

Farm practices and pollinators

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March 17, 2016



Farm practices that affect pollinators:

- Pesticide use: toxicity, timing, targets
- + Creating pollinator habitat in working fields
- + Maintaining pollinator habitat on other farm lands

The bad old days...



Putney VT 1960's

Pollinators can be exposed to pesticides when:

Crops or weeds are sprayed during bloom

Pesticides drift onto non-target plants (in or out of field)

Systemic pesticides are used on crops that bloom

Pollinators collect pesticide-contaminated water

Pesticide Label Statements are not that helpful

Toxicity Group	Precautionary Statement if Extended Residual Toxicity is Displayed	Precautionary Statement if Extended Residual Toxicity is not Displayed
I Product contains any active ingredient with an acute LD50 of 2 micrograms/bee or less	This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.	Product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds while bees are actively visiting treatment area.
II Product contains any active ingredient(s) with acute LD50 of greater than 2 micrograms/bee but less than 11 micrograms/bee.	This product is toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product if bees are visiting the treatment area.	This product is toxic to bees exposed to direct treatment. Do not apply this product while bees are actively visiting the treatment area.
III All others.	No bee caution required.	No bee caution required.

Estimating pesticide hazard to pollinators

Active ingredients vary in their pollinator toxicity

Pollinators exposed to many combinations of pesticides

Little knowledge of synergistic effects, non-lethal stresses

Most research done on honeybees, lacking info on others



gettyimages
Natalie Behring

What is the level of pesticides that bees are experiencing?

High Levels of Miticides and Agrochemicals in North American Apiaries: Implications for Honey Bee Health

C. A. Mullin, et al. 2010. PLoS ONE 5(3): e9754. doi:10.1371/journal.pone.0009754

Sampled bee hives in 23 states, fruits & vegetables, over 2 years

121 different pesticides found in 887 wax, pollen and bee samples

Pollen samples averaged 7.1 different pesticide residues each

60% of pollen and wax samples contained a systemic pesticide

Using a Hazard Quotient to Evaluate Pesticide Residues Detected in Pollen Trapped from Honey Bees (*Apis mellifera*) in Connecticut

Kimberly A. Stoner, Brian D. Eitzer. PLOS. 2013. DOI: 10.1371/journal.pone.0077550

Sampled pollen from apiaries in 5 locations in Connecticut

Urban, rural, and mixed agricultural sites, over 2 – 5 years

60 pesticides detected in 313 sample; PHQs calculated

Pollen Hazard Quotient = pesticide residue in pollen ÷ LD50

active Ingredient	% of samples (n=313)	type of pesticide	mean ppm
coumaphos (Agri-dust, etc.)	47	acaricide	5
carbaryl (Sevin, etc.)	41	insecticide	28
phosmet (Imidan, etc.)	33	insecticide	226
carbenzadim (Benomyl metabolite)	29	fungicide	50
atrazine (AAtrex)	27	herbicide	3
dithiopyr (Dimension)	18	herbicide	9
imidacloprid (Admire, etc.)	12	insecticide	5

	# detections (n=313)	PHQ > 50	PHQ > 500	LD50 basis
phosmet	103	24	9	contact
imidacloprid	38	38	21	oral
chlorpyrifos	14	23	4	contact
carbaryl	127	14	0	contact
fenthion	16	8	1	contact

A PHQ > 500 would be approximately equivalent to consuming 0.5% of the LD50 per day

**IF YOU FIND YOURSELF
IN A HOLE,
THE FIRST THING TO DO
IS STOP DIGGING.**

– WILL ROGERS



Agroecological Strategies to Enhance On-Farm Insect Pollinators

www.sare.org/Learning-Center/Books/Manage-Insects-on-Your-Farm/Text-Version/Recent-Advances-in-Ecological-Pest-Management/Agroecological-Strategies-to-Enhance-On-Farm-Insect-Pollinators

While Managing Crops

- Less insecticide use
- Pesticide risk mitigation (e.g., control spray drift)
- Organic production

Within the Field

- Some flowering weeds
- Flowering cover crops
- Intercropping cash crops with insectary plants
- Reduced tillage (to protect ground-nesting bees)

On the Field Edge

- Reduced mowing and herbicides on non-crop areas
- Restored hedgerows
- Native wildflower meadows
- Large conservation easements



CONTENTS

INTRODUCTION

BASIC POLLINATOR ECOLOGY 2

OTHER BENEFICIAL INSECTS 2

**COVER CROPS ON
YOUR FARM 3**

OPPORTUNITIES TO USE
COVER CROPS 4

PLANTING AND MANAGING
YOUR COVER CROPS 5

PLANT SELECTION 6

COVER CROP COCKTAILS 7

COMMON AND SUGGESTED
ROTATIONS 7

**BALANCING INSECT
CONSERVATION WITH
USDA CROP INSURANCE
RULES 9**

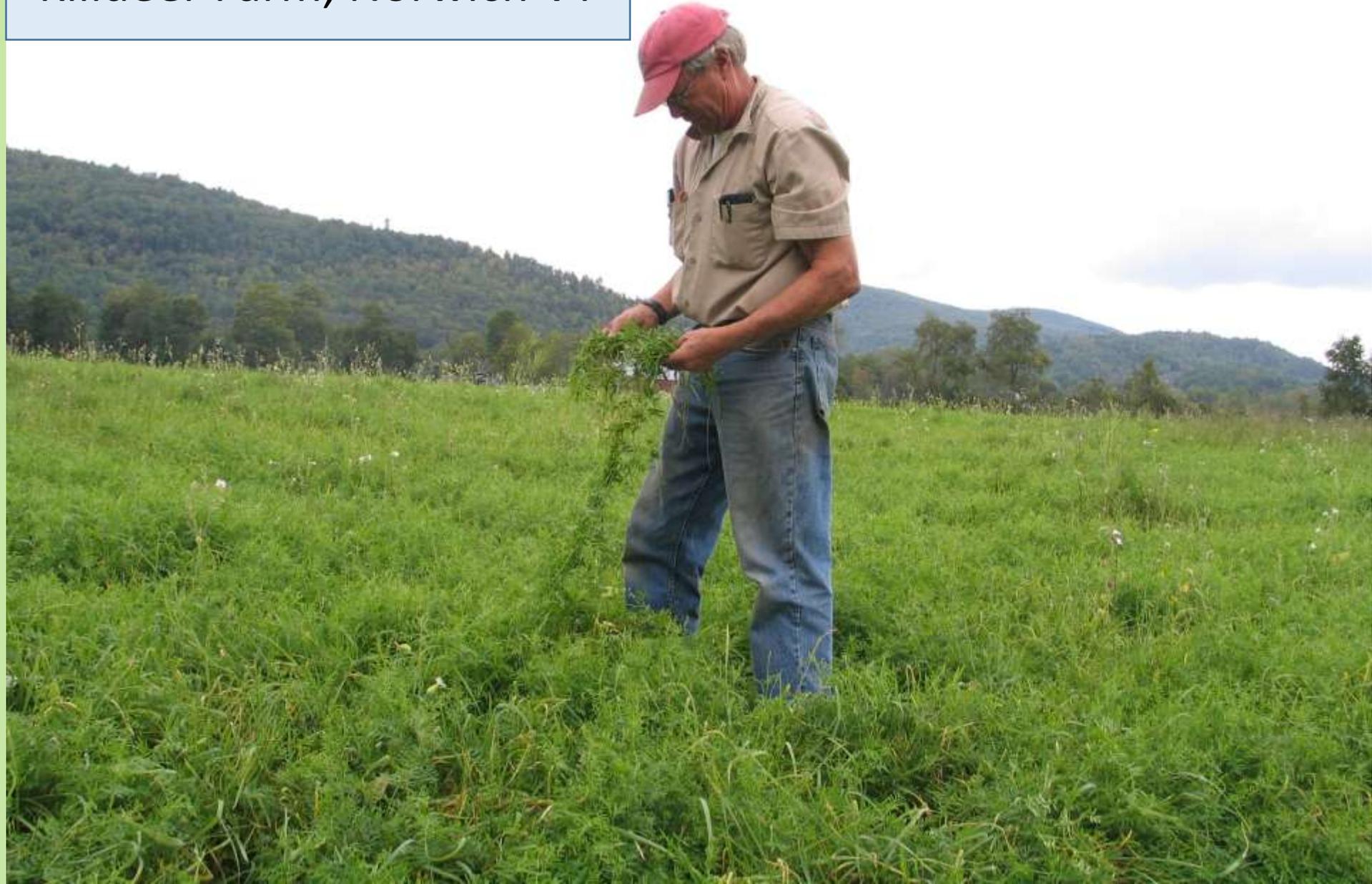
TABLE: RELATIVE VALUE OF
COVER CROP SPECIES TO BEES
AND OTHER BENEFICIAL INSECTS
10

Cover Cropping for Pollinators and Beneficial Insects



win-win-win:
pollinators – water quality – soil health

hairy vetch -winter annual
Killdeer Farm, Norwich VT



oats and field peas – spring cover
Marble Rose Farm, Middlebury VT



sweet clover, year-long fallow
River Berry Farm, Fairfax VT



white clover, intercrop strips
Edgewater Farm, Plainfield NH



organic 'no-till'
Hudak Farm, Swanton



Enhancing Nectar Production with Clover - Innovative Methods to Utilize White and Alsike Clover in VT Hay Fields

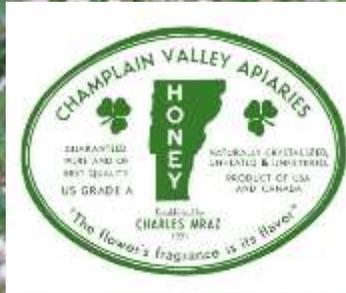
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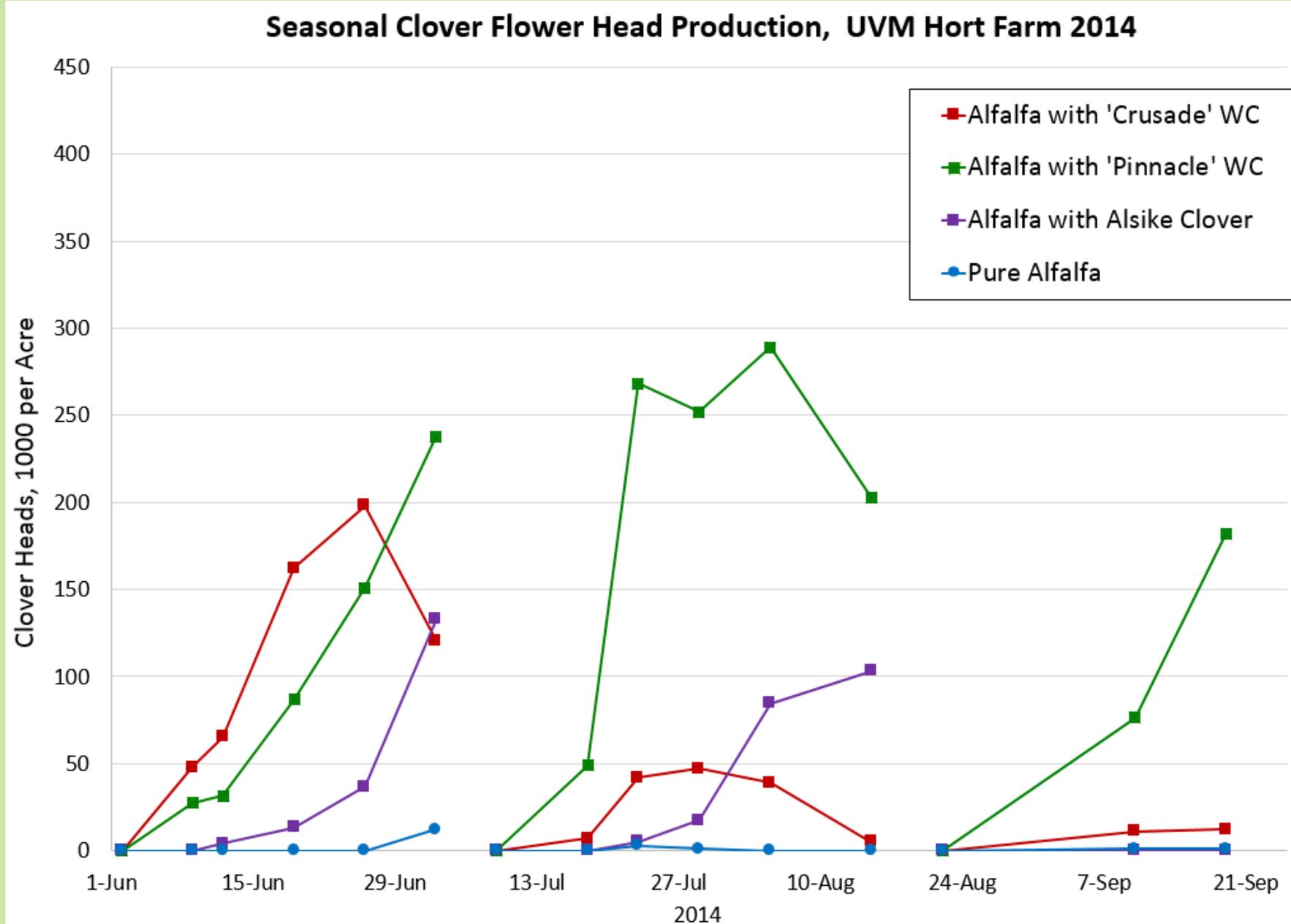
In the Champlain Valley today:

- Intense hay cutting results in little bloom of alfalfa, clover
- Large machinery quickly cuts vast acreage
- Legume hay has been replaced by pure stands of grass



Goal of project: incorporate clovers in hay crops to provide sustained flower production during the critical summer period without negatively affecting hay value.

Clover cultivars differ in flower production



Recommendations

Help farmers make good pesticide decisions:

fund more research and outreach about pollinator impacts.

Tighten up control of pollinator-hazardous pesticides:

for farmers, landscapers and especially homeowners.

Incentivize cover crops and hay crops that provide multiple benefits:

pollinators, erosion control, nutrient management, soil health.

Promote management of field edges and 'marginal' land:

for pollinators, and other ecosystem services (nesting birds, water quality...)