopterous larvae as a stomach poison and must be ingested. The major mode of action is by mid-gut paralysis which occurs soon after feeding. The result is a cessation in feeding and death by starvation. B.t. formulations are available as flowable concentrates, wettable powders, and emulsifiable suspensions. The normal application rates range from 12-20 Billion International Units (BIUs) per acre in each of 1-3 treatments. With proper application, foliage protection and population reductions of about 70 percent can be expected for each application.

Alternatives

With the previously described management options in mind, the following four intervention alternatives have been developed for your consideration.

Alternative 1 - No treatment (action). Implement this alternative if gypsy moth caused defoliation would not have any impact on the management objectives at this site or if gypsy moth populations are not high enough to cause significant defoliation.

Alternative 2 - Apply a single aerial application of DFB at the rate of 2 ounces (formulated material) in 1.0 gallon of water per acre. Foliage protection and a population reduction of at least 90 percent can be expected. Since the material is toxic to aquatic invertebrates, care should be exercised not to apply the insecticide directly to water or wetlands.

Alternative 3 - Apply a single aerial application of B.t. at the rate of 12-20 BIUs per acre in 0.75 to 1.0 gallon of water per acre. A spreader/sticker should be added to the mix at the rate of 2 percent by volume. Expect foliage protection and a partial reduction in population levels.

Alternative 4 - Apply two aerial applications of B.t. at the same rate as discussed in Alternative 3. The second application should be made 7-10 days following the first. Foliage protection and a population reduction of at least 70 percent can be expected.

RECOMMENDATIONS

Based on our survey, gypsy moth populations are expected to cause moderate defoliation at Fort Nonsense and heavy defoliation at Jockey Hollow. The most appropriate alternative to implement is:

Alternative 2 or Alternative 4

At Washington Headquarters, where no defoliation is expected, the most appropriate alternative to implement is:

Alternative 1 (No Action)

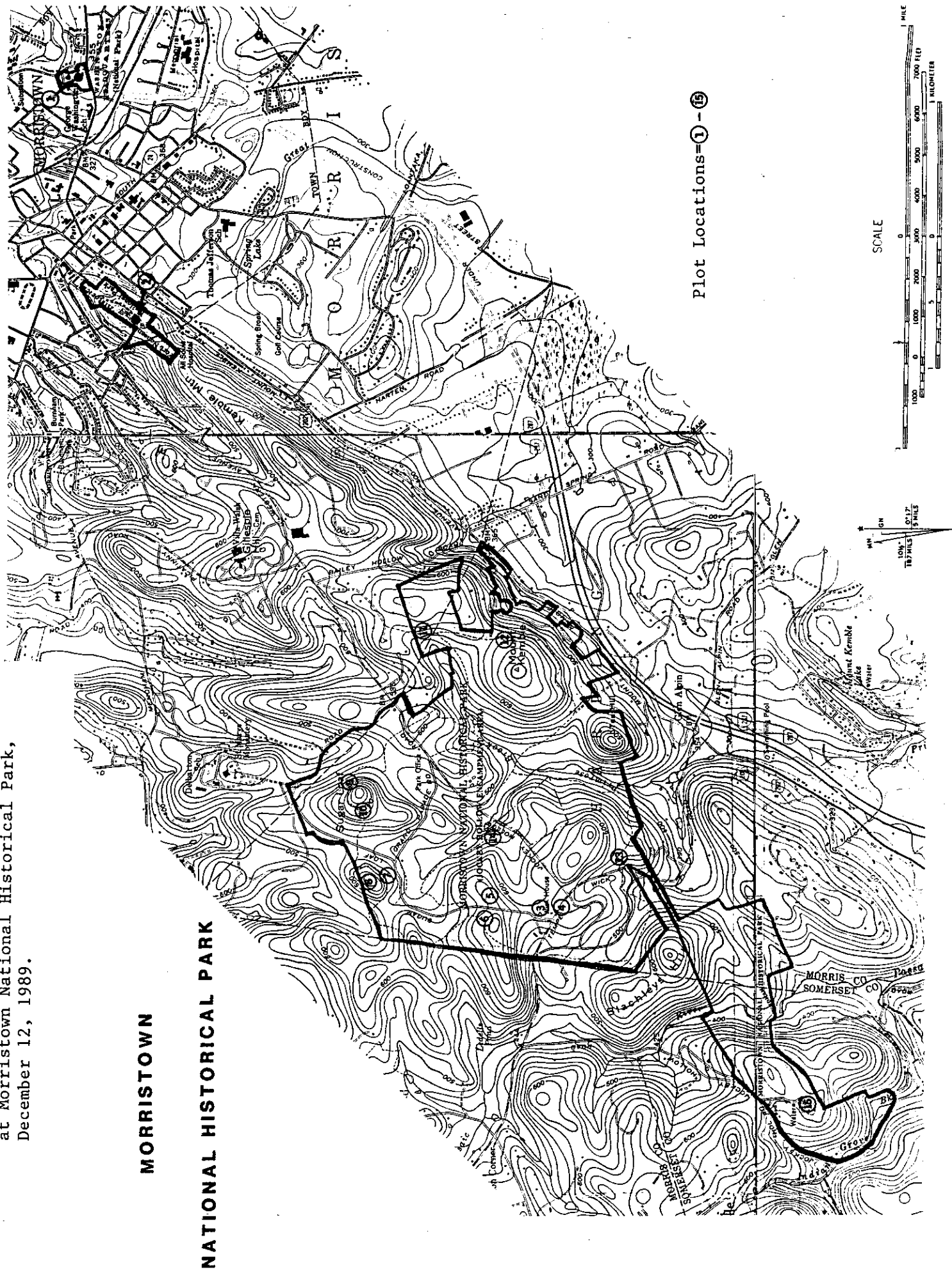
Table 1. -- Egg mass counts (per acre) by survey point location
at Morristown National Historical Park.

Plot Number	General Location	Egg Masses/Acre
1	Washington Headquarters	0
2	Fort Nonsense	343
3	Jockey Hollow (Apple Orchard)	364
4	" " (Wick House)	261
5	" " (Sugar Loaf Road)	3798
6	" " (Sugar Loaf Road)	3777
7	" " (Sugar Loaf Road)	0
8	" " (Sugar Loaf Road)	2420
9	" " (Sugar Loaf)	179
10	" " (Sugar Loaf)	241
11	" " (Foot Path)	4887
12	" " (Mount Kemble)	1186
13	" " (Tempe Wick Road)	1043
14	" " (Jockey Hollow Road)	56
15	" " (Cross Estate)	755

Average = 1287 egg masses per acre

Range = 0-4887 egg masses per acre

Figure 1.--Gypsy Moth Egg Mass Survey Plot Locations
at Morristown National Historical Park,
December 12, 1989.



Plot Locations=①-⑮

SCALE

