Neonicotinoid in Vermont Update

Vermont Agency of Agriculture, Food & Markets

1/30/2018

Timeline of events

- 2014-The Legislature directed the Agency of Agriculture to review Neonicotinoids Safety & Use in the State
  - Report delivered in January of 2015
  - Covered research on pollen, status of use patterns

- 2016-The Legislature, by Act 83, formed a Pollinator Protection Committee comprised of multiple stakeholders.
  - Report delivered in February of 2017
  - Covered status of pollinators in Vermont (native, managed) and provided key areas of recommendations along with a list of specific recommendations
  - Did not complete State Pollinator Protection Plan

- 2016-The Legislature passed Act 99 giving the Agency of Agriculture the authority to regulate treated articles, if it was determined to be needed

Significant items since 2015

- Convened Pollinator Protection Committee
- Agency supported grant application with the UVM, matching funds for research and training opportunities ($100K). Was not funded.
- Certified dozens of training courses for applicators about neonicotinoids
- Increased Agency apiary inspection
- Improved hive location data, Now charge a fee to register hives
- Pollinator Label language now on neonicotinoid pesticide products
- Three new research initiatives by the Agency (more later in the presentations…)
- Preliminary Pollinator Assessments completed by EPA.
- Federal ecological benchmarks updated

Things that have not changed since 2015

- Mammalian toxicity low
- Use patterns remain the same:
  - Homeowner products
  - Greenhouse production
  - Tree fruit
  - Turf
  - Seed treatment (dust off measures improved)
- No reports of Colony Collapse in Vermont

Key themes from the Pollinator Protection Committee

- State lands can be used as a valuable resource to protect pollinators.

- Education and outreach about pollinator health are essential, not only to key stakeholders (pesticide applicators & sellers, organic and conventional farmers, local, state and federal government land managers), but also to homeowners and the general public.

- Gaps exist in Vermont-specific data as related to pesticide usage (including miticides), pathogen and pest loads in Vermont pollinators, and economic thresholds of pests and pesticide use, especially related to treated corn and soybean seeds in Vermont's dairy systems. State-specific research and tracking should be enhanced.

- Funding should be earmarked for pollinator programs that would incentivize pollinator-friendly practices on farms and protect farmers from incurring any related economic loss.

Key themes from the Pollinator Protection Committee

- Native pollinators are vital to Vermont's agricultural systems, thus providing healthy habitats for managed and native pollinators should be considered wherever possible (rural, suburban, urban landscapes). The Natural Resources Conservation Services addresses this through some of their work, but other land managers and the public can provide additional habitat in Vermont.

- Improving and maintaining healthy populations of managed honey bees can protect native bees. This requires
  - providing proper education for new beekeepers,
  - protecting honey bees from diseases, pests and other unfavorable traits that enter Vermont, and
  - limiting or eliminating exposures of pollinators to pesticides, especially those that are highly toxic to bees, or those that may have synergistic effects, when used in combination with other pesticides (certain fungicides).

Federal actions

- Preliminary Pollinator Assessments released: DRAFT
- No observed effect levels:
  - Imidacloprid: 25 ppb (MATRIX)
  - Clothianidin & thiamethoxam:

  19 ppb (nectar)
- Work done in conjunction with PMRA
- Policy to mitigate acute risks from acutely toxic pesticides (organic & conventional)

Pesticide	Year Updated	Fish		Invertebrates		Nonvascular Plants	Vascular Plants
		Acute	Chronic	Acute	Chronic	Acute	Acute
Imidacloprid	2017	114500	9000	0.385	0.01	> 10000	
Thiamethoxam	2017	> 50000	20000	17.5		> 97000	> 90000
Clothianidin	2016	> 50750	9700	11	1.1	64000	121000
		all units ug/L or parts per billion; data extracted 1/2018					

Aquatic invertebrates benchmarks-updated

Most used Neonicotinoids in Vermont

- Imidacloprid, generally associated with foliar use, turf products and some seed treatment.
  - Degradates less toxic
  - Degrades quickly in water, not in soil-can build up

- Thiamethoxam & Clothianidin generally used as a seed treatments. Clothianidin is breakdown product of thiamethoxam.

Draft Pollinator Risk Assessments by the EPA indicate there is low on field risk to pollinators from seeds treated with these.

- The Agency of Agriculture tests for these 3 neonicotinoids

Summary of the IMIDACLOPRID toxicity **endpoints** to be used in risk estimation for individual bees.

Study Type	**Endpoint**[1]
Adult Acute Contact Toxicity	96-hr LD_{50}: 0.043 µg a.i/bee
Adult Acute Oral Toxicity	48-hr LD_{50}: 0.0039 µg a.i/bee
Adult Chronic Oral Toxicity	10-day NOAEC/LOAEC (mortality, body weight): 0.00016/0.00024 µg a.i/bee
Larval Acute (single dose)	No data available
Larval Chronic (repeat dose)	21-day NOAEC/LOAEC: 0.0018/>0.0018 µg a.i/larva

Summarized by California DPH, PMRA and EPA: NOAEC = 25 ug/L of imidacloprid in nectar

Summary of the CLOTHIANIDIN toxicity **endpoints** to be used in risk estimation for individual bees.

Study Type	**Endpoint** in Clothianidin equivalents
Adult Acute Contact Toxicity	96-hr LD_{50}: 0.0275 µg c.e. /bee
Adult Acute Oral Toxicity	48-hr LD_{50}: 0.0037 µg c.e./bee
Adult Chronic Oral Toxicity	10-day NOAEC/LOAEC (mortality, body weight): 0.00036/0.00072 µg c.e./bee/day
Larval Acute (single dose)	LC50 (ng c.e./g) >15000
Larval Chronic (repeat dose)	21-day NOAEC/LOAEC: 680/1500 ng c.e/g

Summarized by California DPH, PMRA and EPA: NOAEC = 19 ng c.e./g of Clothianidin in nectar

Agrichemical Program: 3 research projects

- Surface water collected by DEC post-rain events, added these compounds
- New Collaborative effort with Miner Institute related to seed treatment in corn fields, tile and surface water
- Two year study in Franklin County, tiles, surface water, soil and vegetation

Status-All data in and being verified, compiled electronically. Report shortly.

Expanding the ambient surface water sampling program to other areas of the State in 2018

Research Considerations

- Use patterns: foliar, granular, seed treatments
- Degradation rates in soil--carry over?
- Plant uptake into pollen/nectar
- Other regulatory considerations:
  - Human health-ground water, consumption?
  - Aquatic invertebrates impacts?
  - They are insecticides-→unintentional impacts to pollinators?
  - Economic cost/benefit?

It's complicated

Figure 4-1 depicts important processes governing exposure of bees to imidacloprid through the plant. In this figure, it is assumed that imidacloprid alone is systemic as it is uncertain if any of imidacloprid metabolites are systemic.

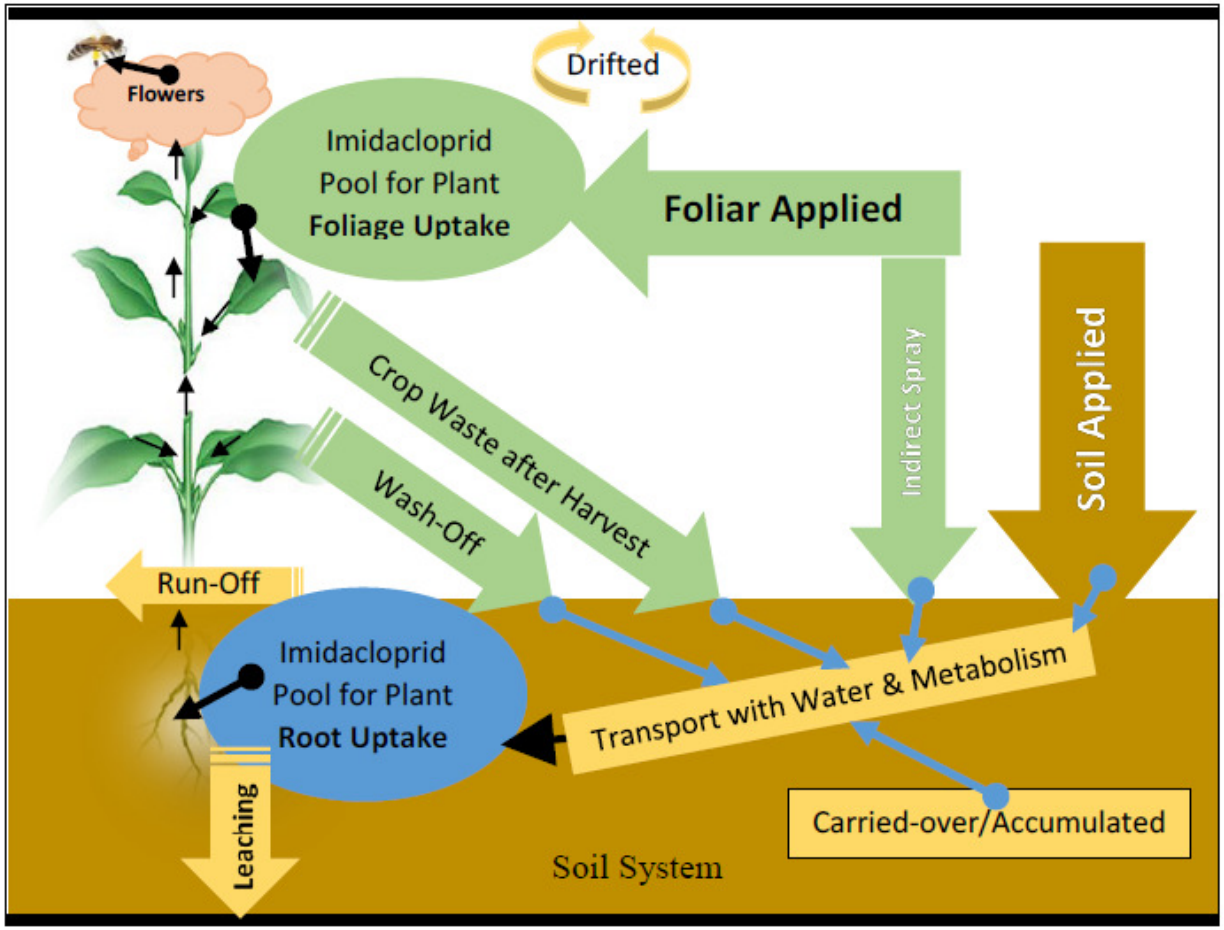

Figure 4-1. Imidacloprid application and processes involved in bee exposure

Media/Pathways the Agency looked at

- Surface water:
  - impacts to aquatic invertebrates?
  - as a source of water for pollinators (theoretical calculations)
  - runoff from fields
  - role of tile drains/surface water
- Flowering vegetation
- Soil cores
- Pollen studies (done previously)

Lake Champlain & Tribs water sampling

- Post-rain events, samples collected by VTDEC
- Lake Champlain and tributaries
- Past 2 years: samples from 10 sites. Detections of neonicotinoids in 2 locations: Jewett Brook, Rock River and Pike River. All detections less than aquatic invertebrate benchmark, with one exception. However, our detection limit is higher than that particular benchmark.
- In 2018, expand surface water sampling to other areas of the state with Agency of Agriculture Staff. Pre-scouting of locations already completed.

Focused Project in Franklin County

- 2-year study: corn, soybean and grass fields
  - Tile drain effluent
  - Five ambient surface water locations
  - Soil cores
  - Vegetation taken in fall, flowering, roots in surface water or tile outlet
  - Groundwater taken at 3 sites

  - Results still being verified and compiled-
  - One general area, may not be applicable to all of Vermont. Surface waters are known to be impaired.

Miner Institute Project

- Sampling & transport covered by Miner Institute in Chazy New York
- Sampling containers and testing provided by Vermont Agency of Agriculture
- Two fields: Heavily planted in corn for several years.
- Samples taken pre-plant throughout the year and ongoing for 2018.
- Fields are tile drained with a water collection/sampling system
- Fields also have a surface water collection/sampling system
- Fields planted May 28^{th,} 2017, with thiamethoxam-treated corn seeds (0.25 mg a.i./seed)

Summary of results–Miner Institute Project

- No samples exceeded the guidelines for aquatic invertebrates acute or chronic values (most restrictive) for the neonicotinoids tested: imidacloprid, thiamethoxam and clothianidin. *Currently no chronic value for thiamethoxam, but by extrapolation appears reasonable.*
- Only clothianidin and thiamethoxam were detected
- No detections of neonicotinoids were observed prior to the May 28th planting
- Samples still being collected
- Results to date 68 samples, samples still being collected and tested

….more to come

Timeline

- Finalize data from the past two years on projects and report to the Legislature
- Begin plans for sampling in 2018
- June/July Final EPA Risk Assessments released