

A NEW ERADICATION STRATEGY FOR SMALL, REMOTE GYPSY MOTH INFESTATIONS

by Paul Appelt

Abstract. A small, recently introduced gypsy moth infestation was eradicated in Downers Grove, Illinois in a cooperative multi-participant program. Treatment methods used included aerial spraying with *Bacillus thuringiensis* and mass trapping with pheromone baited traps tended by volunteers.

Gypsy moth caterpillars (*Lymantria dispar*) are leaf-feeding insects that defoliate many species of trees and shrubs. Where this non-native pest has become established in the United States, it has caused millions of dollars in damage to trees. Additionally, gypsy moth is considered a serious nuisance to urban and suburban dwellers.

Although heavy infestations of gypsy moths are centered in northeastern states, gypsy moths have been brought to several other areas of the country through inadvertent assistance of people. When household items such as outdoor furniture, bird feeders, etc. are moved after egg masses have been laid upon them gypsy moths may become established in the new location. Household moves have been a common means of transportation for the gypsy moth to Illinois.

In July, 1981, a gypsy moth infestation in Downers Grove, Illinois was found and confirmed through a delimiting trapping program carried out by the United States Department of Agriculture (USDA) in cooperation with the Illinois Department of Agriculture (IDA). This delimiting program was initiated following the 1980 discovery of five moths in a gypsy moth detection trap. In 1981, seventy-three (73) male moths were trapped in twenty (20) traps. No egg masses were located even after multiple surveys.

Various approaches were considered to deal with this infestation while it was very small and still manageable. Initial proposals included aerial spraying with the insecticide carbaryl, which had been used successfully in similar eradication programs in other locations. Ultimately, the implemented program involved agencies at four levels of government, resident volunteers, and the use of pheromone baited traps together with aerial spraying of a bacterial insecticide.

Program Description

The objective of this program was to eradicate the small existing gypsy moth infestation over a two-year period through methods generally perceived by the community to be environmentally safe, and also to reduce the likelihood that additional gypsy moth infestations would become established.

Three methods were implemented to accomplish this objective:

- I. *Bacillus thuringiensis* (B.t.) was aurally sprayed by helicopter over the treatment area in 1982 and 1983. Two applications were made each year approximately one week apart. The timing of the insecticidal spraying was tied to egg hatch in order for the pesticide to be present on the leaves as the first larval hatch began to feed. Egg hatch for the infestation was estimated through the use of degree-day records, observation of oak leaf development, and monitoring of egg masses from another Illinois infestation.
- II. A treatment technique termed "Trap Eradication" or "Mass Trapping" was employed in order to further reduce the gypsy moth population by catching male moths in pheromone baited traps prior to mating, and to delimit or pinpoint the location of any residual infestation. Numbered traps were attached to trees throughout the treatment area at a density of three traps per acre. Trap locations were pre-established in a grid pattern on aerial photographs of the area.
- III. Two techniques were employed to locate new infestations. New residents to the Village were contacted on a monthly basis to determine if they had moved from an area of the country generally infested with gypsy moths. If a new resident had moved from a generally infested area, arrangements were made to inspect outdoor articles in search of gypsy moth egg masses. Additionally, the USDA conducted a detection trapping program

throughout those areas of the Village not included in the experimental treatment area.

A summary of the specific program components is contained in Table #1.

Principal participants in the program and their respective roles were as follows:

1. The USDA Animal & Plant Health Inspection Service, Plant Protection and Quarantine provided all traps and lures used in the program. In 1983, they supplied the pesticide, sticker and miscellaneous equipment utilized in the spraying operation in addition to supervising the spraying operation, trapping 41 acres within the treatment area, and providing general technical support.
2. The Village of Downers Grove provided assistance in the administration and coordination of the aerial spraying, provided ground personnel during the spraying, prepared the aerial spraying specifications, contracted with the aerial applicator, provided necessary public notification and technical support, coordinated the volunteer trap tenders, and handled the public relations aspects of the

program. The Village also purchased the pesticide in 1982.

3. The volunteer trap tenders assembled, set, monitored, and retrieved traps between June and the end of August within the mass trapping areas for the three years that mass trappings took place.
4. The Illinois Department of Agriculture provided ground personnel on the days of the spraying, provided technical support, and conducted the necessary public hearings prior to the spraying. In 1982, they were also responsible for supervision of the aerial spraying.
5. The DuPage County Forest Preserve District funded a prorated portion of the aerial applications costs in 1982.

Many other individuals and organizations had direct or peripheral involvement in the program including: Clarke Outdoor Spraying, Inc., Downers Grove Police Department, Federal Aviation Administration, and local newspapers.

TABLE 1. Gypsy moth eradication program summary

	1982	1983	1984
No. of acres aerially sprayed with B.t.	800	50	0
No. of aerial B.t. applications	2	2	0
Potency of B.t. formulation applied	8 B.I.U./ acre	17.5 B.I.U./ acre	NA
Trade name of B.t. formulation used	Dipel 4L	Bactospein	NA
Sticker mixed with B.t.	Plyac	Plyac	NA
Agency which was responsible for the supervision of the aerial spraying	Illinois Dept. of Agriculture	USDA APHIS	NA
Spraying dates	May 20-21, May 26	May, 26 June 1	NA
No. acres trapped on grid system at a density of 3 traps per acre	800	313	50
No. of volunteer trap tenders	116	50	7
No. of letters sent to new water billing customers	1,428	972	1,542
No. of inspections made	23	9	10
No. of gypsy moth introductions discovered through inspections	0	0	0
Detection/Delimiting trapping rates	32 traps/ sq. mile	32 traps/ sq. mile for 4 sq. miles 9 traps/ sq. mile for remaining area of Village	36 traps/ sq. mile for 1 sq. mile 9 traps sq. mile for 9 sq. miles

Results

Table #2 contains the 1982 through 1984 trapping results from within the treatment area. In addition to the moths caught in 1982, a single empty pupal case was discovered within the core area during an egg mass survey in November, 1982. No egg masses, however, were discovered through egg mass surveys conducted in 1981 and 1982. Only one male gypsy moth was trapped within the treatment area in 1983. This one moth was trapped along the edge of the infestation core as defined by the 1982 moth catches (See map). No moths were trapped within this infestation core area in 1984.

Table #3 contains a comparison of the 1981 through 1984 gypsy moth trapping results for the entire Village. This included catches both within and outside the treatment areas.

Detection trapping, both in 1983 and 1984,

TABLE 2. Village of Downers Grove gypsy moth education program. Mass trapping data for 1982-1984

	1982	1983	1984
No. of traps set at 3 traps per acre	2000	905	125
No. of traps returned	1911	895	124
No. of traps vandalized, missing or destroyed	89	10	1
No. of traps with positive moth catches	18	1	0
No. of traps with multiple catches	3	0	0
No. of gypsy moths caught within treatment area	25	1	0

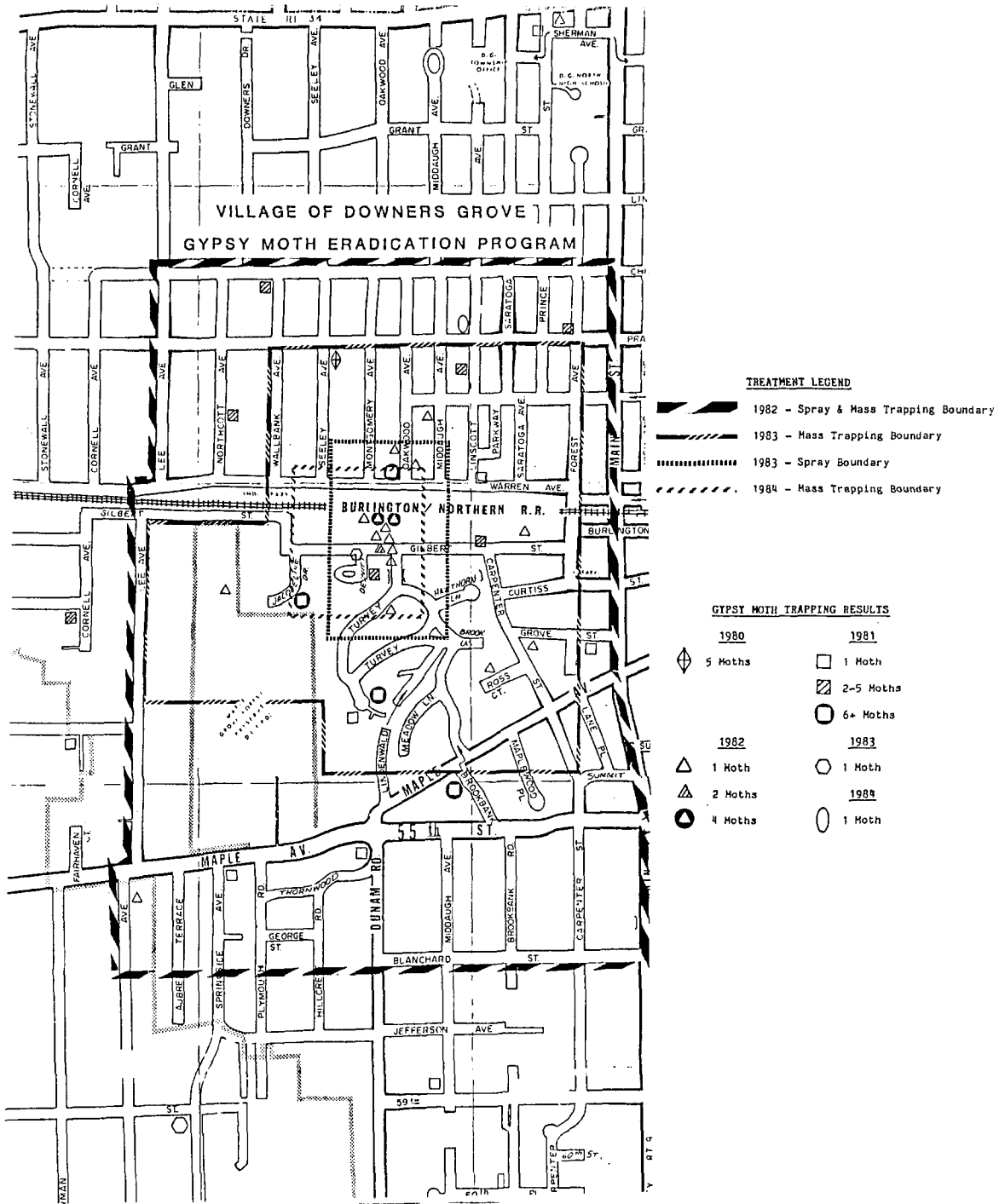
outside of the treatment area, by the USDA resulted in only a single moth catch in locations southwest and north, respectively, of the treatment area. A single catch in a remote area is not considered a consistently reliable indicator of whether or not an infestation is developing in that area. Areas surrounding single catches are, therefore, only monitored through additional trapping in subsequent years. Results from the 1982 mass trapping allowed a reduction in the 1983 spray area from 800 acres to only 50 acres, substantially decreasing the cost of the program. The area mass trapped in 1983 was also reduced to 313 acres.

Efforts to contact new Downers Grove residents who may have moved to the Village from areas generally infested with gypsy moths resulted in 1,709 replies over 3 years. Although the purpose of this part of the program was to locate and destroy new egg mass introductions, none was discovered. Part of the reason no egg masses were located may be attributable to the high level of gypsy moth awareness among people from quarantined areas which prompted them to thoroughly clean household articles before they moved. Comments made by former residents of northeastern states were very much in support of any effort made to eliminate or avoid a gypsy moth problem in Downers Grove. Although the response rate was only about 43%, it is assumed that the response is close to 100% from new residents who have experienced the problems associated with gypsy moths.

TABLE 3. Village of Downers Grove gypsy moth trapping results. All trapping programs for 1981, 1982, 1983, and 1984.

	1981	1982	1983	1984
No. of moths caught	73	28	2	1
No. of traps with positive catches	20	21	2	1
No. of traps with multiple catches	11	3	0	0
Trapping density per square mile within treatment area	32	1920	1920	1920
Trapping density per square mile outside treatment area	1	32	32/9*	32/9*

*32 traps/sq. mile throughout 4 sq. miles and 9 traps/sq. mile throughout the remaining area



Discussion

The likelihood was high that the Downers Grove gypsy moth infestation had been eradicated after the 1983 treatment. However, because one (1) gypsy moth was trapped within the treatment area, a 50 acre treatment block around this catch was mass trapped in 1984. It was possible, although not likely, that both a male and a female gypsy moth survived the cold wet spring and B.t. spraying, and that the two moths mated prior to the male being caught in the trap. However, the tendency for there to be twice as many male gypsy moths as females and for adult males to be flying and susceptible to trapping prior to the emergence of females, supports the contention that the gypsy moth infestation had been eliminated. The 1984 trap results confirmed that eradication of the infestation had been achieved.

A number of factors were probably responsible for these successful results as measured by male moth catches. The principal factors were the record cold temperatures (-26°F) of the 1981-82 winter, the unusually cold and wet spring in 1983, the B.t. spraying in 1982 and 1983, and the trapping of male moths prior to mating. The B.t. formulation change, which became available for use in this program in 1983 was a major improvement, increasing the potency in application from 8 billion International Units (BIU) per acre to 17.5 BIU per acre.

The Village of Downers Grove spent nearly \$15,000 on aerial spraying and supplies. Had no action been taken, it is probable that the gypsy moth population would have grown exponentially and demanded periodic control efforts by the Village and private homeowners. The cost of two aerial applications of B.t. over the entire 12 square mile Village is estimated to be in excess of \$135,000. The potential need for this type of large scale control program has been eliminated or at least postponed for the foreseeable future as a result of the successful eradication effort.

Conclusion

Tentative plans call for continued monitoring of the area in the coming years through systematic

trapping, although there are no plans for further mass trapping. Detection trapping is expected to continue throughout the Village and single catches shall be delimited as part of the USDA gypsy moth survey program.

The threat of new gypsy moth introductions to Downers Grove appears to be diminishing as a result of declining gypsy moth populations in the northern United States. However, continued trapping and contact with new residents from high risk gypsy moth areas are viewed as critical to avoidance of future gypsy moth infestations, especially as gypsy moth populations begin to build again toward the next cyclical peak.

The information which was gained through the high density trapping was, in large measure, the result of the conscientious efforts of a dedicated group of volunteer residents who assembled, set, and retrieved the traps. The effectiveness of volunteers in a program of this sort is often underestimated. The minor loss of control associated with volunteer labor was more than offset by the high level of neighborhood support and general enthusiasm which volunteers lend to the project. Generation of community support for this program was especially important since the effects of a gypsy moth infestation was beyond the experience of most residents. The entire program was geared toward avoidance of a potential crisis rather than management of an existing, observable crisis. The hundreds of property owners who cooperated with the neighborhood trap tenders were also particularly helpful in watching over the traps which they allowed to be placed on their properties. The progressive regional leadership role of the USDA in this cooperative program was critical to the success experienced. Consistent implementation of the Plant Protection and Quarantine Gypsy Moth Regulatory Program throughout Illinois and neighboring states enable the Village to respond cooperatively with the USDA in a timely fashion to avert a serious environmental problem for the community. The real success story behind this program is the effective and constructive cooperation which occurred between the various governmental agencies and a group of environmentally concerned citizens.