

PESTICIDES AND WILDLIFE

NAT SHAMBAUGH

March 17, 2021

RETIRED FROM VERMONT AGENCY OF AGRICULTURE IN 2016

30 YEARS AS A PESTICIDE CHEMIST SUPPORTING THE REGULATION OF PESTICIDES IN
VERMONT.



**Investigations into the Causes of Amphibian
Malformations in the Lake Champlain Basin
of New England**



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Final Report
May 2003

*** Detected atrazine in Lake Champlain in 2001**



**PESTICIDES IN THE WATERS OF
THE CHAMPLAIN BASIN:
WHAT DO WE KNOW?**

**Vermont Agency Of
Agriculture, Food & Markets**

**ASSESSMENT OF POSSIBLE PESTICIDE
ACCUMULATION IN THE SEDIMENT OF THE
BATTEN KILL RIVER, 2008.**

Nathaniel Shambaugh
Vermont Agency of Agriculture, Food and Markets
Waterbury, VT 05671
October, 29, 2009

*** Bifenthrin detected in sediment of Batten Kill River in 2008**

NEONICOTINOID PESTICIDES; SAFETY AND USE

The Secretary of Agriculture Food, and Markets shall evaluate whether the use or application of the pesticides imidacloprid, clothianidin, thiamethoxam, dinotefuran, or any other member of the nitro group of neonicotinoid pesticides is safe and not harmful to human health or the health of bees and other pollinators in the State.

(Major use of neonicotinoids in Vermont is as a “treated article”, being coated on seeds before planting to protect the growing plant. Because the actual application of pesticides to seeds does not occur in Vermont, EPA says that Vermont does not have jurisdiction)

* Detected neonicotinoid insecticides in pollen in 2013

Report concluded with:

“Vermont should be prepared to exert regulatory oversight to take corrective actions when treated articles present unacceptable risks to the environment, pollinators or human health. As such, **authority over treated articles is needed.**”

RESULT:

An act relating to regulation of treated article pesticides.

SIGNED: MAY 10, 2016

paraphrased:

- Enables Vermont Pesticide Advisory Council (VPAC) to recommend to the Sec. of Ag. to regulate use of treated articles when VPAC determines that articles will have a deleterious effect on the environment or human health.
- Sec. of Ag, upon recommendation by VPAC may adopt rules for BMPs and requirements for use if VPAC has determined articles will have a deleterious effect on the environment or human health.
- Unfortunately...VAAFMM can regulate if recommended by VPAC
to date, VPAC won't investigate unless asked by VAAFMM

NEONICOTINOIDS (NEONICS)

Made “restricted use” in Vermont several years ago to take out of the hands of homeowners.

Major use in Vermont is for “treated” corn seed (not currently regulated in Vermont)

TREATED SEEDS IN VERMONT:

94% OF CORN PLANTED IN VERMONT IN 2019

81% OF SOY PLANTED IN VERMONT IN 2019

VAAFAM estimates ~ ***8000 pounds per year*** on treated corn seeds.

In the last 20 years, the largest use of a regulated insecticide on corn was ~2800 pounds of chlorpyrifos in 2001 (VAAFAM data).

NEONICOTINOID INSECTICIDES

- RELATIVELY NON-TOXIC TO PEOPLE, OTHER MAMMALS, BIRDS
- **SAFE FOR PEOPLE ISN'T SAFE FOR THE WORLD...**
- SYSTEMIC, WHOLE PLANT BECOMES TOXIC TO INSECTS
- POLLEN AND NECTAR FROM TREATED PLANTS BECOME TOXIC TO POLLENATORS
- HIGHLY WATER SOLUBLE*
- PERSISTENT*
- EXTREMELY TOXIC TO AQUATIC INSECTS* (as well as pollinators)

*** THESE CHARACTERISTICS MAKE NEONICS EXTREMELY DANGEROUS**

UNIQUE CHARACTER OF NEONICS

“Time-Cumulative Toxicity of Neonicotinoids: Experimental Evidence and Implications for Environmental Risk Assessments” (2020)

all neonics bind **IRREVERSIBLY** to same cellular receptor

(exposure is additive!!!)

chronic toxicity is greater than expected from acute toxicity data

at low constant levels, toxicity builds up over time

*Evaluation of
Neonicotinoid Seed
Treatments in the
Environment II*



Vermont Surface Water

- ❖ 2014 – 2019: 382 surface waters tested
 - Areas of high agricultural use
 - 1 positive for imidacloprid
 - Below acute benchmark
 - More detections thiamethoxam and clothianidin
 - Usually at time of planting
 - **No implications for chronic exposure exceedances**



A surface water sampling site.

Summary of neonicotinoid results from the surface water samples.

Neonicotinoid	Positive detection	Detection range	Acute benchmark*	Results \geq Acute benchmark*
	#	ppb	ppb	#
Thiamethoxam	15	0.052 - 0.575	17.50	0
Clothianidin	18	0.059 - 0.50	11.00	0
Imidacloprid	1	0.203	0.385	0

*aquatic invertebrates



No Acute Toxicity

NEONICS IN JEWETT BROOK 2015*

*all neonicotinoids bind irreversibly to same "nicotine" receptor therefore effect may be additive and cumulative!

<u>DATE</u>	<u>CLOTHIANIDIN</u>
5/13/15 JEWETT BROOK-USGS (#1)	ND
5/19/15 JEWETT BROOK-USGS (#1)	ND
5/31/15 JEWETT BROOK-USGS (#1)	0.03
6/1/15 JEWETT BROOK-USGS (#1)	0.33
6/2/15 JEWETT BROOK-USGS (#1)	0.29
6/10/15 JEWETT BROOK-USGS (#1)	0.08
6/10/15 JEWETT BROOK-USGS (#1)	0.13
6/17/15 JEWETT BROOK-USGS (#1)	0.05
6/22/15 JEWETT BROOK-USGS (#1)	0.03
7/1/15 JEWETT BROOK-USGS (#1)	0.12
7/2/2015 JEWETT BROOK-USGS (#1)	0.14

EPA CHRONIC AQUATIC LIFE BENCHMARK (2021)

0.05ppb

TABLE 2: JEWETT BROOK WATERSHED
(06/06/16)

<u>COMPOUND</u>	<u>EPA BENCHMARK</u> (ppb, chronic/acute)	<u>TILE DRAIN #8*</u>	<u>JEWETT BROOK #1</u>
• ATRAZINE	< 1.0/4.6	37 ug/L	114 ug/L
• METOLACHLOR	1.0/8.0	31 ug/L	64 ug/L
• CLOTHIANIDIN	0.05/11	4.2 ug/L	0.49 ug/L
• THIAMETHOXAM	0.74/17.5	1.3 ug/L	1.1 ug/L
• NITRATE-N:		32 mg/L	17 mg/L
• TOTAL-P:		57 ug/L	420 ug/L

*TILE #8 FLOW = **294** L/minute

NEONICS USED ON TREATED CORN

CONCERN GROWING WORLDWIDE ABOUT
“NON-TARGET” EFFECTS OF NEONICOTINOID
INSECTICIDES.

RESEARCH ON NEONIC EFFECTS ON INVERTEBRATES: (AT LEVELS EXPECTED FROM ROUTINE USE)

- ACUTE EFFECTS ON HONEYBEES
- ***CHRONIC EFFECTS ON HONEYBEE PHYSIOLOGY AND BEHAVIOR***
- CHRONIC EFFECTS ON WILD BEES AND OTHER POLLINATORS
- MOST TOXIC OF 24 INSECTICIDES TO EARTHWORMS
- MAY POSE RISK TO EARTHWORMS AFTER ONE APPLICATION
- “Chronic effects of an environmentally-relevant, short-term neonicotinoid insecticide pulse on four aquatic invertebrates” (2018)

RESEARCH ON SECONDARY NEONIC EFFECTS ON WILDLIFE:

- “The Impact of the Nation’s Most Widely Used Insecticides on Birds”(2013)
- ***“Increasing neonicotinoid use and the declining butterfly fauna of lowland California” (2016)***
- “Are neonicotinoid insecticides driving declines of widespread butterflies?” (2015)
- “Contamination of wild plants near neonicotinoid seed-treated crops, and implications for non-target invertebrates” (2016)
- “Effects of neonicotinoids and fipronil on non-target invertebrates” (2015)
- Slugs are tolerant to neonics, but their bodies become toxic to predators, therefore fewer predators.
- ***“Neonicotinoids in excretion product of phloem-feeding insects kill beneficial insects” (2019)***

WORLDWIDE CONCERN OF NEONIC EFFECTS ON BIODIVERSITY, FOOD WEBS, etc.:

- “Residues of currently used pesticides in soils and earthworms: A silent threat?” (2021)
- “An update of the Worldwide Integrated Assessment (WIA) on systemic insecticides. Part 2: impacts on organisms and ecosystems” (2021)
- “Literature Review: Global Neonicotinoid Insecticide Occurrence in Aquatic Environments” (2020)
- ***“Call to Restrict Neonicotinoids” (call for worldwide ban) in the Journal SCIENCE. Signed by 233 scientists worldwide. (2018)***

WORLDWIDE CONCERN OF NEONIC EFFECTS ON BIODIVERSITY, FOOD WEBS, etc.:

(cont.)

- “Neonicotinoids pose undocumented threats to food webs” (2020)
- “***Neonicotinoids disrupt aquatic food webs and decrease fishery yields***” (2019)
- “Risks of large-scale use of systemic insecticides to ecosystem functioning and services” (2015)
- “Declines in insectivorous birds are associated with high neonicotinoid concentrations” (2014)
- “Environmental Risks and Challenges Associated with Neonicotinoid Insecticides” (2018)

WORK STARTING ON HOW TO REPLACE OUR CURRENT ADDICTION TO NEONICS

- “Alternatives to neonicotinoids” (2019)
- Alternatives to neonicotinoid insecticides for pest control: case studies in agriculture and forestry (2015)
- ***An update of the Worldwide Integrated Assessment (WIA) on systemic insecticides. Part 3: alternatives to systemic insecticides (2021)***
- An update of the Worldwide Integrated Assessment (WIA) on systemic pesticides. Part 4: Alternatives in major cropping systems (2021)

2021 BAYER ACCELERON BASIC 2021 SEED TREATMENTS FOR CORN:

INSECTICIDES: Metalaxyl and Clothianidin

FUNGICIDES: Prothioconazole and Fluaxastrobin

NEMATOCIDE: Bacillus firmus I-1582

2021 PIONEER CORN SEED TREATMENTS

FUNGICIDES: Ipconazole, Ethaboxam, and L-2012-R

INSECTICIDES: Chlorantraniprole, and Chlothianidin

NEMATOCIDE: Lumialza

BECK'S CORN SEED TREATMENT

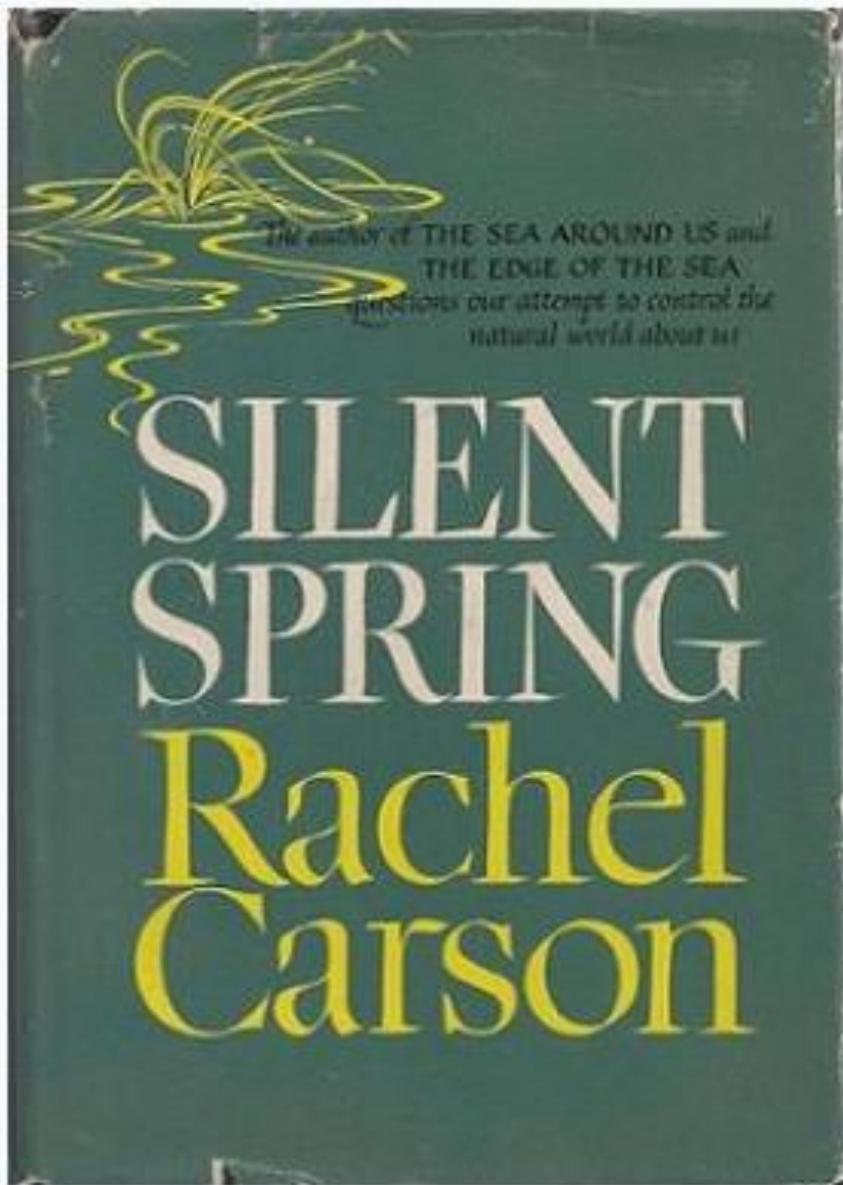
Beck's Escalate® with Nemasect® is an elite seed treatment comprised of 12 active ingredients that controls at least 16 different diseases, insects, and nematodes. That's more than any competitor's standard seed treatment package. New for 2021, we added a sixth fungicide for improved emergence and vigor under cold conditions.

12 MOAs	<ul style="list-style-type: none">▫ 6 Fungicides▫ 2 Insecticides▫ 2 Nematicides▫ 1 Bio-Stimulant▫ 1 Biological	<p>STANDARD, AT NO EXTRA COST.</p> <p>This seed treatment comes standard on every bag of Beck's seed corn. It includes Poncho®/VOTiVO® 2.0, a fluency agent and polymer for improved flowability and plantability, and Nemasect®, a broad spectrum nematicide with activity on many soil-dwelling insects.</p>
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DISEASES	
DAMPING OFF	✓
SEEDLING BLIGHTS	✓
PYTHIUM	✓
SURFACE & INTERNAL	✓

ADD IN ANNUAL USE OF GLYPHOSATE, ATRAZINE, AND OTHER HERBICIDES



The author of *THE SEA AROUND US* and
THE EDGE OF THE SEA
questions our attempt to control the
natural world about us

SILENT
SPRING
Rachel
Carson

Houghton Mifflin Company

CONCLUSIONS:

- USE OF NEONICS ON TREATED SEEDS IS **NOT** CONSISTENT WITH “INTEGRATED PEST MANAGEMENT” (IPM = use pesticides only when there is a demonstrated need)
- WIDESPREAD ‘**PROPHYLACTIC**’ USE OF NEONICS IS WIDELY BELIEVED TO BE ***HARMING WILD INSECT POPULATIONS, FOOD WEBS, BIODIVERSITY, AND ECOSYSTEM FUNCTION*** ACROSS THE WORLD

CURRENT PESTICIDE REGULATORY SCHEME IS NOT WORKING:

EPA: initiated special review of Atrazine in 1994, completed in 2006

EPA: initiated review of Neonics in 2008, completed in ????

VAAFM: initiated elimination of Chlorpyrifos in 2017, **completed in 2021.**

VAAFM PROPOSING TO REVISE PESTICIDE REGULATIONS IN 2021, **haven't been revised since 1991.**

LEGISLATIVE BILLS TO BAN INDIVIDUAL PESTICIDES DON'T WORK: doesn't address issue of overall pesticide use

AGRICULTURAL INNOVATION BOARD proposed to replace VPAC.

INTERNAL TO VAAFM

CONSISTS OF FARMERS, CROP CONSULTANTS, AND OTHERS WITH AGRICULTURAL EXPERTISE

NOT APPROPRIATE MEMBERSHIP FOR ADDRESSING PESTICIDE REGULATION ISSUES

BUT ASKED TO MAKE RECOMMENDATIONS ON: mosquito control, treated seeds, toxicity of pesticides.

PESTICIDES IN OUR ENVIRONMENT NEED TO BE ADDRESSED AT THE STATEWIDE LEVEL, NOT WITHIN AGRICULTURAL COMMUNITY

CONCEPT:

“AGRICULTURAL INNOVATION PROGRAM”

NEW PROGRAM TO BE HOUSED AT VERMONT TECHNICAL COLLEGE

JOINT PROGRAM BETWEEN UVM Extension AND VTC TO DO
RESEARCH, EDUCATION AND OUTREACH CONCERNING:

- WISE USE AND MINIMIZATION OF PESTICIDES STATEWIDE
- RESEARCH ON TRANSITION TO MORE RESILIENT, SUSTAINABLE AGRICULTURE
- TRAINING AND COURSEWORK ON 21ST CENTURY RESILIENT FARMING
- RESEARCH AND OUTREACH ON SOIL HEALTH, CARBON STORAGE, etc.

(not just agriculture!!!!)