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DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY  
BOARD OF PESTICIDES CONTROL  
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**Memorandum**

To: Board of Pesticides Control

From: Pamela J. Bryer, PhD, Toxicologist

Subject: Pesticides allowed for treatment of browntail moth near marine waters

Date: January 6, 2020

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**Introduction**

At the April 19, 2019 meeting, the board agreed that the toxicologist should pursue updates to the list of current allowable active ingredients for treatment of browntail moth in the 50' to 250' marine shore zone.

There are several reasons to revisit the browntail moth allowable active ingredients list:

- Newer actives may appear in the marketplace and may be effective against browntail moth while also presenting a low risk profile.
- Risk assessment methodologies are constantly being refined and improved.
- Periodic reviews of the currently allowable active ingredients labeled for the management of browntail moth help to ensure implementation of appropriate protective efforts for Gulf of Maine marine organisms.

**Process**

Risk assessment is a multipart process and many of those components are herein summarized. Additional information may be obtained by contacting Pam Bryer.

This risk assessment evaluates the potential for harm to aquatic organisms living in the Gulf of Maine from the management of browntail moth infestations on coastal properties. Maine Forest Service provided BPC with information on their recommendations for selecting pesticides to be used to treatment for browntail moth. BPC then conducted a database search for pesticides matching those criteria and

collected the physical and chemical data on those pesticides. Using the labeled rates for the appropriate sites (ornamental, pome trees, etc) the expected concentration in the water was calculated. This predicted water concentration was then compared to estuarine and marine organisms' ability to tolerate those specific pesticides. Standard formulas and benchmarks for acceptable risk were used to establish a new list of potential chemicals for use in treating for browntail moth.

This document provides clarification of the risk assessment process in five sections:

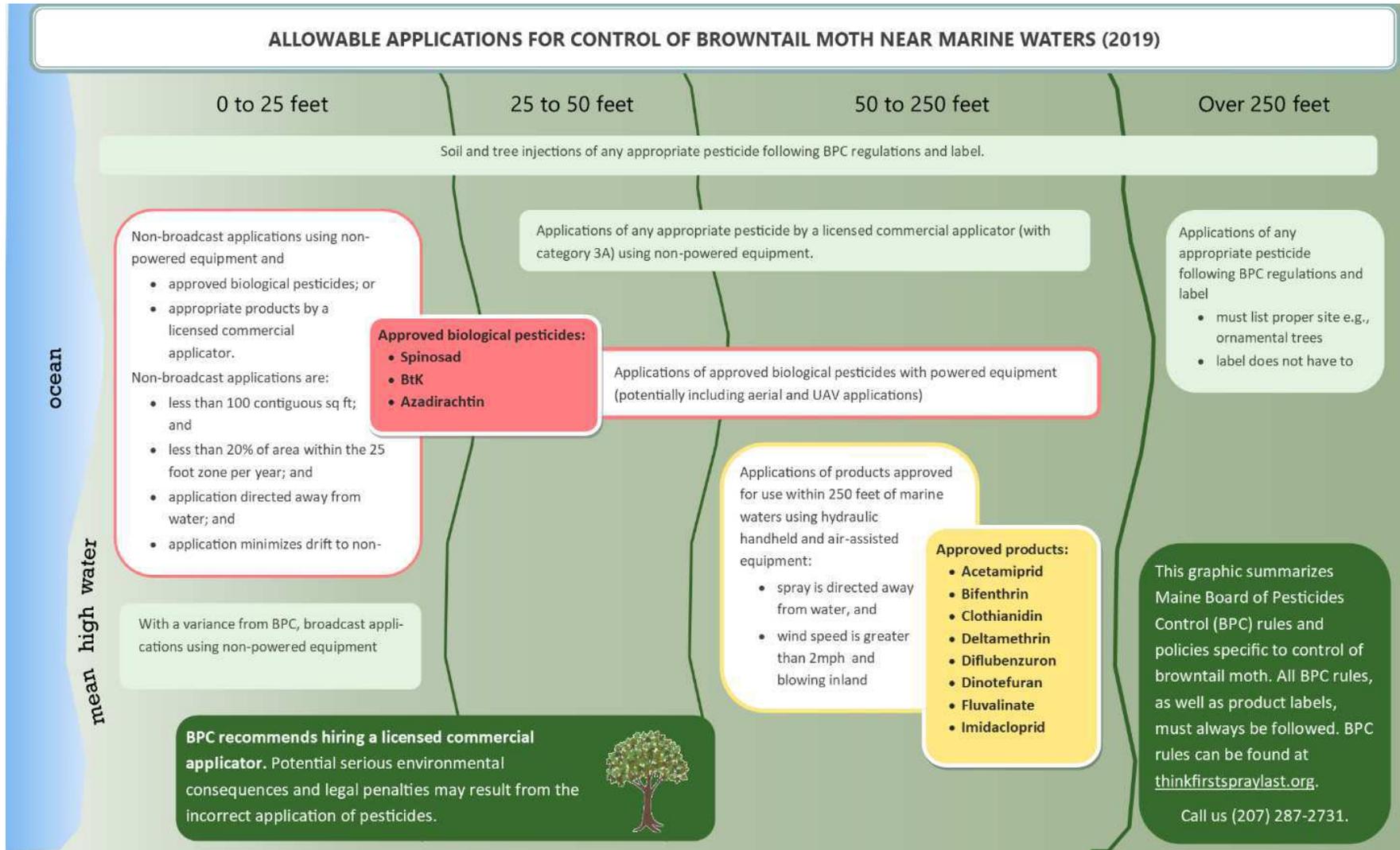
1. Describes the formation of the initial list
2. Explains how the predicted water concentration is derived and how chemical data are selected
3. Covers the Risk Quotient calculation and how the toxicity data were selected
4. Describes how the EPA Level of Concern works
5. Describes the proposed list of active ingredients and other relevant information on those actives

## Summary

- None of the previously approved active ingredients for the management of browntail moth between 50 to 250 feet from the marine highwater mark were included on the new list allowed for broadcast applications.
- Those pyrethroid insecticides assessed were deemed to have unacceptable risk, including some that were previously on the list of allowable pesticides.
- The proposed list contains six active ingredients for use with powered equipment in the area between 50 and 250 feet from the mean high-water mark. Pesticides applied by tree injection demonstrated consistently low risk profiles and represent the overall best method for avoiding off-target movement.

This ecological risk assessment only covers the potential effects on aquatic organisms (fish and invertebrates) that live in the estuarine/marine environment. Biological pesticides were not evaluated with this risk assessment.

Previous browntail moth guidance with list of approved products in the 50' to 250' zone.



## Section 1 Initial List Development

The BPC does not make pesticide recommendations and relied on the Maine Forest Service to provide guidance on selecting active ingredients to consider for this risk assessment. There is little data available on efficacy and use of pesticides for the treatment of browntail moth. Relatively few pesticide labels indicate use on browntail moths.

The Maine pesticide registration database (NPIRS) was queried for all currently registered pesticides stating “gypsy moth” on their label. The list was further refined by restricting database returns by the year 2019, and the following sites: ornamental, fruit trees, forestry, cherry, and oak. Maine Forest Service suggested gypsy moth as a starting point for identifying potential pesticides to be used for browntail moth control because gypsy moths share several life history traits with browntail moths making them a good surrogate species. Maine Forest Service previously objected to the use of imidacloprid for browntail moth control (imidacloprid is not expected to be effective) so that chemical was eliminated from the potential list.

On October 10, 2019 Maine Forest Service and BPC participated in a Browntail Moth Roundtable Meeting. A goal of the roundtable was to provide an opportunity for status updates, as well as, to receive feedback and suggestions from applicators on the proposed list of allowed pesticides. Additionally,

applicators were surveyed by Maine Forest Service prior to the meeting to determine the most commonly used pesticides and which pesticides are considered effective.

The pesticide products database results were reduced to a list of active ingredients associated with products claiming efficacy against gypsy moths. After removing imidacloprid, as per Maine Forest Service, the list was reviewed and additional changes made. The following items were considered in shaping this initial list:

- Pesticides that are not insecticides were removed from the list.
- Pesticides that are not primarily used on ornamentals or on agricultural commodities were removed from the list. These were products that listed gypsy moth on the label but were not labeled for typical browntail moth applications, like agricultural fumigants.
  - For example, the methyl bromide label containing a gypsy moth usage listed farm equipment as the site for application.
- Pesticides that did not include the proper sites were removed from the list. Several pesticides, although labeled for gypsy moths did not include any of the following sites: outdoor ornamental; oaks; pome, stone, nut trees or cherries. This removal was practical because there was no way to calculate an Expected Environmental Concentration (EEC) without a label rate as the basis.

### **Label Review**

For each remaining active ingredient, the label was reviewed to find the site-specific application rate and/or the site-specific maximum application rate.

This risk assessment is based on the scenario of a residential yard treatment with infested oaks. The assumption was for treatment to take place during a narrow window in early spring. When the label omitted ornamentals but included pome/stone/nut tree rates those rates were used.

When the label contained a maximum annual usage rate statement that rate was modeled. Frequently, that corresponded to the scenario of a single application. Additional usage rates were modeled when the maximum annual rate included many more applications than could be expected for a browntail moth treatment in spring. When there was no annual maximum usage statement and there were no restrictions on repeated applications one treatment a week for a month was modeled unless the label required a longer span between treatments.

The goal with selecting these rates was to push the modeled concentration to the maximum legal amount possible within the given scenario. The maximum legal amount possible exceeds the browntail moth treatment application rate most of the time.

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**Initial List of Considered Active Ingredients for  
Treatment of Browntail Moth Near Marine Waters (EPA  
Chem Code)**

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Abamectin (122804)
Acephate (103301)
Acetamiprid (99050)
Bifenthrin (128825)
Carbaryl (56801)
Chlorantraniliprole (90100)
Chlorpyrifos (59101)
Clothianidin (44309)
Cyantraniliprole (90098)
Cyfluthrin (128831)
Cyfluthrin-beta (118831)
Cyhalothrin-lambda (128897)
Cypermethrin (109702)
Cypermethrin-zeta (129064)
Deltamethrin (97805)
Diflubenzuron (108201)
Dinotefuran (44312)
Emamectin benzoate (122806)
Esfenvalerate (109303)
Fenpropathrin (127901)
Fluvalinate (109302)
Indoxacarb (67710)
Malathion (57701)
Methoxyfenozide (121027)
Naled (34401)
Novaluron (124002)
Oxydemeton-methyl (58702)
Permethrin (109701)
Phosmet (59201)
Piperonyl butoxide (67501)
Pyrethrins (69001)
Spinetoram (110008)
Tebufenozide (129026)

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## Section 2 EEC Calculation

### Expected Environmental Concentration (EEC)

The primary driver of a risk assessment is the modeled concentration predicted to occur in the environment. How much of a hazardous compound that is found off-target, in the environment, underlies the potential for harm. In ecological risk assessments, the amount of active ingredient predicted/modeled to occur in the environment is called the Expected Environmental Concentration or EEC.

EEC was calculated via the EPA's Pesticide in Water Calculator version 1.52. This newer model from EPA combines two different models (PRZM5 & VVWM) into one and improves the graphical user interface. The Pesticide in Water Calculator replaces the Surface Water Concentration Calculator.

The Pesticide in Water Calculator bases EEC on 1) pesticide specific chemical parameters; 2) a weather file representing local weather; 3) a standard commodity scenario; and 4) adjustable application variables including timing, frequency, boom height, application type, etc.

For this ecological risk assessment, the Pesticide in Water Calculator was set to run the "Standard EPA Pond" scenario. In this scenario, 100% of a 10-hectare plot is treated and all of the potential drift and runoff are directed to a 1-hectare pond. The model uses the local weather data with the pesticide application and chemical data to run 30 years of variable Expected Environmental Concentrations. The maximum or peak concentration produced by the model becomes the basis of the acute exposure Risk Quotient calculation. The model also calculates a 21-day average and a 60-day average, these averages become the basis for the

chronic exposure Risk Quotient calculations for invertebrates and fish respectively.

### Model Input Selection

The chemical data needed for modeling are not always available so multiple sources were used. The source for each data point entered into the Pesticide in Water Calculator model for each active ingredient was recorded and is available upon request.

Preference was given to collecting data from EPA's pesticide registration risk assessment documents. For risk assessments done recently by EPA, data reported for the Pesticide in Water Calculator models used in registration documents were used directly. However, some of the older risk assessments were not modeled the same way and those cases data were not available in the most recent EPA registration risk assessment documents.

When EPA registration documents were not available, the next sources of chemical data searched were (in this order) PubChem, EPA's CompTox, University of Hertfordshire's Pesticide Properties Database (PPDB); links to these sites are in the table below.

Database Name	URL
EPA Pesticide Chemical Search	<a href="https://iaspub.epa.gov/apex/pesticides/f?p=CHEMICALSEARCH:1:0::NO:1::">https://iaspub.epa.gov/apex/pesticides/f?p=CHEMICALSEARCH:1:0::NO:1::</a>
PubChem	<a href="https://pubchem.ncbi.nlm.nih.gov/">https://pubchem.ncbi.nlm.nih.gov/</a>
CompTox	<a href="https://comptox.epa.gov/dashboard">https://comptox.epa.gov/dashboard</a>
PPDB	<a href="https://sitem.herts.ac.uk/aeru/ppdb/en/atoz.htm">https://sitem.herts.ac.uk/aeru/ppdb/en/atoz.htm</a>

## **Resolving Input Data Conflicts When Necessary**

In an attempt to make this risk assessment as protective as possible, every chance for a conservative interpretation was taken. With chemical data this translates into resolving conflicting inputs with whichever value would allow the chemical to escape into and last the longest in the environment. For example, soil half-life is variable by nature, if a chemical's half-life data were reported as 10-14 days, 14 days would be the value chosen for use in the Pesticide in Water Calculator.

This practice of using the most conservative values is valuable in ecological risk assessments because of differences in how uncertainty is accounted for. In human health risk assessments, the risk equation is influenced by degrees of uncertainty that reflect the acknowledgement that there are missing or incomplete data (for example, studies that are done on rats will not always predict what will happen in people). Uncertainty and modifying factors are not used in ecological risk assessments, however, by selecting the most protective or conservative values possible the ecological risk assessment process attempts to ensure maximum protection.

## Section 3 RQ Calculation & Toxicity Data

### Risk Quotient (RQ)

$$\text{Acute RQ} = \text{EEC} / \text{LD}_{50}$$

$$\text{Chronic RQ} = \text{EEC} / \text{NOAEL}$$

The risk assessment equation compares the Expected Environmental Concentration to the lowest concentration that causes an effect in toxicity studies. The Risk Quotient, or RQ, is the variable produced and used for ecological risk characterizations. For acute studies, the toxicity study is an 'LD<sub>50</sub>' study where the lethal dose to kill half of the study group is determined. For chronic studies, the toxicity study is typically a 'NOAEL' study where the highest administered concentration that causes no effect is found; NOAEL stands for No Observed Adverse Effect Level.

### Toxicity Input Study Source

Where possible the toxicity data used for RQ calculations were taken from the pesticide registration documents published by the Office of Pesticide Programs at EPA. However, ideal data does not always exist and alternative data sources were required. The source of each toxicity value used was documented and those data are available upon request.

The focus of the browntail moth regulations is the protection of coastal habitats to conserve lobsters and other important marine organisms. No lobster-specific data were used in this study because there are very few published studies on lobster ecotoxicology. Toxicity data from marine and estuarine species were used, with a few exceptions when no marine or estuarine data could be located and freshwater toxicity studies were substituted. The table in Section 2 contains URLs to the data sources used for finding toxicity data.

### **Lowest Toxicity Value Selected**

For the Risk Quotient (RQ) calculations, the lowest toxicity values were selected. The lowest value represents the highest concentration in a toxicity study where the organisms showed no effects to the pesticide, this ensures the most sensitive study organisms will be included. Unlike the simplistic acute studies and their LD<sub>50</sub>s, NOAEL studies cover a broad range of toxic effects. Effects studied include growth, development, reproductive or fecundity effects, birth defects and morphology, endocrine disruption, nervous system effects, immune system factors and a suite of assays to understand the potential for cancer.

The lowest toxicity values were selected for the RQ calculation and were taken from either a fish or an invertebrate species. Although invertebrates and fish are quite different, by selecting one of two the most sensitive responses to the active ingredients under consideration the RQ calculation is made as conservative and protective as possible for the habitat as a whole. The chronic RQ calculation differs between invertebrates (21-d NOAEL study) and fish (60-d NOAEL study) to reflect the different lifespans of these organisms; and was taken into account for these calculations.

## Calculated Acute & Chronic Risk Quotient (RQ) Values

Compound	Peak EEC (ppb)	21-day EEC (ppb)	60-day EEC (ppb)	Acute Aquatic LD50 (ppb)	Chronic Aquatic NOAEC (ppb)	Acute RQ	Chronic RQ
Abamectin	0	0	0	0.02	0.0029	<b>0</b>	<b>0</b>
Acephate Foliar	18.7	10.5	4.76	7300	580	<b>0.003</b>	<b>0.018</b>
Acephate Injection	0	0	0	7300	580	<b>0</b>	<b>0</b>
Acetamiprid Pome/Stone	5.14	4.64	4.08	66	2.5	<b>0.078</b>	<b>1.86</b>
Acetamiprid Nut Tree	6.17	5.56	4.89	66	2.5	<b>0.094</b>	<b>2.22</b>
Bifenthrin EPA RA	0.935	0.06.6	0.0626	0.004	0.004	<b>233.75</b>	<b>16.5</b>
Bifenthrin Ornamental Gypsy	0.374	0.0264	0.0225	0.004	0.004	<b>93.5</b>	<b>6.6</b>
Bifenthrin Ornamental Other	3.4	0.24	0.227	0.004	0.004	<b>850</b>	<b>60</b>
Carbaryl	77.4	30.3	11.8	5.7	1.5	<b>13.58</b>	<b>20.2</b>
Chlorantraniliprole	0.922	0.646	0.437	1150	695	<b>0.001</b>	<b>0.001</b>
Chlorpyrifos Apple	3.98	1.8	1.13	0.035	0.0046	<b>113.71</b>	<b>391.30</b>
Chlorpyrifos Ornamental	1.99	0.902	0.565	0.035	0.0046	<b>56.86</b>	<b>196.09</b>
Clothianidin	4.49	4.38	4.14	53	5.1	<b>0.085</b>	<b>0.859</b>
Cyantraniliprole	3.03	1.75	0.863	1200	386	<b>0.003</b>	<b>0.005</b>
Cyfluthrin	0.224	0.0161	0.0099	0.0024	0.00017	<b>93.33</b>	<b>94.71</b>
Cyfluthrin EPA RA	0.313	0.0223	0.014	0.0024	0.00017	<b>130.42</b>	<b>132.94</b>
Cyfluthrin-β	0.0028	0.0002	0.0001	0.0022	0.00007	<b>1.272</b>	<b>2.871</b>
Cyfluthrin-β a 4X Appl	0.215	0.0192	0.00993	0.0022	0.00007	<b>97.73</b>	<b>274.29</b>
Cyhalothrin-λ Pome	0.281	0.0663	0.0586	0.00491	0.0002	<b>57.23</b>	<b>313.5</b>
Cyhalothrin-λ Seed Orchard	0.704	0.157	0.147	0.00491	0.0002	<b>143.38</b>	<b>785</b>
Cyhalothrin-λ Ornamental	0.507	0.113	0.106	0.00491	0.0002	<b>103.26</b>	<b>565</b>
Cypermethrin	0.986	0.0603	0.0366	0.0054	0.000781	<b>182.59</b>	<b>77.21</b>
Cypermethrin EPA RA	0.448	0.0274	0.0166	0.0054	0.000781	<b>82.96</b>	<b>35.08</b>
Cypermethrin-zeta	0.348	0.0213	0.0129	0.04	0.01	<b>8.7</b>	<b>1.29</b>
Deltamethrin Low	0.111	0.0110	0.009	0.0037	0.024	<b>30</b>	<b>0.458</b>
Deltamethrin Mid	0.273	0.0272	0.0221	0.0037	0.024	<b>73.78</b>	<b>1.134</b>
Deltamethrin High	0.302	0.03	0.0244	0.0037	0.024	<b>81.62</b>	<b>1.25</b>
Dicrotophos	0	0	0	77	3.09	<b>0</b>	<b>0</b>
Diflubenzuron	0.126	0.0696	0.0410	0.64	0.045	<b>0.197</b>	<b>1.547</b>
Dinotefuran	0	0	0	790	6360	<b>0</b>	<b>0</b>
Emamectin benzoate	0	0	0	0.04	0.00017	<b>0</b>	<b>0</b>
Esfenvalerate	1.08	0.173	0.126	0.00466	0.012	<b>231.76</b>	<b>1017.65</b>
Fenpropathrin	2.68	0.515	0.426	0.021	16.9	<b>127.62</b>	<b>42.92</b>
Indoxacarb	0.793	0.416	0.257	54.2	25	<b>0.015</b>	<b>0.025</b>
Methoxyfenozide	5.98	5.48	5.22	1200	6.9	<b>0.005</b>	<b>0.219</b>
Naled	24.7	1.3	0.456	8.8	0.06	<b>2.807</b>	<b>0.188</b>
Novaluron	0.451	0.0535	0.0263	0.12	46	<b>3.758</b>	<b>0.892</b>
Oxydemeton-methyl	5.17	2.32	0.949	3	0.0024	<b>1.723</b>	<b>0.050</b>
Permethrin	5	0.629	0.464	0.018	0.69	<b>277.78</b>	<b>262.08</b>
Phosmet	3.79	0.0858	0.0304	2	2.1	<b>1.895</b>	<b>0.124</b>
Piperonyl butoxide	0.523	0.238	0.176	490	0.25	<b>0.001</b>	<b>0.113</b>
Pyrethrins	0.126	0.0310	0.0181	1.4	0.25	<b>0.09</b>	<b>0.124</b>
Spinetoram	0.399	0.119	0.098	2.05	38	<b>0.195</b>	<b>0.003</b>
Spinetoram Do Not Exceed	1.59	0.475	0.386	2.05	38	<b>0.776</b>	<b>0.013</b>
Tebufenozide	1.84	1.5	1.23	500	22	<b>0.004</b>	<b>0.068</b>

## Section 4 Level of Concern

### EPA's Level of Concern (LOC) Table

**Table 2.3. Agency Risk Quotient (RQ) Metrics and Levels of Concern (LOC) Per Risk Class.**

Risk Class	Risk Description	RQ	LOC
<b>Aquatic Animals (fish and invertebrates)</b>			
Acute	Potential for effects to non-listed animals from acute exposures	Peak EEC/LC <sub>50</sub> <sup>1</sup>	0.5
Acute Restricted Use	Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification	Peak EEC/LC <sub>50</sub> <sup>1</sup>	0.1
Acute Listed Species	Listed species may be potentially affected by acute exposures	Peak EEC/LC <sub>50</sub> <sup>1</sup>	0.05
Chronic	Potential for effects to non-listed and listed animals from chronic exposures	60-day EEC/NOAEC (fish)	1
		21-day EEC/NOAEC (invertebrates)	
<b>Aquatic Plants</b>			
Non-Listed	Potential for effects to non-listed plants from exposures	Peak EEC/LC <sub>50</sub> <sup>1</sup>	1
Listed	Potential for effects to listed plants from exposures	Peak EEC/NOAEC	1
<b>Terrestrial Animals (mammals and birds)<sup>2</sup></b>			
Acute	Potential for effects to non-listed animals from acute exposures	EEC/LC <sub>50</sub> (Dietary)	0.5
		EEC/LD <sub>50</sub> (Dose)	
Acute Restricted Use	Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification	EEC/LC <sub>50</sub> (Dietary)	0.2
		EEC/LD <sub>50</sub> (Dose)	
Acute Listed Species	Listed species may be potentially affected by acute exposures	EEC/LC <sub>50</sub> (Dietary)	0.1
		EEC/LD <sub>50</sub> (Dose)	
Chronic	Potential for effects to non-listed and listed animals from chronic exposures	EEC/NOAEC	1
<b>Terrestrial and Semi-Aquatic Plants</b>			
Non-Listed	Potential for effects to nontarget, non-listed plants from exposures	EEC/ EC <sub>25</sub>	1
Listed Plant	Potential for effects to nontarget, listed plants from exposures	EEC/ NOAEC	1
		EEC/ EC <sub>05</sub>	

<sup>1</sup> LC<sub>50</sub> or EC<sub>50</sub>.

<sup>2</sup> EEC based on upper bound Kenaga nomogram values for foliar exposure.

When the calculated Risk Quotient (RQ) is higher than the established Level of Concern (LOC) there is unacceptable risk, and conversely when the RQ is lower than the LOC value, risk is deemed acceptable.

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Risk Quotient > Level Of Concern --> Unacceptable Risk  
 Risk Quotient < Level Of Concern --> Acceptable Risk

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**For example, imagine a modeled application produced the following:**

A 21-day average Expected Environmental Concentration, EEC, of 20 ppm -and we know that-

The 14 speckled sand shrimp shows a toxicity response, NOAEL, (say, fewer than normal number of babies) when exposed to 7 ppm but not to 5 ppm. -then we calculate-

**RQ = EEC/NOAEL -->                      RQ = 20 ppm /5 ppm -->                      RQ = 4**

We would compare this RQ = 4 to the LOC that is appropriate (LOC = 1) from the EPA LOC Table, as below.

**Table 2.3. Agency Risk Quotient (RQ) Metrics and Levels of Concern (LOC) Per Risk Class.**

Risk Class	Risk Description	RQ	LOC
<b>Aquatic Animals (fish and invertebrates)</b>			
Acute	Potential for effects to non-listed animals from acute exposures	Peak EEC/LC <sub>50</sub> <sup>1</sup>	0.5
Acute Restricted Use	Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification	Peak EEC/LC <sub>50</sub> <sup>1</sup>	0.1
Acute Listed Species	Listed species may be potentially affected by acute exposures	Peak EEC/LC <sub>50</sub> <sup>1</sup>	0.05
Chronic	Potential for effects to non-listed and listed animals from chronic exposures	60-day EEC/NOAEC (fish)	1
		21-day EEC/NOAEC (invertebrates)	

**In this scenario, we would say this active ingredient use poses unacceptable risk to the environment because RQ of 4 is greater than LOC of 1.**

Higher RQ values indicate how many more times toxic the environment is over what is known to cause effects in the most sensitive organism. In the example here, the shrimp show toxic effects starting at 5 ppm. The environmental concentration is 4 times greater than that (20 ppm) and would very likely cause effects.

### Selection of Listed Species Criteria

Under the acute exposure scenario EPA has established three risk classes: acute, acute restricted use, and acute listed species. With each level the acceptable risk threshold is lowered. In this risk assessment, only the 'Acute Listed Species' value was used.

The 'Listed Species' risk class was selected not because lobsters and shellfish are currently federally or state listed but as a means to make this risk assessment as

conservative as possible to protect this unique habitat. Very little toxicity testing has taken place on lobsters or other species of shellfish important to the Gulf of Maine ecosystem. Ecological risk assessments do not include uncertainty or modifying factors, like those used in human health risk assessments, to account for unknown variables in the available data so accepting the listed status level can help account for unknown species differences.

**Table 2.3. Agency Risk Quotient (RQ) Metrics and Levels of Concern (LOC)**

Risk Class	Risk Description
<b>Aquatic Animals (fish and invertebrates)</b>	
Acute	Potential for effects to non-listed animals from acute exposures
Acute Restricted Use	Potential for effects to animals from acute exposures Risks may be mitigated through restricted use classification
Acute Listed Species	Listed species may be potentially affected by acute exposures
Chronic	Potential for effects to non-listed and listed animals from chronic exposures

## Acceptable Risk Indicated with Green Highlighting

Compound	Peak	21-day	60-day	Acute Aquatic	Chronic Aquatic	Acute RQ	Chronic RQ
	EEC (ppb)	EEC (ppb)	EEC (ppb)	LD <sub>50</sub> (ppb)	NOAEC (ppb)	(LOC<0.05)	(LOC<1)
Abamectin	0	0	0	0.02	0.0029	0	0
Acephate Foliar	18.7	10.5	4.76	7300	580	0.003	0.018
Acephate Injection	0	0	0	7300	580	0	0
Acetamiprid Pome/Stone	5.14	4.64	4.08	66	2.5	0.078	1.86
Acetamiprid Nut Tree	6.17	5.56	4.89	66	2.5	0.094	2.22
Bifenthrin EPA RA	0.935	0.06.6	0.0626	0.004	0.004	233.75	16.5
Bifenthrin Ornamental Gypsy	0.374	0.0264	0.0225	0.004	0.004	93.5	6.6
Bifenthrin Ornamental Other	3.4	0.24	0.227	0.004	0.004	850	60
Carbaryl	77.4	30.3	11.8	5.7	1.5	13.58	20.2
Chlorantraniliprole	0.922	0.646	0.437	1150	695	0.001	0.001
Chlorpyrifos Apple	3.98	1.8	1.13	0.035	0.0046	113.71	391.30
Chlorpyrifos Ornamental	1.99	0.902	0.565	0.035	0.0046	56.86	196.09
Clothianidin	4.49	4.38	4.14	53	5.1	0.085	0.859
Cyantraniliprole	3.03	1.75	0.863	1200	386	0.003	0.005
Cyfluthrin	0.224	0.0161	0.0099	0.0024	0.00017	93.33	94.71
Cyfluthrin EPA RA	0.313	0.0223	0.014	0.0024	0.00017	130.42	132.94
Cyfluthrin-β	0.0028	0.0002	0.0001	0.0022	0.00007	1.272	2.871
Cyfluthrin-β a 4X Appl	0.215	0.0192	0.00993	0.0022	0.00007	97.73	274.29
Cyhalothrin-λ Pome	0.281	0.0663	0.0586	0.00491	0.0002	57.23	313.5
Cyhalothrin- λ Seed Orchard	0.704	0.157	0.147	0.00491	0.0002	143.38	785
Cyhalothrin- λ Ornamental	0.507	0.113	0.106	0.00491	0.0002	103.26	565
Cypermethrin	0.986	0.0603	0.0366	0.0054	0.000781	182.59	77.21
Cypermethrin EPA RA	0.448	0.0274	0.0166	0.0054	0.000781	82.96	35.08
Cypermethrin-zeta	0.348	0.0213	0.0129	0.04	0.01	8.7	1.29
Deltamethrin Low	0.111	0.0110	0.009	0.0037	0.024	30	0.458
Deltamethrin Mid	0.273	0.0272	0.0221	0.0037	0.024	73.78	1.134
Deltamethrin High	0.302	0.03	0.0244	0.0037	0.024	81.62	1.25
Dicrotophos	0	0	0	77	3.09	0	0
Diflubenzuron	0.126	0.0696	0.0410	0.64	0.045	0.197	1.547
Dinotefuran	0	0	0	790	6360	0	0
Emamectin benzoate	0	0	0	0.04	0.00017	0	0
Esfenvalerate	1.08	0.173	0.126	0.00466	0.012	231.76	1017.65
Fenpropathrin	2.68	0.515	0.426	0.021	16.9	127.62	42.92
Indoxacarb	0.793	0.416	0.257	54.2	25	0.015	0.025
Methoxyfenozide	5.98	5.48	5.22	1200	6.9	0.005	0.219
Naled	24.7	1.3	0.456	8.8	0.06	2.807	0.188
Novaluron	0.451	0.0535	0.0263	0.12	46	3.758	0.892
Oxydemeton-methyl	5.17	2.32	0.949	3	0.0024	1.723	0.050
Permethrin	5	0.629	0.464	0.018	0.69	277.78	262.08
Phosmet	3.79	0.0858	0.0304	2	2.1	1.895	0.124
Piperonyl butoxide	0.523	0.238	0.176	490	0.25	0.001	0.113
Pyrethrins	0.126	0.0310	0.0181	1.4	0.25	0.09	0.124
Spinetoram	0.399	0.119	0.098	2.05	38	0.195	0.003
Spinetoram Do Not Exceed	1.59	0.475	0.386	2.05	38	0.776	0.013
Tebufenozide	1.84	1.5	1.23	500	22	0.004	0.068

## Section 5 List of Potential Pesticides

### Proposed List of Active Ingredients Allowed for the Treatment of Browntail Moth Near Marine Waters\*

**Acephate**

**Chlorantraniliprole**

**Cyantraniliprole**

**Indoxacarb**

**Piperonyl butoxide**

**Tebufenozide**

\*within the 50' to 250' zone from the marine water edge using  
powered application equipment

### Major Changes from Previous List

This proposed list represents a major change from the previous list. None of the chemicals available on the previous list are represented on this newer list for powered broadcast application. This change is likely a consequence of changing the assessment scenario and incorporating chronic exposures into the assessment framework. The scenario basis for the previous assessment originated from the

‘worst case’ scenario of a chemical spill into a pond. The current assessment is based on maximum legal use, as intended at the relevant sites, for both acute and chronic exposure levels.

The current method of determining Expected Environmental Concentration allows for the chemical specific details to be incorporated into the scenario. As an example, bifenthrin is a pyrethroid insecticide that has a relatively short half-life on the plant while exposed to sunlight, however, this changes once bifenthrin reaches the sediment. In sediment, the half-life of bifenthrin is roughly 18 times longer than the foliar half-life. Incorporation of more chemical-specific parameters into the environmental modelling allow us to better predict expected effects of the products as used.

After all active ingredient concentrations were modeled with the Pesticides in Water Calculator, the Expected Environmental Concentration was compared to a sensitive marker of toxicity and a Risk Quotient was established. Risk Quotients were compared to Level of Concern values to assess whether or not the potential risk is at acceptable levels. As a secondary check to this, the Expected Environmental Concentrations were compared to EPA’s Aquatic Life Criteria. Specifically, the peak concentration was compared to the Aquatic Life Criteria. If the modeled concentration exceeded the Aquatic Life Criteria the pesticide was removed from the list of acceptable active ingredients. One active ingredient, methoxyfenozide, was removed from the list because of the Aquatic Life Criteria. Due to the work taken to establish Aquatic Life Criteria thresholds, if the Expected Environmental Concentration exceeds that threshold there is good reason to suspect there is a potential for unacceptable risk. It is not clear why there is this difference, though, methoxyfenozide is a newer chemistry and there were still outlying needs for additional data during registration review.

**Biological Pesticides have not been included in this review.** They will be reviewed for the next review cycle. The current list of allowed biologicals should remain the same until the next review.

## **A Note About Tree Injection Pesticides**

The label search turned up 33 active ingredients that were evaluated for acceptable risk in the near marine zone. All 33 active ingredients were included in the risk assessment, however, some of the labels only allowed for tree injection. The risk assessment on these labels proceeded because of the information that could be learned from including them in the risk assessment.

**There is no restriction on tree injection and as such these pesticides did not need to be included in this risk assessment.**

As expected, all active ingredients used via tree injection were modeled to have acceptable risk in this risk assessment. Drift and surface runoff contribute to the majority of off-target movement of pesticides.

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### List of Tree-Injection Pesticides Included in Current Risk Assessment

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**Abamectin**

**Acephate**

**Diclotophos**

**Dinotefuran**

**Emamectin benzoate**

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## No Current Uses

There were a number of active ingredients that appeared during the initial pesticide database search but were not included in the risk assessment. The initial review searched for any pesticide that contained 'gypsy moth' on the label. Below is a table listing those chemistries that were not included in this risk assessment. The most common reason why they were not included is these pesticide products did not have the appropriate site listed to make their inclusion appropriate.

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List of 'Gypsy Moth' Pesticides Not Included in Current Risk Assessment
<b>d-Allethrin</b>
<b>Fluvalinate</b>
<b>Malathion</b>
<b>Mancozeb</b>
<b>Methyl bromide</b>
<b>Pyraclostrobin</b>
<b>Pyridalyl</b>
<b>Tetramethrin</b>
<b>Thiamethoxam</b>

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## Additional aspects of consideration

Additional summary information for the assessed chemicals follows and includes carcinogenic potential, bioconcentration potential, mechanism of action, Aquatic Life Criteria concentrations, and groundwater concentrations over time are listed.

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**EPA Cancer Classification**  
**(organized from highest hazard to lowest)**

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**Likely To Be Carcinogenic To Humans.**

-none-

**Group B--Probable Human Carcinogen.**

-none-

**Group C--Possible Human Carcinogen.**

Acephate

Piperonyl butoxide

**Group D--Not Classifiable As To Human Carcinogenicity.**

-none-

**Suggestive Evidence Of Carcinogenicity, But Not Sufficient To Assess Human Carcinogenic Potential.**

Dicrotophos

**Not Likely To Be Carcinogenic To Humans: At Doses That Do Not Cause A Mitogenic Response In The Liver.**

-none-

**Not Likely To Be Carcinogenic To Humans.**

Chlorantraniliprole

Cyantraniliprole

Dinotefuran

Emamectin benzoate

Indoxacarb

Methoxyfenozone

**Group E--Evidence Of Non-Carcinogenicity For Humans.**

Abamectin

Tebufenozide

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## Potential for Bioconcentration

<b>Compound</b>	<b>Bioconcentration Factor</b>	<b>Potential for Bioconcentration<sup>1</sup></b>
<b>Abamectin</b>	18.9	Low
<b>Acephate</b>	8.55	Low
<b>Chlorantraniliprole</b>	166	Threshold for concern
<b>Cyantraniliprole</b>	251	Threshold for concern
<b>Dicrotophos</b>	3	Low
<b>Dinotefuran</b>	2	Low
<b>Emamectin benzoate</b>	71	Low
<b>Indoxacarb</b>	449,000	High
<b>Methoxyfenozide</b>	124	Threshold for concern
<b>Piperonyl butoxide</b>	249	Threshold for concern
<b>Tebufenozide</b>	277	Threshold for concern

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<sup>1</sup> Rule of thumb used by EPA

## General Chemistry and Mechanism of Action

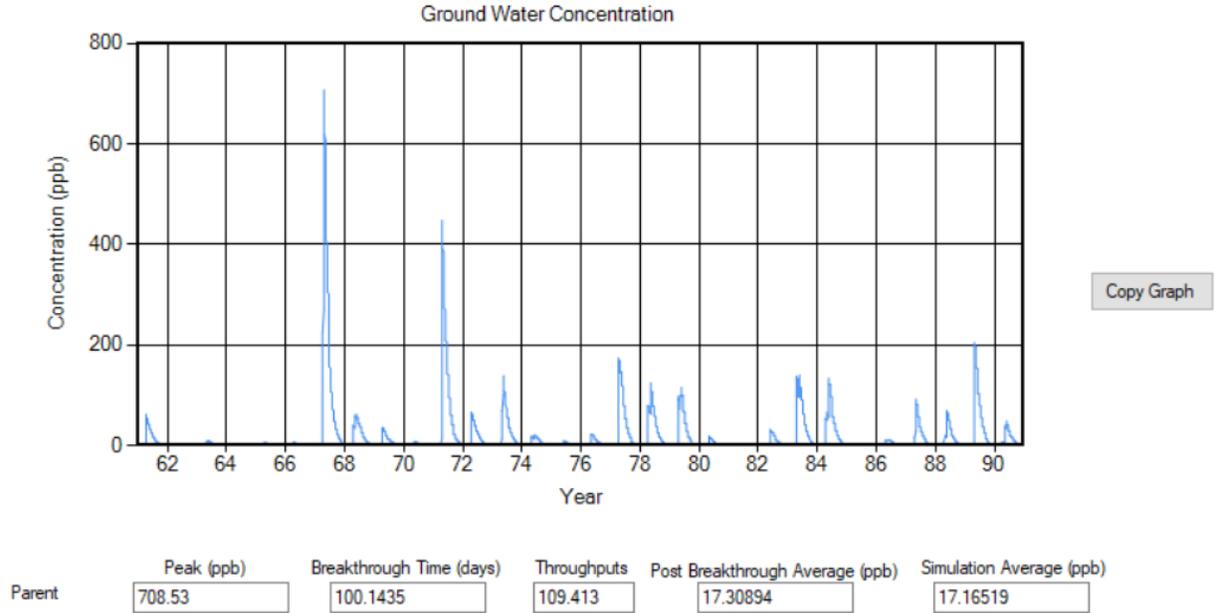
Compound	Specific BTM Efficacy	General Chemistry	Mechanism of Action
Abamectin	Yes	Mectins	Chloride channel activators
Acephate	Yes / On label	Organophosphate	Cholinesterase inhibition
Chlorantraniliprole	Unknown	Other	Ryanodine receptor modulators
Cyantraniliprole	Unknown	Other	Ryanodine receptor modulators
Dicrotophos	Unknown	Organophosphate	Cholinesterase inhibition
Dinotefuran	Yes	Neonicotinoid	nAChR activators
Emamectin benzoate	Yes	Mectins	Chloride channel activators
Indoxacarb	Unknown	Other	Sodium channel blocker
Methoxyfenozide	On label	IGR	Ecdysone agonist
Piperonyl butoxide	On label	Synergist	Modulates liver detox enzymes

## EPA Aquatic Life Criteria Compared to Modeled Expected Environmental Concentrations (EEC)

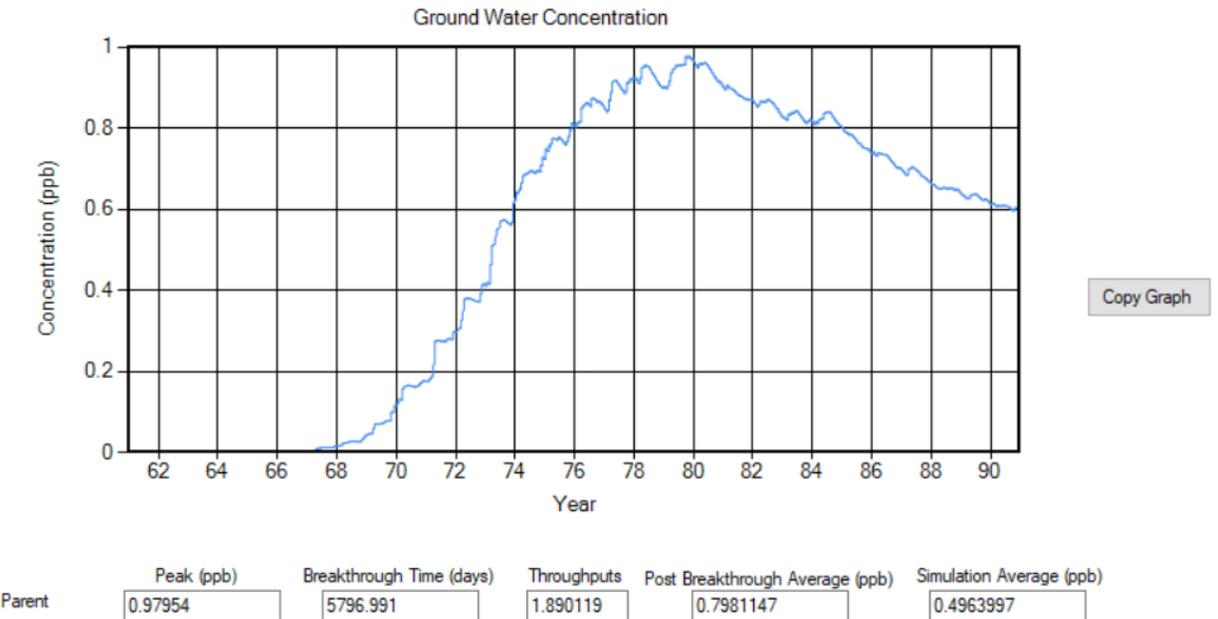
	Fish		Invertebrates		Nonvascular Plants	Vascular Plants	Peak EEC	21-day EEC	60-day EEC
	Acute	Chronic	Acute	Chronic	Acute	Acute			
<i>all units ug/L (ppb)</i>							<i>all units ug/L (ppb)</i>		
<b>Abamectin</b>	1.6	0.52	0.17		> 100,000	3,900	0	0	0
<b>Acephate</b>	416,000	5,760	550	150	> 50,000		18.7	10.5	4.76
<b>Chlorantraniliprole</b>	> 6,900	110	5.8	4.47	1,780	> 2,000	0.922	0.646	0.437
<b>Cyantraniliprole</b>	> 5,000	10,700	10.2	6.56	> 10,000	> 12,100	3.03	1.75	0.863
<b>Dicrotophos</b>	2,850	9,880	6.3	1.7	> 118,000	> 117,000	0	0	0
<b>Dinotefuran</b>	> 49,550	6,360	> 484,150	> 95,300	> 97,600	> 110,000	0	0	0
<b>Emamectin benzoate</b>							0	0	0
<b>Indoxacarb</b>	145	150	300	75	> 110	> 84	0.793	0.416	0.257
<b>Methoxyfenozide</b>	> 2,100	530	28.5	3.1	> 3,400		5.98	5.48	5.22
<b>Piperonyl butoxide</b>	950	40	255	30			0.523	0.238	0.176
<b>Tebufenozide</b>	1,500	51.1	1,900	29	> 740	> 940	1.84	1.5	1.23

## Groundwater concentration profiles for the proposed allowable active ingredients.

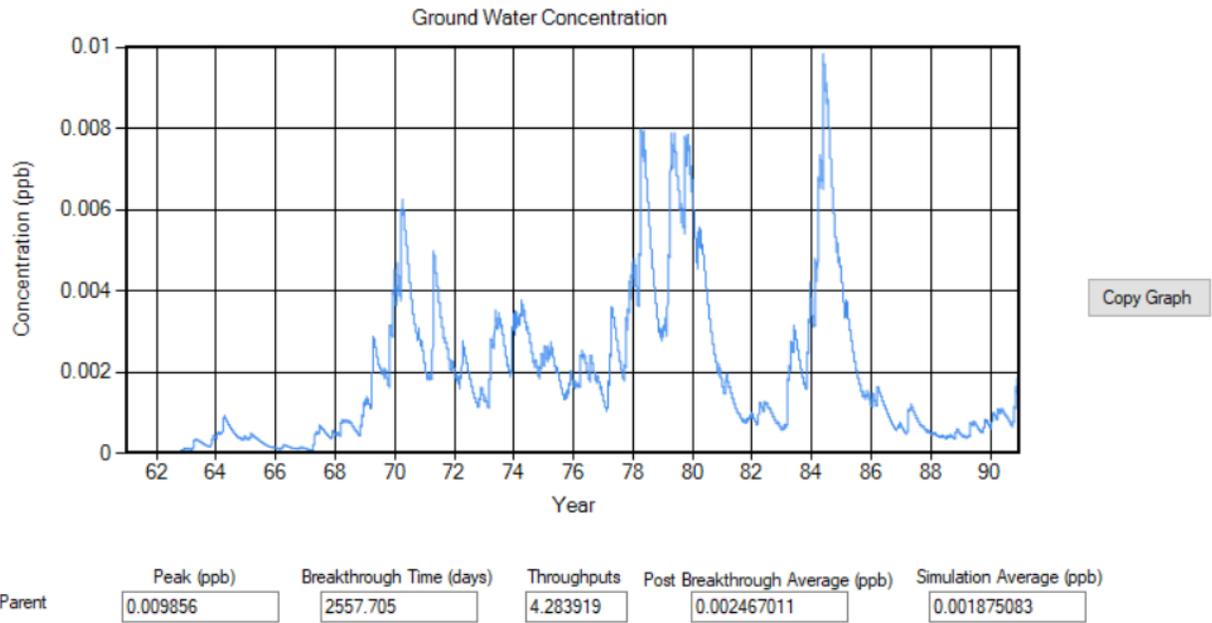
Acephate:



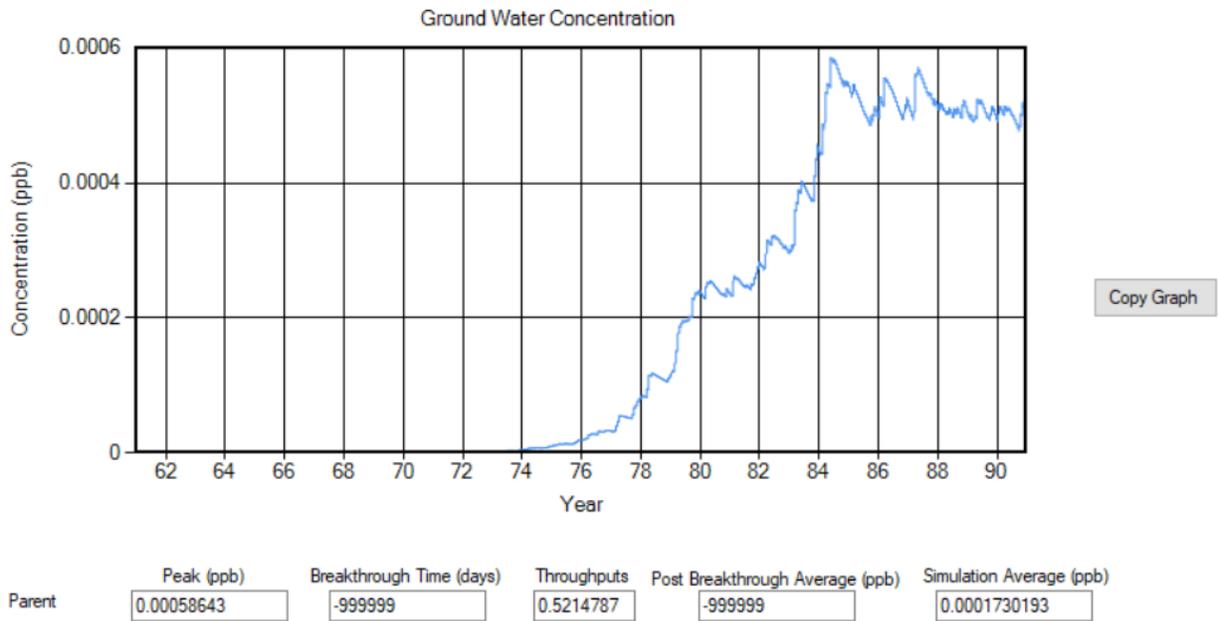
Chlorantraniliprole:



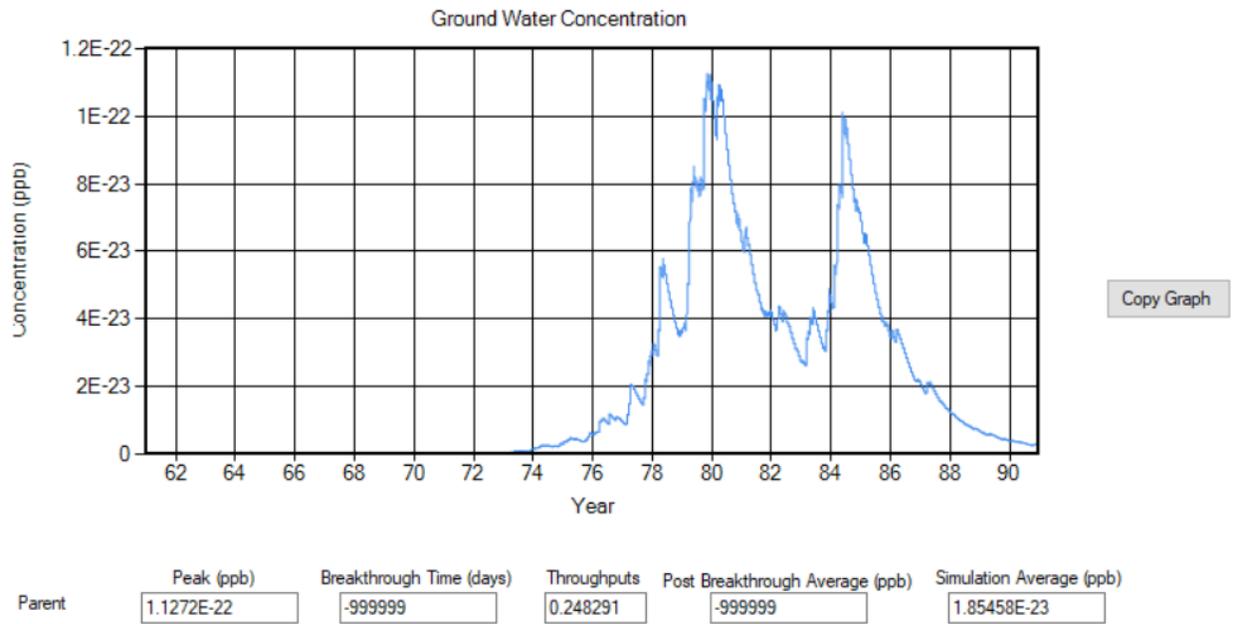
Cyantraniliprole:



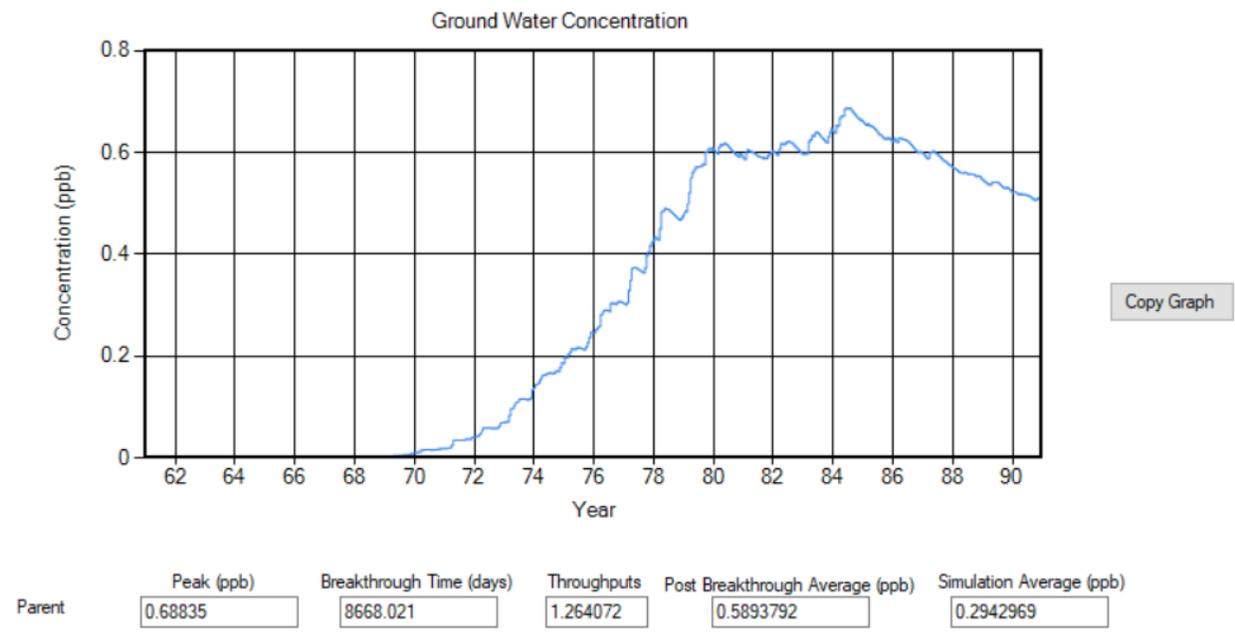
Indoxacarb:



Piperonyl butoxide:

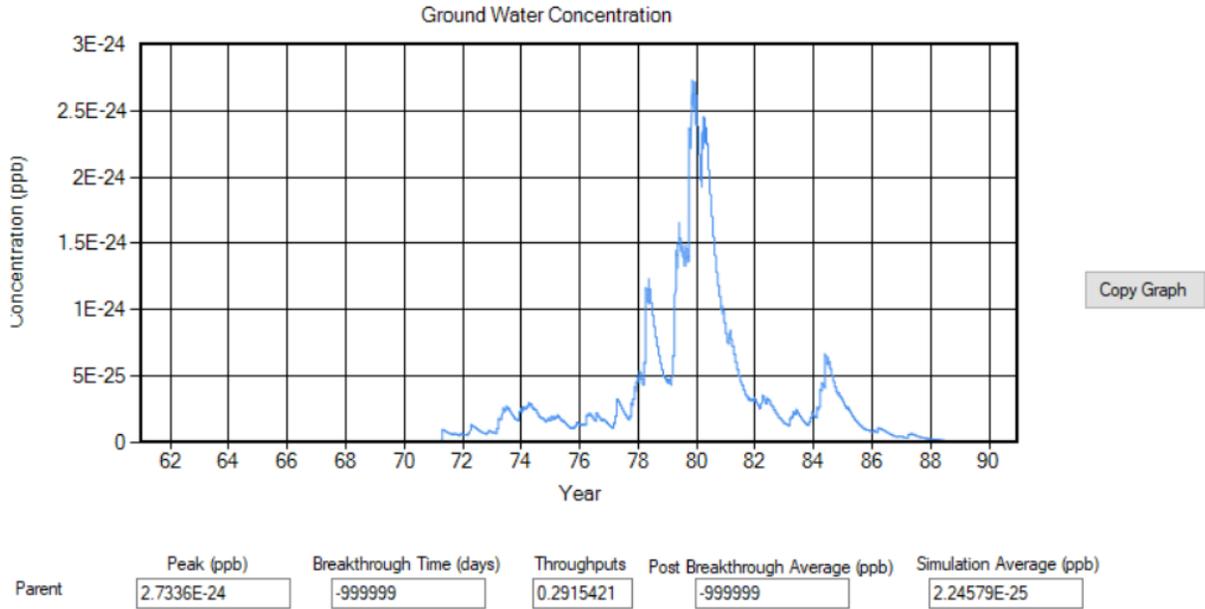


Tebufenozide:

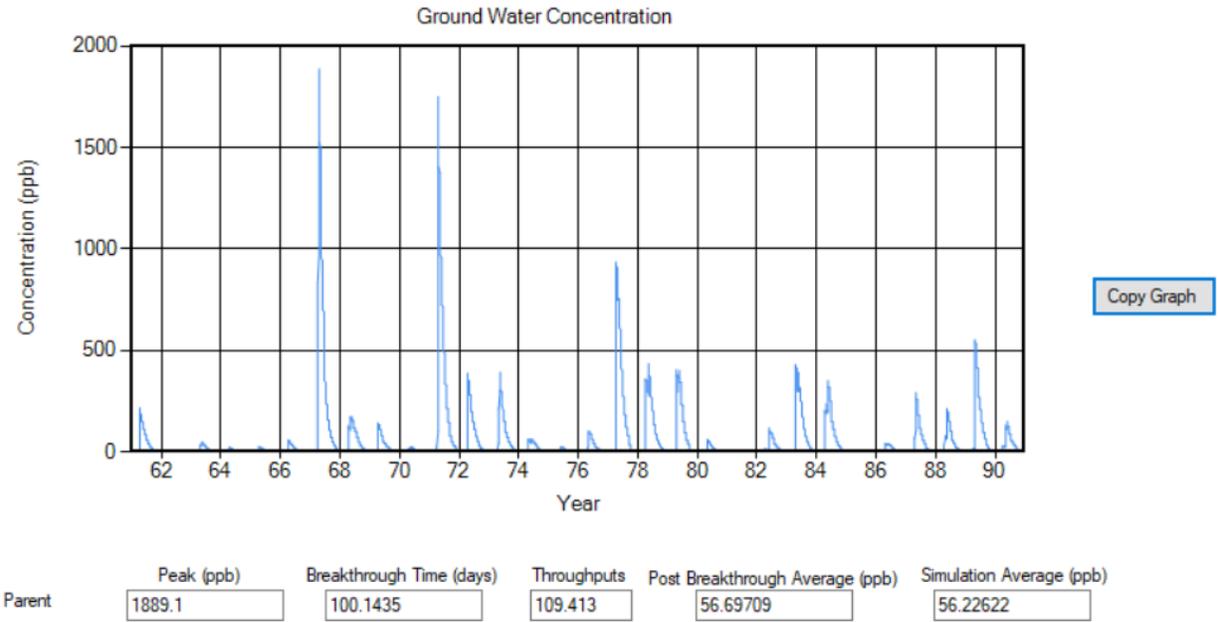


## Groundwater concentration profiles for several tree-injection active ingredients.

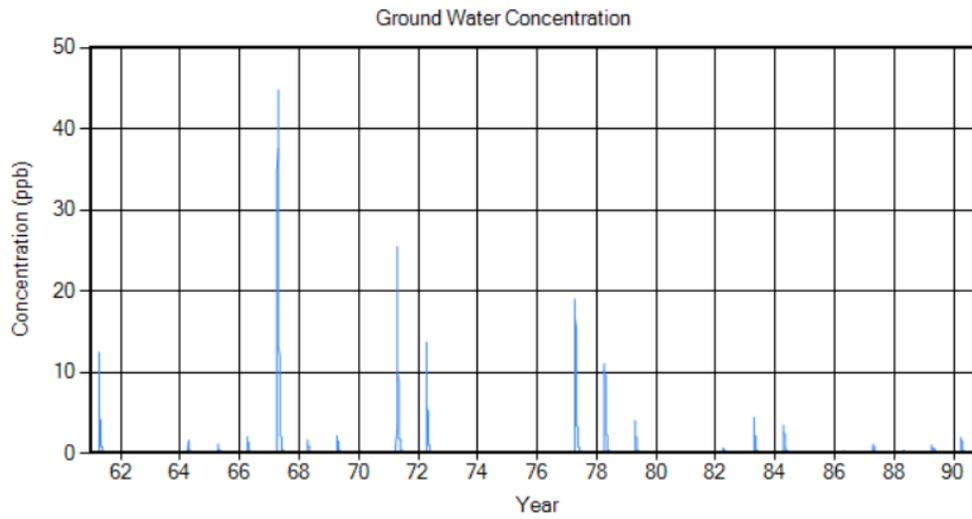
Abamectin:



Acephate:



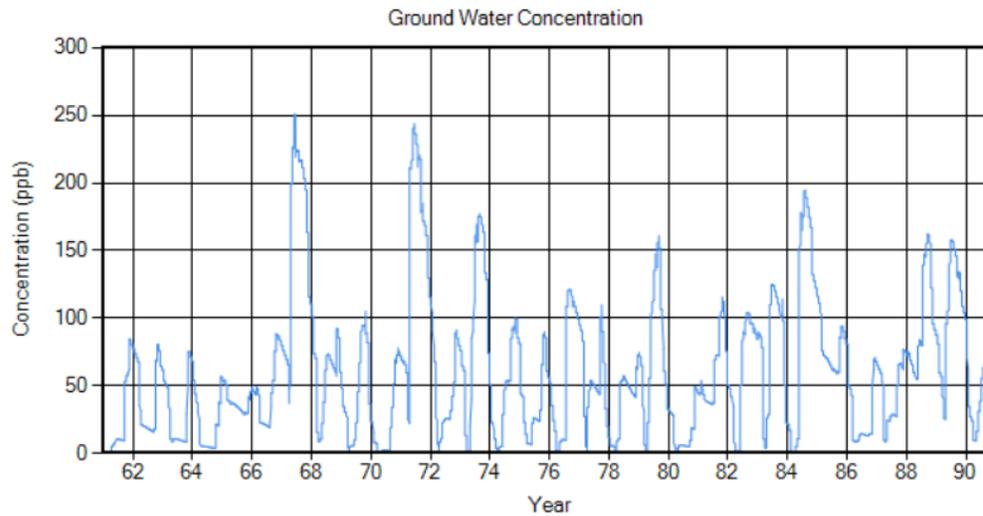
## Dicrotophos:



Copy Graph

	Peak (ppb)	Breakthrough Time (days)	Throughputs	Post Breakthrough Average (ppb)	Simulation Average (ppb)
Parent	44.846	90.86891	120.5803	0.2321686	0.2302615

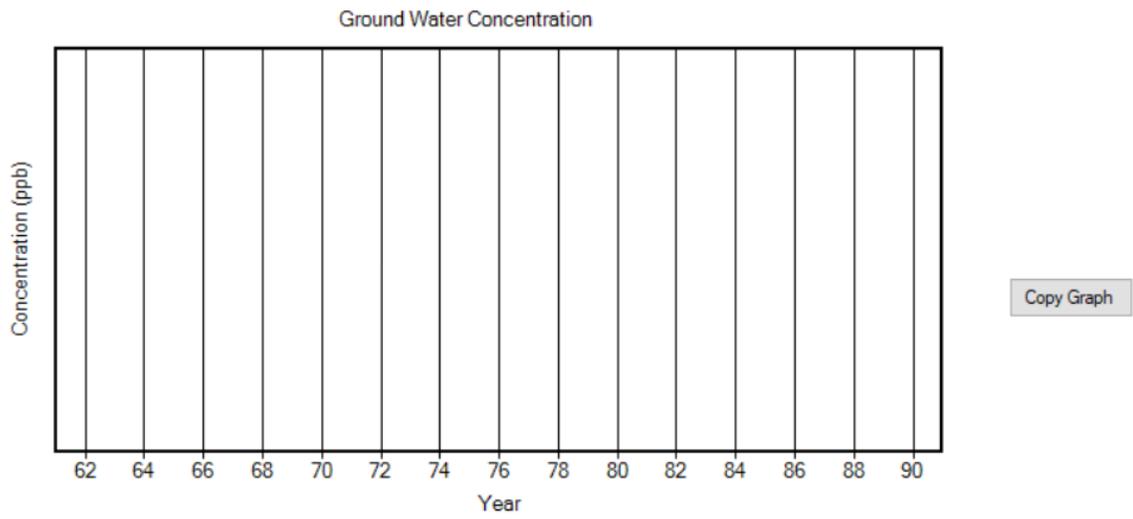
## Dinotefuran:



Copy Graph

	Peak (ppb)	Breakthrough Time (days)	Throughputs	Post Breakthrough Average (ppb)	Simulation Average (ppb)
Parent	250.8	164.0427	66.79359	61.2508	60.66385

Emamectin benzoate:



	Peak (ppb)	Breakthrough Time (days)	Throughputs	Post Breakthrough Average (ppb)	Simulation Average (ppb)
Parent	0	-999999	0.006047101	-999999	0



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AUGUSTA, MAINE 04333

6b

**WALTER E. WHITCOMB**  
COMMISSIONER

**MAINE BOARD OF PESTICIDES CONTROL POLICY ON ALLOWABLE  
PESTICIDES FOR THE CONTROL OF BROWNTAIL MOTH WITHIN 250  
FEET OF MARINE WATERS**

Adopted January 11, 2017

**BACKGROUND**

On January 25, 2008, the Board adopted Section 5 of Chapter 29 which regulates the use of insecticides used to control browntail moth within 250 feet of marine waters. Section 5 limits insecticide active ingredients to those approved by the Board. Since that time, a number of newer chemistries have been registered for use and far more data is available on the efficacy of many products. On November 4, 2016 and December 16, 2016 the Board discussed the browntail moth populations and the available products. On January 11, 2017, the Board approved the following active ingredients for control of browntail moth in coastal areas located between 50 and 250 feet from the mean high water mark in accordance with CMR 01-026 Chapter 29: Standards for Water Quality Protection.

Acetamiprid  
Bifenthrin  
Clothianidin  
Deltamethrin  
Diiflubenzuron  
Dinotefuran  
Fluvalinate  
Imidacloprid  
Spinosad

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**01 DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY**

**026 BOARD OF PESTICIDES CONTROL**

**Chapter 29: STANDARDS FOR WATER QUALITY PROTECTION**

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**SUMMARY:** These regulations establish standards for protecting surface water. This chapter establishes a fifty-foot setback from surface water for mixing and loading of pesticides, sets forth requirements for securing containers on sprayers and cleaning up spills occurring within the setback zone, establishes restrictions on pesticide applications to control browntail moths near marine waters and requires an untreated 25-foot buffer zone for outdoor terrestrial broadcast pesticide applications near waters of the State.

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**Section 1. Protecting Waters of the State during Pesticide Mixing and Loading Operations**

- A. No person shall mix or load any pesticides or fill a sprayer or mix tank within fifty (50) feet from the high water mark of any surface waters of the State as defined in 38 M.R.S.A. §361-A(7).
- B. No person shall use a pump that pumps pesticide concentrate or formulation or any hose that has been in contact with pesticide solution to draw liquid from any surface waters.
- C. All pesticide pumping systems that come in contact with any surface waters shall be equipped with an anti-siphoning device.

**Section 2. Securing Pesticide Product Containers and Mix Tanks on Sprayers, Nurse Vehicles and Other Support Vehicles during Transportation**

No person shall transport any pesticide unless it is secured so as to prevent release of pesticides onto the vehicle or from the vehicle. All tanks, liquid containers, cartons and bags must be securely held so they may not shift and become punctured or spilled.

**Section 3. Cleaning up Pesticide Spills within Setback Zone in Section 1**

Any person who spills a pesticide within fifty (50) feet from the high water mark of any surface water shall take immediate steps to recover the pesticide by the most efficient means available and remove all contaminated soil to prevent water contamination.

**Section 4. Exemptions**

The following persons are exempt from Section 1(A) regarding mixing and loading within fifty (50) feet of the high water mark of any surface water:

- A. Applicators with a variance approved by staff for an impervious mixing/loading pad with containment features. Applications for a variance must be submitted to the Board on or before December 31, 1999;
- B. Applicators using chemigation equipment specified on labels to draw water from their tail-water ponds;
- C. Commercial applicators using small individually packaged concentrates to mix no more than five (5) gallons for use in non powered equipment; and
- D. Commercial applicators making aquatic applications from boats and barges.

## **Section 5. Restrictions on Pesticide Applications to Control Browntail Moths Near Marine Waters**

Pesticide applications for control of browntail moths within 250 feet of the mean high tide mark adjacent to coastal waters and extending upriver or upstream to the first bridge are subject to the requirements of this section:

### **A. Exemptions**

The prohibitions and restrictions in Section 5 do not apply to biological pesticides, to the injection of pesticides directly into the soil or shade and ornamental trees or to the application of pesticides by licensed commercial pesticide applicators using non-powered equipment.

### **B. Prohibitions and Restrictions**

- I. A person may not apply a pesticide to control browntail moths on shade or ornamental trees within 50 feet of the mean high water mark.
- II. A person may not apply a pesticide to control browntail moths on shade or ornamental trees in coastal areas located between 50 and 250 feet from the mean high water mark except in accordance with this subsection.
  - a. Only products with active ingredients specifically approved by the Board for this purpose may be applied.
  - b. Applications may be performed only with a hydraulic hand-held spray gun or air-assisted sprayers.
  - c. Applications may be performed only in a manner in which the applicator directs the spray away from marine waters.
  - d. Applications may not be made when the wind is blowing toward marine waters.
  - e. Applications may be performed only when the wind is equal to or greater than 2 miles per hour and blowing away from marine waters.

**Section 6. Buffer Requirement**

- A. No person shall make an outdoor terrestrial broadcast application of pesticides, except for applications made to control arthropod vectors of human disease or stinging insects, within twenty-five (25) feet from the mean high water mark of:
- I. Any lake or pond, except ponds that are confined and retained completely upon the property of one person and do not drain into or have a surficial connection with any other waters of the State;
  - II. Rivers
  - III. Any stream depicted as a solid or broken blue line on the most recent edition of the U.S. Geological 7.5-minute series topographic map or, if not available, a 15-minute series topographic map;
  - IV. Estuarine and marine waters as defined under 38 M.R.S.A. §361-A (5); or
  - V. Wetlands, except man-made wetlands that are designed and managed for agricultural purposes, which are:
    - a. connected to great ponds at any time of the year; or
    - b. characterized by visible surface water; or
    - c. dominated by emergent or aquatic plants.
- B. An applicator may vary from the standards imposed under Chapter 29, Section 6 (A) by obtaining a permit to do so from the Board. Permit applications shall be made on such forms as the Board provides and shall include at least the following information:
- I. The name, address and telephone number of the applicant;
  - II. The area(s) where pesticides will be applied;
  - III. The type(s) of pesticides to be applied;
  - IV. The purpose for which the pesticide application(s) will be made;
  - V. The approximate application date(s);
  - VI. The type(s) of application equipment to be employed; and
  - VII. The particular reasons why the applicant seeks a variance from the requirements of this section, including a detailed description of the techniques to be employed to assure that a reasonably equivalent degree of protection of the water body will be obtained.
- C. Within 30 days after a complete application is submitted, the Board or its staff shall issue a permit if it finds that the applicant will:

- I. Achieve a substantially equivalent degree of protection as adherence to the requirements of this section would provide; or
- II. Demonstrate an appropriate balance of risk and benefit; and
- III. Will conduct the application in a manner which protects surface waters as defined in Chapter 29, section 6 (A).

The Board may place conditions on any such permit, and the applicant shall comply with such conditions. Except as required by the permit, the applicant shall undertake the application in accordance with all of the procedures described in his variance request and all other applicable legal standards. Permits issued by the Board under this section shall not be transferable or assignable except with further written approval of the Board and shall be valid only for the period specified in the permit.

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STATUTORY AUTHORITY: 7 M.R.S.A. §§ 601-625 and 22 M.R.S.A. §§ 1471-A-X.

EFFECTIVE DATE:

April 14, 1999

AMENDED:

February 3, 2008 – filing 2008-35 (except that the major substantive language of Section 6, which was undergoing legislative review)

May 1, 2008 - filing 2008-154, including Section 6's final adoption

CORRECTIONS:

February, 2014 – agency names, formatting