



Impacts of Systemic Pesticide Exposure On Bees: A Case Study from Nebraska That's Affecting Us All

Judy Wu-Smart
2024 Long Island Beekeepers

A little background...

BS in Zoology (Humboldt State Univ.) Arcata, California

-2005-6: Student Conservation Association (AmeriCorp) Intern
(USDA APHIS Fort Lauderdale, Florida)

-2007-10: MS (Washington State Univ.) *Pesticide residue accumulation in brood comb and potential impacts on colony development in honey bees*

-2010-15: PhD (Univ. Minnesota): *Neonicotinoid insecticide exposure on honey bee and bumble bee queens and effects on egg-laying behavior & inhibition of colony functions*

Started at UNL October 2015

University of Nebraska-Lincoln

Appointment: 50% Research 50% Extension



Research focus areas:

Bee stressors

Pesticides

Nutrition/landscapes

Pests & diseases

Better bee management

Judy Wu-Smart (2015)
Research & Extension

Autumn Smart (2019)
Research & Teaching

Meet the UNL Bee Team

Past and present graduate research students



Shelby Kittle
MS student



Rogan Tokach
MS 2022



Sheldon Brummel
MS 2021
GPMB coordinator



Courtney Brummel
MS 2021
GPMB technician



Bridget Gross
MS 2021

co-advised with D. Golick



Natalia Bjorklund
PhD 2020



Jennifer
Weisbrod
MS 2020



Kayla Mollet
MS 2019



Katie Lamke
MS 2019



Tuğçe Karaçoban
MS 2018



Surabhi
Vakil
PhD 2020

UNL Bee Team



Luke Norris
Apiary Manager



Daisy Warnick
GPMB coordinator



Isabelle Kratsville
Media technician

Undergraduate students:

Fiona Callahan

Erica Engel

Erik Strickland

Edward Rule

Shaylyn Miller

*Emily Cummings

*Shelby Kittle (2020 UCARE)

Madison King (2020 UCARE)

Madison Smart

Pauline Choo (2019 REEU intern)

Erica Maul (2019 REEU intern)

Hunter Brophy (2019 Cabela's intern)



Paige Meyers
2023 UCARE



Emma Knezevic
2023 UCARE



Whitney McDaniels
2019 UCARE



Paola Perez
2019 UCARE



Helen Little

Potential effects of pesticides vary

Acute Lethal Exposure

Direct effects



Individual Bee Deaths



Colonies of Bees

individual

colony

Chronic Sub-Lethal Exposure

Direct effects

&

Indirect effects

Behavior



Foraging

Learning

Memory

Orientation

Grooming

Development



Inability to grow

More susceptible to disease

Shorter lifespan

Reproduction



Improper mating

Reduced sperm viability

Reduced egg-laying

Queen/Drone development

Habitat



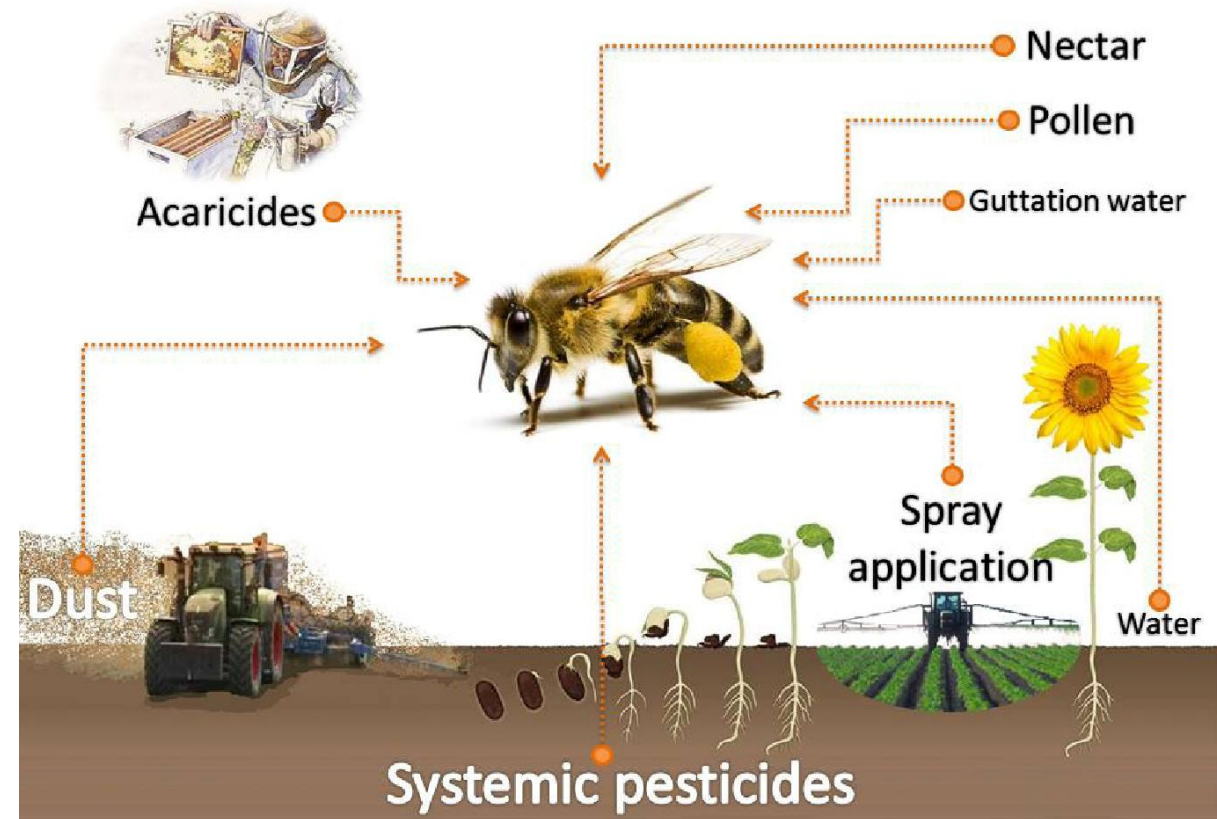
Reduced resource availability

Reduced diversity

Poor nutrition

Estimating pesticide risk is difficult

- **Risk** = probability that **exposure** to a **hazard** will result in harm
- **Hazard** = toxicity of active ingredient (LD50; LC50)
 - Note: some additives/formulations may exhibit toxicity to bees
(ex .Organosilicone surfactants (*Mullin et al. 2016*))
- **Exposure** = depends on:
 - Type (residues from air, water, plants)
 - Route: oral, contact, inhalation
 - Intensity, frequency, and duration



Neonicotinoids and Bees

Mode of action:

- chloronicotinyl nitroguanidine/cyanoamidine insecticides
- binds nicotinic acetylcholine receptors (nAChR)
- constant transmission = paralysis & death
- higher affinity = ↑ insect selectivity
- systemic action: translocates to all parts of the plant (nectar/pollen)

Active ingredient:

Imidacloprid

Clothianidin

Thiamethoxam

Dinotefuran

Thiacloprid

Acetamiprid

Trade Name(s)

Merit, Marathon, Provado, Admire

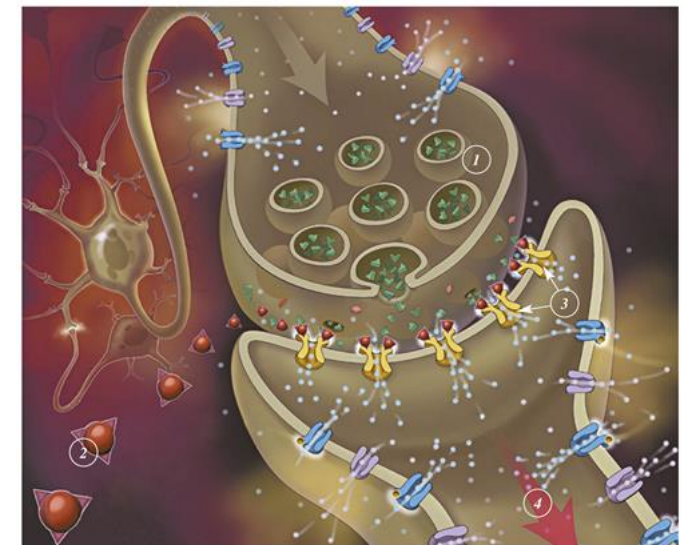
Poncho, Arena, Celero

Centric, Cruiser, Flagship

Safari, Starkle, Abarin

Calypso, Bariard, Destroyer....

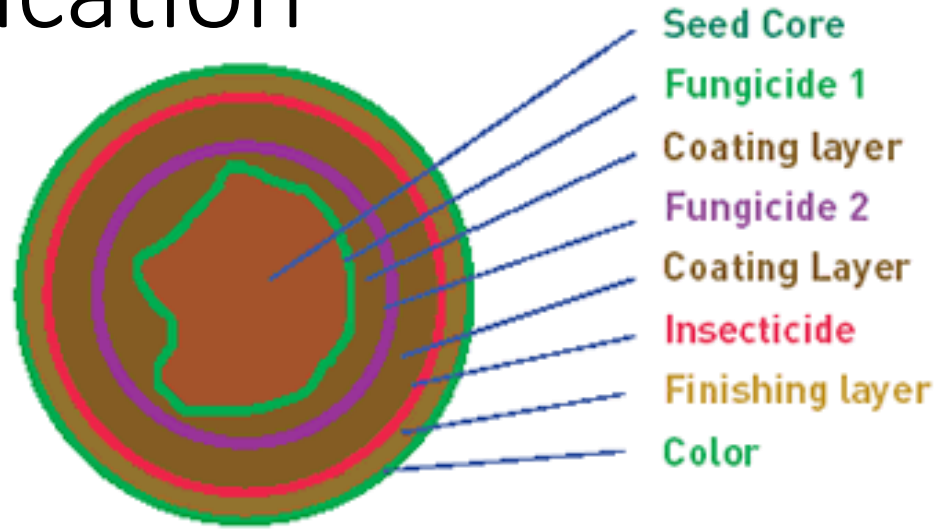
Transport, Assail, Chipco....



1 Vesicles of acetylcholine
2 Imidacloprid

3 Nicotinic receptors blocked open
4 Constant neuromuscular stimulation

Methods of application



Seed-treatments



Field dust



Foliar sprays



Soil drench



Trunk injection



Chemigation

Treatment

Foliar spray

Seed treatment

Soil injection

Lethal
to insects

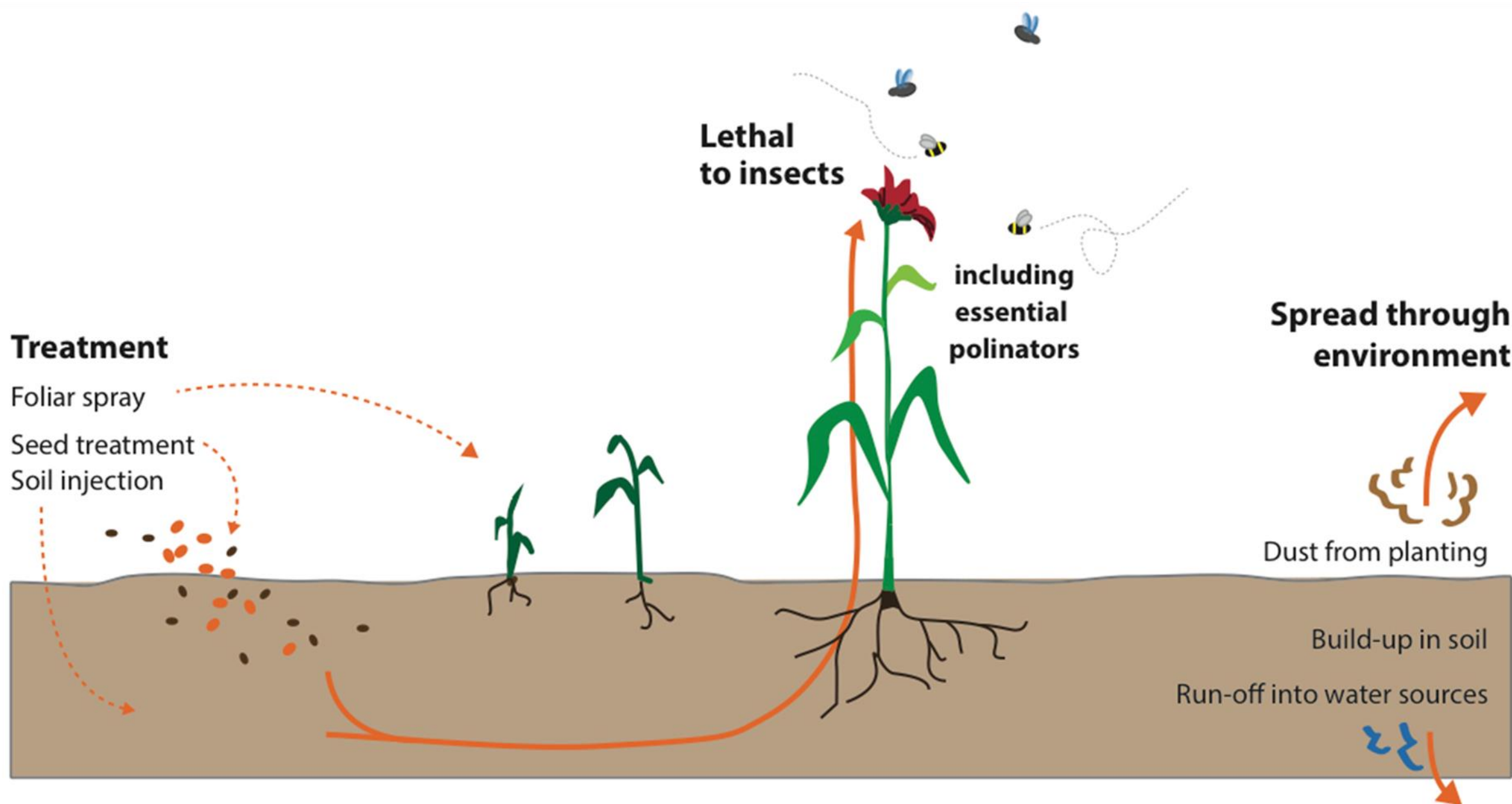
including
essential
pollinators

Spread through
environment

Dust from planting

Build-up in soil

Run-off into water sources



A pesticide doesn't have to outright kill a bee to harm the colony...



Treatment in video:

Imidacloprid @ 50 ppb

Fed 50 ml (1.6 fluid oz)
every other day

Sub-lethal impacts of
imidacloprid insecticide on
queen egg laying and
colony functions

Wu-Smart, J. & Spivak, M. 2016.
Scientific Reports 6 (32108)

Estimating risk is difficult

Challenges: Estimating “field-relevant” exposure is quite difficult

Where are bees getting exposed?



Are they bringing contaminants back to the hive?



Risk to individual bees will depend on role
(Rortais et al 2005).

Which bees consume pollen?

Potential effects of insecticides vary

Acute Lethal Exposure



Individual Bee Deaths



“Pesticide/Bee KILLS”

Chronic Sub-Lethal Exposure

“INCIDENTS”



Behavior



Foraging

Learning

Memory

Orientation

Development



Inability to grow

More susceptible to disease

Shorter

Reproduction



Improper mating

Reduced sperm viability

Reduced egg-laying

Queen/Drone development

Habitat



Reduced resource availability

Reduced diversity

Poor nutrition

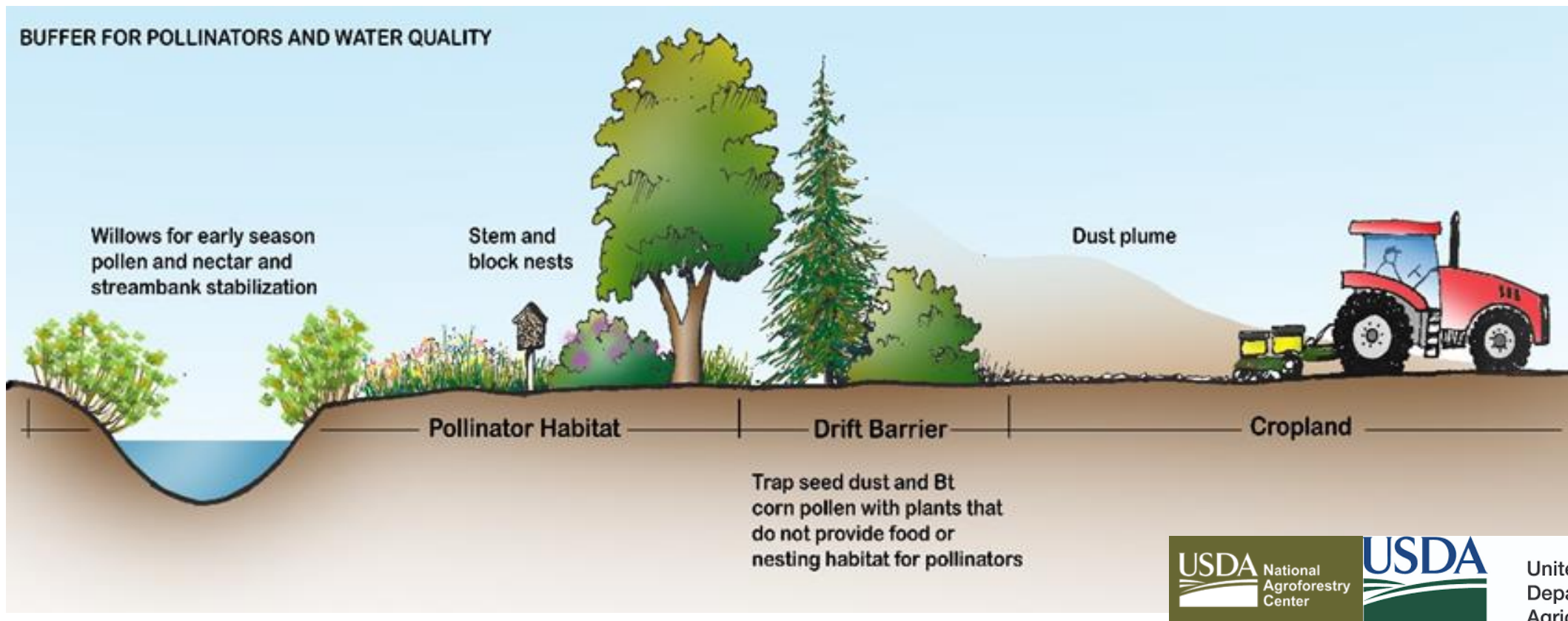
Landscape enhancements to reduce pesticide drift & increase forage for pollinators in agricultural fields

Drift from:

Neonicotinoid insecticides (Spring)

Bacillus thuringiensis (Bt toxins) embedded corn pollen (Fall)

Surabhi Vakil,
PhD student



Supported by the Nebraska Agricultural Experiment Station with funding from the Hatch Multistate Research capacity funding program (Accession Number 1011128) from the USDA National Institute of Food and Agriculture and the USDA National Agroforestry Center.

United States
Department of
Agriculture

National Institute
of Food and
Agriculture

Dr. Marion Ellis retired in 2013/14

I began in Fall of 2015

Spring 2017

4-6 colonies died out

Spring 2018

4 hives at 3 locations at ENREC

All 12 dead by end of summer

Summer 2019

Dead Bee Trap Study

Hive deployed in July (to avoid planting exposure)

All colonies dead again by fall

Spring 2020

Hives deployed May 12th shortly after planting

Trying to access time frame of when losses begin

Only 4 hives, due to previous losses



Collected on Monday, May 18, 2020



Tuesday, May 19, 2020



Integrated Pesticide Management for Beekeepers

Identifying ways to address pesticide-related issues

Goal:

- Empower beekeepers
- Monitor *proactively* for pesticide incidents (dead bee traps)
- Figure out what is happening
 - Seasonality of losses?
 - Duration of loss?
 - Rate of loss?
- Identify ways to mitigate pesticide impacts
 - comb replacement
 - apiary placement
 - protection plan (communication with landowners)
 - habitat enhancements



Rogan Tokach
MS student



Jennifer Weisbrod
Dead bee trap study
MS student (2018-19)

Spotty brood patterns
“crud” = signs of dying brood



Erratic movements, trembling, inability to right itself, brood with little jelly



Discolored, dying larvae





Bee losses and preliminary pesticide results indicate that there's high systemic pesticide pollution and leaching of contaminates into nearby plants

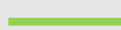
Milkweed plant leaves ~3,000 to 5,000+ ppb clothianidin

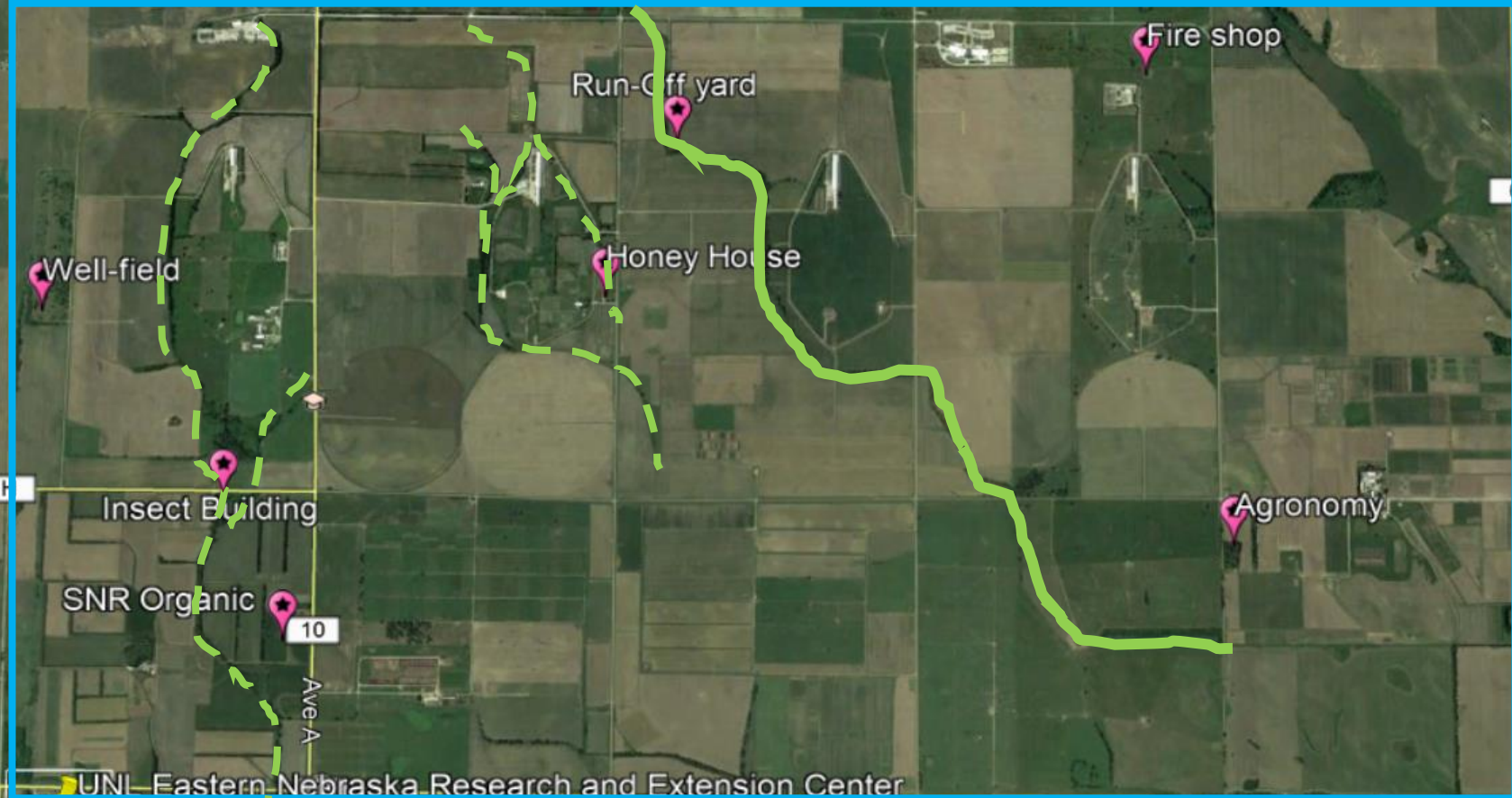
Results contested at first, reconfirm lab results

Highest levels closest to waterways





-  Ethanol Plant
-  ENREC property
-  Continuous stream
-  Intermittent/flood areas



Met with state and federal officials

Ethanol plant (AltEn)

~ 1.8 miles from Honey house
processing pesticide-treated seeds
to produce ethanol

© 2020 Google

7

Imagery Date: 6/4/2018 41°10'11.70" N 96°26'46.51" W elev

June 8th meeting with NDA and EPA officials

- Unable to assist in the investigations because farm applications ruled out!!!
- Would be better to have more hives on site
- Need to identify exposure pathway:
How did bees get exposed? to which compounds?
at what levels? and where?
- Multiple matrices would need to be tested
(bees, in-hive nectar & pollen stores, surrounding water & soil, nectar/pollen forage sources from multiple locations)
- Seasonal considerations (Pre/Post rain events?)

Table 2: List of UNL, NDA, and EPA officials on the initial conference call regarding beekills at ENREC (June 8, 2020)

UNL	Email
Mark Schroeder	mark.schroeder@unl.edu
John Ruberson	jruberson2@unl.edu
Douglas Zalesky	dzalesky2@unl.edu
NE Department of Ag	
Tim Creger	tim.creger@nebraska.gov
Tammy Zimmerman	tammy.zimmerman@nebraska.gov
Buzz Vance	buzz.vance@nebraska.gov
Regional EPA (#7)	
Michael Daniels	daniels.michael@epa.gov
Jamie Green	Green.Jamie@epa.gov
National EPA	
Tom Steeger	Steeger.Thomas@epa.gov
Edwin Buckner	
Mike Martin	

And 3 days after our meeting, twelve additional strong hives were set out at additional locations around ENREC (1-3 miles away).



Within a week we begin observing high losses of newly placed hives at all ENREC sites



Total of 6 apiaries, 16 hives
1-3 miles away (South/SE of facility)
All dead by August/Sept

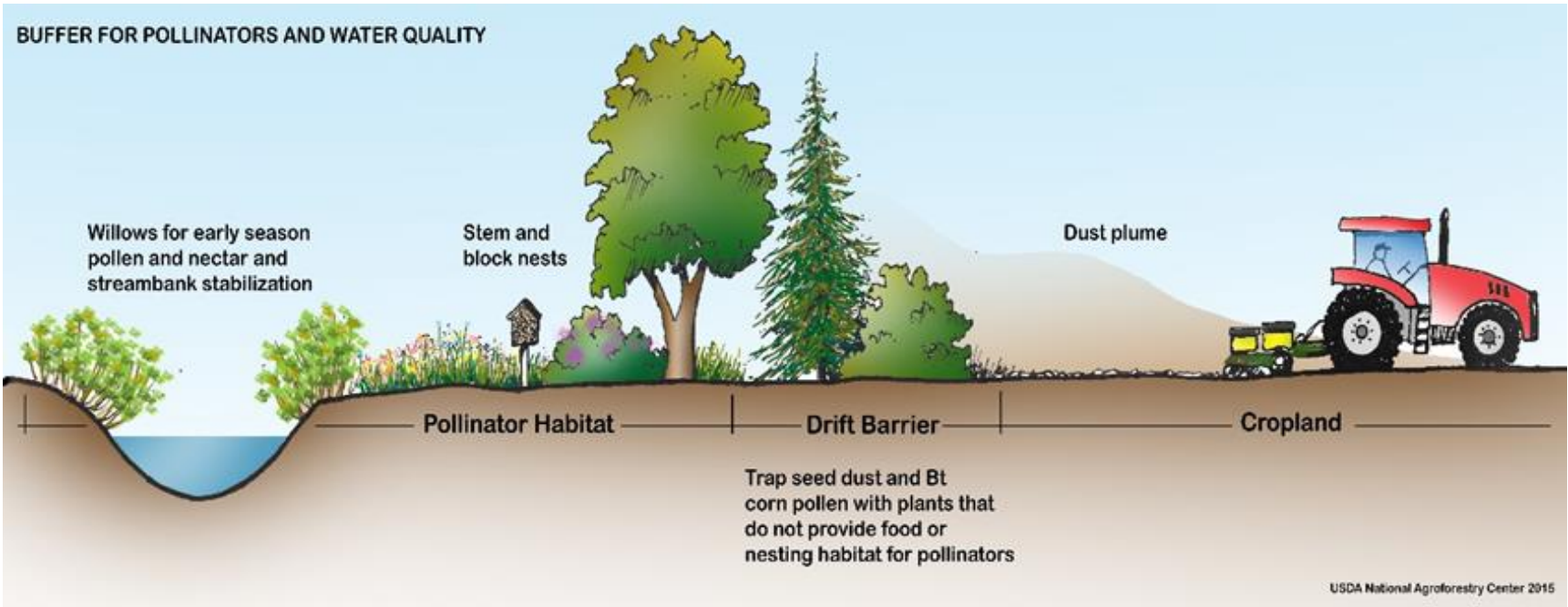


Low losses at all our other apiaries
East campus (Lincoln)
Stock seeds property (Murdock)
Loreal property (Omaha)
Private farm (Davey)
Kimmel Orchard (Nebraska City)

2018-2019
sticky trap samples



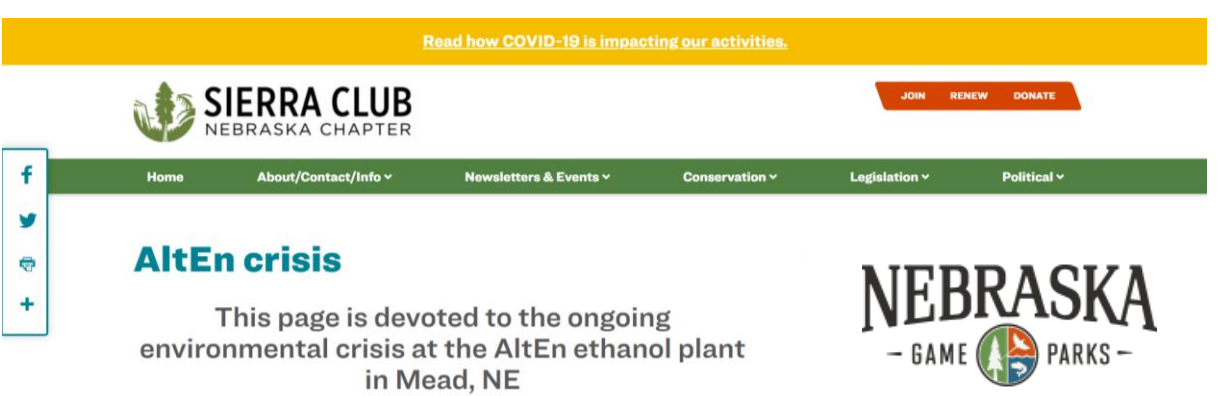
(Dan Snow: Water Science Lab)



Open space traps		Clothianidin (ppb)			Traps behind tree barriers		Clothianidin (ppb)		
Distance south of plant (miles)	# samples	ave	low	high	Distance south of plant (miles)	# samples	ave	low	high
0.94-0.98	7	214.32	1.27	520.64	1.1-1.2	3	10.22	0	30.35
1-1 -2.36	25	28.04	0.35	169.98	2.26-2.34	10	5.89	0.35	50.02
2.55-2.87	9	3.73	0.13	27.94	2.64-2.87	8	0.99	0.06	2.9

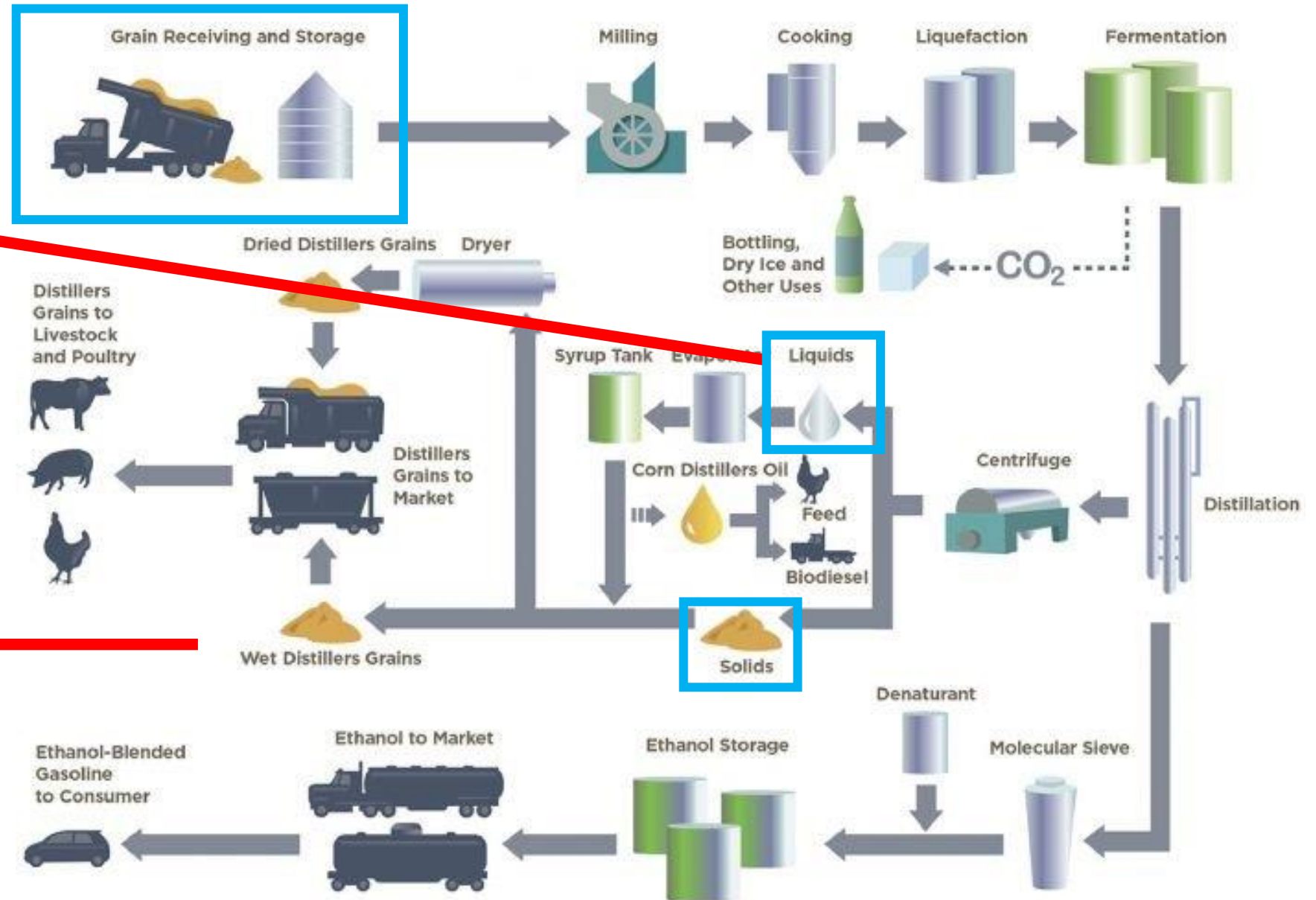
Know anything about treated seed disposal?

Is this happening anywhere else?



“Not waste but rather economically valuable byproducts...”

DRY MILL ETHANOL PROCESS



“Soil conditioners”

“Soil conditioners”



March 2020

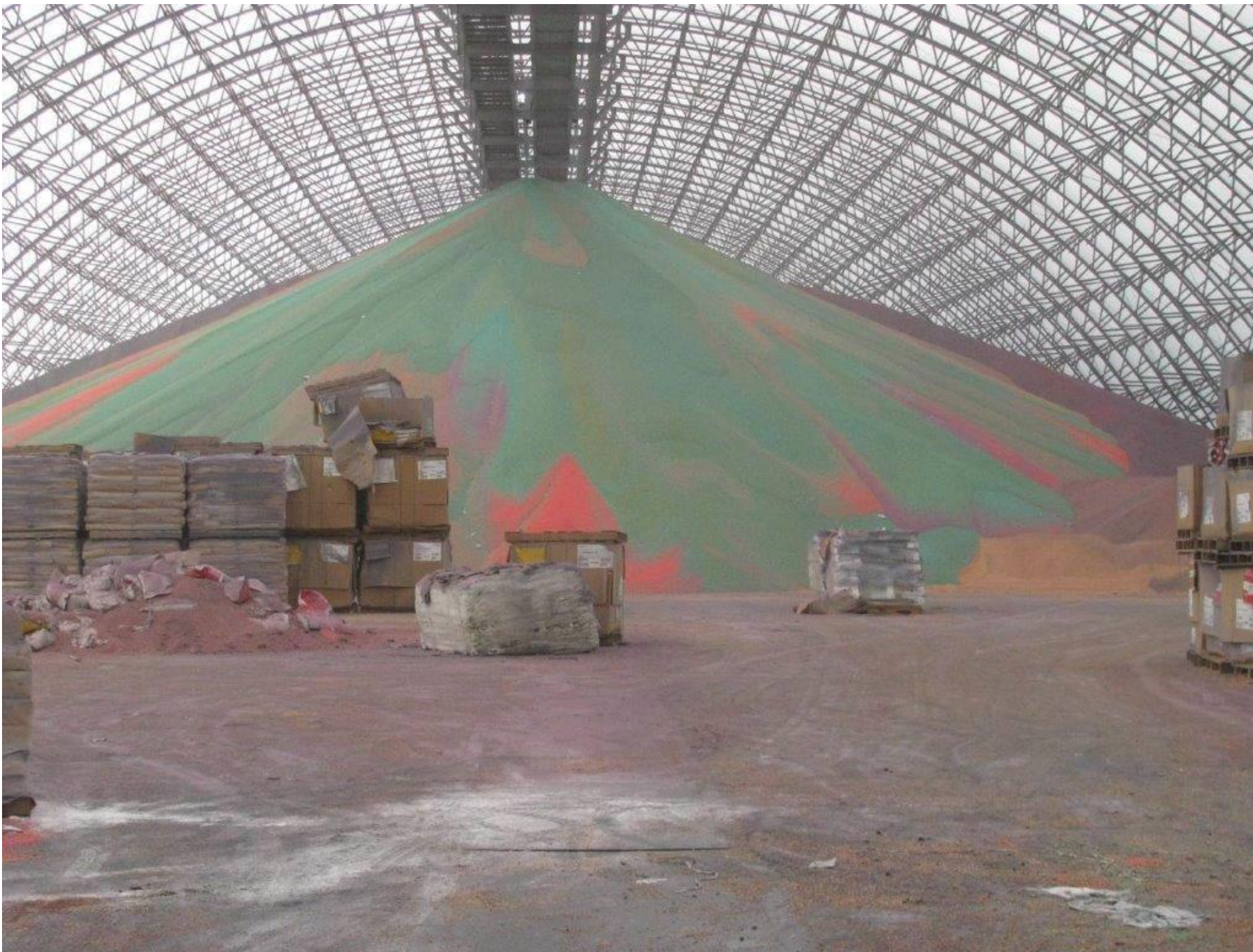


Surplus treated seeds no longer viable for market

Used as the primary carbohydrate source for ethanol production



NDA inspection photos 2019



Treated corn seeds older than 2 yrs are not sold

Other crop seeds & harvested grains also processed

Flooding 2019-2020 prevented corn planting in Midwest



~ 430 ft x 300 ft

March 2020



Wet distiller's grain
"wetcake" pile

Photo 6
Date Taken: February 1, 2021
Photographer: Hillary Stoll
Facility Name/Project Name: AltEn, LLC, Mead, NE
Facility IIS number/Project Identifier: IIS #84069, PCS NE0137634
Direction Facing: Southeast
Description: Influent pipe into the Northwest lagoon cell

Sampling Medium/Location	Chemical	Concentration (ppb)
Wastewater/West Lagoon	Clothianidin	58,400
	Imidacloprid	108
	Thiamethoxam	35,400
Wastewater/Overflow Lagoon	Clothianidin	44.7
	Thiamethoxam	26
Wet Cakes	Clothianidin	112,000
	Imidacloprid	485
	Thiamethoxam	30,500

Sampling Results (Oct. 8, 2019) (Excerpt- Attachment E; full text available through Nebraska Content Management Portal, <https://bit.ly/2UZkmwD>). These sampling results suggest that AltEn is collecting and processing large amounts of treated seed, concentrating neonics and other pesticides into waste materials that are stored on-site.

Photo taken in April 2020





Photo taken in July 2020

Pesticide contaminated wetcake (distiller's grain) byproduct piled up 7-9 ft high

No protective measures to prevent run-off or leaching of residues



Photo taken in July 2020



Photo taken March 2021



How does disposal of treated seed typically occur?

Researchers

State officials and policy experts

EPA, Regional EPA, former EPA folks

Not-for-profit groups, industry representatives

Wetcake byproduct marketed as soil conditioners





(Photos taken by NDA)

~ 33,400 tons (or 66,800,000 lbs) of wetcake soil amendments were distributed to local farms in 2018-2019

STOP Use Issued May 2019 “20 tons per acre as recommended would be 85 times higher than the maximum annual field load allowed by a typical registered pesticide label”

Toxicity & impacts of these chemical mixtures unknown

ANALYTE	FOUND
Acetamprid	ND ppb
Azoxystrobin	2,430 ppb
Bifenthrin	ND ppb
Chlorpyrifos-ethyl	ND ppb
Chlorpyrifos-methyl	ND ppb
5X Clothianidin	554,000 ppb
Cyfluthrin	ND ppb
Cypermethrin	ND ppb
Deltamethrin	ND ppb
Dimoxystrobin	ND ppb
Dinotefuron	ND ppb
Fludioxonil	2,940 ppb
Fluoxastrobin	35,400 ppb
Imidacloprid	309.00 ppb
Lambda-cyhalothrin	ND ppb
Metalaxyl	12,900 ppb
Nitenpyram	ND ppb
Orysastrobin	ND ppb
Permethrin	ND ppb
Picoxystrobin	ND ppb
Pyraclostrobin	ND ppb
Thiacloprid	ND ppb
Thiamethoxam	5,590 ppb

Several fungicides & herbicides also present

From: [REDACTED]
 Sent: Monday, August 3, 2020 12:02 PM
 To: [REDACTED]
 Subject: [REDACTED] Treated Seed Green Recycling at \$0.00 cost for Processing Corn- Wheat- Sorghum - Starches

2020 [REDACTED] Green Recycling Program for Corn – Wheat and Sorghum Seed

Greetings from [REDACTED] of Mead, NE. the Seeds industry's #1 choice for recycling treated and regulated seeds in North America.

[REDACTED] uses the discard to produce Ethanol and all by products are put thru an anaerobic digester and the by products are all land applied under State of Nebraska EPA permit and allowance by the USDA.

The 2020 [REDACTED] Corn- Wheat and Sorghum Seed Recycling Program is as follows:

[REDACTED] can use palletized unit bags seeds - palletized super sacked seeds and true bulk treated seeds - 44,000 lbs net required for all Van deliveries and 50,000 lbs net for all hopper deliveries. You can deliver as little as 1 pallet yourself to our plant in Mead, NE. for \$0.00 cost for process- you will need an [REDACTED] BCL and delivery date and time scheduled with our plant site.

[REDACTED] requires the grain to arrive in USDA #2 grader or better to ensure the starches in full strength in each seed recycled. Basically, the seed has to have stayed completely dry during its entire storage period. Any seeds delivered to [REDACTED] Mead, NE. that the starch is damaged will be dispose of the full expense of the seed producer that shipped the non-usable product to [REDACTED]. [REDACTED] will bill the producer for all labor – disposal freight and disposal fees payment due in 30 days from ship date.

[REDACTED] is charging \$00 for all seed processing delivered to Mead, NE. Contact [REDACTED] to get started. email: [REDACTED] [REDACTED] will do all the arranging and get shipping pricing to make the entire process of green recycling treated discard seed as easy as one phone call or email. [REDACTED] furnishes all BCLs need. If you want to deliver you discard yourself you will still need an AltEn BCL – and delivery date for our Mead, NE. plant site.

[REDACTED] is currently receiving nearly 98% of all the discard created by the seed industry in North America. We are under long term contract by all the Major producers as: Monsanto– Bayer- Syngenta- Dow AgReliant and Land O Lakes. We receive discard from at least another 100 producers across North America annually. [REDACTED] is now offering this very same program to every seed producer in North America - \$00 for seed processing deliver to Mead, NE.

2020 [REDACTED] - with Integrated Recycling offers Fee Based Disposal Programs for all other Treated, non-treated or regulated non-Ethanol producing seed; as Soybeans- Rye- barley, popcorn and all other.

If you have treated seed discard of any type Integrated Recycling Inc. can get the discard out of your facility and disposed of properly, timely, affordable, safely, and legally. IR can get you pricing on freight and fees prior to ship for your approval and [REDACTED]

Any questions please call [REDACTED] Thankyou for reading this email.

Email distributed to seed companies in **August 2020** soliciting more clients

Despite having 20+ notices of violations/warnings related to issues with:

- Air quality (odors and opacity)
- Wastewater containment
- Stockpiling of wetcakes without storm runoff protection
- Use of wetcakes as soil conditioners (Stop Use Issued 2019)
- Use of waste water as liquid soil conditioners (Stop Use Issued 2020)

2020 AltEn Green Recycling Program for Corn – Wheat and Sorghum Seed

Greetings from AltEn of Mead, NE. the Seeds industry's #1 choice for recycling treated and regulated seeds in North America.

AltEn uses the discard to produce Ethanol and all by products are put thru an anaerobic digester and the by products are all land applied under State of Nebraska EPA permit and allowance by the USDA.

“AltEn is currently receiving nearly 98% of all the discard created by the seed industry in North America. We are under long term contract by all the Major producers as: Monsanto– Bayer- Syngenta- Dow AgReliant and Land O Lakes. We receive discard from at least another 100 producers across North America annually. AltEn is now offering this very same program to every seed producer in North America - \$00 for seed processing deliver to Mead, NE.”

Mead residents have been complaining since 2017

Sep 14, 2018 · 🌐

UPDATE: I have submitted 20 complaints to the Senator so far. I have sent in 14 complaints to NDEQ one at a time, will send in more Monday, I didn't want to get flagged as spam, I have only 3 more to send in. There are more people out there unhappy and coughing and sick from this toxic emissions, now is the time to SPEAK OUT!!

I need your help. Working with our Senator and DEQ we need names of people who are adversely affected by the aroma coming from the composting at Alten. If you would give me your name and your issue with the odor I will turn it into the Senator. If you are not comfortable with your name on here please please pm me. We have a chance to help our community tag your friends, share this post!!

👍👎 13 70 Comments 4 Shares

It affects my sinuses & breathing, plus you can't hang cloths out to dry, or enjoy any type of out door fun. I've been,getting terrible headaches,which affects my sleep pattern and it just plain,stinks!

1y Love Reply 👍❤️👎 3

Thanks Sara!!!

1y Like Reply

Write a reply...

Came home from work and about puked when I opened the door to my car!!! Thanks Ethanol Plant!!

1y Like Reply 👍 2

Write a comment...

📷 🗣️ 📺 📄 📱 📧

It is really bad. Headaches and nausea, along with constant respiratory issues! Can't open the windows on nice days, don't want to walk the dogs when it's bad.

1y Love Reply 👍❤️👎 4

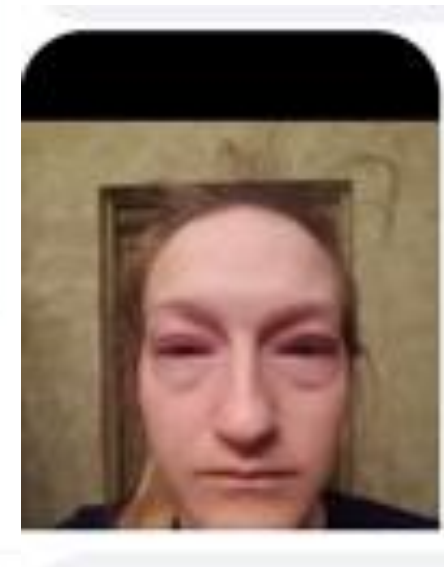
This is what Amanda's eyes looked like while that pile was on the field next to us. She went to the doctor and they said it was not pink eye. It was a reaction to something. After it was tilled into the field the swelling in her eyes went down and no problem since.

Write a comment...

📷 🗣️ 📺 📄 📱 📧

Write a comment...

📷 🗣️ 📺 📄 📱 📧



Are public health providers in area aware? Funding for pesticide testing? Healthcare services?

EARNINGS FEBRUARY 23, 2007 / 1:12 PM / UPDATED 15 YEARS AGO

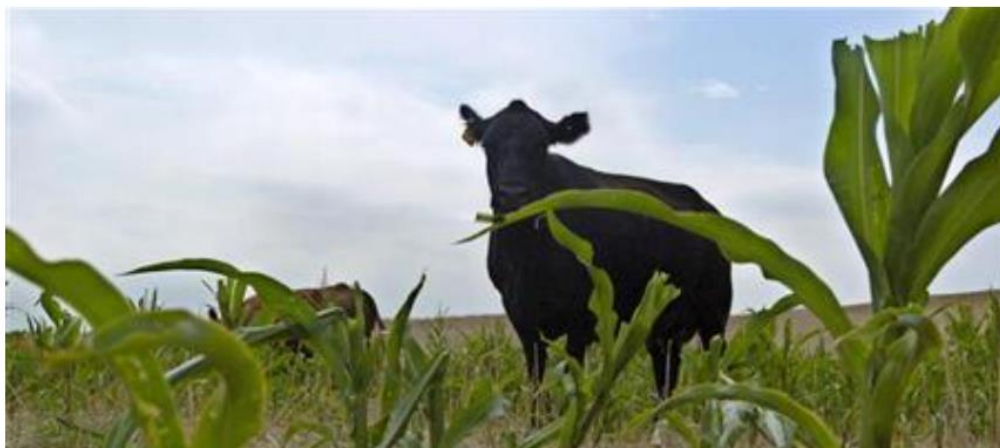
Dung power at ethanol plant

By Carey Gillam

5 MIN READ



MEAD, Nebraska (Reuters) - The frosty-breathed cattle jostling for position at a feeding trough in rural Nebraska are not quite as typical as they appear: their manure is being captured in a new bid to quench America's thirst for ethanol.



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Nebraska

'There's a red flag here': how an ethanol plant is dangerously polluting a US village

Situation in Mead, Nebraska, where AltEn has been processing seed coated with fungicides and insecticides, is a warning sign, experts say

Carey Gillam
@careygillam
Sun 10 Jan 2021 09:00 EST

f t e

A pesticide pile Mead, Nebraska. Photograph: Andy Wu-Smart

For the residents of Mead, Nebraska, the first sign of something amiss was the stench, the smell of something rotting. People reported eye and throat irritation and nosebleeds. Then colonies of bees started dying, birds and butterflies appeared disoriented and pet dogs grew ill, staggering about with dilated pupils.

There is no mystery as to the cause of the concerns in Mead: a firmine

2021

Jan 9: Guardian article reported this story

-Many local journalists followed up

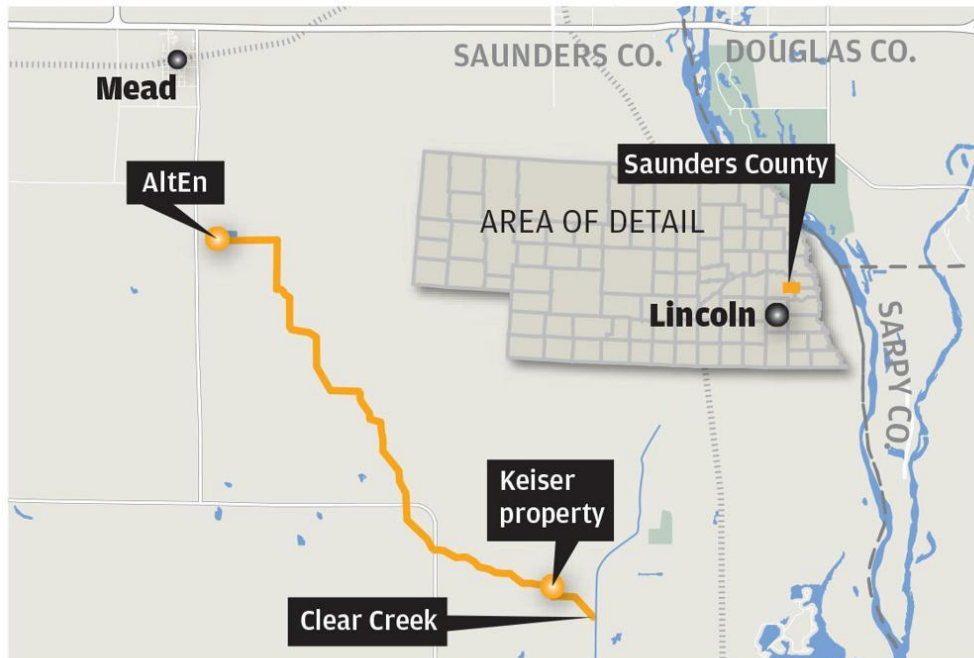
Feb 10: AltEn shut down due to outstanding violations

Mead AltEn Ethanol plant



Stormwater runoff path

Stormwater running off of pesticide-contaminated wet distiller's grains at AltEn flowed downstream 6 miles to Stan and Evelyn Keiser's property.



maps4news.com/@HERE, Lee Enterprises graphic

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Nebraska

'There's a red flag here': how an ethanol plant is dangerously polluting a US village

Situation in Mead, Nebraska, where AltEn has been processing seed coated with fungicides and insecticides, is a warning sign, experts say

Carey Gilliam
@careygilliam
Sun 10 Jan 2021 09:00 EST

f t e



A pesticide pile Mead, Nebraska. Photograph: Andy Wu-Smart

For the residents of Mead, Nebraska, the first sign of something amiss was the stench, the smell of something rotting. People reported eye and throat irritation and nosebleeds. Then colonies of bees started dying, birds and butterflies appeared disoriented and pet dogs grew ill, staggering about with dilated pupils.

There is no mystery as to the cause of the concerns in Mead: a famine



2021

Jan 9: Guardian article reported this story

-Many local journalists followed up

Feb 10: AltEn shut down due to outstanding violations

**Feb 17: Ruptured digester released 4 mil gallons of waste
~6+ miles downstream**



Estimating exposure is difficult

<10 20 40 60 80 100 200 400 800 1600+

Exposure rates (ppb): **Seed-applied** Agricultural Urban landscape

Application	Imidacloprid residue levels	Reference
Seed	0.6-1.9 ppb sunflower & corn (pollen); canola (nectar)	Schmuck et al. 2001 Bonmatin et al. 2005 Scott-Dupree & Spivak 2001
Soil	3-10 ppb purple tansy (nectar)	Wallner et al. 1999
Soil	15-27 ppb buckwheat (nectar)	Krischik et al. 2007
Water	30-80 ppb pumpkin (pollen); 4-12 ppb pumpkin (nectar)	Dively & Hooks 2010
Soil	27-850 ppb rhododendron (blossom)	Doering et al. 2004
Soil	1,038-2,816 ppb cornelian cherry (blossom)	Doering et al. 2005

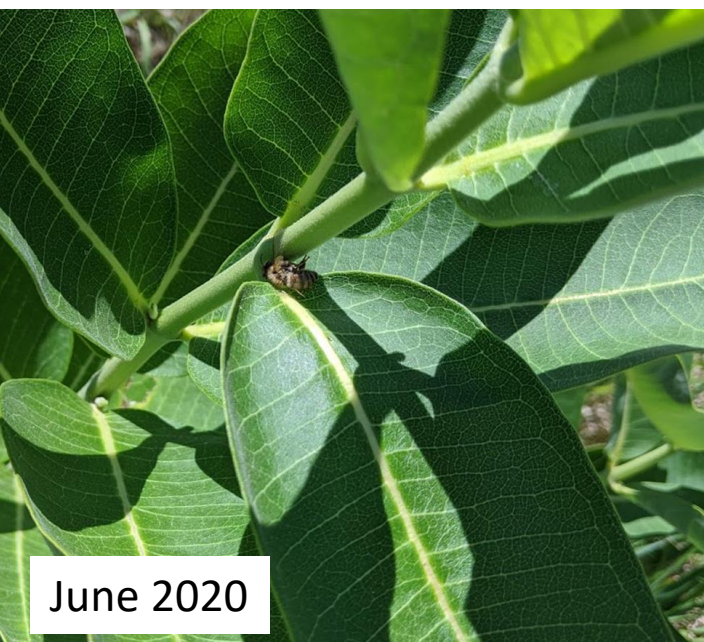


Milkweed leaves as high as 5000
ppb clothianidin

What's in nectar & pollen?



Dead water forager bee collecting
plant guttation from milkweeds



June 2020



Hive Setup

Pollen Trap

Weight scales



Dead Bee Traps



Persistence of residues in landscape?
Impacts of chronic exposure?

Clothianidin (ug/L or ppb)			
2020 Samples	high	average	n
Wildflowers	42.8	13.3	6
In-Hive Pollen	284.5	109.2	10
In-Hive Nectar/Honey	1.8	0.2	8



Pesticide levels in pollen stores

Category	Pesticide	Detects	%	High (ppb)	Low (ppb)	Mean (ppb)
Insecticide	Clothianidin	11	100	284.5	35.3	109.3
Insecticide	Thiamethoxam	11	100	50.9	8.0	25.6
Insecticide	Thymol*	2	18.2	719.0	250.0	484.5
Insecticide	Chlorantraniprole	10	90.9	44.5	2.6	20.6
Fungicide	Thiabendazole	10	90.9	19.9	4.0	10.8
Fungicide	Carbendazim	8	72.7	90.2	2.8	27.6
Fungicide	Azoxystrobin	3	27.3	10.7	2.7	6.6
Fungicide	Pyraclostrobin	4	36.4	30.3	9.9	16.2
Fungicide	Propiconazole	6	54.6	16.3	2.2	7.6
Fungicide	Tebuconazole	9	81.8	16.4	3.4	5.7
Fungicide	Picoxystrobin	2	18.2	25.2	9.3	17.2
Fungicide	Ipconazole	7	63.6	2.6	1.8	7.0
Fungicide	Fluoxastrobin	10	90.9	88.0	3.0	15.9
Fungicide	Metalaxyl	8	72.7	6.1	2.4	3.8
Fungicide	Trifoxystrobin	3	27.3	5.4	1.0	3.0
Herbicide	Atrazine	11	100	80.6	11.3	40.1
Herbicide	Metolachlor	10	90.9	145.5	5.1	38.9



Are there lingering environmental impacts on colony functions?

Rogan Tokach MS Student



2020 Christi Heintz Memorial Award Recipient
2022 PAm-Costco Scholar

Behaviors monitored



Rogan Tokach

Paint-marked bees introduced every 3 days

4 observation hives at each site

2 sites (treatments: ENREEC vs Kimmel Orchard (control farm))

4 reps (**2021-2022**) conducted after AltEn was shut down



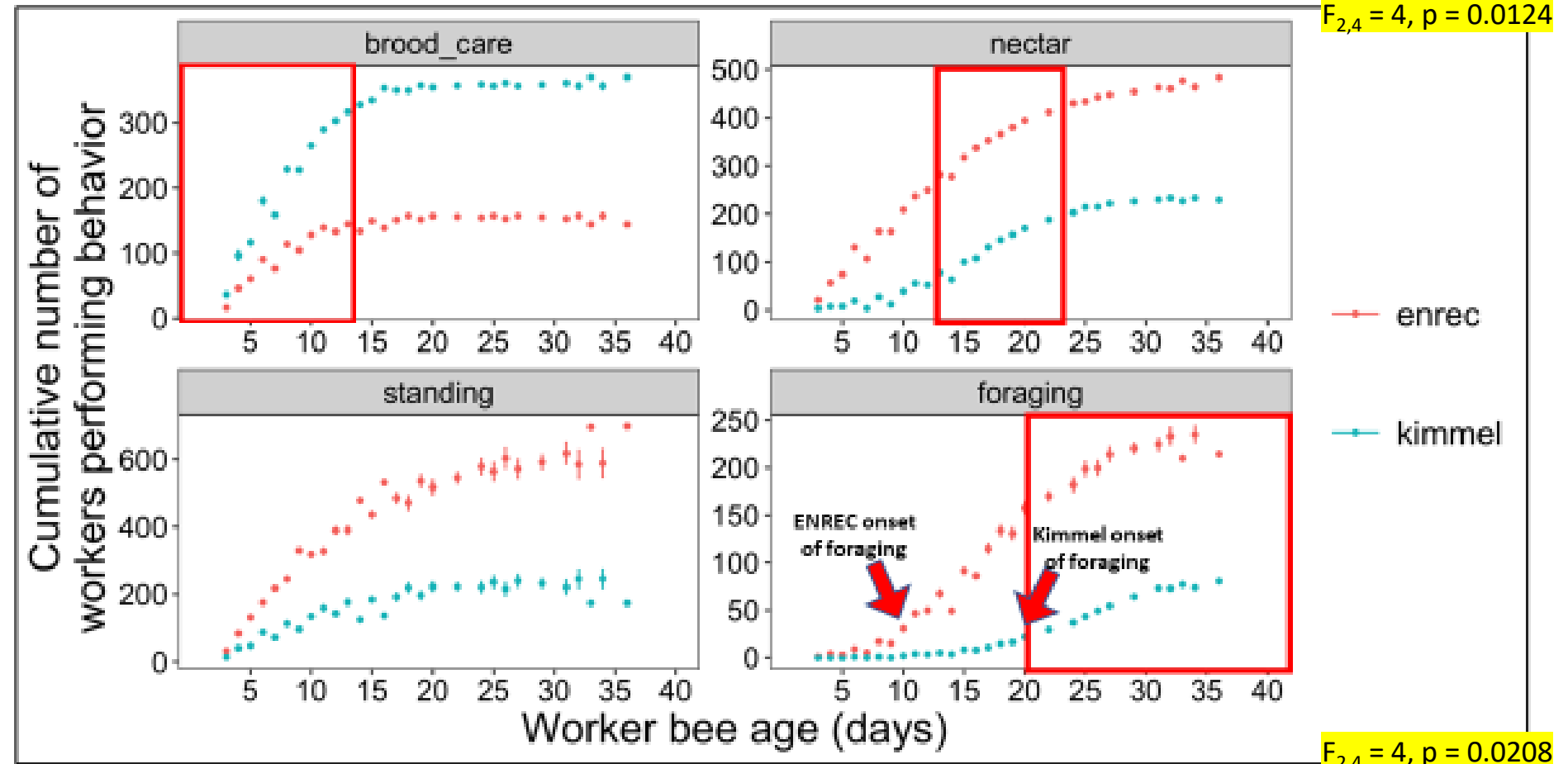
Nurse bee
3-12 days old



Nest bee
13-21 days old

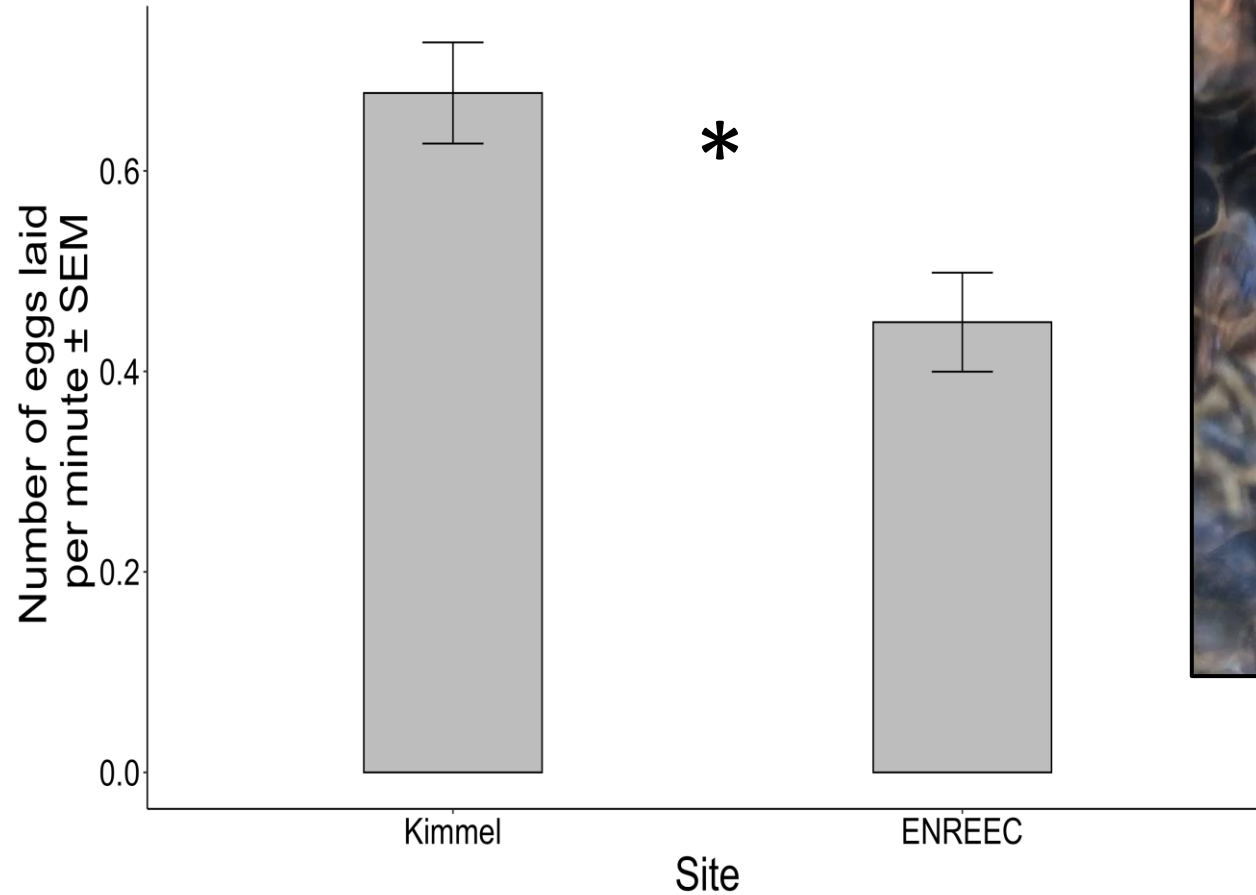


Forager bee
21+ days old



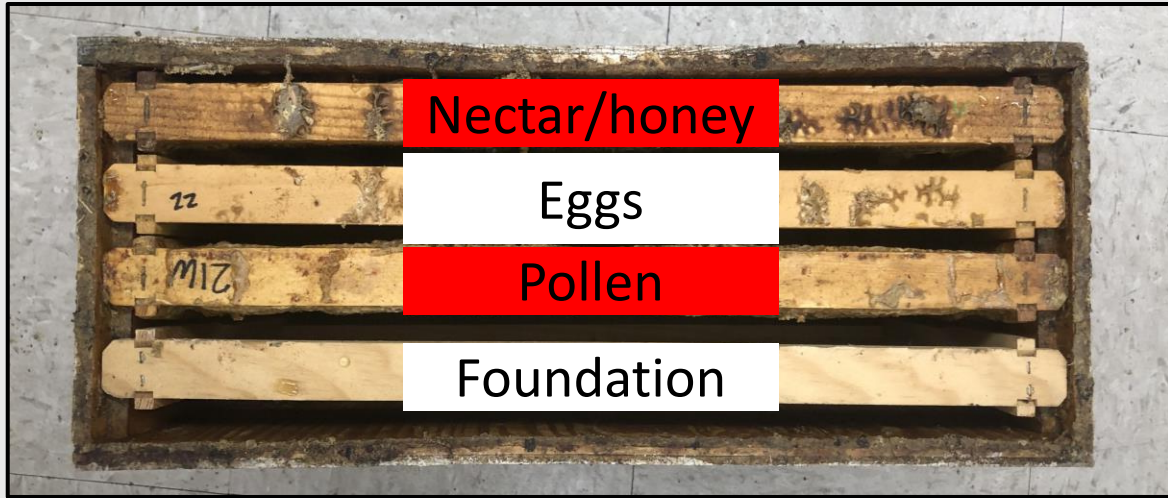
Critical hive behaviors were impacted

Impacted tasks: caring for offspring, food processing, foraging, and egg-laying

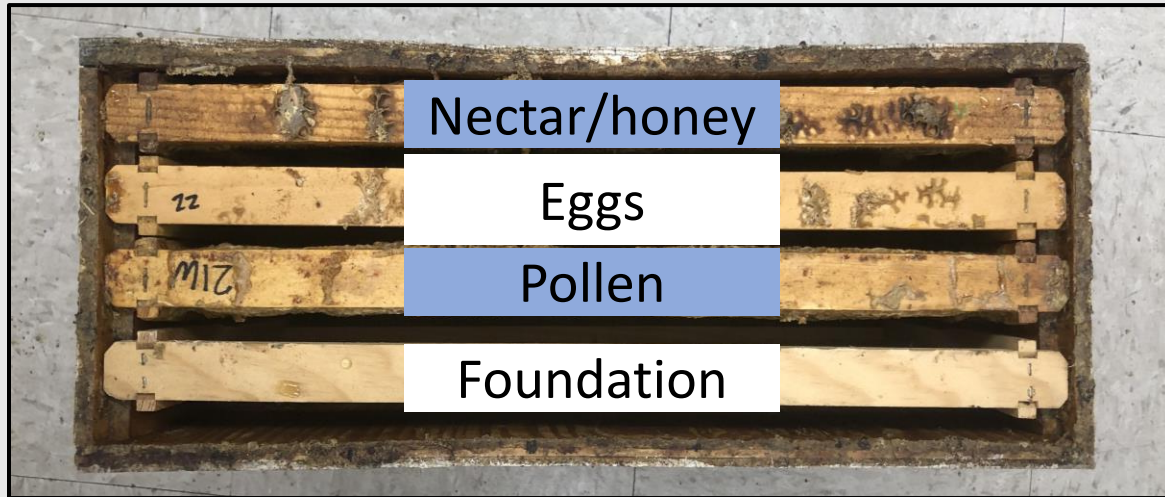


$$F_{1,3} = 10.49, p = 0.048$$

Queenless nucs with ~3,500 adult workers



Treatment colony with “contaminated” resources (n=52)



Control colony with “clean” resources (n=52)

Queen rearing capacity

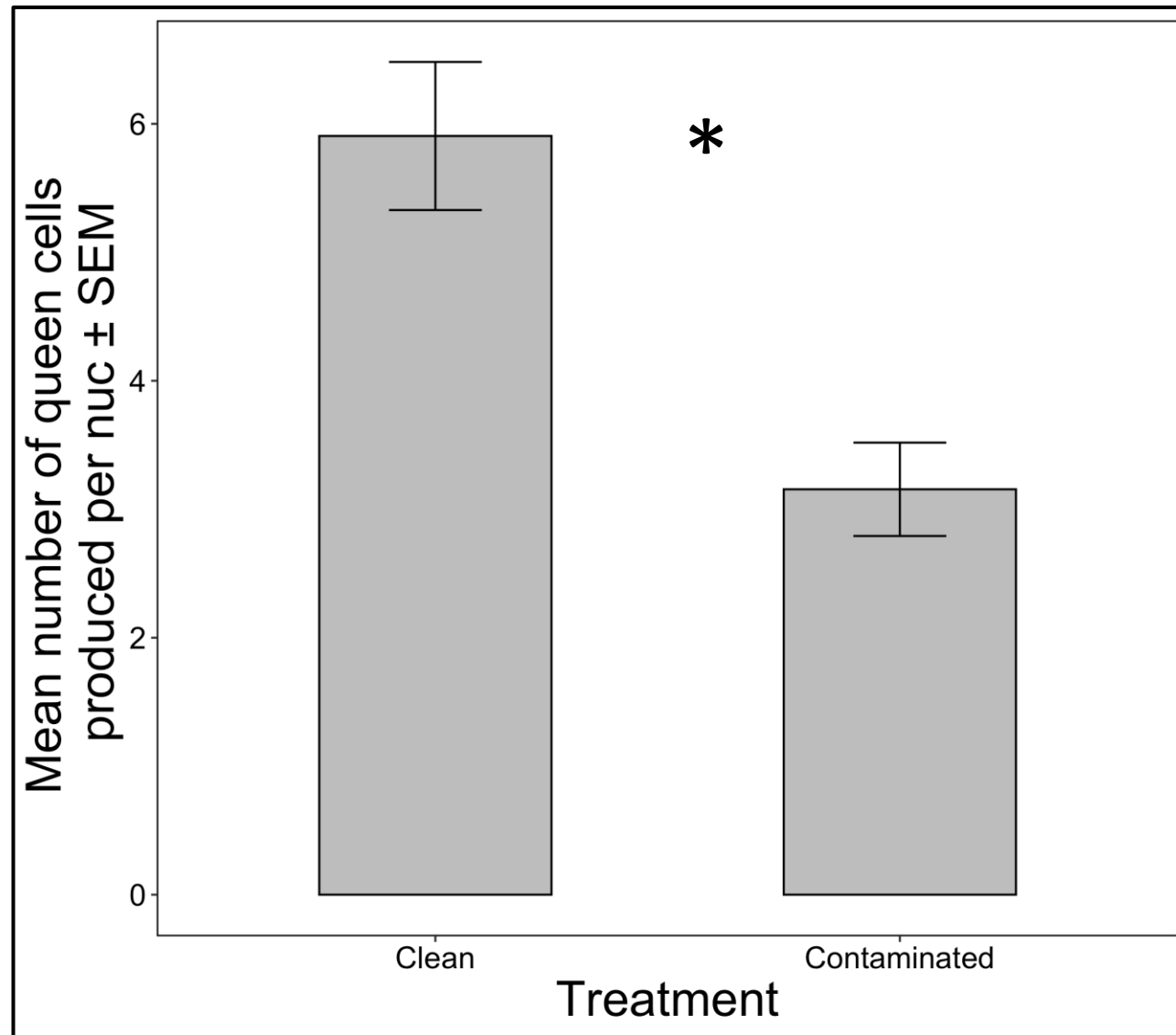


Queen cell production



Requeening success

Queen cells per nucleus colony



$F_{1,8} = 17.24; p < 0.01$

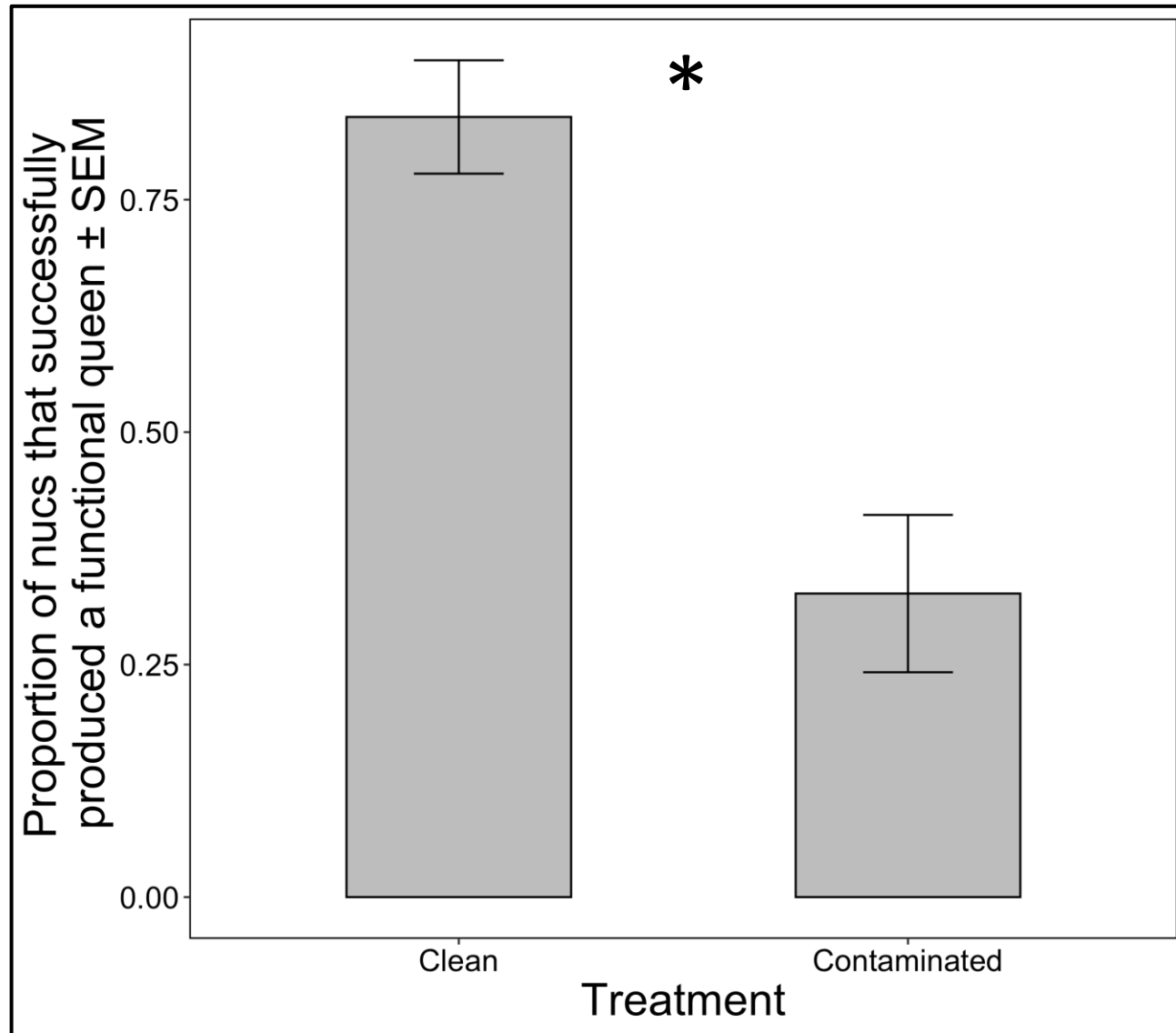


Healthy capped queen cell



Aborted queen cell

Functional queen production



$F_{1,8} = 19.05; p < 0.01$



Successful requeening events



Site	Replication Number									
	1		2		3		4		Total	
	Clean	Contaminated	Clean	Contaminated	Clean	Contaminated	Clean	Contaminated	Clean	Contaminated
ENREEC	N/A	N/A	3/4	1/4	3/4	1/4	4/4	3/4	10/12	5/12
Kimmel Orchard	5/8	3/8	4/4	1/4	3/4	0/4	4/4	1/4	16/20	5/20
Pollinator Garden	5/8	4/8	4/4	2/4	4/4	0/4	4/4	1/4	17/20	7/20
Total	10/16	7/16	11/12	4/12	10/12	1/12	12/12	5/12	43/52	17/52

Proportion of **clean** colonies to successfully requeen: **82.7%**

Proportion of **contaminated** colonies to successfully requeen: **32.7%**

$$F_{1,8} = 19.05; p < 0.01$$

High bee losses at apiaries near AltEn pollution

ENREC Fire shop apiary



ENREC Agronomy apiary



Weekly dead bee trap collection June 25, 2020

From 2017-2020:

- 54 hives across 6 apiaries
- 1-3 miles away (South/SE of facility)

100% mortality by Fall; **0% overwintering survival**

In 2021 (AltEn closed)

- 6 “contaminated” + 2 “control” apiaries
- **30% overwinter survival** (7 alive/23 total)

Low losses at all our other apiaries (Lincoln and Nebraska City)

Omaha apiary (North)



Lincoln apiary (South)



Weekly dead bee trap collection June 26, 2020

In 2022

- 28 new + 12 overwintered colonies
- 10 “contaminated” and 2 “control” apiaries
- **69% survival** (Fall 2022) (22 alive/32 total)
- **50% Overwinter survival** (16 alive/32 total)

From 2018-2022:

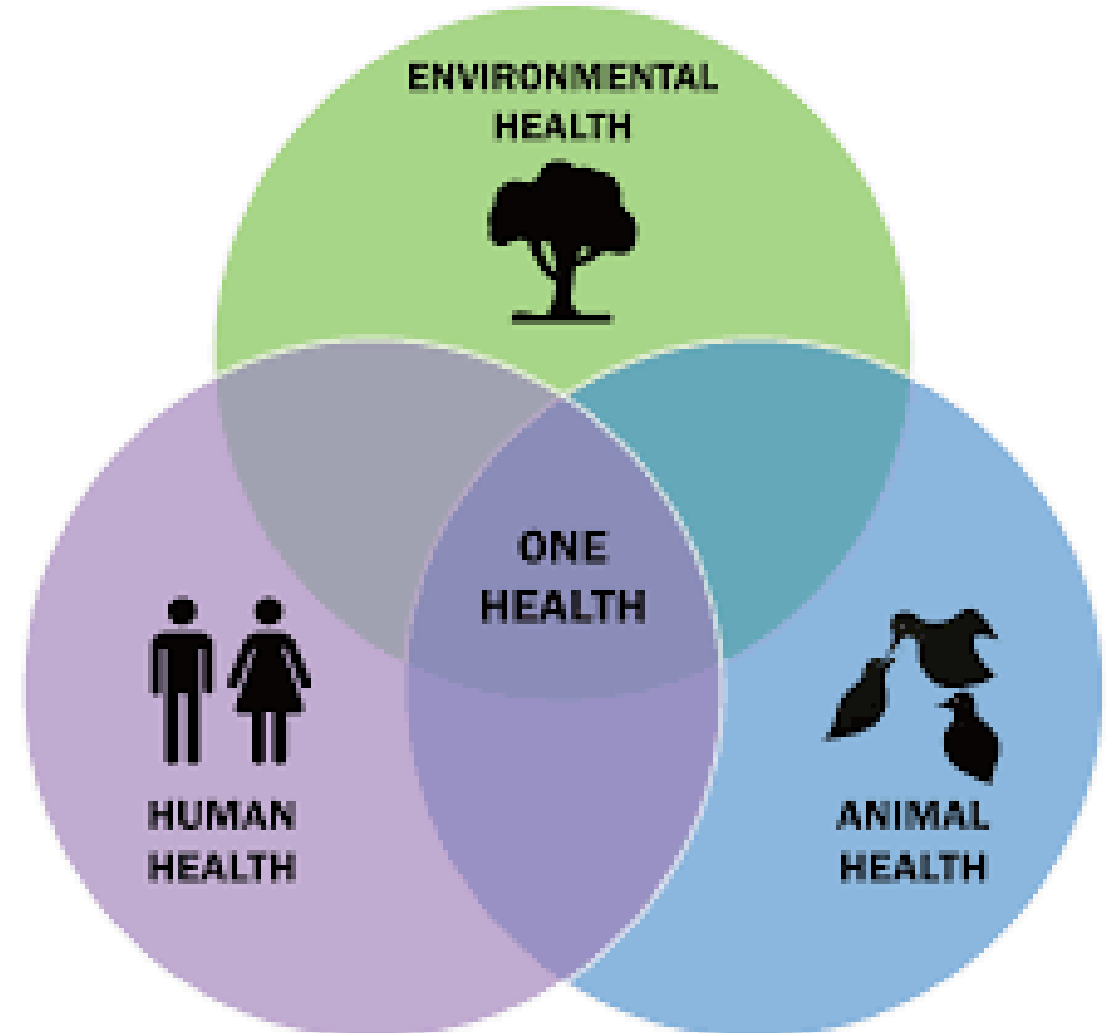
88% survival of control hives (28 alive/32 total)

Is the “Burden of Proof” too high?

- On beekeepers and researchers
- Costly, time sensitive, seasonal
- How much data is enough for action?
- No resources for beekeepers when it's not a misuse of a pesticide application (not under FIFRA)

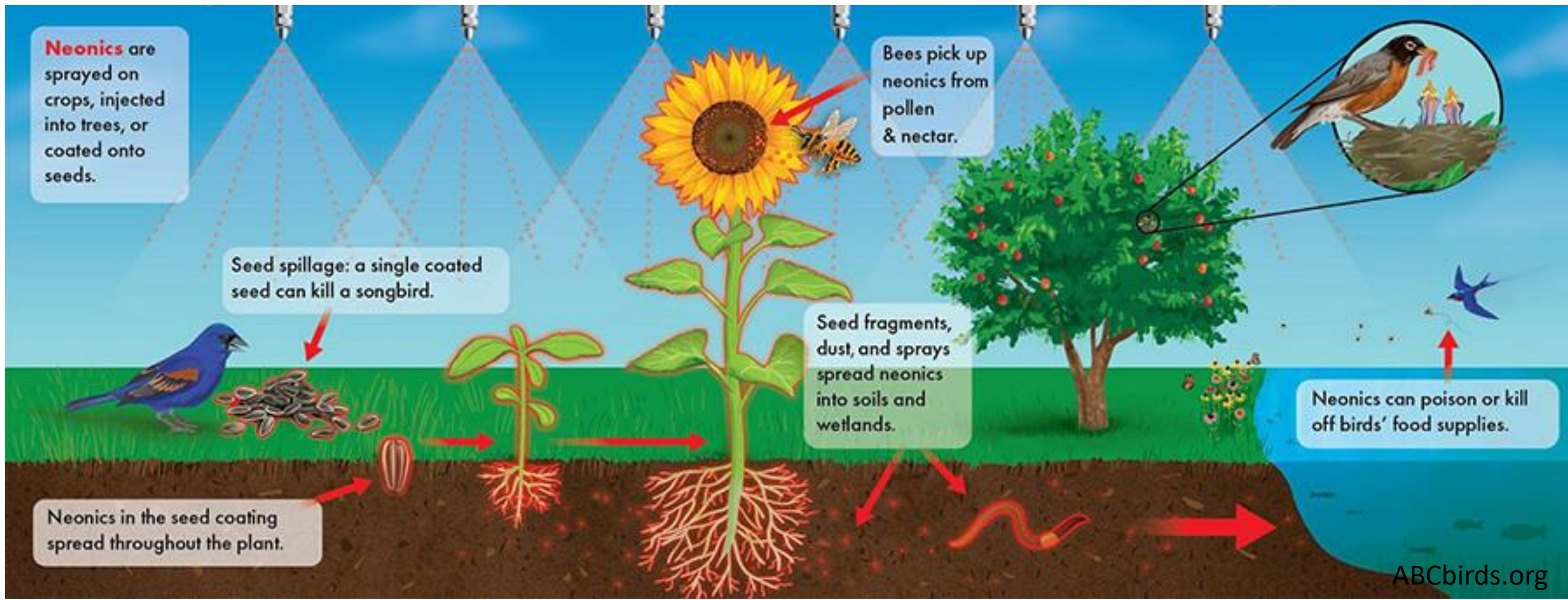


“One Health” approach for action



Systemic pesticide pollution: (neonicotinoids and several kinds of fungicides) may move from water into soil and through plants. Systemic pesticides may be expressed in leaves, nectar, and pollen, where wildlife may become exposed.

Despite decades of studies showing concerning levels of residues in nectar/pollen, **there's no regulatory division at EPA to address this kind of pollution** but internal discussions are occurring





How are the pesticide residues getting into waterways?

Soil application of liquid waste? Run-off from wetcake piles?



1

Culvert opening (facing south)

Snow melt from East wetcake pile

(Map sites A & B)



1

2



Barrier of dirt (~1-2 ft high) around wetcake pile to mitigate run-off.

March 12, 2021 (Pre-rain)

Culvert opening (at north end; red dot)



2

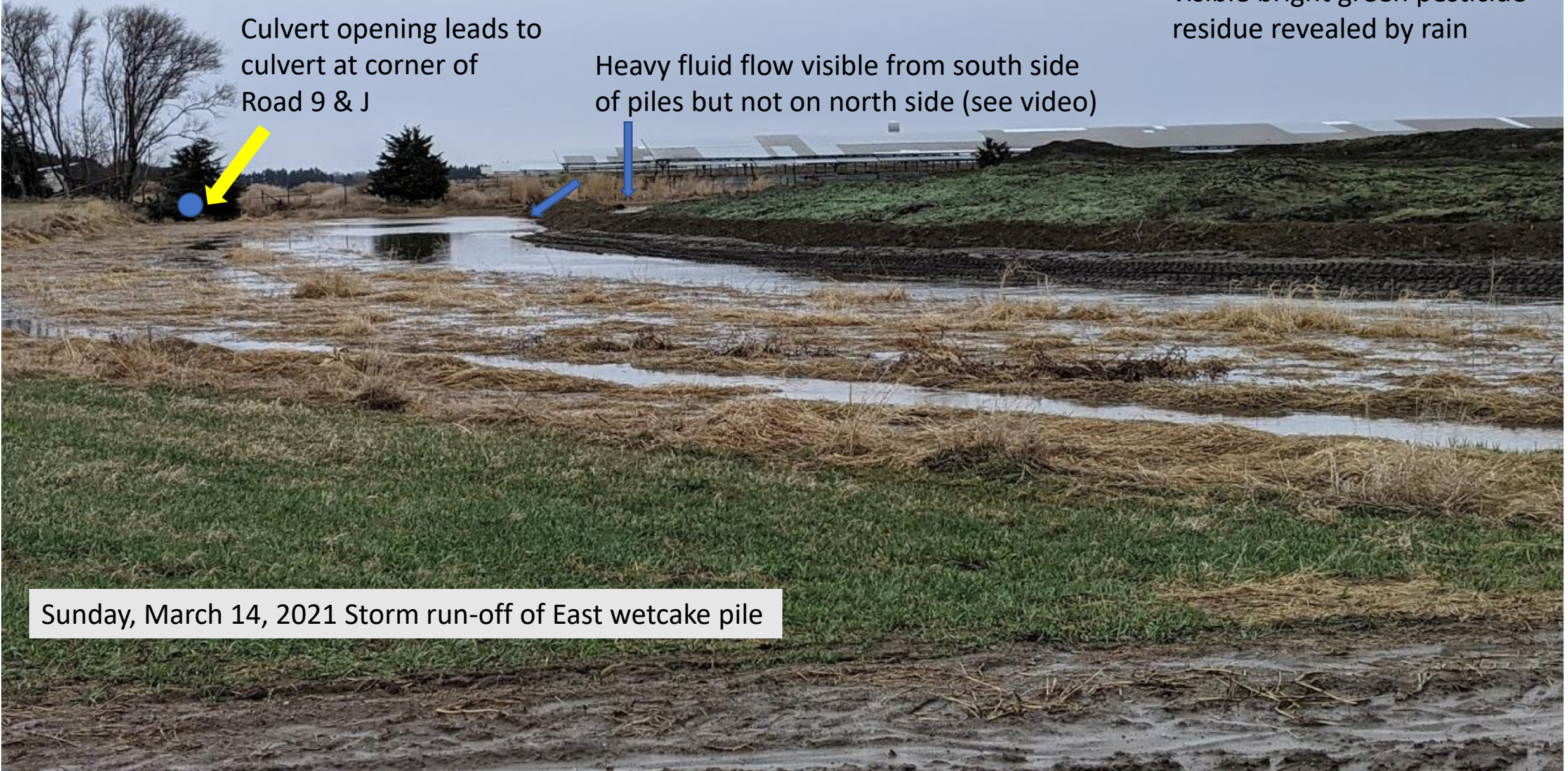
(Map site B)

Culvert opening leads to
culvert at corner of
Road 9 & J

Heavy fluid flow visible from south side
of piles but not on north side (see video)

East wetcake stock pile with
visible bright green pesticide
residue revealed by rain

Sunday, March 14, 2021 Storm run-off of East wetcake pile



May 17, 2021
Drone images (NDEE)

How functional are soil berms?

How easily are they breached
during heavy rain/flooding?

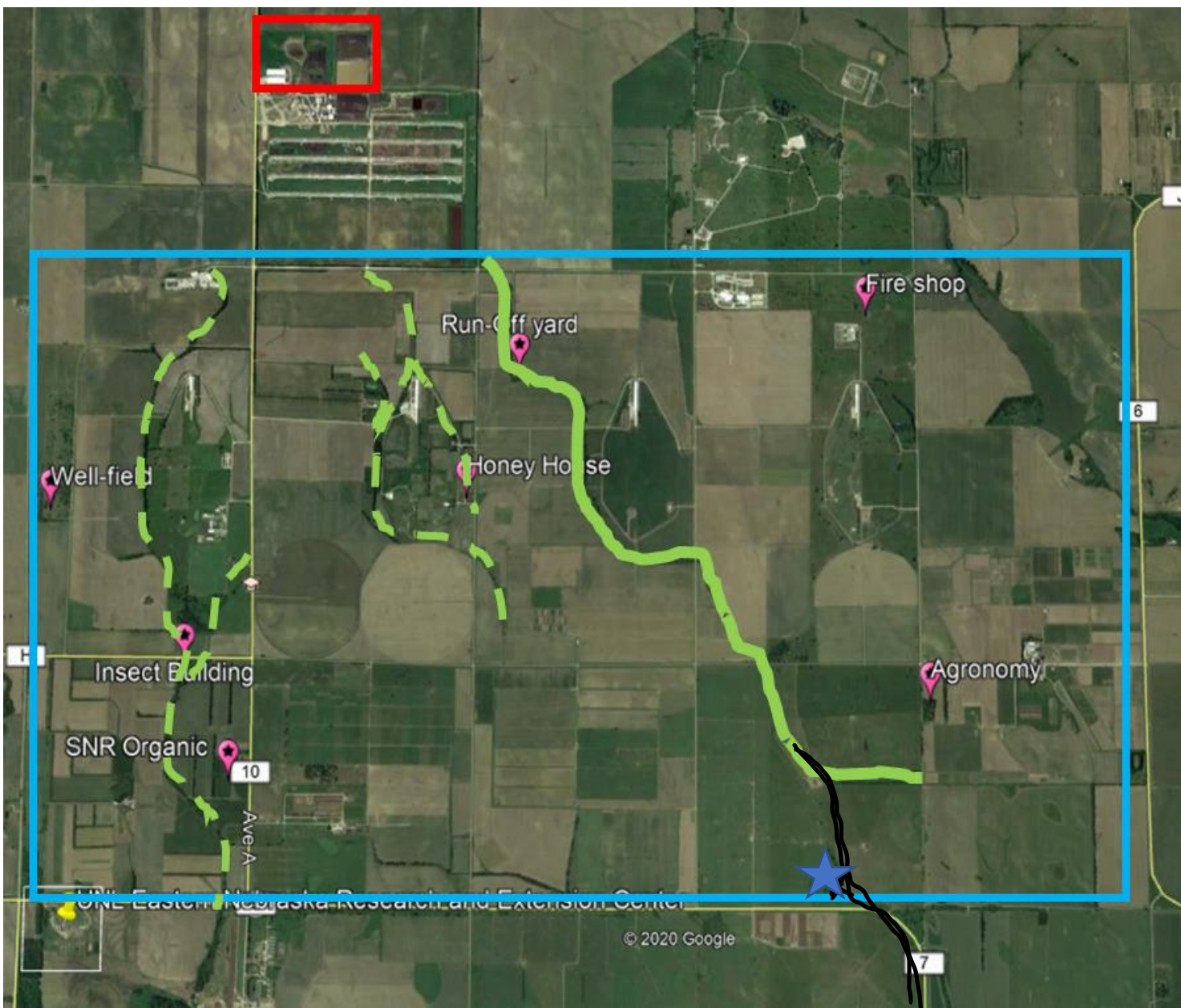
How are these keeping residues
from leaching into soil?

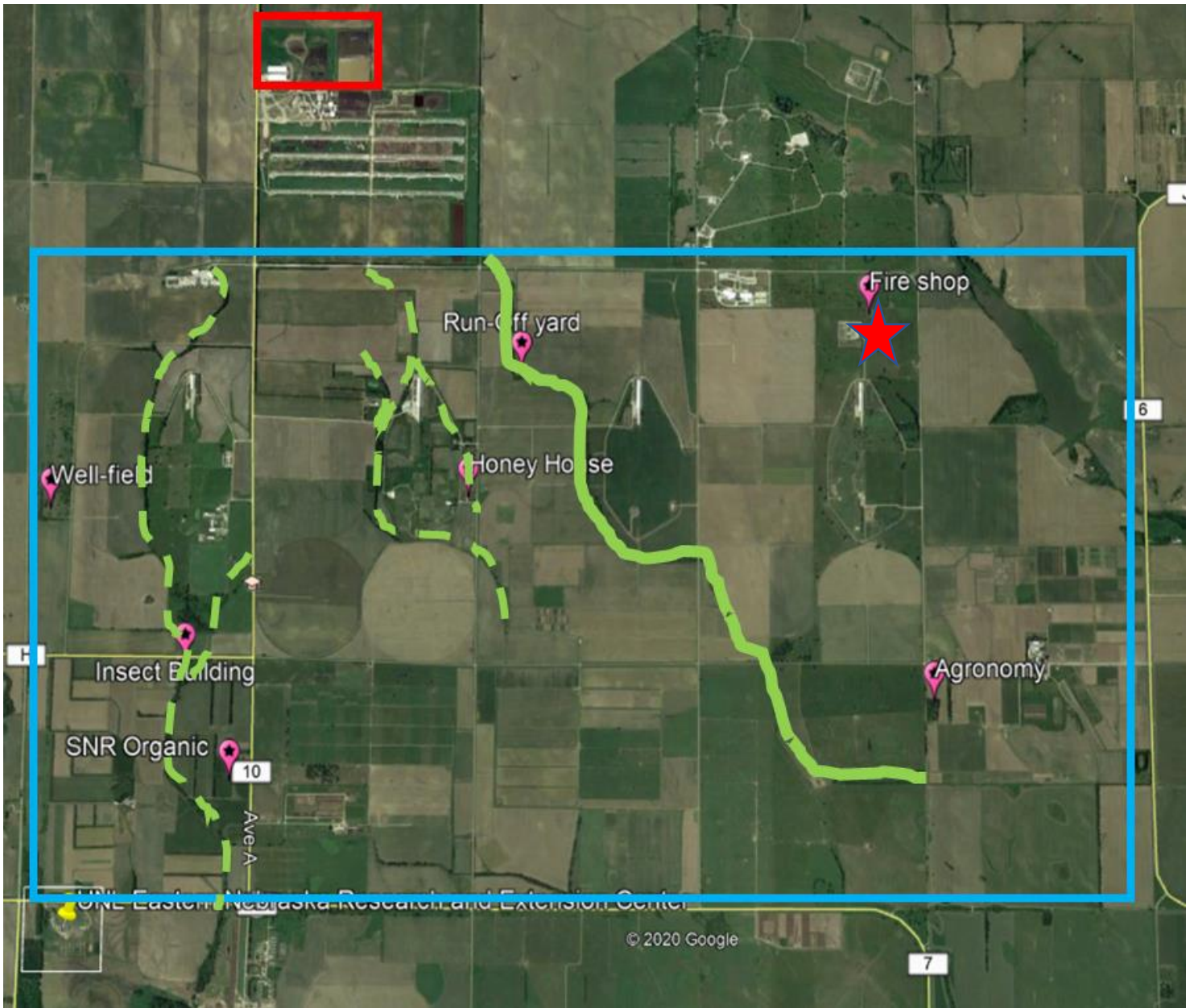
And into nearby plants?

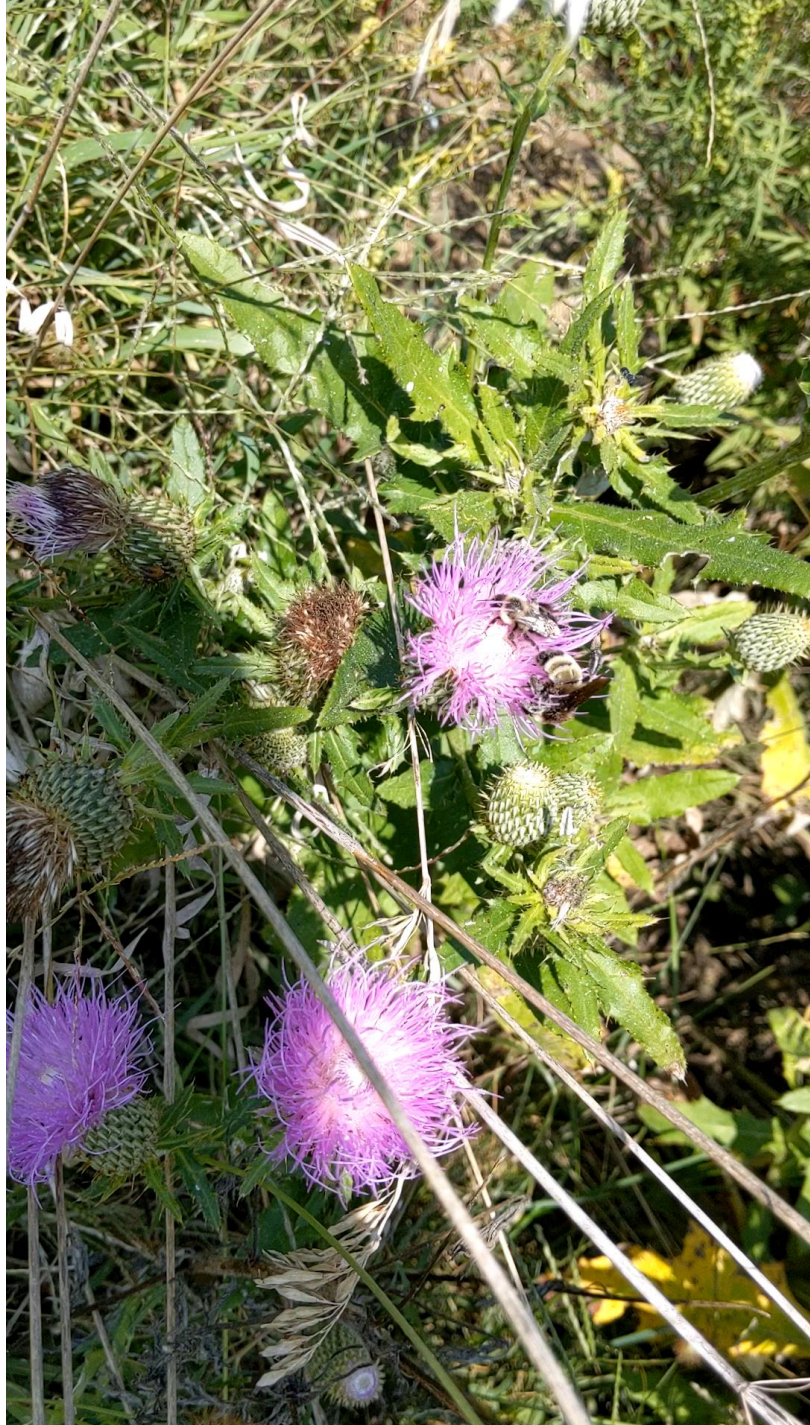
Organically certified crops













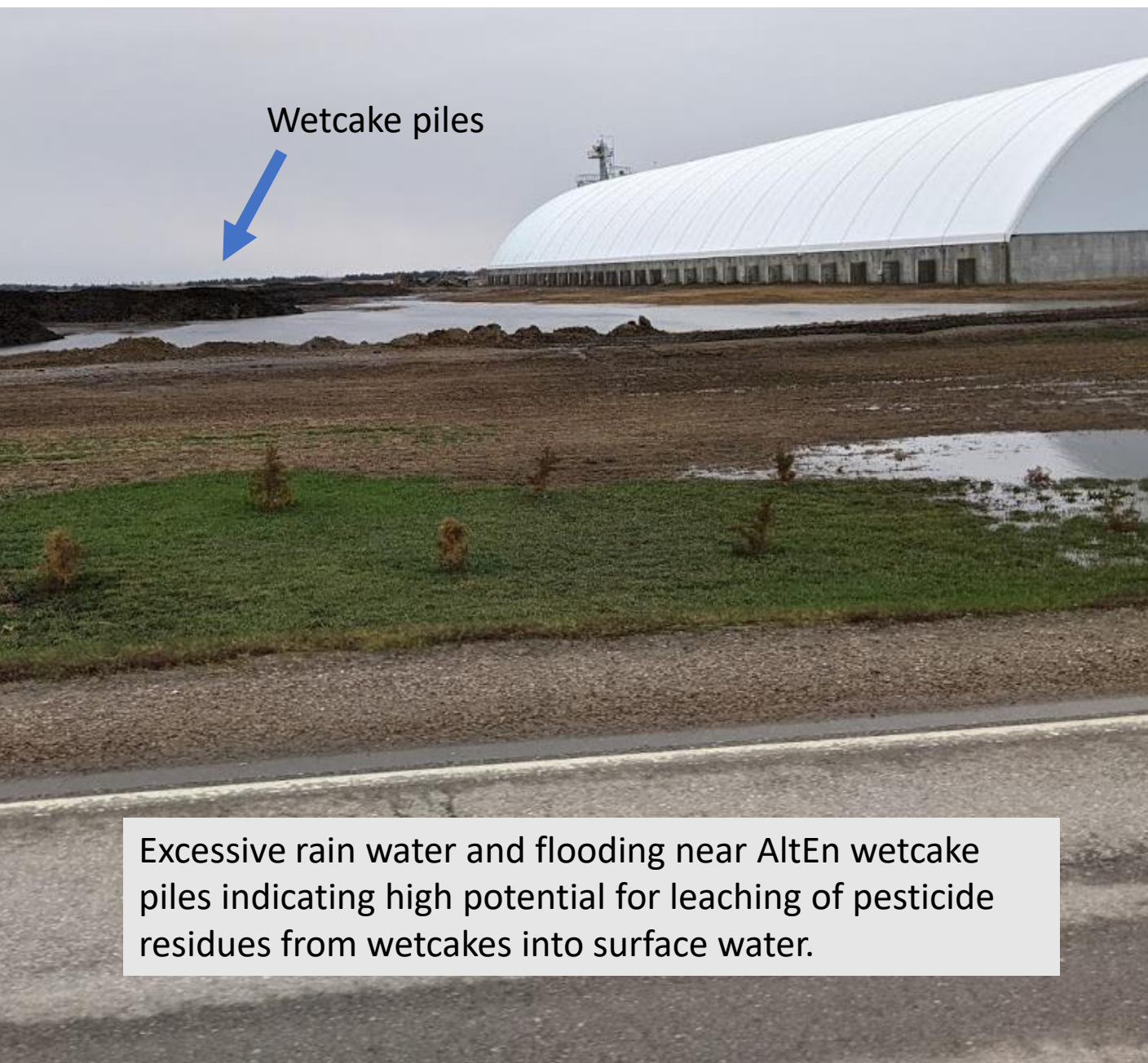
Residents observed sick/dead geese, raccoons, and other wild animals
Mammals and birds will prey on sick/dead bees

Photo above: Chewed up wads of bee bodies (skunk)

Photo right: Birds and other mammals depend on insects as critical food sources



Sunday March 14, 2021 Road 10 (AltEn North wetcake piles)



March 14th heavy rain
May blooms



May 17, 2021
Drone images



AIR

SOIL

PLANTS

WATER

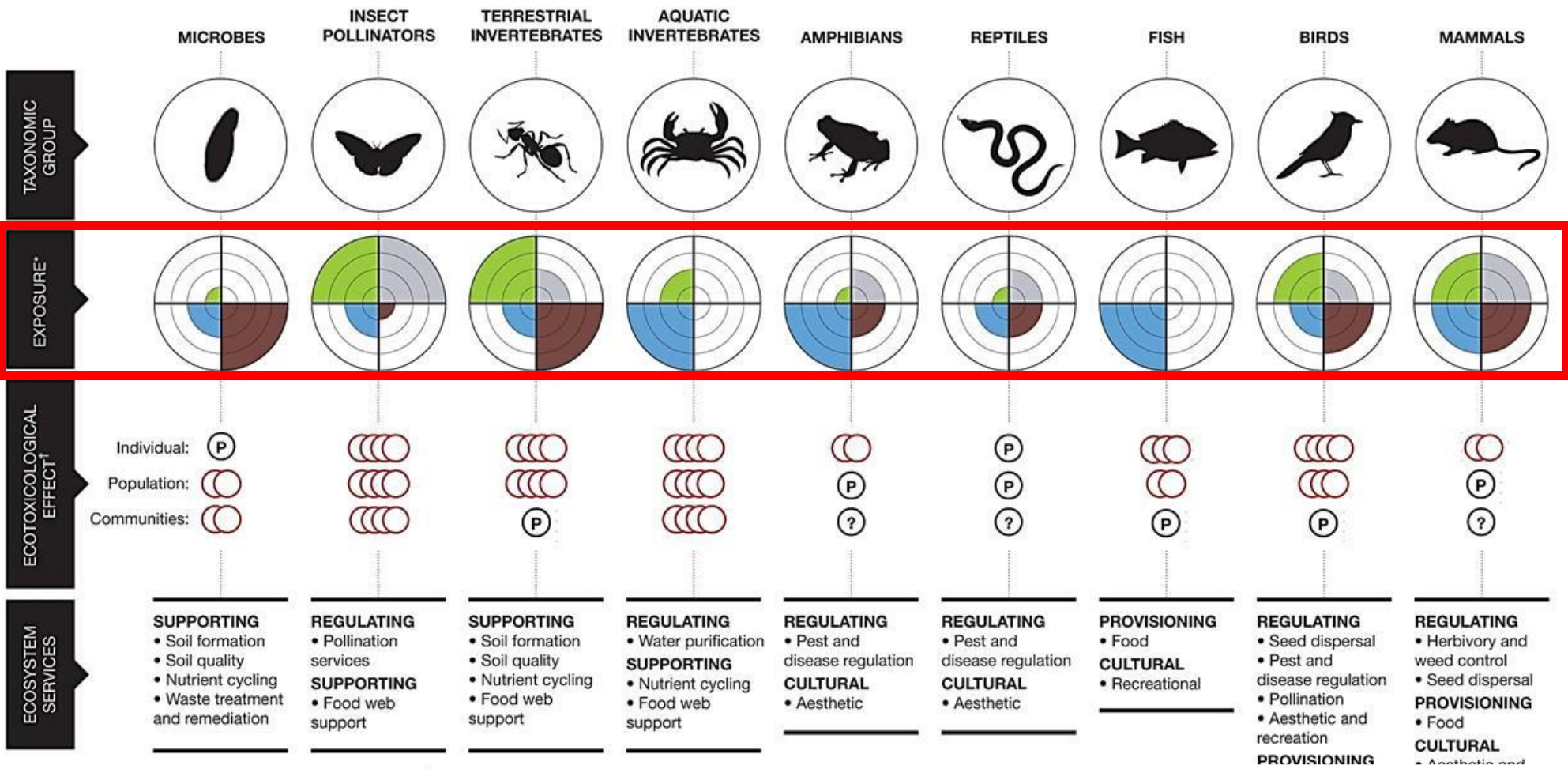
Photo taken by NDEE

Review of potential risks & impacts from neonicotinoid insecticides

Figure 2: Infographic summarizing the main findings of the WIA study on the state of knowledge on impacts of neonic insecticides on biodiversity and ecosystem services (Pisa et al., 2017:36).

Where's the highest exposure risk?

Who's at highest risk?



***EXPOSURE**

0: No route of exposure
1: Potential route of exposure assumed negligible
2: Relevant route of exposure low
3: Relevant route of exposure moderate
4: Relevant route of exposure high

0 1 2 3 4

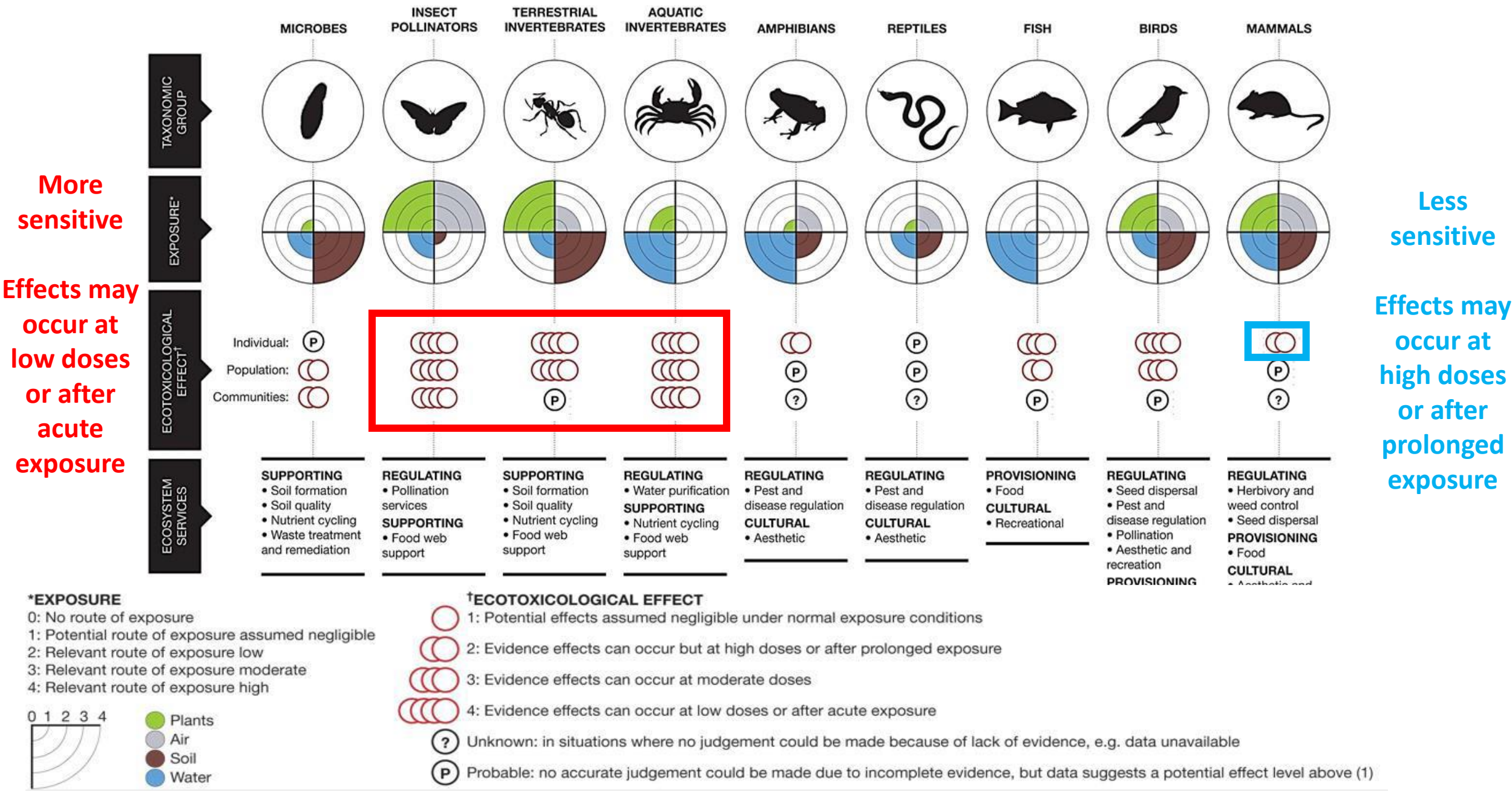
†ECOTOXICOLOGICAL EFFECT

1: Potential effects assumed negligible under normal exposure conditions
2: Evidence effects can occur but at high doses or after prolonged exposure
3: Evidence effects can occur at moderate doses
4: Evidence effects can occur at low doses or after acute exposure
? Unknown: in situations where no judgement could be made because of lack of evidence, e.g. data unavailable
P Probable: no accurate judgement could be made due to incomplete evidence, but data suggests a potential effect level above (1)

No regulatory division???

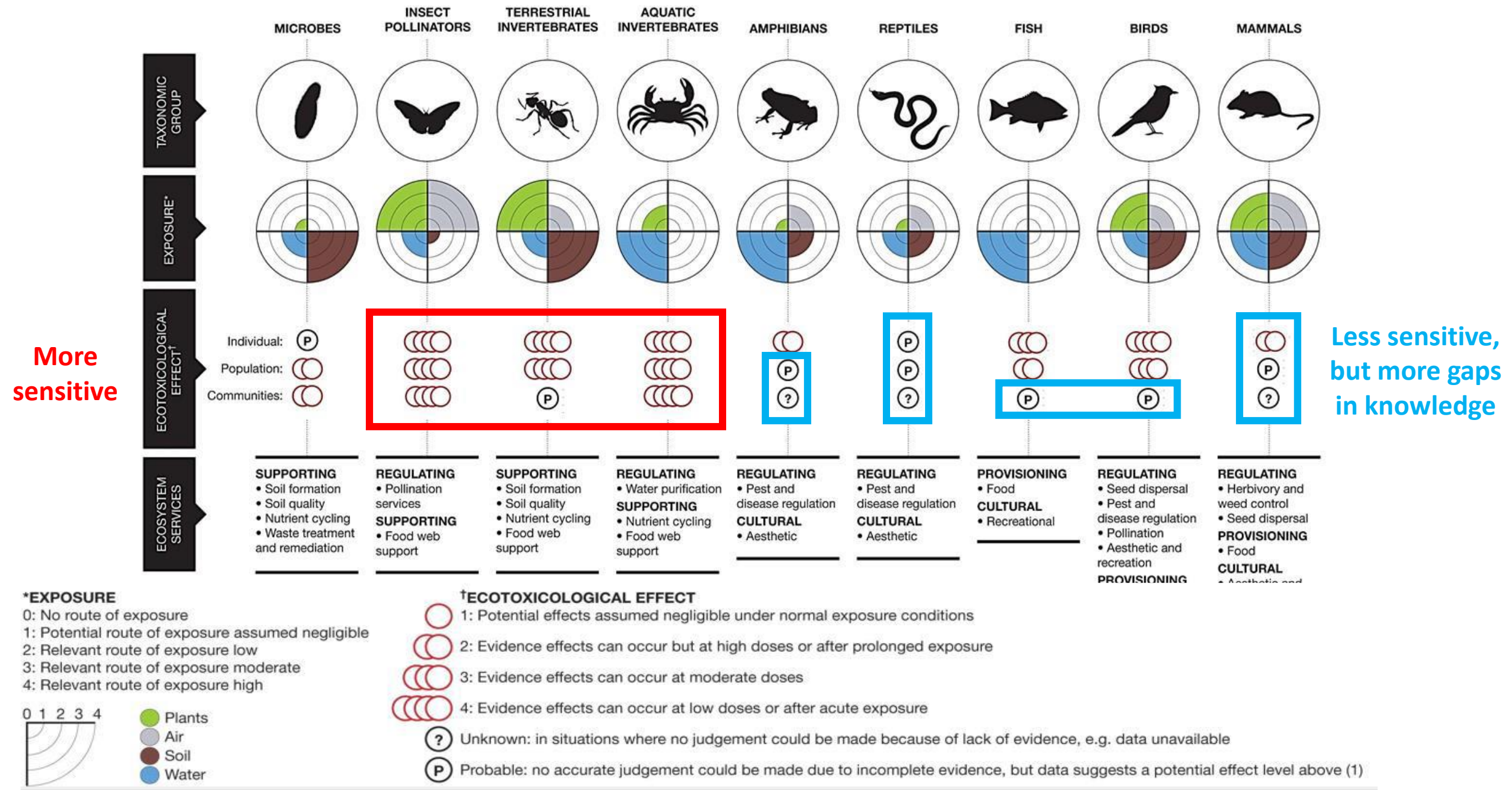
Review of potential risks & impacts from neonicotinoid insecticides

Figure 2: Infographic summarizing the main findings of the WIA study on the state of knowledge on impacts of neonic insecticides on biodiversity and ecosystem services (Pisa et al., 2017:36).



Review of potential risks & impacts from neonicotinoid insecticides

Figure 2: Infographic summarizing the main findings of the WIA study on the state of knowledge on impacts of neonic insecticides on biodiversity and ecosystem services (Pisa et al., 2017:36).



Bioindicator species

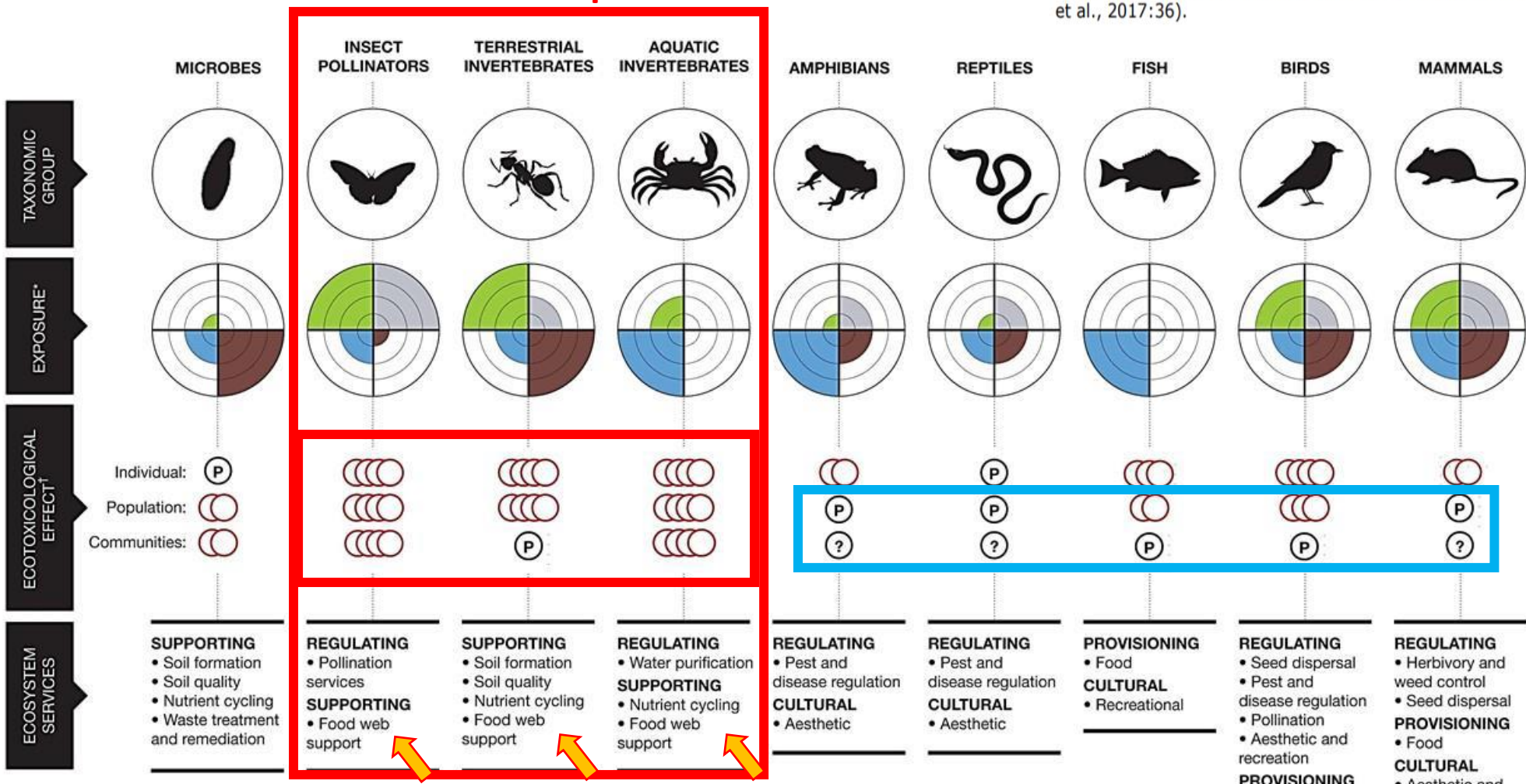
Figure 2: Infographic summarizing the main findings of the WIA study on the state of knowledge on impacts of neonic insecticides on biodiversity and ecosystem services (Pisa et al., 2017:36).

More
sensitive

Loss of food
support may
impact a suite
of animals



Requires
long-term
monitoring



*EXPOSURE

- 0: No route of exposure
- 1: Potential route of exposure assumed negligible
- 2: Relevant route of exposure low
- 3: Relevant route of exposure moderate
- 4: Relevant route of exposure high

0 1 2 3 4



- Plants
- Air
- Soil
- Water

†ECOTOXICOLOGICAL EFFECT

- 1: Potential effects assumed negligible under normal exposure conditions
- 2: Evidence effects can occur but at high doses or after prolonged exposure
- 3: Evidence effects can occur at moderate doses
- 4: Evidence effects can occur at low doses or after acute exposure
- ?: Unknown: in situations where no judgement could be made because of lack of evidence, e.g. data unavailable
- P: Probable: no accurate judgement could be made due to incomplete evidence, but data suggests a potential effect level above (1)

One Health approach (*still in progress*)

Phase I: Environmental Impact Monitoring

- To determine which compounds are present in **air, water, soil, and vegetation** and at what levels
- To inform which systems may have highest potential of exposure risk
- Pesticide analysis conducted by Drs. Dan Snow (NE Water Science Laboratory) and Michelle Hladik (USGS-California)
- Initial funding through UNMC private donations; seeking additional funding through USGS104b, NSF rapid funds, etc.

Air Emissions:

- Chandran Achuten (UNMC): air vacuum samples collected near wetcake piles (March 12) for preliminary assessment;
- Judy Wu-Smart (UNL): sticky traps set out on ENREC, Nat Guard properties (March 1-10) and again in mid summer and fall to collect dust particles from ~1-3 miles from AltEn.

Water

- Shannon Bartelt-Hunt (UNL)-Ground water monitoring @ ENREC, Nat Guard, and AltEn wells
- Wu-Smart (UNL)-Surface run-off samples collected pre/post rain events (March 12-16) and will continue to monitor storm run-off concerns

Soil and Vegetation

- Wu-Smart (UNL): Field vegetation & bee-collected pollen sampled for pesticide analysis and plant ID will help locate potential "hot spots" in the landscape. This will be coordinated with water sampling and target areas of high leaching/run-off risk
- Deb Iwanowicz (USGS-Pollen ID)

Phase II: Ecological Impact Studies

& Human/Domestic Animal Screening* (human health work led by UNMC partners, domestic animal work by UNL partners)

Biological Indicator Species (short term monitoring):

- Aquatic insect surveys to monitor stream quality (Louis Lynch O'Brien)
- Ground beetle pitfall trapping, and nematode abundance/diversity as terrestrial indicators of soil health (Shaun Dunn (NGPC), Tom Powers (UNL))
- Pollinating insects (bees & butterflies) as aerial indicators of landscape or community-level health (Wu-Smart (UNL), Milkweed visitors-Tom Weissling (UNL))

Population-level impacts (long-term monitoring):

- Amphibians: breeding site, tadpole, and adult surveys with water testing (VanWormer, Dennis Ferraro, UNL).
- Birds: blood samples, abundance estimates, and reproductive success surveys (VanWormer, Powell (UNL).
- Small mammals: blood samples, abundance estimates (TBD (UNL), Dunn (NGPC))
- Trail cameras to identify scavengers at dead bee traps and examine activity; (Wu-Smart (UNL); Dunn (NGPC))

which will allow us to examine long-term impacts on the food web supply and cascading effects on consumers

Researchers from:

UNMC College of Public Health
Three Rivers Public Health Department
Saunders Medical Center
UNL Department of Entomology
UNL School of Veterinary Medicine
UNL School of Natural Resources
UNL College of Engineering
Creighton University Biology Department
Creighton Dept of Cultural & Social Studies
US Geological Survey
-California (Dr. Michelle Hladik)
-West Virginia (Dr. Deb Iwanowicz)

Recruiting others

-Dr. Liz VanWormer (director of One Health)
One Health student research advisers
-NE Game & Parks Wildlife Biologists
-Outreach & Public engagement



Mead, NE Investigation Team

 Eleanor Rogan, PhD UNMC College of Public Health	 Ali S. Khan, MD, MPH, MBA UNMC College of Public Health	 Brandon Grimm, PhD, MPH UNMC College of Public Health	 Terra Uling, MS Three Rivers Public Health Department
 Chandran Achutan, PhD UNMC College of Public Health	 Judy Wu-Smart, PhD UNL Department of Entomology	 Elizabeth VanWormer, DVM, PhD UNL School of Veterinary Medicine, School of Natural Resources	 Shannon Bartelt-Hunt, PhD UNL College of Engineering
 Daniel Snow, PhD UNL School of Natural Resources	 Jesse Bell, PhD UNMC College of Public Health	 John Schalles, PhD Creighton University Biology Department	 Hank Newburn, MD Saunders Medical Center
 Pierce Greenberg, PhD Creighton University Department of Cultural and Social Studies	 Michelle L. Hladik U.S. Geological Survey		

UNMC > Public Health >

AltEn Environmental Pollution



For more information regarding research efforts and updates:

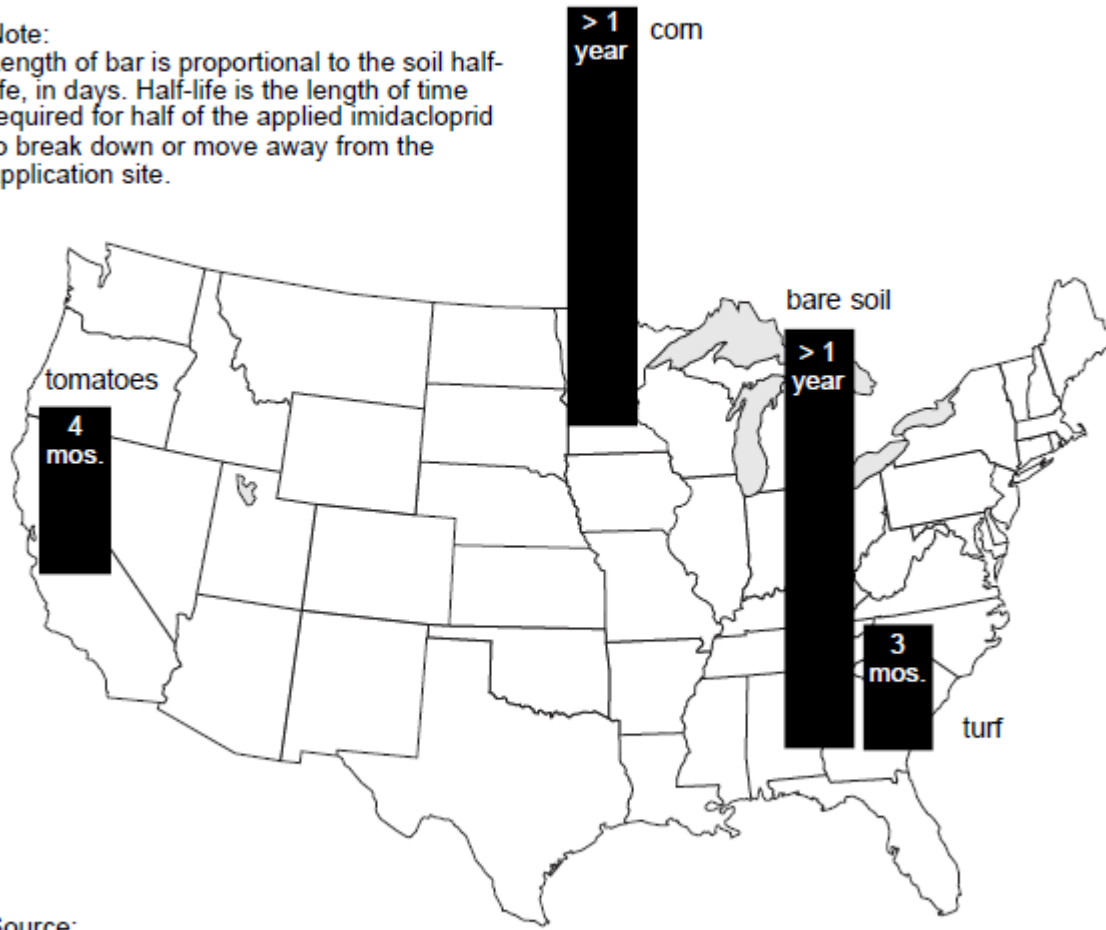
MEAD research team website
<https://www.unmc.edu/publichealth/departments/environmental/mead/>

Donate to research efforts here:
<https://fundraise.nufoundation.org/campaign/mead-ne-health-and-environmental-campaign/c333090>

Persistence & Bioactivity of Systemic Pesticides

Figure 7
Persistence of Imidacloprid in Soil in Three States

Note:
Length of bar is proportional to the soil half-life, in days. Half-life is the length of time required for half of the applied imidacloprid to break down or move away from the application site.



Source:
U.S. EPA. Environmental Fate and Groundwater Branch. 1993. EFGWB review of imidacloprid. Washington, D.C., Jun 11. Pp. 5-6 and attached pesticide environmental fate one line summary.

Data lacking

Are they bioactive?
in soil?
in water?

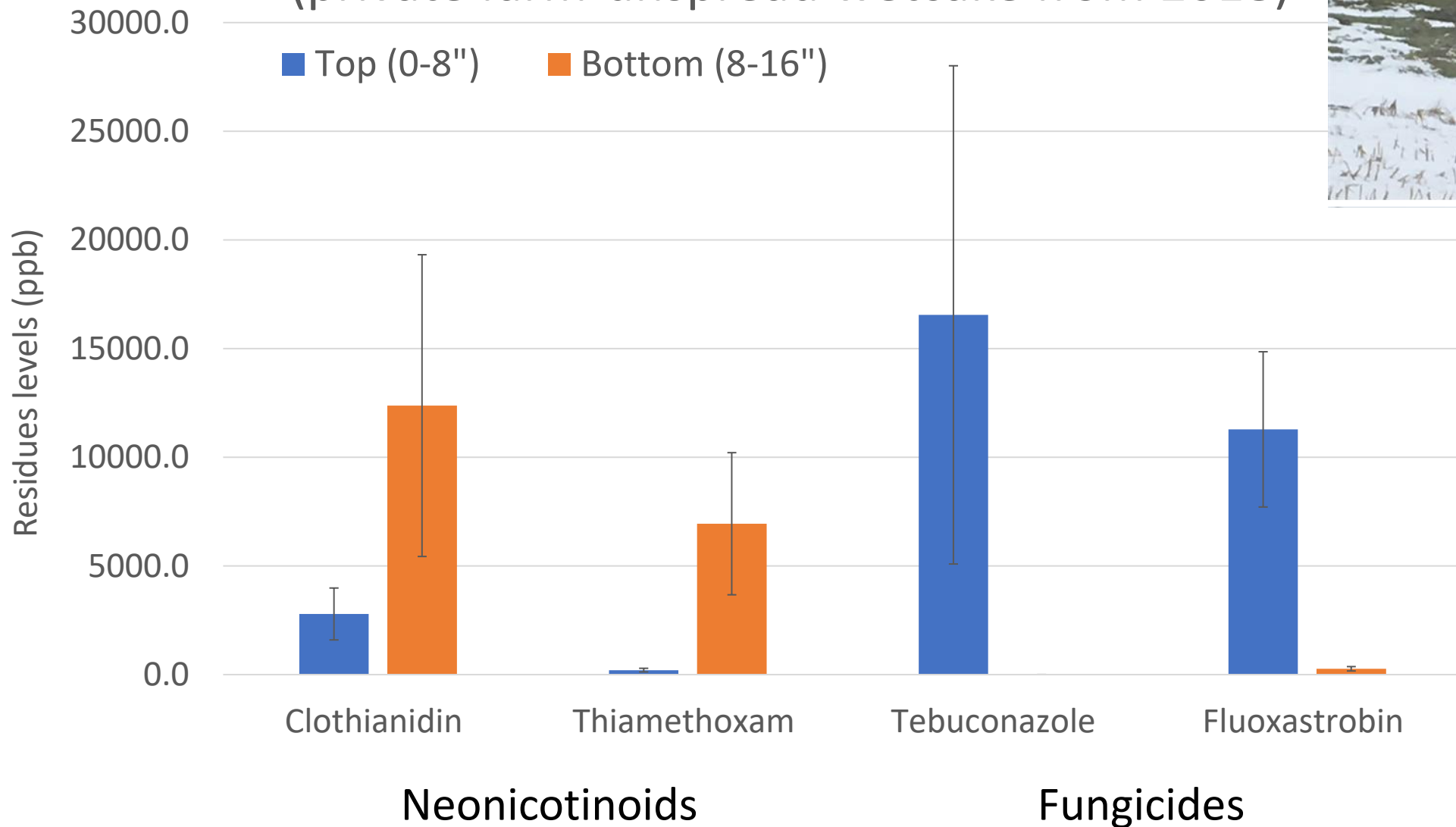
Can residues be continuously taking up by roots?

Accumulate in plants?

Detected in some trees 3+ yrs after soil/tree injection (Cowles and Cheah 2006)

Soil Samples 2020

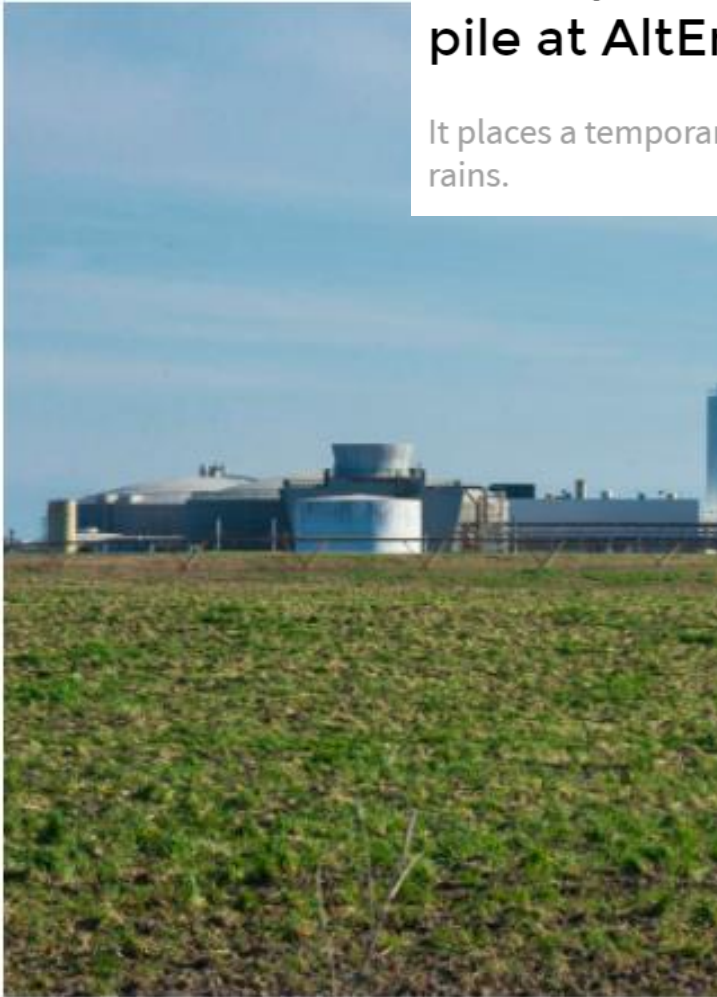
(private farm-unspread wetcake from 2018)



Seed companies to shoulder cost, burden of cleaning up troubled AltEn ethanol plant

Helicopter installs temporary cover on toxic waste pile at AltEn

It places a temporary Posi-Shell to shield 80,000 tons of toxic waste from getting wet when it rains.



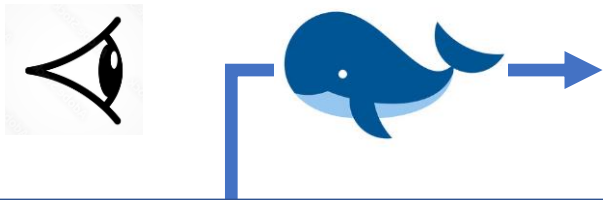
The AltEn ethanol plant near Mead in early April.

Journal Star file photo



AltEn Facility Response Group:

- Taking lead on clean up efforts at AltEn **“on-site” (no off-site clean up efforts)**
- Numerous issues with wetcakes, damaged lagoons, and storm run-off
- Another “spill” reported Sept 2021; breached soil berms during heavy rain event
- lagoon leakages & **“WHALES”**



South facing view of rising “gas-filled whales” from Road 10

Drone images
Creighton University
Nov 09, 2021

Background

Accumulation of air and gases since the spring of 2021 have expanded gas pockets (whales) in both the NW and NE lagoons. The evolution of these whales is shown on Figure 1.

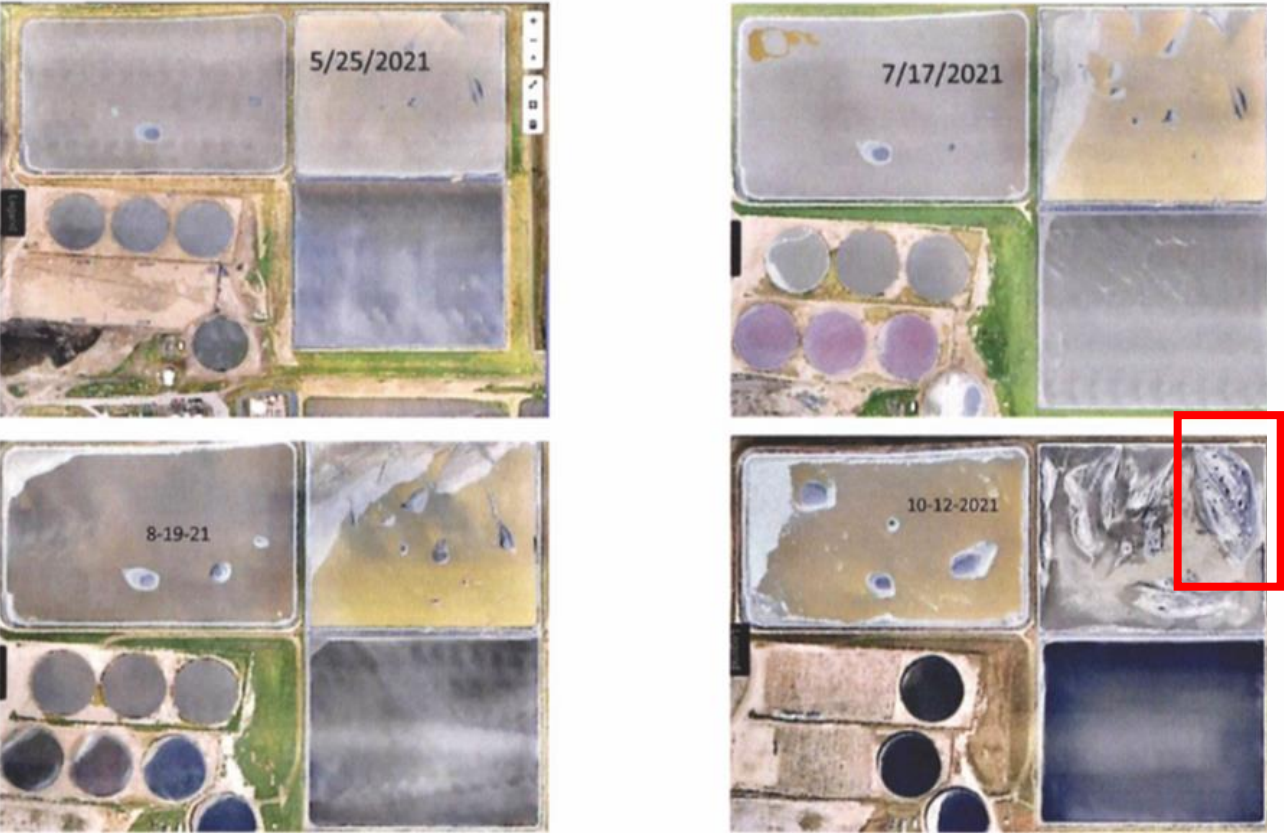


Figure 1- Evolution of Gas Pockets (whales) in NE and NW Lagoons – May to October 2021

The most likely cause of the creation and growth of the whales is the accumulation of air, methane and H₂S from anaerobic decomposition of organic matter in sludges and water that

General Approach

The approach will utilize a built for purpose vacuum device with a ball valve at the user end and a hose that would connect to a Dual Phase Extraction and Catalytic Oxidizer unit under a vacuum. Treatment media will be “Purple Carbon” HS-600 Vapor Phase, Potassium Permanganate. Access to the edge of the whale will be from a constructed floating dock that allows personnel to access, perforate, and seal the perforation point with adhesives and a sealing block. The set up is shown in Figure 3.

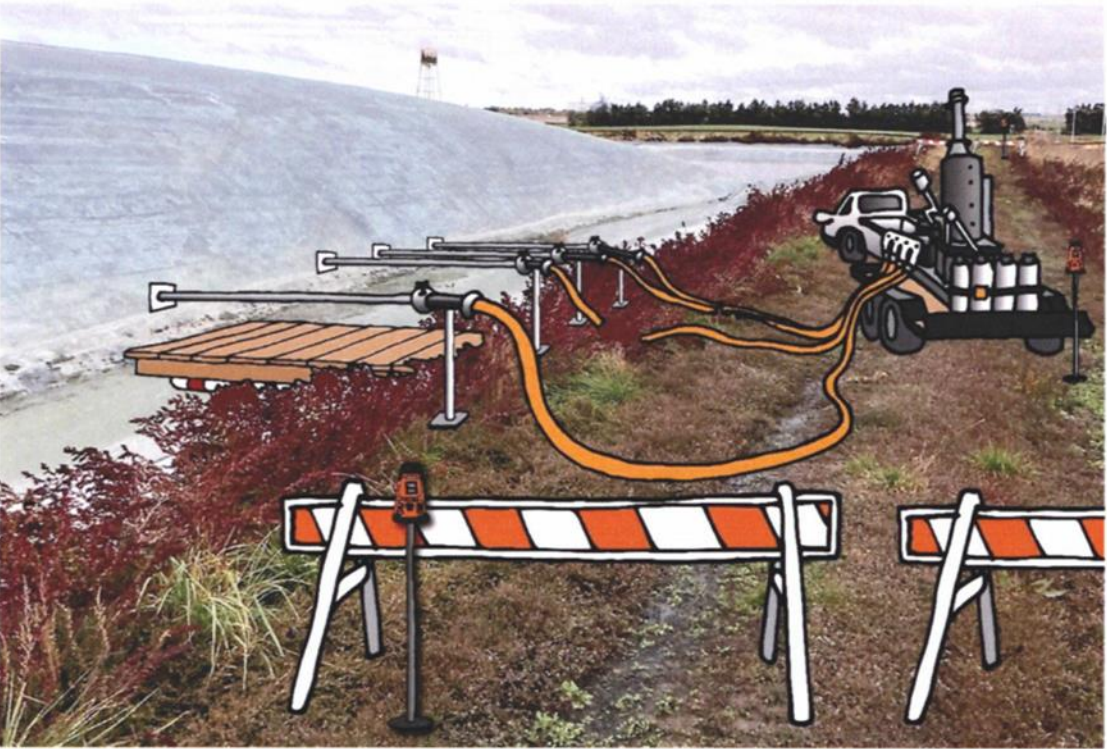
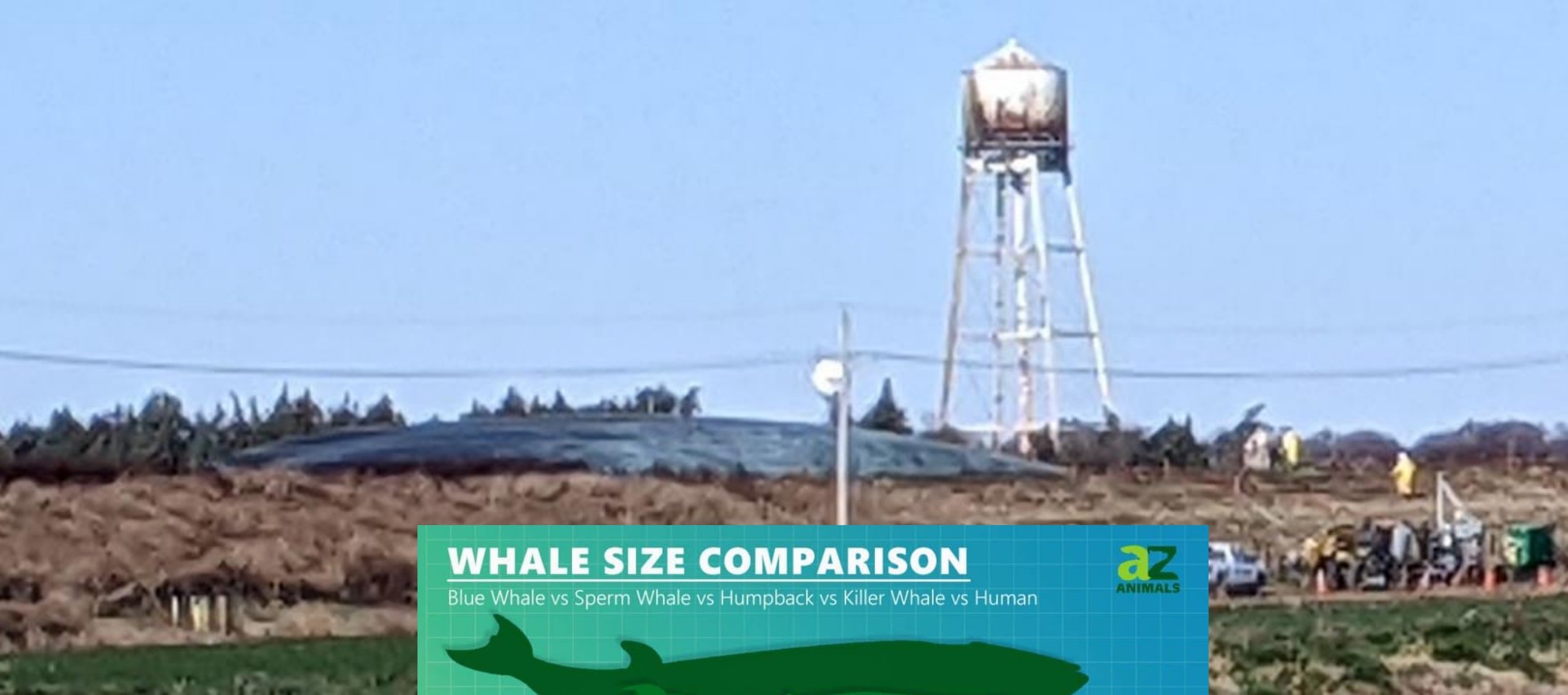


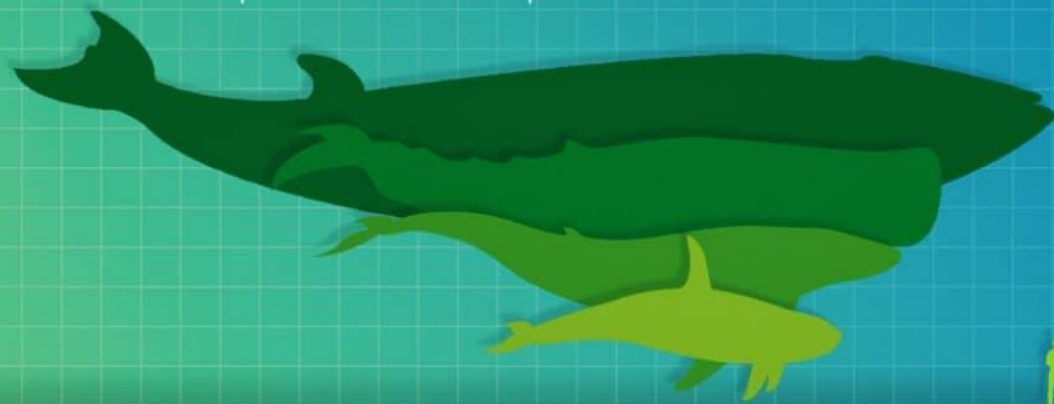
Figure 3- Conceptual Depressurization System



WHALE SIZE COMPARISON

Blue Whale vs Sperm Whale vs Humpback vs Killer Whale vs Human

az
ANIMALS



Nov 18, 2021

NW lagoon leakage



Photos: 12

Site Visit Report

Date Taken 3/30/2022

Photographer: Randol Wehrbein

Facility Name/ Project Name: AltEn LLC

Facility IIS number / Project identifier: IIS: 84069 / NE0137634

Location: Northwest lagoon.

Direction Facing: West

Description: The photo shows northwest lagoon's northwest corner water level indicator lines painted by Clean Harbors on 3/3/2022 (red arrow) and 3/5/2022 (yellow arrow).



Lagoon has a 20' depth capacity.

October 25, 2021: 20' (FULL)

January 4, 2022: 15'

February 28, 2022: 14.5'

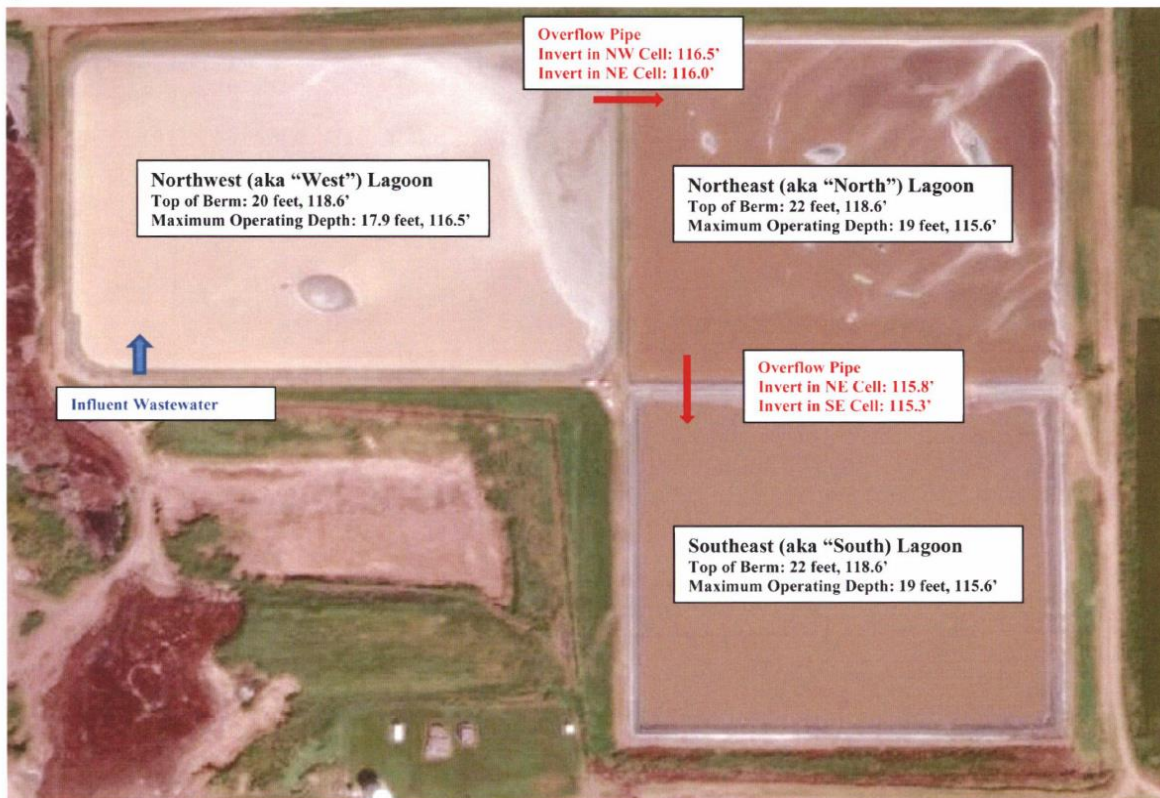
March 23, 2022: 14'

-new whale present (yellow)

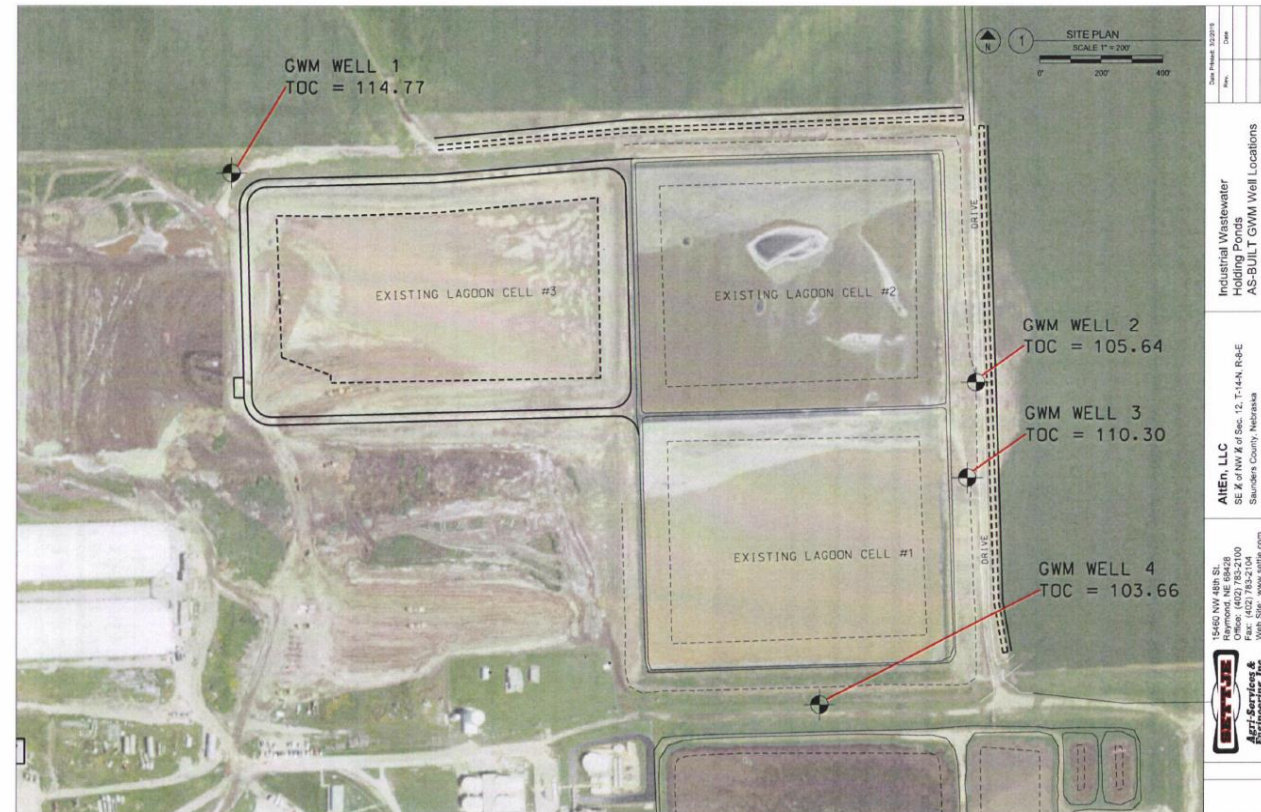
-existing whales unchanged



Map



*All information included in this map is based on design information from Document ID 20180025019 & Document ID 20180034184.



Ground water report:

January 19, 2021: Well #MW4 had Thiamethoxam (22.6 ppb) and Clothianidin (48 ppb) at 28.74 ft

March 28, 2022: Well #SP-2 had Thiamethoxam (2000 ppb) and Clothianidin (25 ppb) at 46-50 ft

For more information regarding AltEn site inspections, non-compliance, and violation notices:

<https://ecmp.nebraska.gov/publicaccess/viewer.aspx?&MyQueryID=340>

AltEn's facility ID #: 84069

Critical support

Project Apis m.



head)

Sick pets ~ 5.6 miles away

Wetcake

Yutan

Mead

Beekills ~2 miles away

East Stockpile

West stockpile

UNL

UNL

UNL

UNL

UNL

UNL

UNL

UNL

UNL

UNL

UNL

UNL

Hwy 66/Rd 7

LG

7

fish

© 2021 Google

Memphis

Need to assess environmental and ecological impacts observed off-site (potential impacts cover 6 miles radius)

-How much farther has the contaminates spread?

-To what extent and where (water, soil, air, vegetation)?

-High costs, limited funds



Pair of beavers found dead
July 2021



Bee losses at apiaries near AltEn pollution

ENREEC Fire shop apiary



Weekly dead bee collection 2020

From 2017-2020:

- 54 hives across 6 apiaries
- 1-3 miles away (South/SE of facility)
- 100% mortality by Fall; **0% overwintering survival**

In 2021 (AltEn facility closed in Feb*)

- 6 “contaminated” + 2 “control” apiaries
- **30% overwinter survival** (7 alive/23 total)

In 2022

- 28 new + 12 overwintered colonies
- 10 “contaminated” and 2 “control” apiaries
- **69% survival** (Fall 2022) (22 alive/32 total)
- **50% Overwinter survival** (16 alive/32 total)

In 2023

- 43 hives in 7 “contaminated” apiaries & 15 hives in 2 “control” apiaries
- **81% Fall survival** (35 alive/43 total), **80% Fall survival controls** (12/15)
- **% Overwinter survival ??? (check in Spring)**

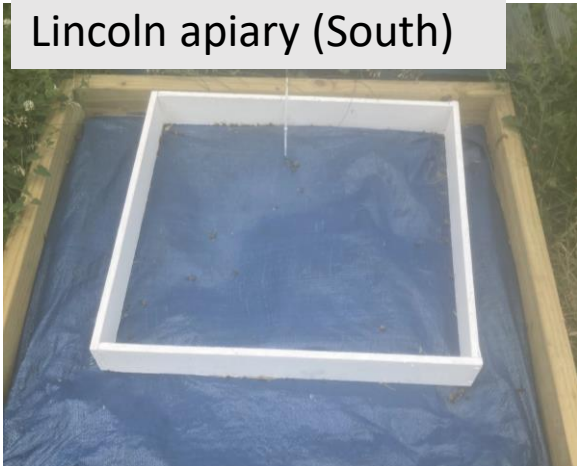
From 2018-2022:

88% winter survival of control hives (28 alive/32 total)

Low losses at all our other apiaries

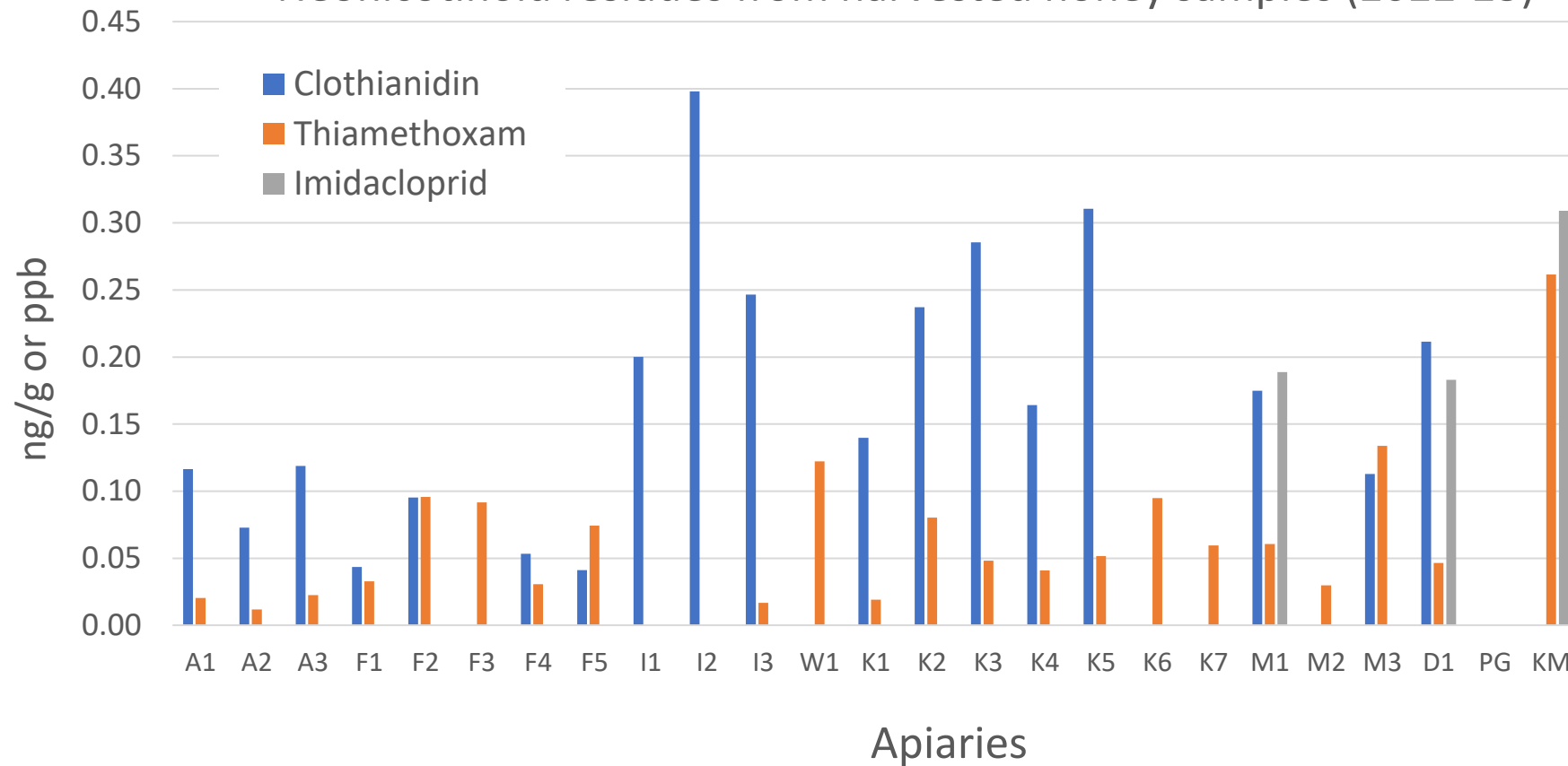
(Lincoln and Nebraska City)

Lincoln apiary (South)



Weekly dead bee collection 2020

Neonicotinoid residues from harvested honey samples (2022-23)



In 2023 (1st year with honey crop):

- 23 of 25 buckets of honey tested had detectable level of pesticides or metabolites
- 18 honey samples had at least 2 or more types of neonicotinoids.
- Residues ranged from 0.04 to 0.4 ng/g clothianidin (found in 18 samples), 0.01 to 0.26 ng/g thiamethoxam (found in 23 samples), 0.01 to 2.44 ng/g *acetamiprid** (found in 12 samples), 0.19 to 0.31 ng/g imidacloprid (found in 3 samples), and 0.01-0.28 ng/g imidacloprid desnitro metabolite (found in 18 samples)



- 100-150 colonies for research/teaching (~80 that produce honey)
- Average production = 1 ton or 2,000 lbs (*2023 = 3,000+ lbs)
- 23 buckets = 1,150 lbs of contaminated honey
- Lost revenue: @ \$9 for 12 oz bear= \$10,350 (*from just honey production* in 2023*)
- What about loss revenue from dead bees and no production?

Too many unknowns to determine impacts

"The EPA has a comprehensive and robust assessment process for assessing the environmental effects of a chemical used as a pesticide, the **wetcake** produced by the Nebraska facility represents a level of contamination that has no uniformity or limit on the number and amount of pesticides present. The **EPA cannot conclude that *a land application of the wetcake will not result in unreasonable adverse effects on humans or the environment.***"

(Excerpt from email response to Kara Valentine NDEE on **November 2020** from Ed Messina, Ese., Acting Director Office of Pesticide Programs EPA)

"The EPA has a comprehensive and robust assessment process for assessing the environmental effects of a chemical used as a pesticide, the **waste water** produced by the Nebraska facility represents a level of contamination that has no uniformity or limit on the number and amount of pesticides present. The **EPA cannot conclude that *discharging this water onto land will not result in unreasonable adverse effects on humans or the environment.***"

(Excerpt from email response to Kara Valentine NDEE on **January 2021** from Ed Messina, Ese., Acting Director Office of Pesticide Programs EPA)

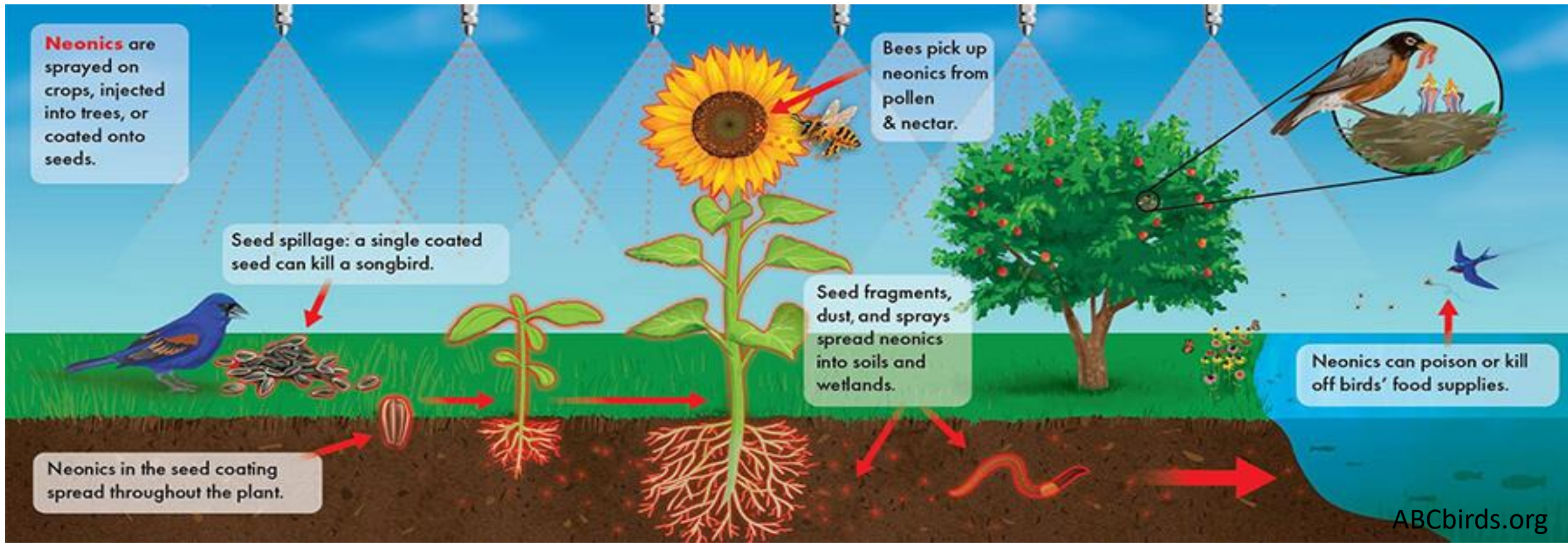
“Systemic pesticide pollution” (neonicotinoids and several kinds of fungicides) may move from water into soil and through plants. Systemic pesticides move into leaves, nectar, pollen, where wildlife become exposed.

Federal gaps

Pollution issues were caused by regulatory loopholes/gaps and federal exemption for “treated articles”
(Not waste but economically valuable? hazardous waste? industrial waste? agricultural waste? special waste?)

Local/state solutions

Despite decades of studies showing residues in non-target plants (nectar/pollen), **there’s no regulatory division at EPA to address this kind of pollution in plants** (robust regulations over contaminants in air, water, soil)



Federal exemption loophole for treated seeds complicate regulatory & research efforts

***Treated Articles or Substances.** The Agency has determined that an article or substance containing a pesticide to protect the article or substance itself **does not require registration and is exempt from all provisions of FIFRA**, provided the pesticide is registered for such use and bears appropriate directions for such use. Claims for the preserved article or substance are limited to the protection of the article or substance itself. See 40 CFR 152.25(a) and PR Notice 2000-1. E*

- Permit for operation 2015-16 claimed processing of “corn” not treated seed corn; ***no requirements for pesticide testing***
- 2018 - 2019 Wetcake was distributed to farmers ***without knowledge of contaminates***
- Nov 2019 through Feb 2020 AltEn argued that distiller’s grain was not a solid waste and therefore they did not need to provide a plan for disposal. It’s economically valuable (people will paid for it as a soil conditioner) so it is not waste.
- Required to dispose of wetcake in landfills but similar questions were raised about whether it should be contained as hazardous waste

When in the life of a treated seed is it considered hazardous waste?

Lessons learned....

Everyone has a role to play!

- Researchers Identify areas of concerns
- Regulators Enforces or develops laws to address concerns
- Policy Makers
- Organizations Helps establish context. What are typical or proper practices?
- Industry
- Journalists Brings science to the public
- Public Puts pressure on government/regulators

The image shows a screenshot of a news article from The Guardian. The article is titled "There's a red flag here: how an ethanol plant is dangerously polluting a US village" and is located in the "Nebraska" section. The author is Carey Gillam. The article includes a photograph of a landscape with green hills and a body of water. A timeline overlay on the right side of the image shows the following sequence of events: "Jan 2021" (Local news coverage) leads to "AltEn closes Feb 2021".

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The Guardian
For 200 years
US edition
News Opinion Sport Culture Lifestyle More
Environment Climate crisis Wildlife Energy Pollution Green light
Nebraska
'There's a red flag here': how an ethanol plant is dangerously polluting a US village
Situation in Mead, Nebraska, where AltEn has been processing seed coated with fungicides and insecticides, is a warning sign, experts say
Carey Gillam
@careygillam
Sun 10 Jan 2021 04:00 EST
A pesticide pile Mead, Nebraska. Photograph: Judy Wu-Smart
F or the residents of Mead, Nebraska, the first sign of something amiss was the stench, the smell of something rotting. People reported eye and throat irritation and nosebleeds. Then colonies of bees started dying, birds and butterflies appeared disoriented and pet dogs grew ill, staggering about with dilated pupils.
There is no mystery as to the cause of the concerns in Mead: a famine

Jan 2021
Local news coverage
AltEn closes Feb 2021

Local/state solutions

LB507: *The Ethanol Development Act; in which the use of treated seed corn in the production of agricultural ethyl alcohol shall be prohibited if such use results in the generation of a byproduct that is deemed unsafe for livestock consumption or land application. (Introduced by Senator Blood, testified Feb 2021)*

LB634: *which seeks to provide a cause of action for unsafe disposal of treated seed. (Introduced by Senator Cavanaugh, testified Mar 2021)*

2020-23 policy changes/restrictions on neonicotinoid insecticides “Extended Producer Responsibility Bills”

MN (HF766, HF1317, HF2472) requiring additional seed label information; prohibiting certain seed uses; requiring product stewardship (including use, storage, disposal) for corn and soybean seed coated with neonicotinoids. (**multiple testimonies*)

NE (LB507, LB634) prohibits use of pesticide treated seeds in ethanol production.

NY (S699B, S.1856-A/A.7640) enacts the birds and bees protection act; prohibits the sale of certain pesticides or use of seeds coated with such pesticides; requires the department of environmental conservation to review the latest scientific information concerning certain pesticide active ingredients. **(passed June 2023; signed by Governor Hochul Dec 22, 2023)**

CA (AB567) on and after January 1, 2024, the use a of neonicotinoid on a seed is prohibited.

VT (Act No. 35 (H.205) neonicotinoid pesticides approved for outdoor use as restricted use pesticides sold by only a licensed dealer and shall only be applied by State certified applicators.

VT* (**H706 passed by House Feb 2024**) prohibits the sale, use or distribution of neonicotinoid-treated seeds for soybeans or for any cereal grains crop

NJ (A-2070) direct the Department of Environmental Protection to classify neonicotinoid pesticides as restricted use pesticides, and establish a list of chemicals that belong to the neonicotinoid class.



Federal measures may affect state powers

Congress of the United States

Washington, DC 20515

October 27, 2023

Honorable Glenn Thompson
Chairman, House Committee on Agriculture
1301 Longworth House Office Building
Washington, DC 20515

Honorable David Scott
Ranking Member, House Committee on Agriculture
1010 Longworth House Office Building
Washington, DC 20515

Agricultural Labeling Uniformity Act

Proposed *failed* measure would have:

- made EPA *the sole authority* on pesticide regulations
- obstruct local governments from implementing restrictions on pesticide use
- ***block many legal claims***
- thus provide protections for pesticide companies and their products
- 150 legislators signed opposition letter

Dear Chairman Thompson and Ranking Member Scott,

We write to express our strong opposition to any efforts to limit longstanding state and local authority to protect people, animals, and the environment by regulating pesticides. As Congress considers legislation related to agriculture, including the reauthorization of the Farm Bill and Fiscal Year 2024 appropriations bills, we urge you to ensure that state, county, and local governments retain the right to protect their communities and set policies that best suit local needs.

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) establishes the authority of the Environmental Protection Agency to oversee the registration, distribution, sale, and use of pesticides in the United States. Congress has long considered FIFRA to set a federal *floor* for pesticide policy, and under FIFRA, state, county, and local governments possess authority to enact supplementary standards. The majority of states – as well as hundreds of towns and cities – have adopted laws and ordinances related to pesticide safety. These include laws to restrict pesticide use near schools, parks, and playgrounds, protect drinking water supplies and wildlife, provide consumers with adequate information to make informed decisions about use and exposure, and equip workers with information and tools to minimize occupational risk.

We are deeply concerned that legislative proposals to curtail state and local input regarding pesticide policy are contrary to FIFRA’s longstanding balance of federal, state, and local authority. These proposals seek to overturn decades of precedent and Supreme Court rulings that allow for democratically elected local governments to address the specific needs of their communities. State and local governments are often best positioned to respond quickly to emerging risks within their communities, and proposals to weaken their ability to respond could have a significant impact on public safety. Preemption of state and local authority could result in an immediate removal of protections for communities across the country, with the potential to limit accountability for manufacturers who fail to adequately warn consumers about the hazards posed by certain high-risk pesticides.

As the House continues its work in the 118th Congress, we urge you to reject any and all harmful pesticide policy riders that would both diminish local authority and compromise Congress’ ability to deliver bipartisan legislation for the American people. Thank you for your consideration of this request.

Treated Seed Troubles

Seed Treatment Overload: The Unintended Consequences of a Popular Practice

7/13/2021 | 1:01 PM CDT



By [Emily Unglesbee](#), DTN Staff Reporter

Connect with Emily:

[@Emily_Unglesbee](#)



Nearly 100% of commercial corn seed is treated with pesticides before planting, but only a small fraction of the insecticides are taken up by the plant, leaving the rest free to leach into soils and water. (DTN photo by Pamela Smith)

ROCKVILLE, Md. (DTN) -- For the first time in nearly a decade, Dan Hesterberg poured a few bags of untreated corn seed into his planter this spring.

"It was kind of weird opening up the seed and dumping it -- I thought, 'Wow! It's just plain old yellow corn -- no purple, no green!' the Vermilion County, Illinois, farmer recalled.

The seed had no insecticides, fungicides or other chemicals on it, a rare practice known as "planting naked." While that modern moniker conjures up images of vulnerability, it was how most seed arrived on his farm until about 15 years ago, Hesterberg points out.

Since then, seed companies have been coating a growing number of compounds on nearly every corn seed planted in the country; use in other row crops, such as soybeans, wheat, cotton and rice, is rising steadily as well. Yet details about their use, efficacy and fate in the environment are murky.

The seed treatment industry operates with minimal federal oversight, due to a loophole in EPA's governing law, leaving questions about the amount of pesticides applied via this route and how unused treated seed is discarded each year. In the meantime, a growing number of federal and academic studies are casting doubt on its necessity, particularly in soybean fields. Another body of research is showing that treated seeds aren't staying put, with alarming consequences for water

<https://www.dtnpf.com/agriculture/web/ag/crops/article/2021/07/13/seed-treatment-overload-unintended>

"But overall, for the broad prophylactic treatment of every acre, the return on investment was basically zero. If anyone makes money, it's not the farmer. At most they might break even."

EPA Sued Over Seed Treatments

Environmental Groups Sue EPA Over Lack of Action on Seed Treatment Petition

12/15/2021 | 3:24 PM CST



By [Emily Unglesbee](#), DTN Staff Reporter

Connect with Emily:

[@Emily_Unglesbee](#)



EPA has not yet responded to a four-year-old petition from environmental groups, demanding the agency fully regulate pesticide-treated seed as pesticides. Now, those groups are asking a federal court to order the agency to act. (DTN photo by Pamela Smith)

ROCKVILLE, Md. (DTN) -- EPA has not yet responded to a 2017 petition by environmental groups, demanding the agency fully regulate pesticide-treated seed.

Now, in a lawsuit filed Dec. 15, those groups are asking a federal court to order the agency to act.

At issue is a 2017 rule-making petition filed by the Center for Food Safety, which argued that EPA should regulate pesticide-treated seeds as pesticides. Currently, EPA says this kind of pesticide use falls under its "Treated Article exemption," and exempts treated seed from full regulation. The agency initiated a public comment period on the petition back in 2018, which garnered over 16,000 comments, but has since stalled on it.

In June 2021, in response to a DTN story on the lack of regulation and environmental costs of seed treatments, EPA stated that the agency was "working on a response" to the 2017 petition, but no action has been taken yet.

That constitutes an "unlawful delay," the plaintiffs of this

new lawsuit wrote in their complaint, now in front of the U.S. District Court for the Northern District of California.



CENTER FOR
FOOD SAFETY

2017 petition for EPA to regulate seeds coated with systemic pesticides as pesticides has gone unanswered

"unlawful delay"

 Lincoln Journal Star

Sale of contaminated biochar from AltEn halted after state agency intervenes

A Topeka landowner who initially agreed to buy biochar from AltEn told the Journal Star he wasn't aware of the former ethanol plant's...

Jan 19, 2022

 DTN/Progressive Farmer

Biochar Sale Halted, But State Regulators Approve Water Treatment at Defunct Ethanol Plant

OMAHA (DTN) -- Nebraska officials have approved a preliminary plan to treat 150 million gallons of contaminated water at the defunct AltEn...

Jan 19, 2022

 Omaha World Herald

'The cleanup crew': Leader behind controversial NY biochar business has ties to troubled Nebraska ethanol plant

The company includes an official who previously worked at the AltEn ethanol facility shut down by the state of Nebraska over environmental...

Dec 14, 2022



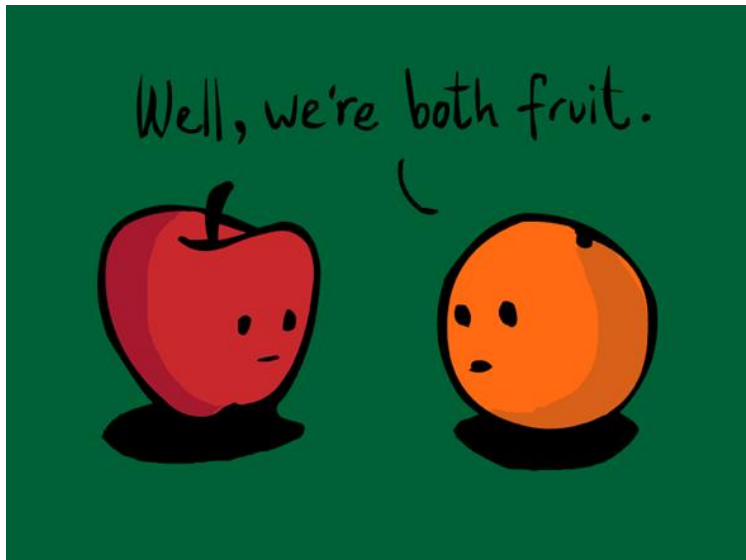
Perivallon Group is a coalition of community leaders that have come together to investigate the unfolding environmental disaster in Mead, NE

<https://www.sierraclub.org/nebraska/alten-crisis>

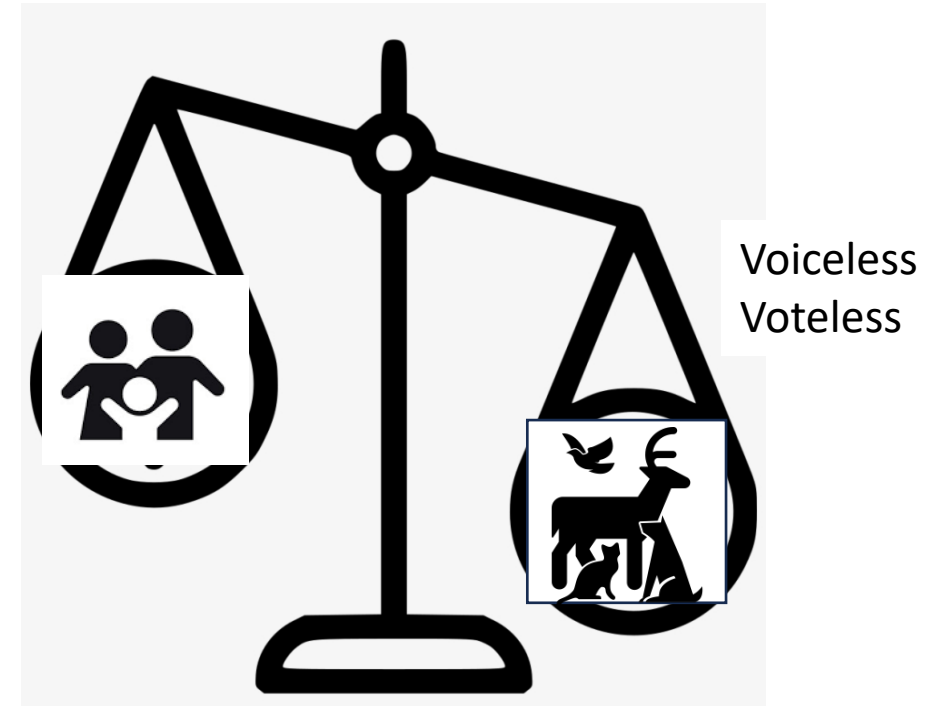


Lessons learned....

- 1) Everyone has a role to play
- 2) Utilize different perspectives (ex: systems approach to finding solutions)
 - Value of pesticide treated seeds?
(benefits vs harm)



→ (profits vs harm)

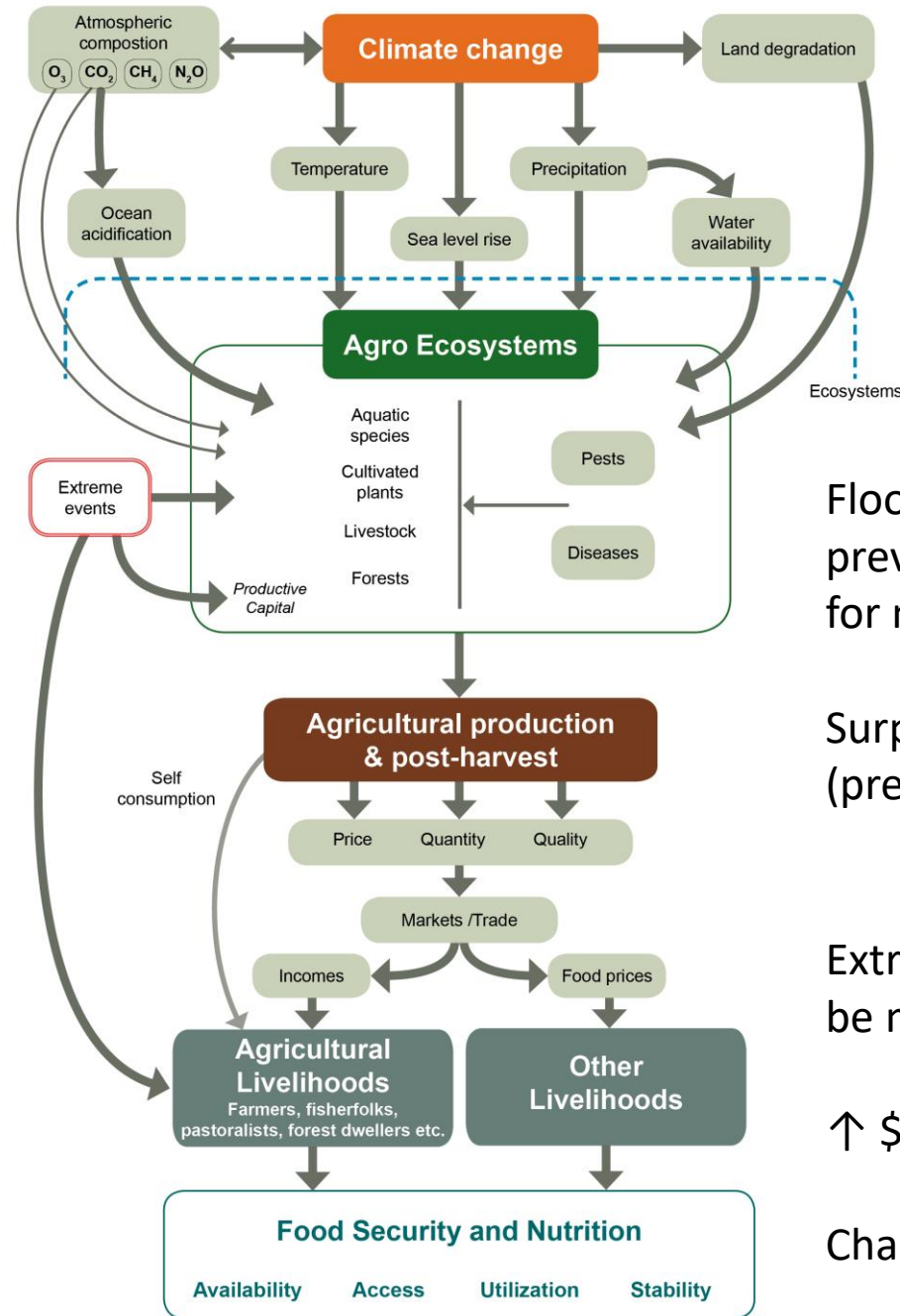


→ (need vs harm; profits vs expenses)

Climate change impacts on global food security



Climate change and food security: risks and responses



Flooding in 2018-2019 prevented farmers from planting corn for many Midwest states

Surplus of unused treated corn seeds (pre-treated; difficult to get untreated)

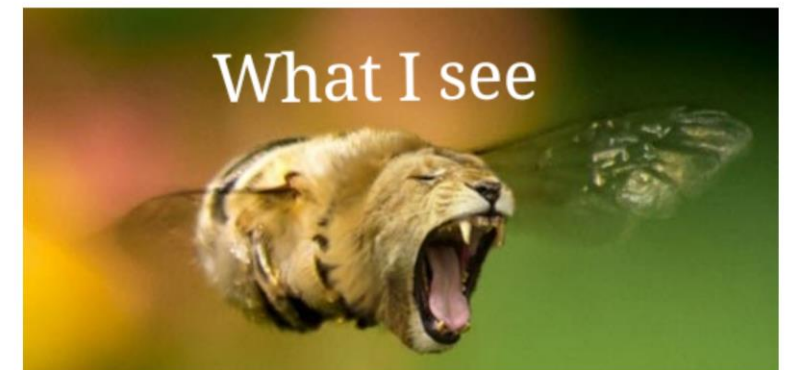
Extreme weather events will continue to be more common and affect farmers

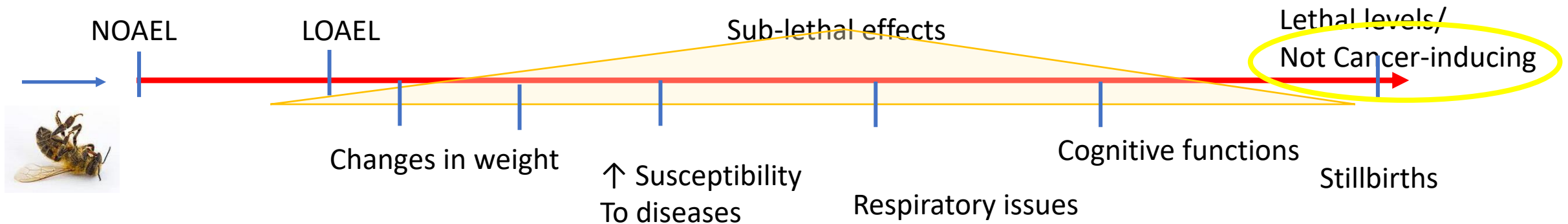
↑ \$\$\$ for proper disposal costs

Changes in production practices?

Lessons learned....

- 1) Everyone has a role to play
- 2) Try a different perspective (ex: systems approach to finding solutions)
- 3) Data informs policy change (but it needs to be relatable)





NOAEL: No
observable adverse
effect level

LOAEL: Lowest
observable adverse
effects level



What are the benchmarks for “safe” levels?

- Chronic exposures (air, water, soil, plants)?
- Impacts of chemical mixtures?

Will there be long-term impacts on other systems?

Bullfrog tadpole sampling in 2021



- Bullfrogs are an invasive species
- Tadpole sampling at 8 sites with different levels of connection to AltEn
- 83 tadpoles collected using dipnets
- Tissues in the process of being tested at our partner USGS lab in California in collaboration with Michelle Hladik

Legend

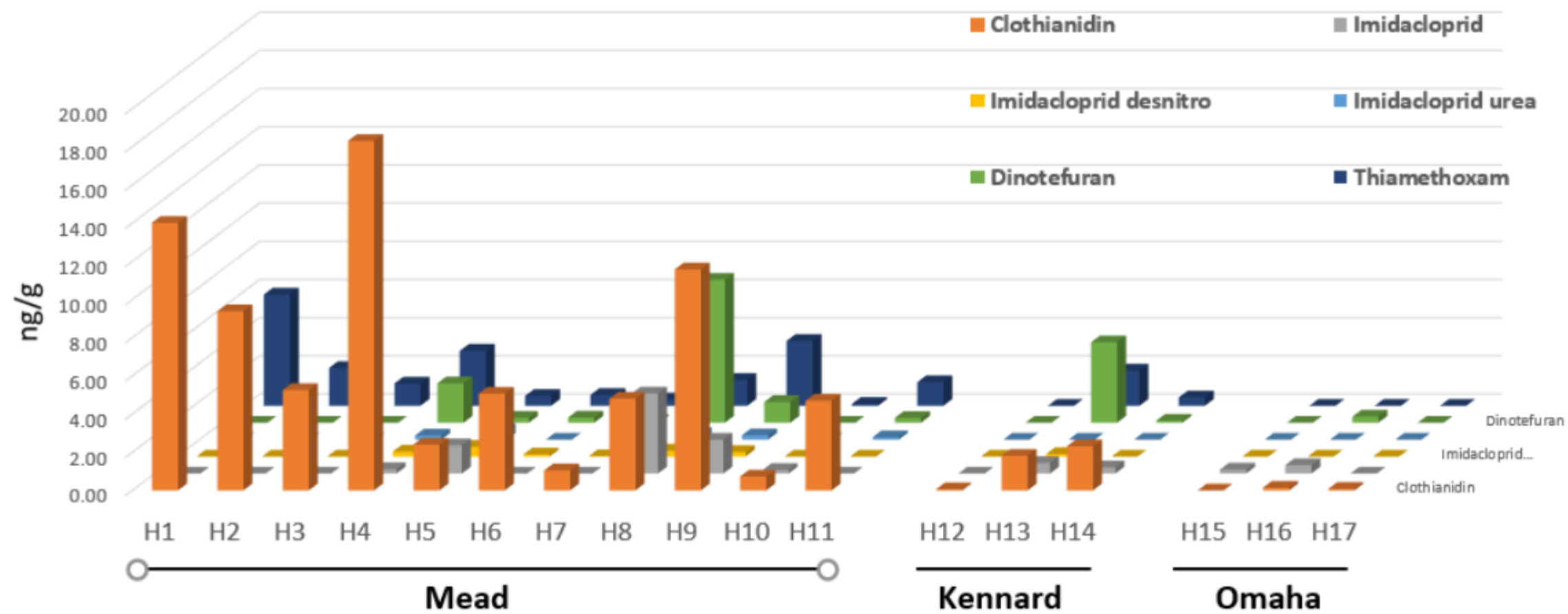
InitialResults

Clothianid

- 0.000000 - 3.200000
- 3.200001 - 13.400000
- 13.400001 - 23.700000
- 23.700001 - 38.500000
- 38.500001 - 315.400000

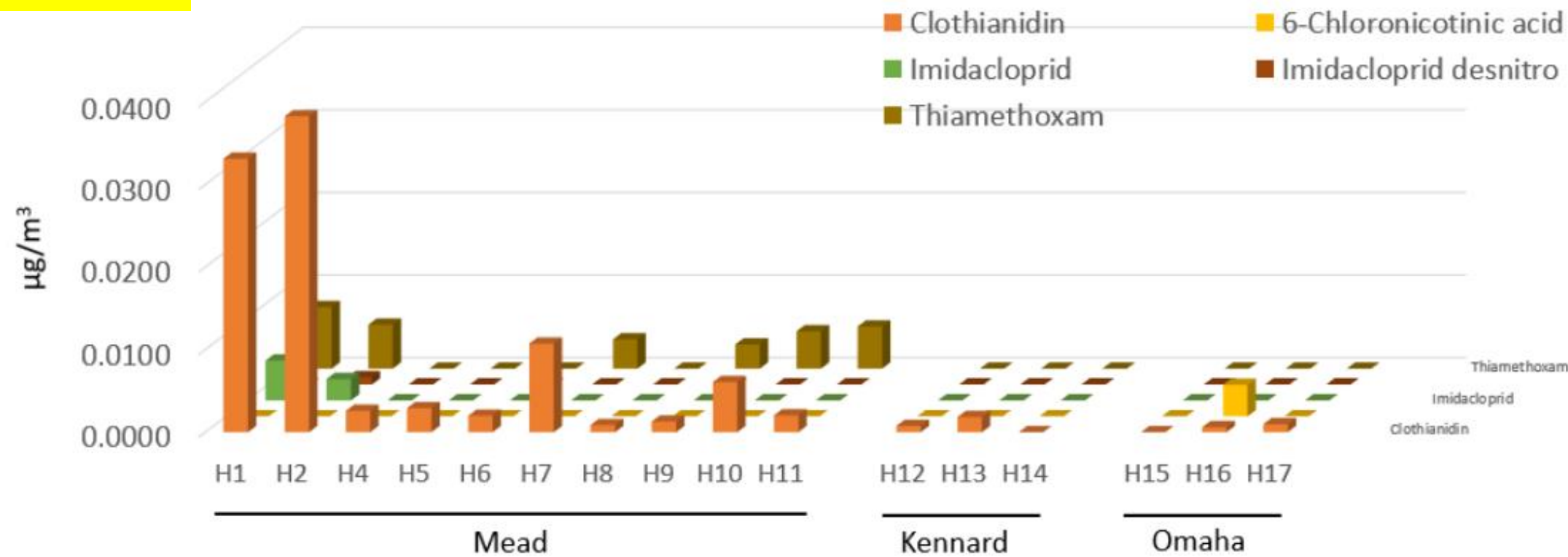


Detection of Neonicotinoids in Mead, Kennard and Omaha Residential Indoor Swipe Samples



Detection of Neonicotinoids in Mead, Kennard and Omaha Residential Indoor Air Samples

Air Vacuum Samples





NOAEL

Researchers are learning that insecticides like neonics can predispose bat populations to white-nose syndrome by further lowering the immune systems of exposed animals. Apr 13, 2021



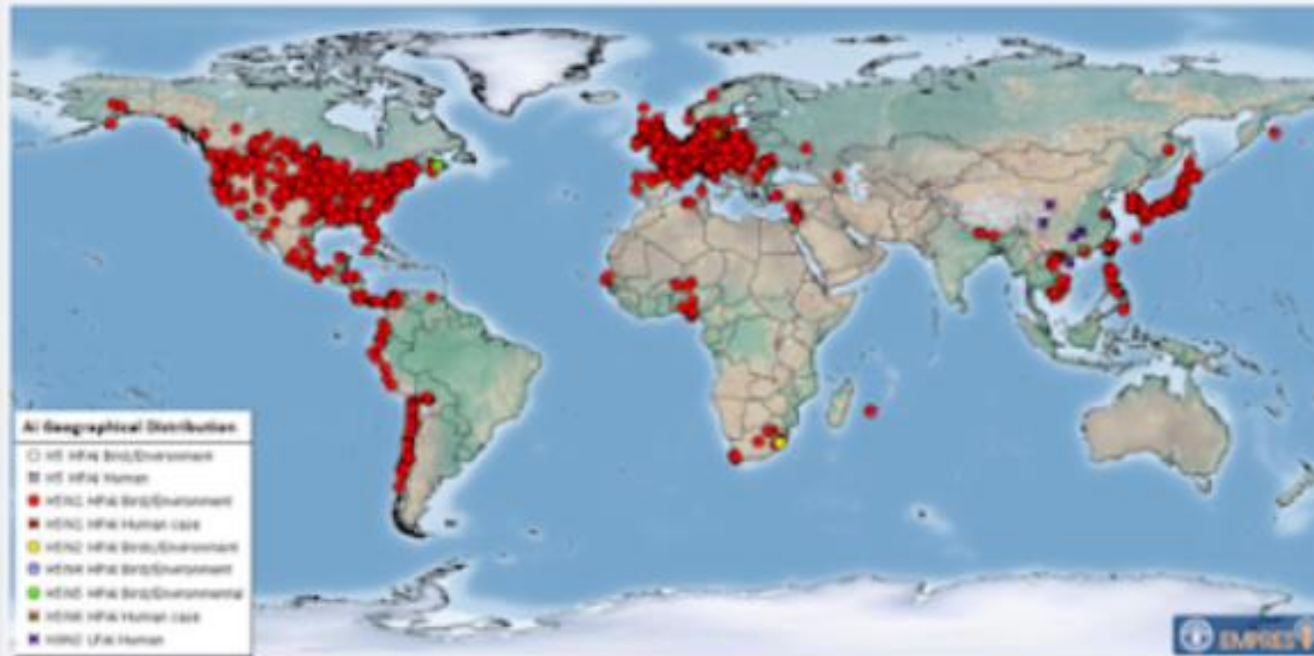
 cwf-fcf.org
<https://blog.cwf-fcf.org/index.php/neonictinoids-and-...>

Neonictinoids and Bats: Yet Another Danger for an Already ...

What other connections we should be considering???

FAO Update: Global Avian Influenza Viruses with Zoonotic Potential (March 2023)

Map 1. Global distribution of AIV with zoonotic potential* observed since 1 October 2022 (i.e. current wave)

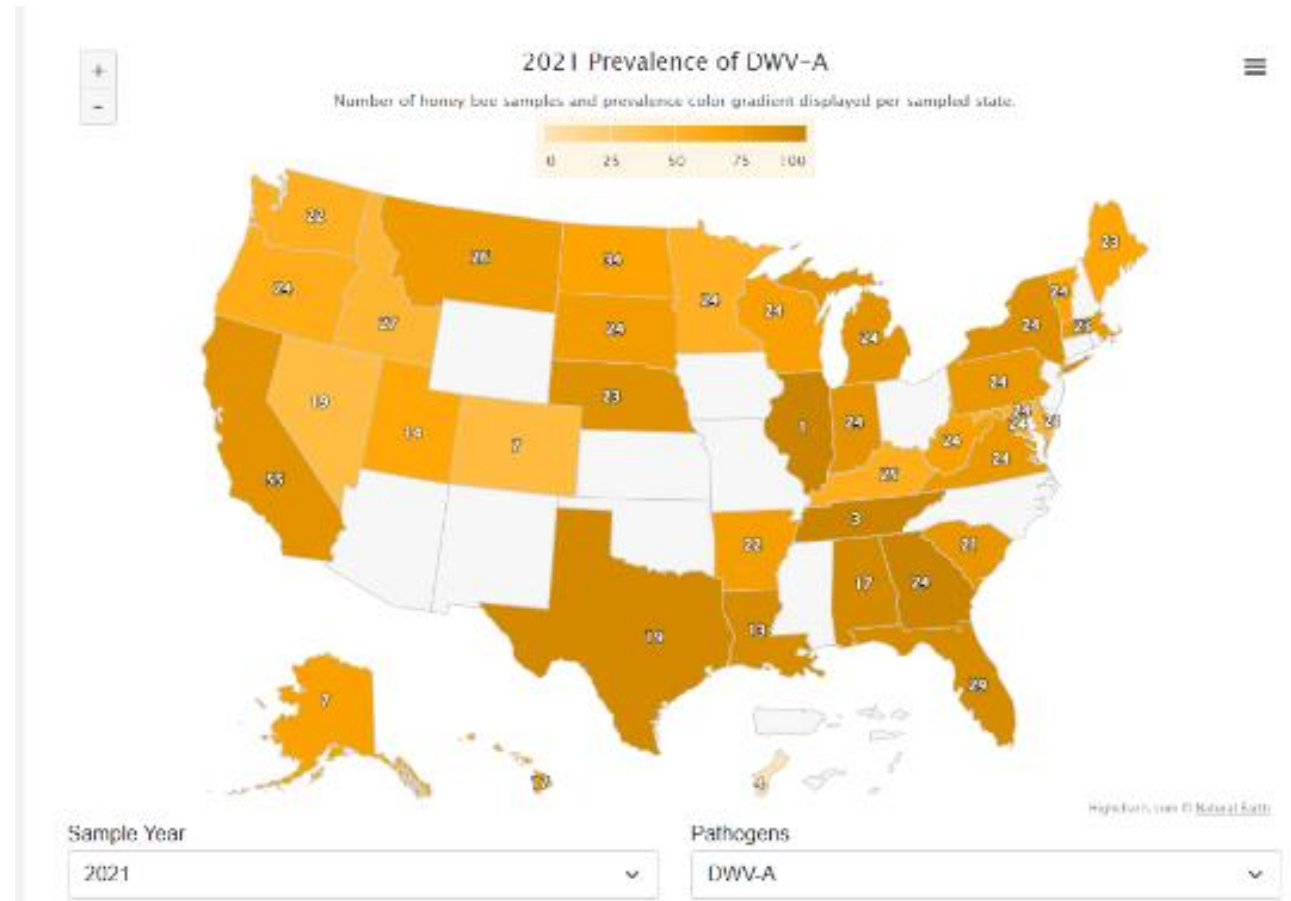


Note: Symbols may overlap for events in similar geographic locations.

* includes H5Nx, high pathogenicity avian influenza (HPAI) viruses.

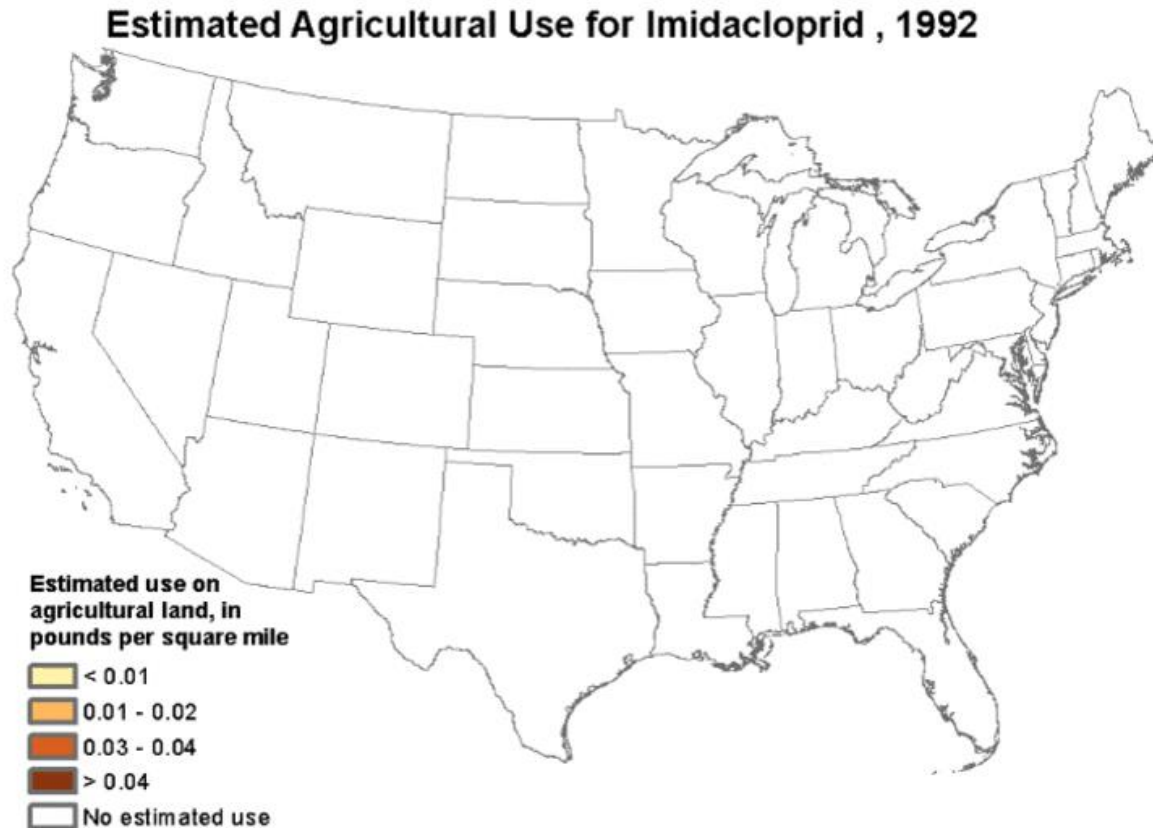
Lessons learned....

- 1) Everyone has a role to play
- 2) Try a different perspective (ex: systems approach to finding solutions)
- 3) Data informs policy change
- 4) Data gaps = no good

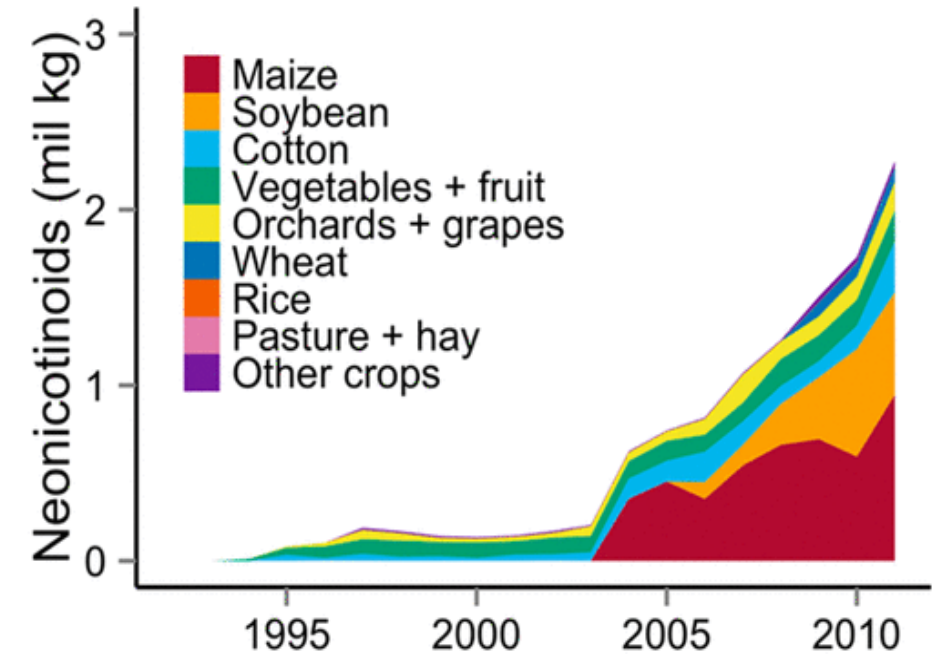


What are the challenges?

- Pervasive use and wide coverage
- Understanding environmental fate
- Estimating realistic/relevant neonicotinoid exposure



Data from USGS National Water-Quality Assessment Project

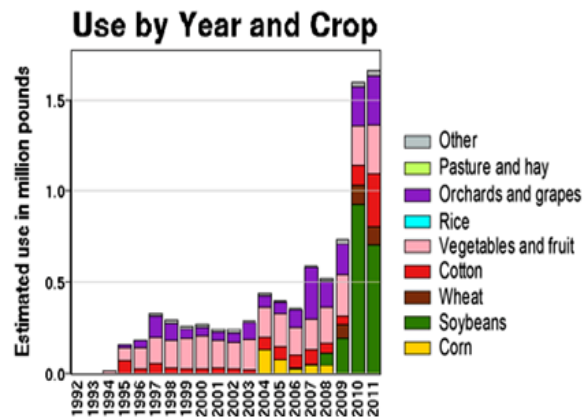
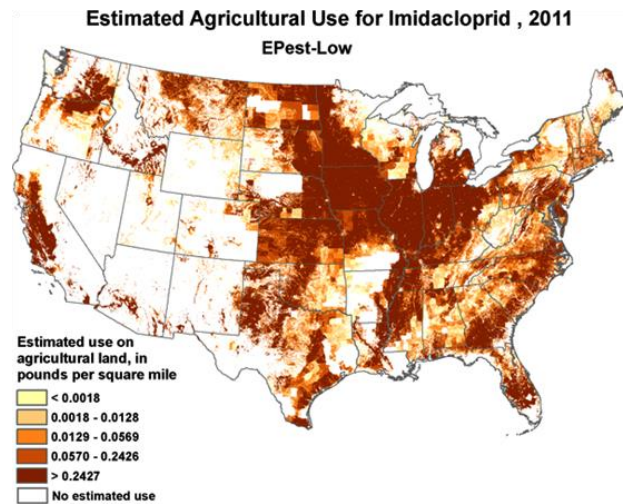


Treated crop seeds for 150+ million acres of corn, soybeans, canola, cotton, wheat, etc..... annually

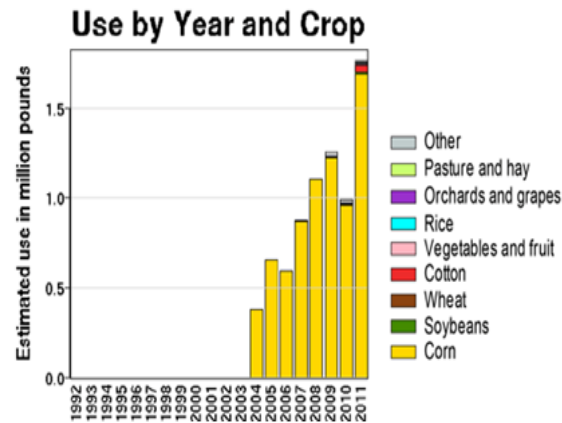
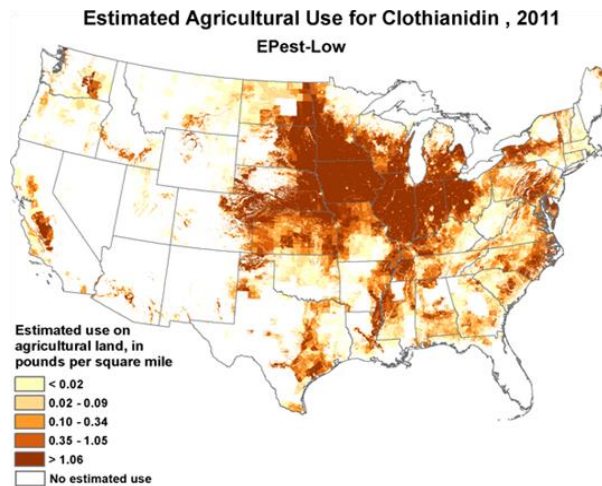
In 2011, 4.7 million pounds of the three neonicotinoids were used in the US



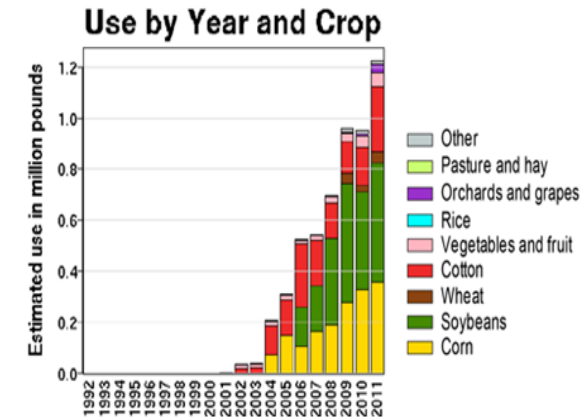
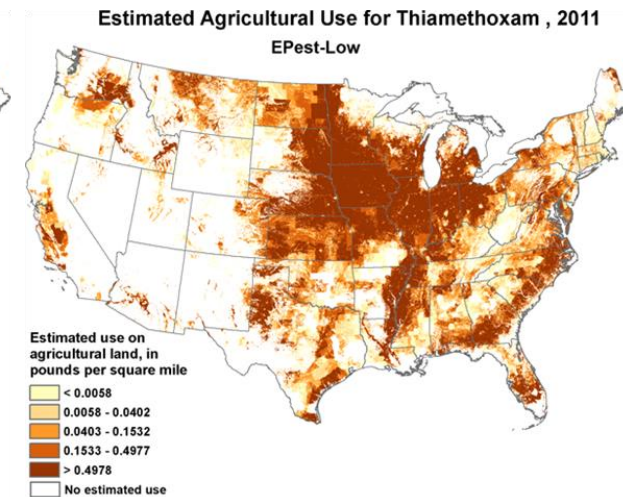
Imidacloprid



Clothianidin



Thiamethoxam

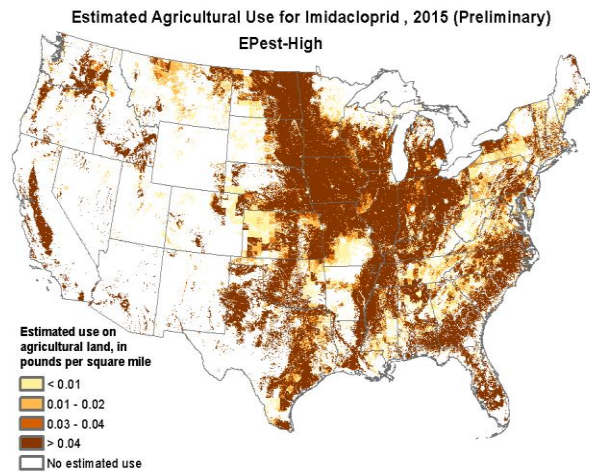


In 2015, <1.5 million pounds used?

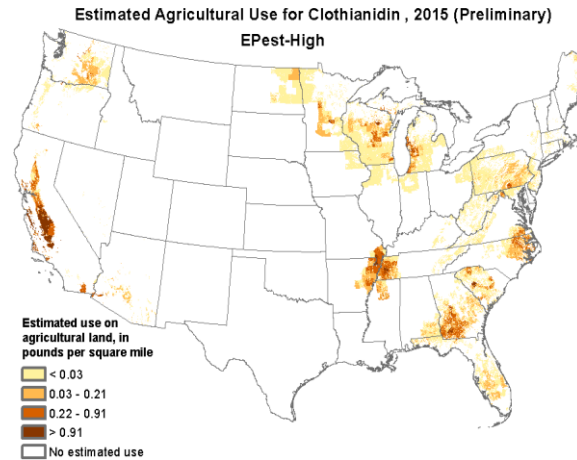
Beginning 2015, the provider of the surveyed pesticide data used to derive the county-level use estimates discontinued making estimates for seed treatment application of pesticides because of complexity and uncertainty. Pesticide use estimates prior to 2015 include estimates with seed treatment application.



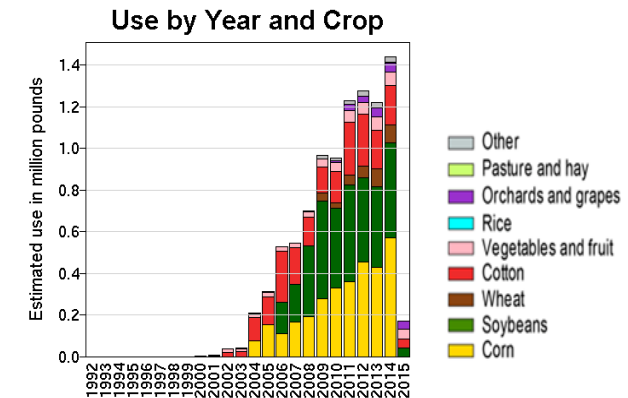
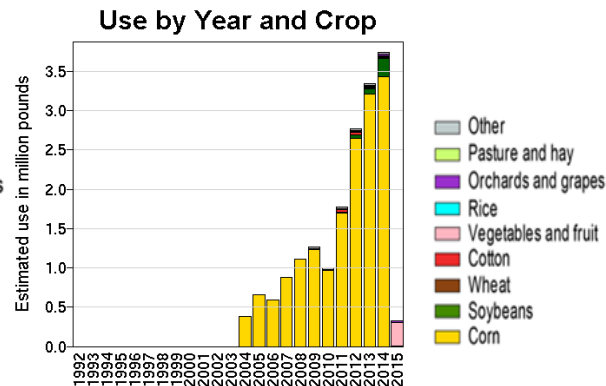
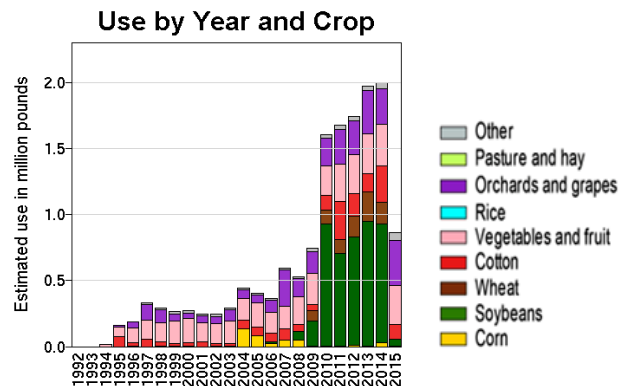
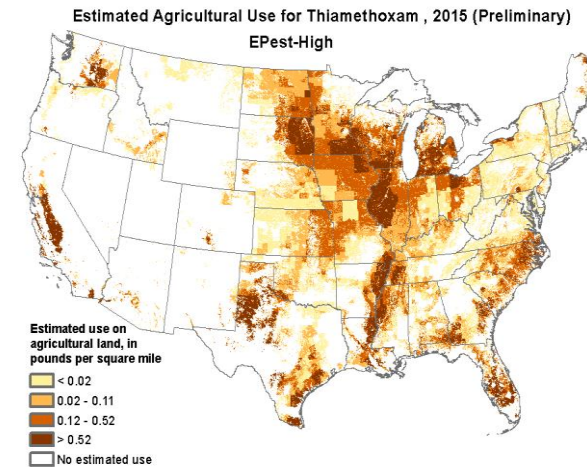
Imidacloprid



Clothianidin



Thiamethoxam



Lessons learned....

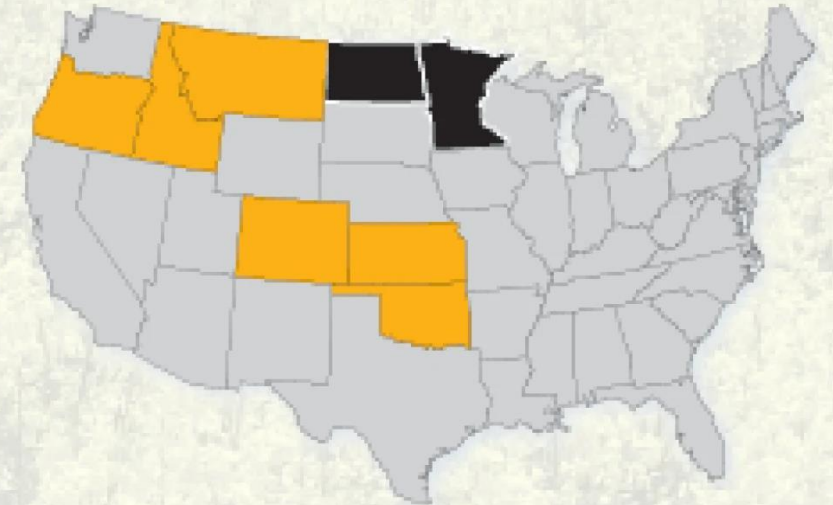
- 1) Everyone has a role to play
- 2) Try a different perspective (ex: systems approach to finding solutions)
- 3) Data informs policy change
- 4) Data gaps = no good
- 5) State & Regional (trends, patterns, programs, efforts)

Great Plains Canola Production Handbook



producer, are projected to plant a record 1.3 million acres this spring. Canola booster also are excited about soaring canola production elsewhere in the nation, particularly on the Southern Plains. Canola acres outside North Dakota and Minnesota have more than tripled since 2005.

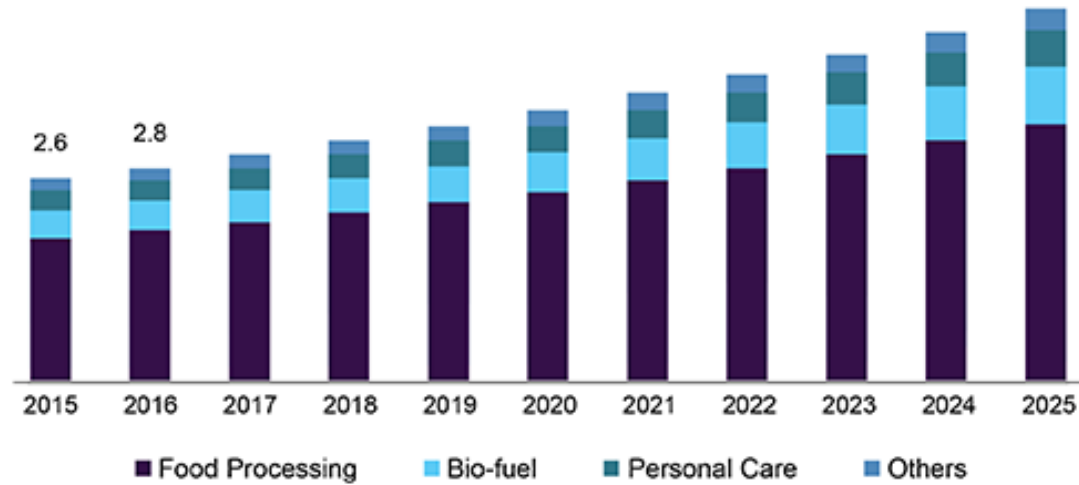
Washington and Colorado.



Canola acres planted



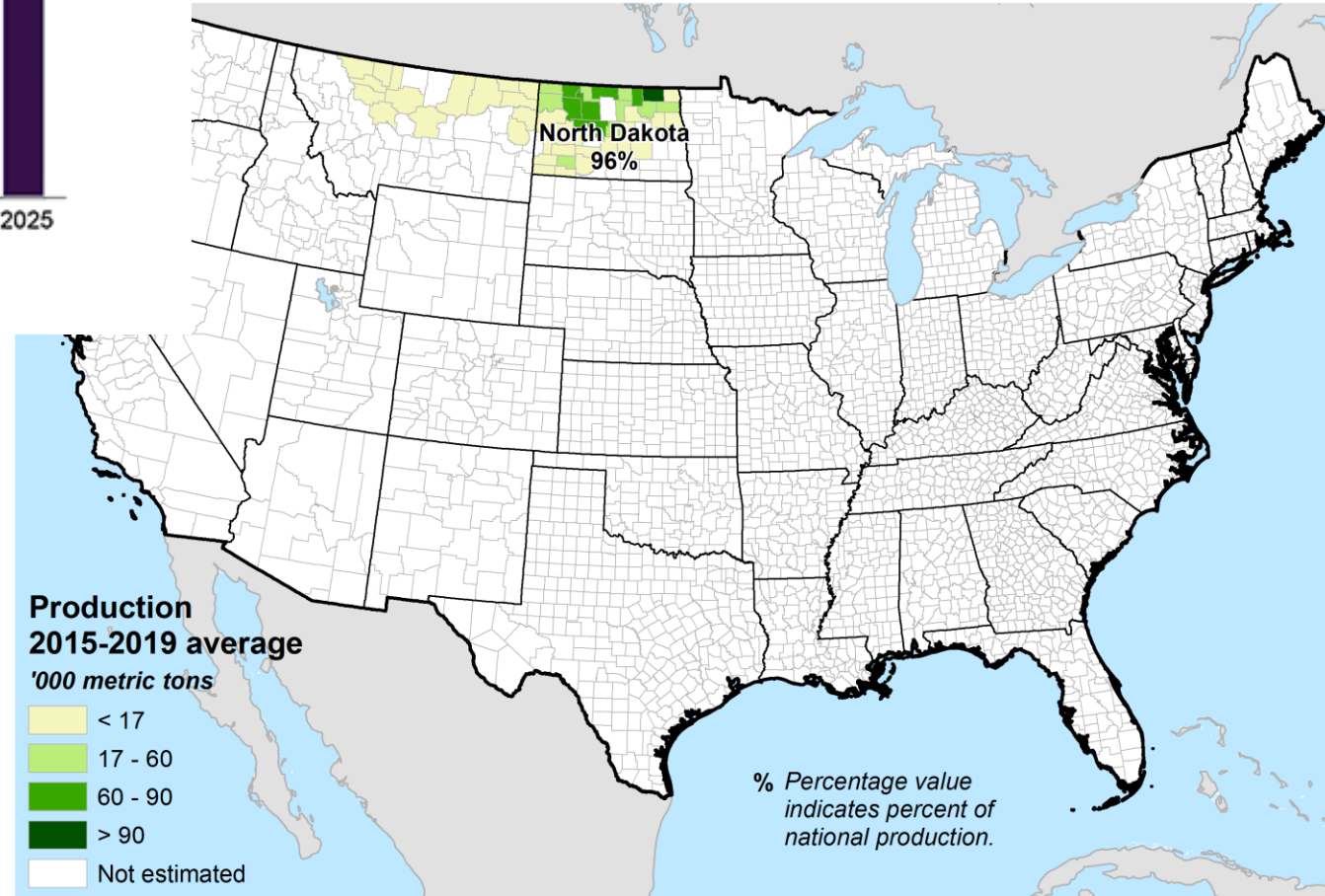
U.S. rapeseed oil market size, by application, 2015 - 2025 (USD Billion)



Source: www.grandviewresearch.com

NE currently has 2 farms with canola ~90 acres

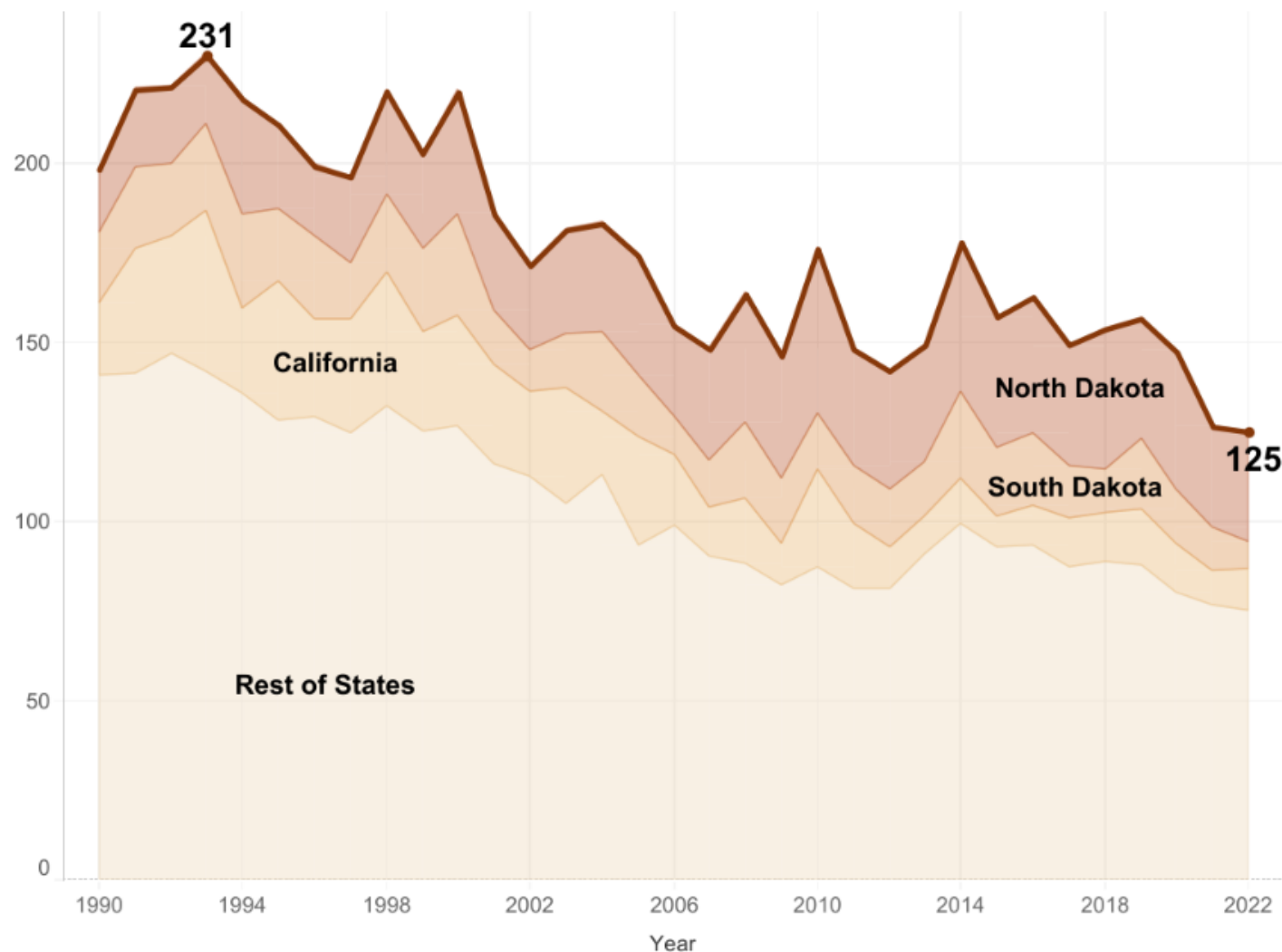
United States: Rapeseed Production



Total U.S. honey production and top three producing States, since 1990

Hover over the area segments to see breakdowns by year and State

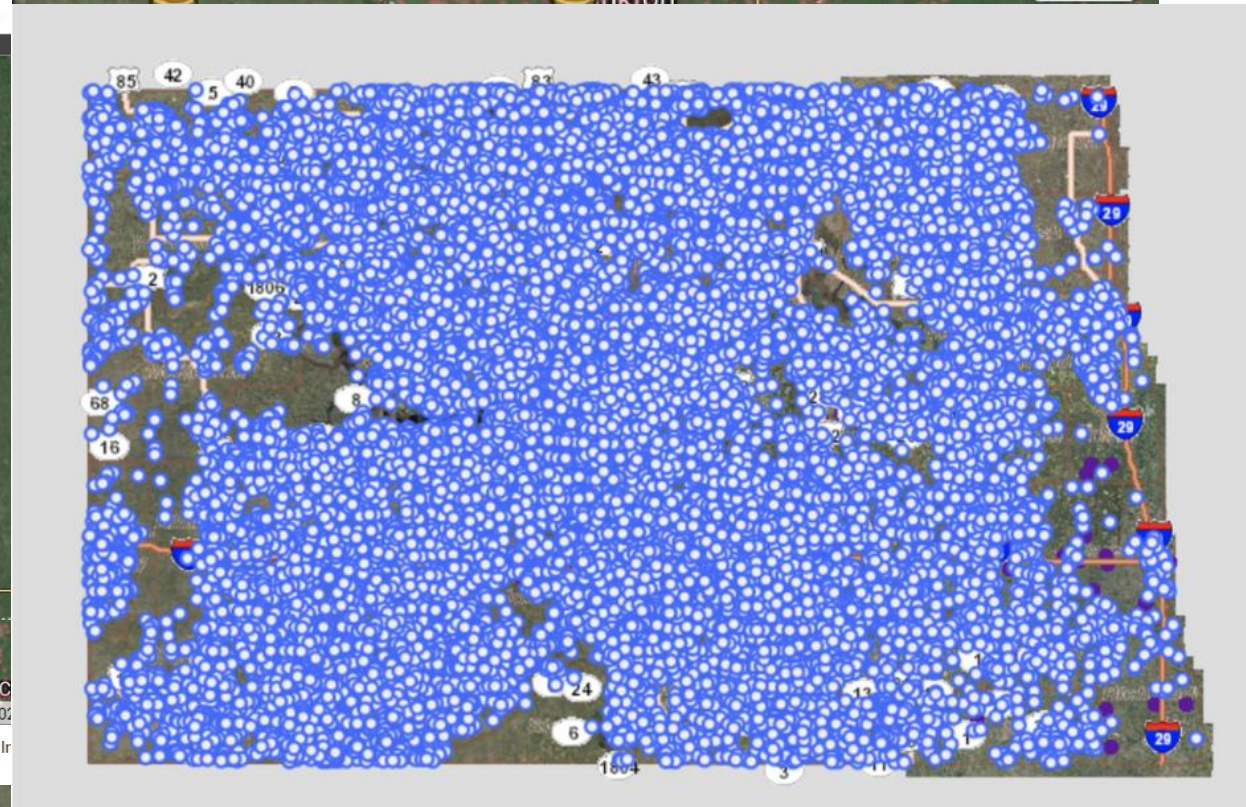
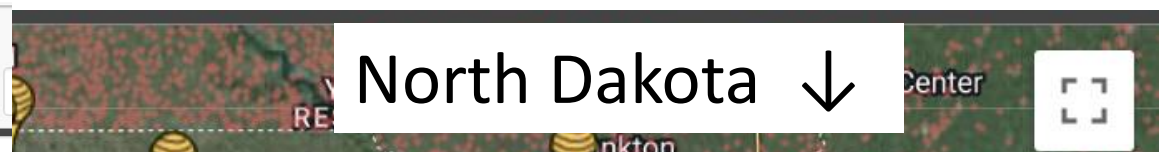
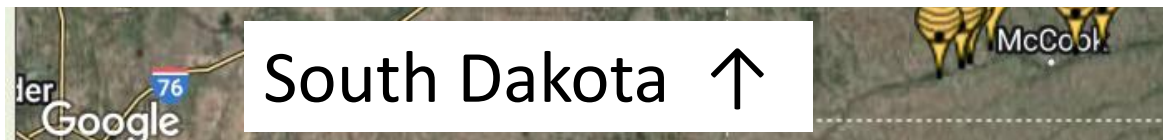
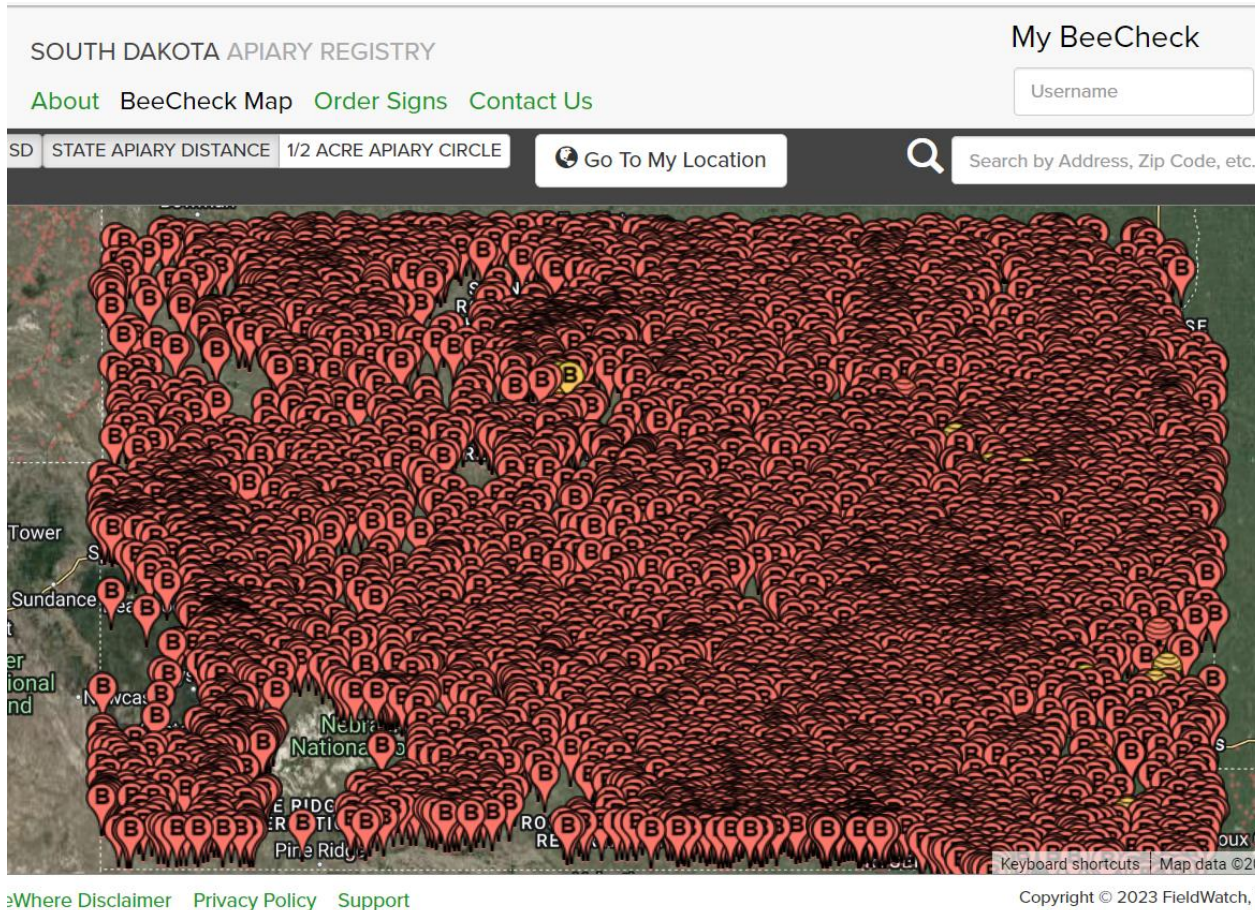
Million pounds



Domestic honey production declines three years in a row

U.S. honey production in 2022 was down for 3 consecutive years to 125 million pounds, 46 percent lower than the production peak of 231 million pounds in 1993. In 2022, production came from 2.667 million colonies, slightly below 2021's 2.697 million. These colonies yielded a national average of 47 pounds of honey, unchanged from 2021 and the lowest since 1990. In recent years, honeybee health and honey production have been affected by environmental stressors including extreme weather events, parasites and pests, and pathogens (Abadam, Yeh, and Brown, 2023). The top 3 honey-producing States have been North Dakota, California, and South Dakota, contributing about 40 percent of the total U.S. production on average.

Our neighboring states.....



Caption: Map of North Dakota bee yards. Each blue dot represents a registered apiary (bee yard) Source: <https://beemap.ndda.nd.gov/>

Keyboard shortcuts | Map data ©2023 Imagery ©2023 TerraMetrics | Terms of Use

How many out-of-state beekeepers operate in NE?

Lessons learned....

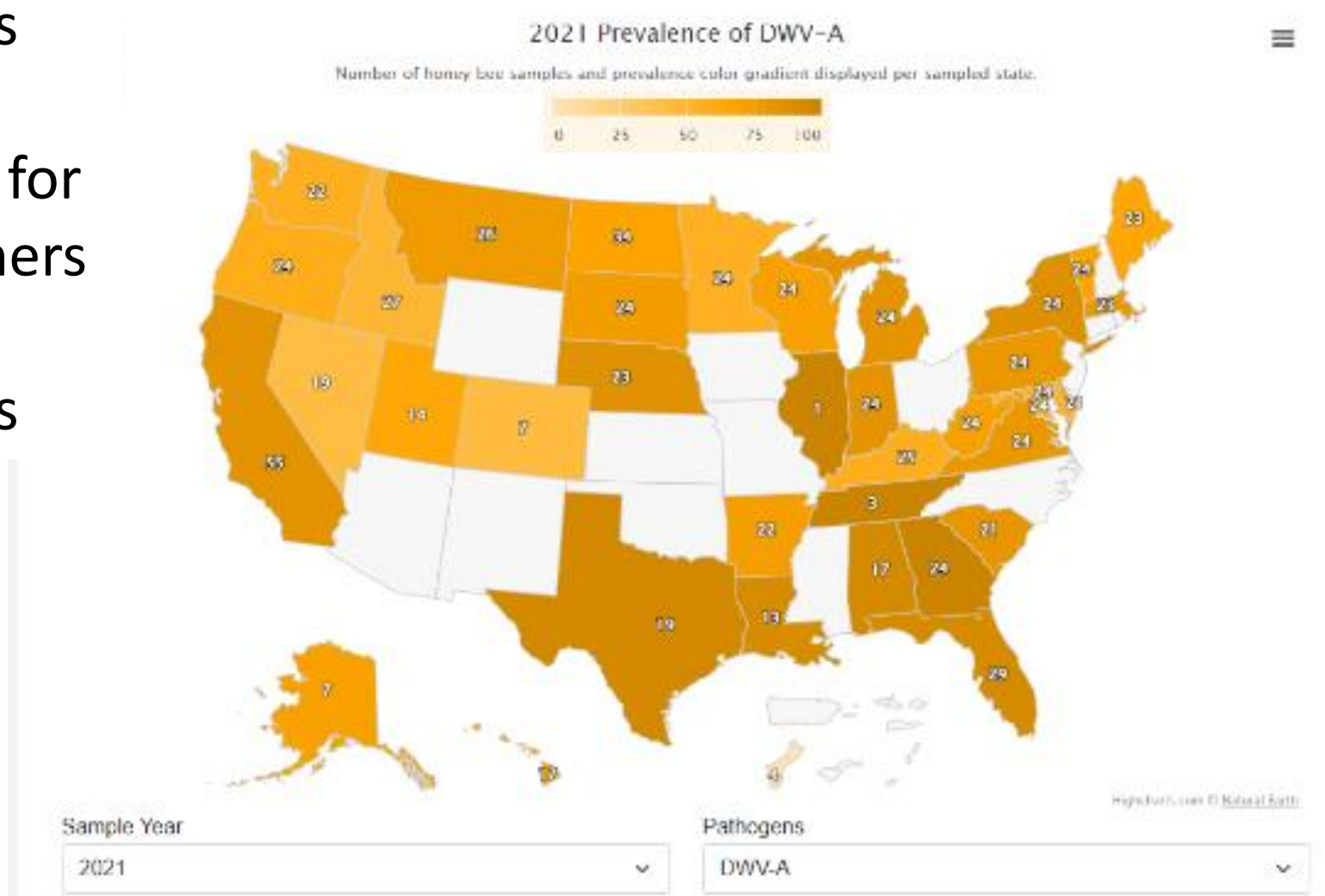
There are too many data gaps

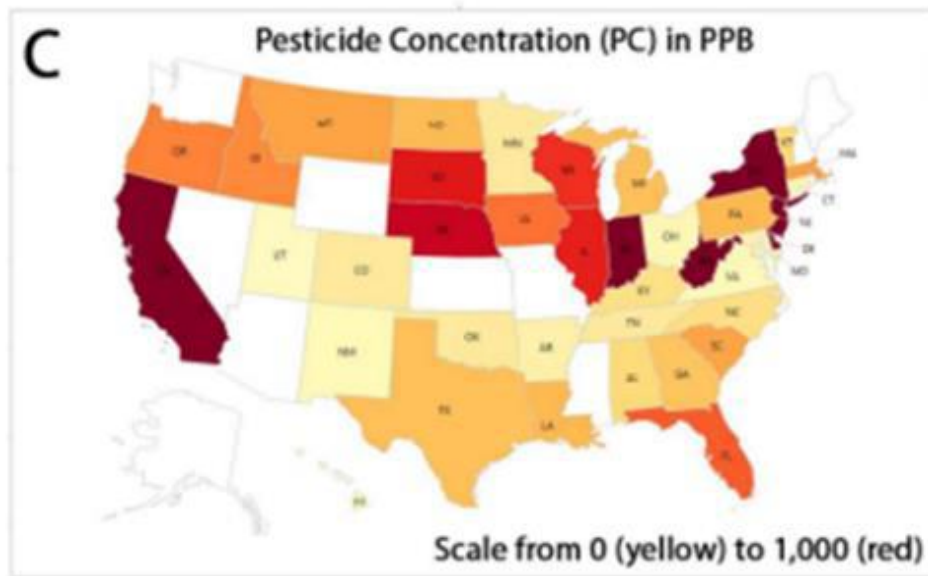
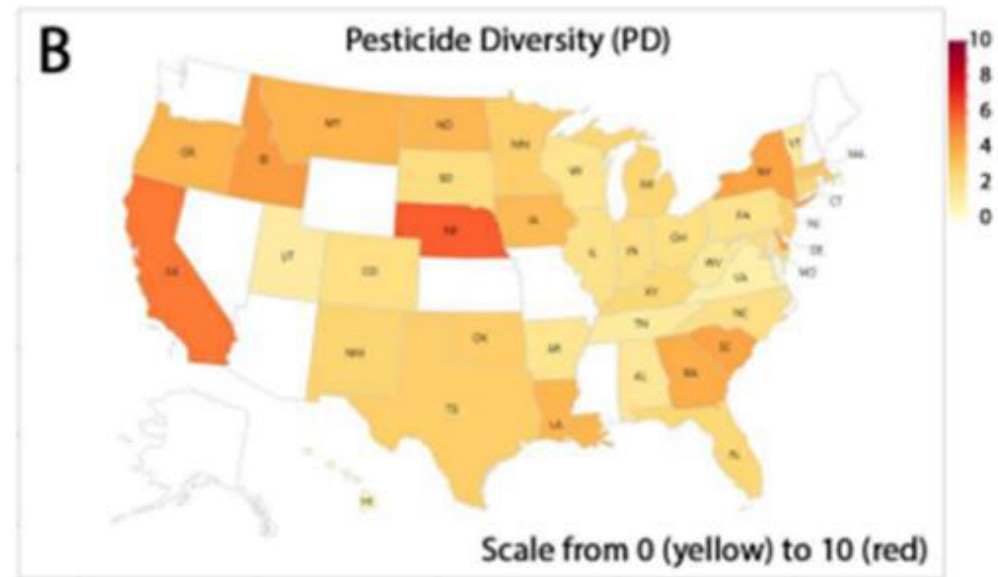
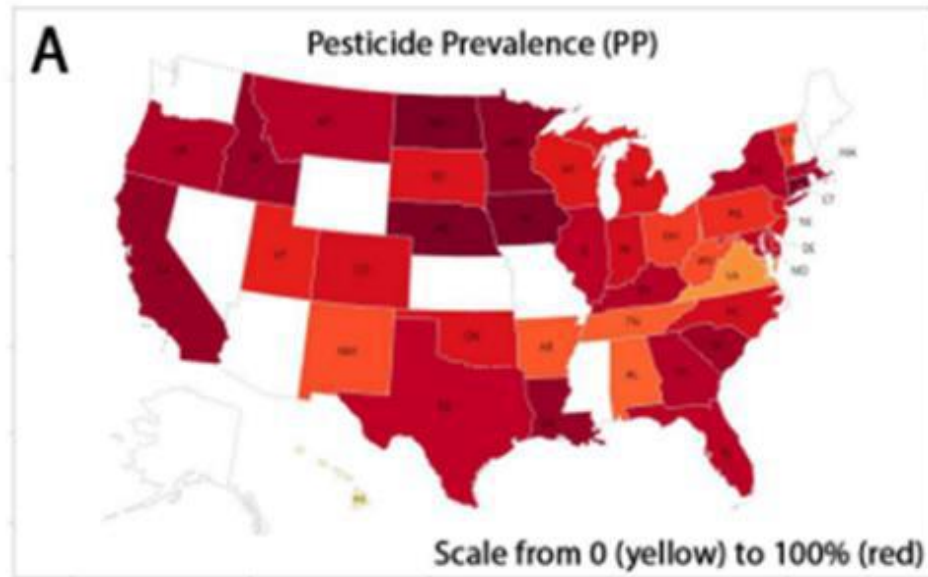
Too few resources & support for
beekeepers and bee researchers

Particularly in Midwest/Plains



Bee infected with *Deformed Wing Virus (DWV)* transmitted by Varroa mites





USDA APHIS National Honey Bee Disease Survey Pesticide results (Traynor et al 2021)

Home / News / Health News / Report Finds High Levels of P...

Report Finds High Levels of Pesticides in 20% of Fruits, Veggies

By [HealthDay](#) | April 18, 2024, at 8:30 a.m.



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Health

Life, But Better

Fitness

Food

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Mindfulness

Relationships

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Reducing pesticides in food: Major food manufacturers earn an F grade

By Sandee LaMotte, CNN

🕒 8 minute read · Published 2:00 PM EST, Wed November 8, 2023





Reducing pesticides in food: Major food manufacturers earn an F grade

By Sandee LaMotte, CNN

🕒 8 minute read · Published 2:00 PM EST, Wed November 8, 2023



(CNN) — Seventeen major food manufacturers earned an average grade of F for their lack of progress in reducing pesticides in the products they sell, according to a new analysis by As You Sow, a nonprofit specializing in shareholder advocacy.



Common contaminants linked to accelerated weight gain in children

“Many companies set pesticide reduction goals of 2025 and 2030 that appeal to shareholders,” said Cailin Dendas, lead author for the report, “Pesticides in the Pantry: Transparency & Risk in Food Supply Chains,” published Wednesday.

“Now, we’re looking at the progress companies are making to achieve those goals, and finding little significant movement,” said Dendas, environmental health program coordinator for the nonprofit.

“It’s disheartening to see so many bad grades across the board for these major food production companies,” said Jane Houlihan, research director for Healthy Babies, Bright Futures, an alliance of nonprofits, scientists and donors with a mission of reducing babies’ exposures to neurotoxic chemicals.

Pesticide linked to reproductive issues found in Cheerios, Quaker Oats and other oat-based foods

MONEY
WATCH

By Kate Gibson

Edited By Aimee Picchi, Anne Marie Lee, Alain Sherter

Updated on: February 20, 2024 / 6:56 AM EST / CBS News

-Pesticide exposure is unavoidable!
(in the air, in our food, in our home)

-What does that mean for bees? For us?

-Growing problem adds to the complexity of issues.

-PROBLEM= Overuse and over dependency of chemical treatments

Chlormequat found in Cheerios, oat foods, per new study: What is it?

A study found chlormequat in 4 out of 5 Americans tested. The EWG says the findings "ring alarm bells" as the chemical has been harmful in...

Feb 16, 2024



Pesticide chlormequat found in oat cereals, U.S. population samples — but scientists debate risks

Even at the highest concentrations detected in the study, "someone would need to eat a kilogram per day" to reach the concentration the EPA...

Feb 19, 2024



Are Cheerios and Quaker Oats safe? Experts weigh in on new pesticide concerns.

An Environmental Working Group study found the pesticide chlormequat in some oat products, including popular breakfast cereal and oatmeal.



Lessons learned....

- 1) Everyone has a role to play
- 2) Try a different perspective (ex: systems approach to finding solutions)
- 3) Data informs policy change
- 4) Data gaps = no good
- 5) State & Regional (trends, patterns, programs, efforts)
- 6) Find a better balance



Suggested Asks: ESA's FY 2023 Funding Requests and Other Priorities

Support for entomological research which includes public health, sustainable agriculture, and environmental protection priorities. Stress the need for champions of science in Congress, specifically for entomology.

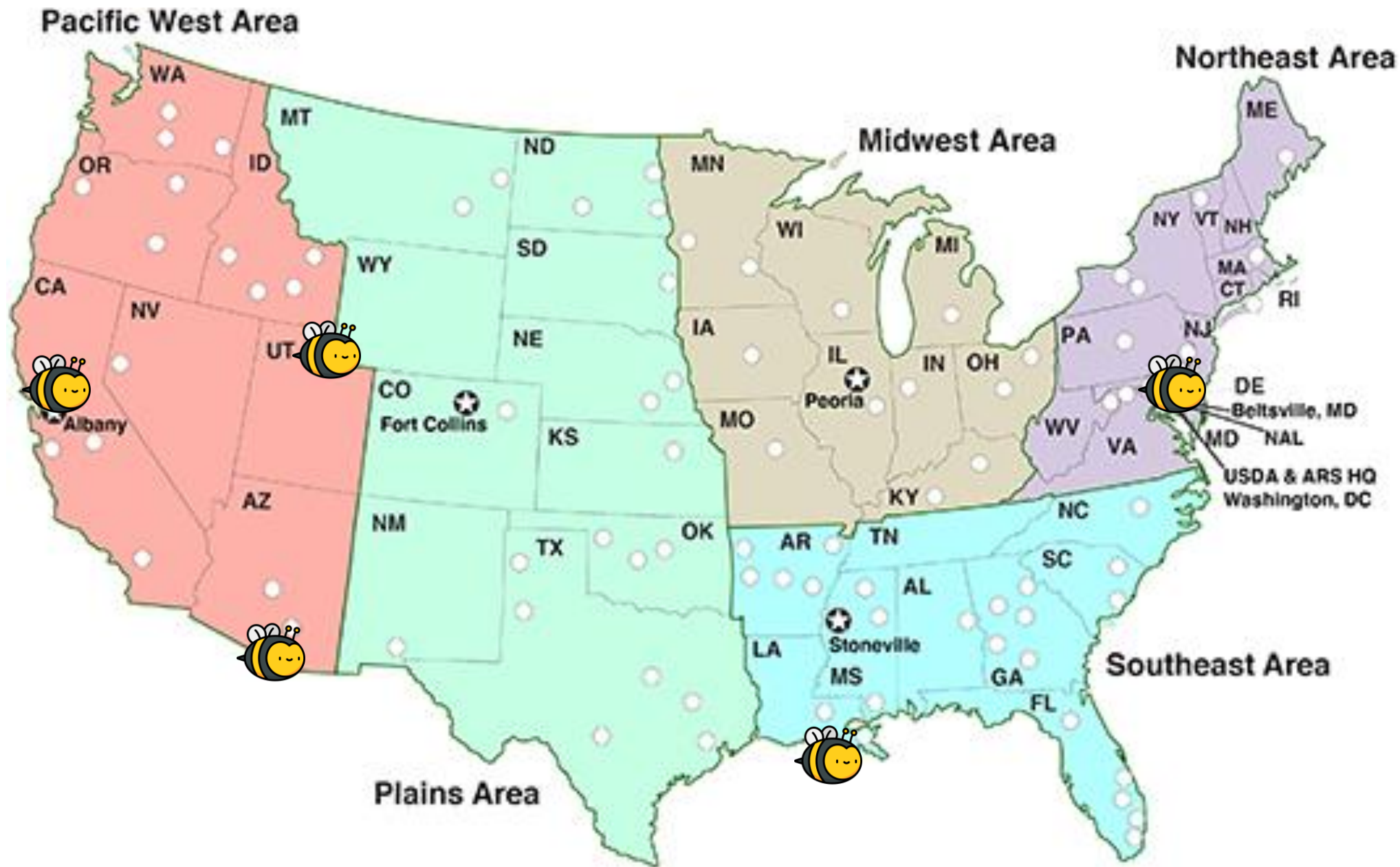


- **U.S. Department of Agriculture (USDA):** ESA requests no less than **\$1.82 billion** for the National Institute of Food and Agriculture (NIFA), including at least **\$700 million** for the Agriculture and Food Research Initiative (AFRI), which administers competitive funding for innovative research, extension, and education activities. ESA also supports a top-line funding level of at least **\$1.90 billion** for the Agricultural Research Service (ARS) and **\$1.15 billion** for the Animal and Plant Health Inspection Service (APHIS), with strong support for pest management research, invasive species programs, and pollinator health.
- **U.S. Forest Service (USFS):** ESA requests **\$9.0 billion** in discretionary funds, of which \$318 million is for Forest and Rangeland Research and no less than the FY 2020 enacted level of \$100 million for Forest Health Management. These programs support research, development, and land management activities designed to mitigate hazards posed by invasive species and other harmful insects, diseases, and plants.
- **National Invasive Species Council (NISC):** ESA requests **\$2 million** for NISC, to coordinate policy, communication, and technology use across 16 federal agencies involved with invasive species control.
- **National Science Foundation (NSF):** ESA joins the research community by requesting **\$11 billion** for NSF, including strong support for the Directorate for Biological Sciences (BIO), which is the nation's primary funder of fundamental research on biodiversity, ecology, and environmental biology.
- **Environmental Protection Agency (EPA):** ESA requests **\$864 million** for EPA Science and Technology, of which \$50 million is requested to support the Science to Achieve Results (STAR) Program. ESA also requests strong support for programs across the agency that advance the safe application of pesticides.
- **National Institutes of Health (NIH):** ESA joins the research community by requesting **\$49 billion** for NIH's base program funding, including increased support for vector-borne disease research at National Institute of Allergy and Infectious Diseases (NIAID). ESA also supports at least \$4 billion for the Advanced Research Projects Agency for Health (ARPA-H) to supplement the core investment in NIH's base funding.
- **Centers for Disease Control and Prevention (CDC):** ESA supports **\$11 billion for CDC**, including full funding for programs authorized in the *Kay Hagan Tick Act* and increased investment to fund scientific activities related to vector-borne diseases, as well as \$110 million for the Climate and Health program.

USDA → ~ \$4 billion

EPA → \$864 million

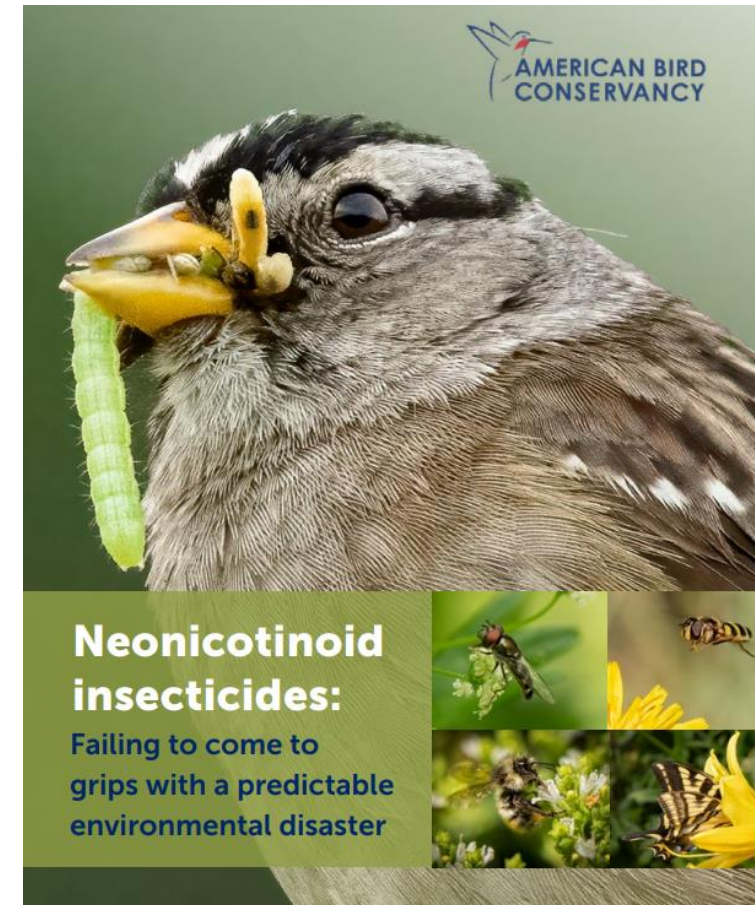
NIH
& CDC → \$60 billion



Lessons learned....

- 1) Everyone has a role to play
- 2) Try a different perspective (ex: systems approach to finding solutions)
- 3) Data informs policy change
- 4) Data gaps = no good
- 5) State & Regional (trends, patterns, programs, efforts)
- 6) Find a better balance
- 7) Don't disengage, don't despair. GET ENGAGED!!!
we need more voices & perspectives

Thank you !!!





Policy Training for Beekeepers

- Asked to design new policy training workshop for beekeepers
- Travel stipends from One Hive (\$2000) to encourage state/local beekeepers to attend national meeting and training
- Provide tips/practice on engagement with policy makers
- Will be offered again next year!



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LEGISLATIVE ISSUES AND UPDATES

The American Beekeeping Federation (ABF) works tirelessly in Washington, D.C., and throughout the U.S. to further our legislative and regulatory priorities that the ABF membership has identified as important to our business.

Below are issues that the American Beekeeping Federation is currently working on or involved in.

We can make a positive impact through strong governmental relations to bring our thoughts and concerns to the appropriate parties. We need to convey our message when proposed legislation and laws will adversely affect beekeepers and their business.

We promise to keep you informed of legislative issues throughout the year, and if we can better serve you as your ABF representatives, please let us know.

We Need Your Involvement!

2025 NATIONAL BEE MEETINGS

American Beekeeping Federation Conference & Tradeshow in RENO, NEVADA

American Honey Producers Association 54th Annual Convention & Trade Show in TEMPE, ARIZONA

2023's Best States for Beekeeping

by Sav Maive | Published: May 16, 2023 | 0 Comments

Studies



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Recent Studies

[2023's Best Cities for Surviving a Zombie Apocalypse](#)

[2023's Cities With the Best Residential Views](#)

Ranking based on four categories:

- Output,
- Earning Potential,
- Distribution,
- and Support

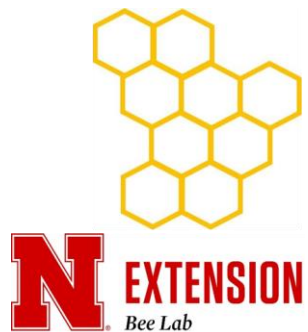


MOST HONEY-PRODUCING COLONIES

- 1 North Dakota
- 2 California
- 3 Florida
- 4 South Dakota
- 5 Texas

FEWEST HONEY-PRODUCING COLONIES

- 1 Kansas (TIE)
- 1 Vermont (TIE)
- 3 Kentucky (TIE)
- 3 Virginia (TIE)
- 3 West Virginia (TIE)



Thanks for your attention

For more information about workshops, research, & upcoming beekeeping programs



Visit our website or follow us

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@JudyWuSmart1



@hapbeelady



Interested in donating to our program?
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