Aquatic Consulting Services

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December 24, 2020

Mr. Fred Lewis, Supervisor
P.O. Box 247
415 E. Main St.
Hale, MI 48739
(989) 728-2811

Dear Mr. Lewis:

We have completed the gypsy moth surveys, maps, and report for the 2021 season in Plainfield Township, Iosco County. I have included JPG and PDF map files of the results for you to review and to post on the city website as needed. Both JPG and PDF files are printable for your purposes although the .PDF file will likely be more user friendly on a website. I will provide your GIS personnel with .SHP files for use in a GIS mapping system. I have also included a short report on the conditions in each recommended spray block. An 18 x 24 inch map is being sent in a separate package for display purposes.

During our survey, we were able to confirm that the areas of concern referenced by Plainfield Township officials and residents are in fact infested with gypsy moths. Several of the areas showed evidence of successive years of infestation, although new egg mass significantly outnumbered old. There are three major environmental controls that limit gypsy moth population buildups; a fungus called *E. maiamiga,* a gypsy moth virus called NPV, and a class of egg parasitoid wasps. For some reason, these environmental controls have not been as effective as they have been in past years. Gypsy moth scientists suspect that successive years of untimely dry conditions in mid-late June have depressed the critical buildup of *E. maimaiga* in the environment. Regardless, we are dealing with a fairly high pressure and volatile gypsy moth population cycle across the state, but we are optimistic that our methods will provide some relief. Thankfully, we were able to catch the populations on the rise, and using our survey, spray, monitor protocol, I anticipate we will be able to limit further population growth and damage. I must emphasize though, when in a growth phase, gypsy moth populations can be quite resilient and several years of treatment and monitoring are often needed. Established populations in prime habitat such as in spray blocks PFT_01, PFT_07, PFT_09, PFT_12 &13, and PFT_22 can be especially hardy and often require 2-3 years of spray just to suppress population growth. The total acreage recommended for spray in spring 2021 is 3,118 acres. This total may be higher or lower than you anticipated, but I must assure you, only the areas with significant, potentially damaging population densities were recommended for spray. There are a few areas with less severe infestations that were not recommended but should definitely be monitored. A proactive approach toward monitoring can usually prevent this type of situation and is much more economical relative to several years of costly reactionary spraying. Overall, I anticipate good results for next season, but strongly encourage Plainfield Township to continue with some sort of monitoring program.

I will hold off on digitizing the spray blocks for the pilot's use until you have had a chance to review the maps. Once we get closer to spray time and you have selected an aerial applicator, I will provide the pilot with spray maps and digitized files.

Thank you for the opportunity to work for Plainfield Township again this season. Please let me know if I can help you with anything further at this time. 989-689-0223 or gypsymoth@aquaticremedies.com.

Sincerely,

Neal Swanson

Neal Swanson
Owner/Biologist

Plainfield Township, Iosco County
Report of Recommended Gypsy Moth Spray Areas 2021

Aquatic Consulting Services LLC
December 2020

Block #	Acres	Reason for Spray
PFT_01	108	An established population in prime habitat. Nuisance level is very high, confirmed by homeowner reports. Historical tree damage is evident throughout area. Tree mortality is likely in stressed trees in coming seasons. Spray to reduce nuisance, limit further tree damage, and suppress population growth.
PFT_02	72	An established population in very good habitat. Nuisance and tree damage thresholds have been reached. Population borders continuous forest, so the possibility of re-infestation is a concern. Spray to limit nuisance, mitigate tree damage, and contain spreading and reinfestation.
PFT_03	18	An established population in very good habitat. Nuisance level is likely not as high as some other areas due to lower resident population density. Several trees in the area are heavily infested and could experience tree mortality in coming seasons if left untreated. Area has the potential to spread to surrounding habitat. Spray to reduce nuisance, suppress further growth, and contain spreading.
PFT_04	116	A sustained population in prime habitat. Nuisance threshold has been surpassed throughout area, although the southern portion of the block shows potential for higher tree damage. Northern portion of block shows higher new/old egg mass ratio implying a more rising population trend. Spray to limit further tree damage and reduce nuisance.
PFT_05	89	A sustained population in prime habitat. Nuisance level is high throughout the area. Evidence of historical tree damage, particularly in northern portion of the block, and tree mortality is a concern in coming seasons. Spray to reduce nuisance and limit further tree damage.
PFT_06	149	A rising population in very good habitat. Nuisance level is lower in the northeastern portion of the block than in other recommended spray areas, but potential for nuisance in coming seasons is a factor. Egg mass densities in southeastern portion of block could spread into less infested areas and cause future nuisance and prolonged infestation. The remainder of the block shows high nuisance and tree damage potential. Spray to limit future tree damage, reduce nuisance, and inhibit spreading.
PFT_07	79	An established population in prime habitat. Habitat conditions are similar to Block PFT_04, but infestation appears slightly more persistent. Nuisance level is quite high, particularly in the northern portion of the block, confirmed by resident reports. Tree damage and possible mortality of stressed trees is also a concern in coming seasons. Spray to reduce nuisance, future tree damage and suppress population growth.
PFT_08	92	A rising population in good habitat. Human activity is somewhat higher than in some other treatment areas. South of block is commercial use, including some log storage, which may introduce additional disturbance into the area. Block also borders untreated Goodar Township which can increase chances of reinfestation. Spray to reduce nuisance, inhibit spreading, and suppress population.

PFT_09	409	An established population in very good habitat. The southern portion of the block along and south of Hwy 65 shows historical tree damage with nuisance also at a very high level, confirmed by resident reports. Potential for future tree damage and increased nuisance is also a concern in the northern portion of the block, but population is rising more slowly. Spray to reduce nuisance and mitigate further tree damage.
PFT_10	90	A rising population in good habitat. Nuisance level is likely not as high as in other areas, but northern portion of block does border a high nuisance block PFT_09. Primary concern is potential tree damage in heavily infested trees throughout block and nuisance in northern portion of block. Spray to reduce nuisance and future tree damage.
PFT_11	107	A sustained population in very good habitat. Lower residential population implies slightly lower nuisance, but this is still a concern. Potential for future tree damage is high, with tree potential for tree mortality in stressed trees, particularly trees close to busy South Branch Rd. Spray to suppress further population growth and limit tree damage.
PFT_12	185	An established population in prime habitat. Nuisance threshold has been reached, confirmed from resident reports and tree damage is a concern in coming seasons. Western portion of the block is less heavily infested, but nuisance is still high. Spray to reduce nuisance and mitigate future tree damage.
PFT_13	117	An established population in very good habitat. Various secondary roads off Lakeside Blvd have slightly different habitat and gypsy moth population conditions, but the overall area shows high potential for tree damage in coming seasons. Nuisance level varied from high to low according to resident reports. Spray to suppress population growth, limit tree damage, and reduce nuisance.
PFT_14	64	An established population in prime habitat. Nuisance level is high according to resident reports and tree damage is a concern in coming seasons. Spray to reduce nuisance and mitigate future tree damage.
PFT_15	143	A rising population in very good habitat. Nuisance level is high confirmed by resident complaints. Various secondary roads off Long Lake Rd have slightly different conditions, but overall nuisance is primary concern with high potential for tree damage in coming seasons. Spray to suppress future tree damage and reduce nuisance.
PFT_16	48	A sustained population in very good habitat. Nuisance level is elevated confirmed by resident reports. Spray to reduce nuisance and suppress population.
PFT_17	103	An established population in very good habitat. Tree damage is a concern with potential for tree mortality in stressed trees in coming seasons, particularly in eastern portion of block. Nuisance level is likely slightly lower in southern and western portion of block, but block borders continuous forest, so potential for prolonged infestation is a concern. Spray to limit tree damage, reduce nuisance, and inhibit potential reinfestation.
PFT_18	71	A rising population in very good habitat. Population has the potential to cause tree damage in coming seasons. Nuisance level is also elevated, confirmed by resident reports. Spray to suppress population growth, reduce nuisance, and potential tree damage.
PFT_19	20	A rising population in good habitat. The northern portion of the block includes a public park. Spray to reduce potential nuisance and tree damage in public and private areas.
PFT_20	63	A rising population in very good habitat. Tree damage is primary concern at this point. Nuisance is moderate, confirmed by resident reports. Area borders

		continuous forest and varied residential density which may cause more prolonged infestation and nuisance. Spray to reduce nuisance, future tree damage and inhibit reinfestation.
PFT_21	68	A rising population in good habitat. Nuisance is likely lower than in other blocks due to lower residential density. Several trees are heavily infested and will sustain tree damage in coming seasons. Spray to limit tree damage and potential nuisance.
PFT_22	240	A sustained population in prime habitat. Habitat quality is varied depending on area of block, but overall habitat quality will support robust infestation. Northwestern portion of block is less populated, and so may see lower nuisance, but heavy infestation will be noticeable. Nuisance is high in areas around lakes, confirmed by resident reports. Tree damage is evident in numerous trees and tree mortality is a concern in stressed trees in coming seasons. Spray to reduce nuisance, limit further tree damage, and suppress population.
PFT_23	76	An established population in good habitat. Varied residential use implies varied nuisance level. A large, historically infested cemetery borders southern portion of block and may serve as source of reinfestation. Spray to limit potential nuisance and inhibit reinfestation.
PFT_24	145	An established population in very good habitat. Nuisance level is moderate, confirmed by resident complaints. Several trees may experience elevated tree damage in coming seasons. Spray to reduce nuisance and limit future tree damage.
PFT_25	240	A rising population in very good habitat. Numerous trees are extremely heavily infested with tree mortality a high concern in stressed trees within the next 1-2 seasons. Varied residential density may contribute to more prolonged infestation. Nuisance is high, confirmed by resident reports. Spray to reduce nuisance, further tree damage, and suppress population.
PFT_26	76	A rising population in prime habitat. Area borders both Grant and Wilber Townships, so potential for reinfestation is high. Nuisance is also high, confirmed by resident reports. Spray to reduce nuisance and inhibit reinfestation,
PFT_27	130	A rising population in prime habitat. Habitat conditions are identical to PFT_26, but residential population is slightly higher. Nuisance is high, confirmed by resident complaints. Spray to reduce nuisance and potential reinfestation.

Total Acreage = **3,118 acres**

The term “nuisance” is subjective and relates to the likelihood that the feeding behavior and number of caterpillars in the area will impact a property owner’s quality of life. Some property owners may experience heavy infestation yet go unbothered. Other property owners may view 5-10 caterpillars visible on a barn door as a nuisance. Field experience during gypsy moth infestation suggests that the number of egg masses found in an area may yield a widespread nuisance situation. The term “tree damage” is more literal, but relative to environmental and historical factors as well. Any level of defoliation should be considered damaging, but otherwise healthy trees are generally much more resilient, even after consecutive years of defoliation. Other environmental stressors such as drought or disease are additive factors that will contribute to greater risk of tree degradation and/or mortality. Defoliation levels of >60% are also very stressful to trees, although most trees can survive 3+ years of >60% defoliation if few other stressors are present. Habitat quality relates to the species composition, density, distribution, understory, and topography of an area. Mixed forest type consisting primarily of oaks, neatly groomed understory, mixed age-class, and low topographic variability are the ideal conditions for persistent infestation, and so this habitat is designated as “prime” with very good, good, and marginal habitat in decreasing suitability. Trends

in populations are designated by the egg mass residues in the area. Rising populations show a high new/old egg mass ratio, with established, sustained, and remnant populations extending toward a high old/new egg mass ratio.

Spray areas are recommended based on historical data, habitat suitability, population dynamics, and field experience in gypsy moth management. Other areas within the township may also contain some level of gypsy moth infestation, but such areas are either show a significant downward trend or habitat conditions do not exhibit high likelihood of a vigorous infestation. The level of damage and/or nuisance can be difficult to predict given the interaction of unpredictable environmental factors. All recommended areas contain potentially damaging gypsy moth egg mass numbers. Accordingly, all spray areas are highly recommended for *Bacillus thuringiensis var. kurstaki* (B.t.k.) treatment in spring 2021. There is significant risk of potential tree damage and high nuisance levels if recommended areas are left untreated for another cycle.

The Michigan State University Extension is a primary environmental information resource available to the public in Michigan and offers management advice on a variety of invasive species Gypsy Moth - Integrated Pest Management (msu.edu). While we hold the survey methodology we employ as proprietary, the MSU Extension published a 1/40-acre survey protocol that designates 200-250 egg masses/acre as having potential for high defoliation and nuisance. At the high end of this range 250/40 = 6.25 egg masses in a 1/40-acre survey plot. A 1/40-acre survey plot is a circle with a radius of 18' 7" where all visible egg masses are counted. In many of the areas we observed at least 10 egg masses on a single tree with several areas showing well over 100 egg masses/tree (See attached Photos 1-3). By these standards we could recommend treatment of large continuous areas of forest, but this would not be cost effective given that some of the area is only sparsely populated and would not provide high visibility of return on expense.

Gypsy moth suppression program managers are often tasked with balancing high potential for damaging gypsy moth numbers with high community benefit. Areas where these considerations overlap are generally the areas that are treated first with available funds and areas of diminishing return are treated as funds are depleted. Our treatment recommendations take this into account, and we try to limit recommended spray areas to these top-tier areas. There is always some risk of the objection "Why did you treat them and not me?" Sometimes the situation is: the disgruntled property owner lives in an isolated plot set back on 10 forested acres. It might cost the township $1,000 to treat this individual's property while 10 one-acre parcels could be treated for the same cost. Given this trade-off, some of our broadly infested clients decide that the best use of available funds is to treat areas of high residential population density that are also generally infested with gypsy moths. We cannot offer any advice on this consideration and take no responsibility for the concluded spray acreage.

Overall, all areas initially designated as problem areas by Township officials did in-fact support robust infestations of gypsy moths. Some areas showed evidence of several successive years of infestation (particularly Chain Lakes/Jose Lake, Long Lake/Loon Lake, Bass Lake, and Hwy 65/Wickert Rd areas), which often proves much more challenging to suppress. Under these circumstances, several years of treatment are often necessary. It is not possible to completely eliminate gypsy moth populations, so this should never be the expectation. With 2-3 years of treatment and monitoring, an acceptable level of control is attainable.

Gypsy moth suppression programs in Michigan generally follow an Integrated Pest Management (IPM) strategy which is focused on low environmental impact and economic awareness. Further, an IPM strategy intends to mitigate exponential population growth with treatment only until latent environmental controls begin to limit populations sufficiently. In order to efficiently determine when treatment is no longer advisable, monitoring is imperative. Accordingly, we strongly advise Plainfield Township to maintain a monitoring program for the next 2-3 years at least.

Photo 1: Numerous egg masses on side on single Balsam fir. Block: PFT_08

Photo 2: Numerous egg masses on two aspen trees. Block: PFT_22

Photo 3: Numerous egg masses on side of single poplar tree. Block PFT_25