



Dry Bean Insect Pests



Janet J. Knodel

Professor and Extension Entomologist



NDSU

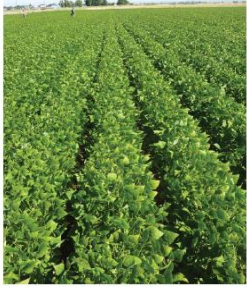
EXTENSION





E1750

2014



E1802

2015 DRY BEAN Grower Survey

*of Production, Pest
and Pesticide Use
in Minnesota and North Da*



J.J. Knodel, P.B. Beauzay, G.J. Endres,
D.W. Franzen, H.J. Kandel, S.G. Markell,
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North Dakota State University

*In cooperation with the
Northarvest Bean Growers Association*

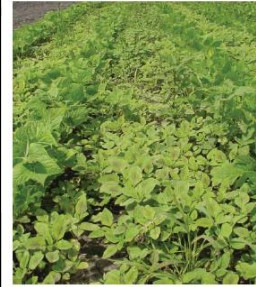
NDSU EXTENSION
SERVICE
March 2016



E1841

2016 DRY BEAN Grower Survey

*of Production, Pest P
and Pesticide Use
in Minnesota and North Da*



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E1884

2017 DRY BEAN Grower Survey

*of Production, Pest P
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in Minnesota and North Da*



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Fargo, ND
April 2018



NDSU EXTENSION EXTENDING KNOWLEDGE » CHANGING LIVES

E1902 (March 2019)

2018 DRY BEAN Grower Survey

*of Production, Pest Problems
and Pesticide Use
in Minnesota and North Dakota*



J.J. Knodel, P.B. Beauzay, G.J. Endres,
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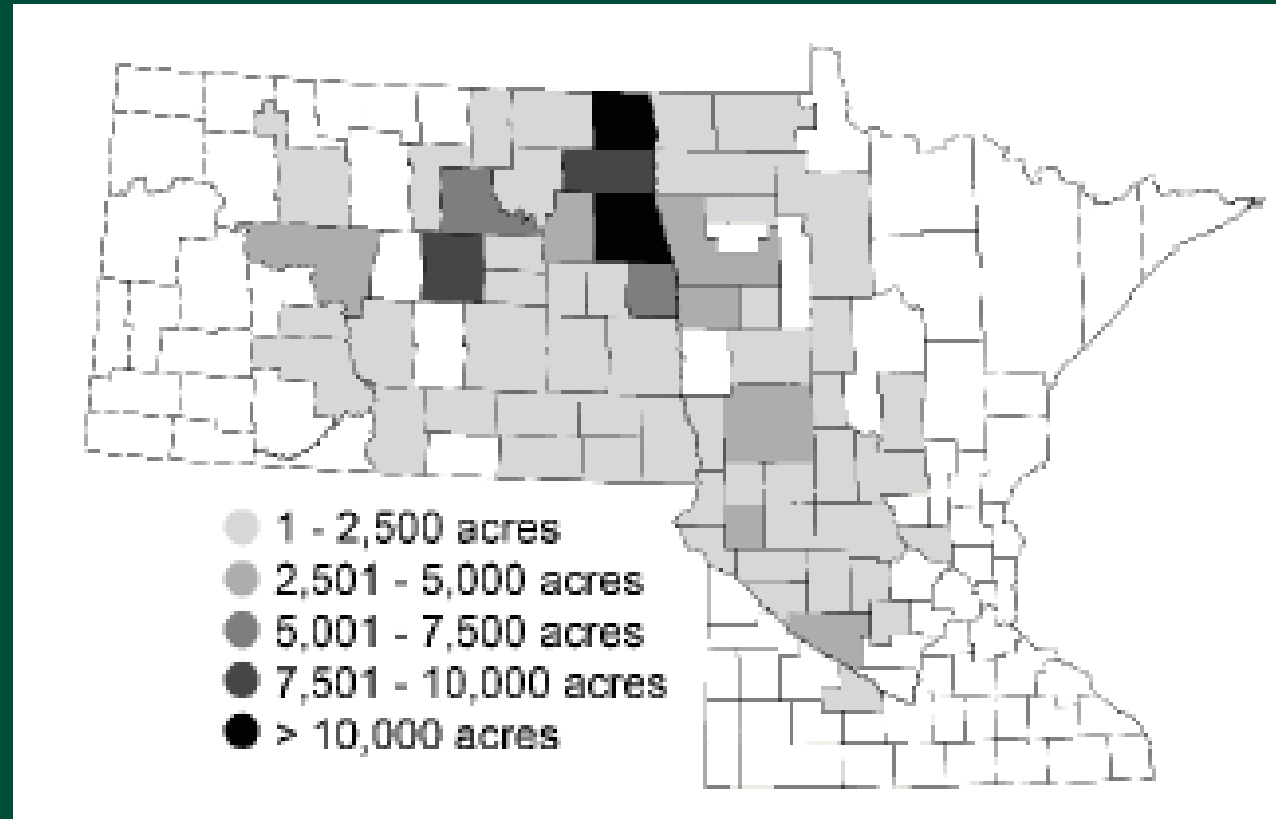
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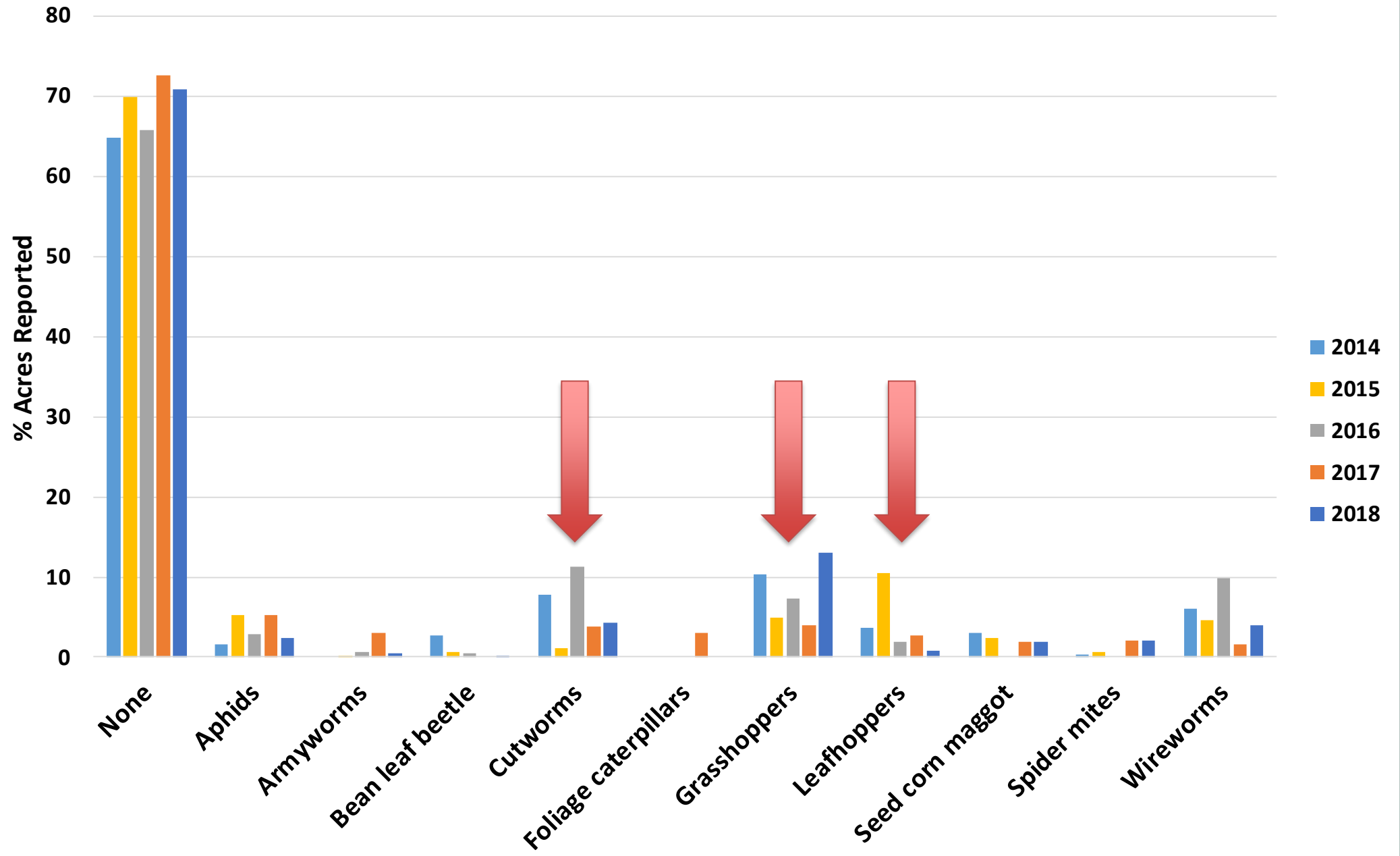
EXTENSION

Dry Bean Production 2018



Source: 2018 Dry Bean Grower Survey of Production, Pest Problems and Pesticide Use in Minnesota and North Dakota, NDSU Extension Service, E1902

Worst Insect in Dry Edible Bean in North Dakota, 2014 - 2018



Seedling and Root Feeders: Cutworms

- **Adult (Family Noctuidae)**
 - Miller moths
 - Very robust, stout bodies
 - Brown or black moths showing various spots or stripes in shades of gray, brown, black or white
 - 1.25-1.5 inch wingspan
- <http://www.ndsu.nodak.edu/ndsu/ndmoths/>



Cutworm Larvae

- Larvae
 - Life stage that causes crop injury!
 - Chewing mouthparts
 - Stout, smooth, soft-bodied, plump caterpillars
 - Brown to tan to pink, green or gray and black
 - 1.25-2 inches long when mature



Cutworm Damage

- Feed at night
- Damage:
 - ✓ Young plants chewed off at or below ground
 - ✓ Foliage feeding injury
 - ✓ Bare spots
 - ✓ Wilted plants
- Reduced plant stand
 - ✓ Increase weed problems
 - ✓ Reduced yield



Cutworm Economic Threshold in Dry Beans

- 1 or more cutworms per 3 feet of row and larvae are small ($<3/4$ inch)
- 5% of the plants damaged

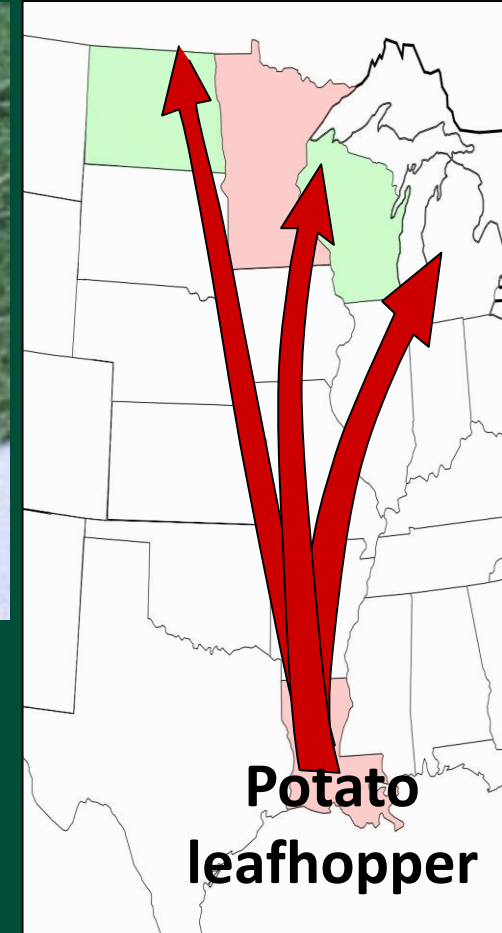


Photo courtesy of John Gavloski, Manitoba

Potato Leafhopper

Empoasca fabae

- **Adult**
 - ✓ Wedge shaped
 - ✓ Pale green
 - ✓ Small, 1/8 inch long
- **Nymphs**
 - ✓ Wingless
 - ✓ Feed on undersides of leaves
- Both adults and nymphs run backwards or sideways when disturbed
- Migrate into ND from southern states



Potato Leafhopper Damage

- “Hopper Burn”
- Foliage dwarfed, crinkled, and curled
- Small triangular area at tips of plants
- Damage worst during dry conditions
- Vector diseases in crops (potato)
- **Economic Threshold**
 - One leafhopper per trifoliate leaf
 - Unifoliate stage – 0.5 leafhopper per plant

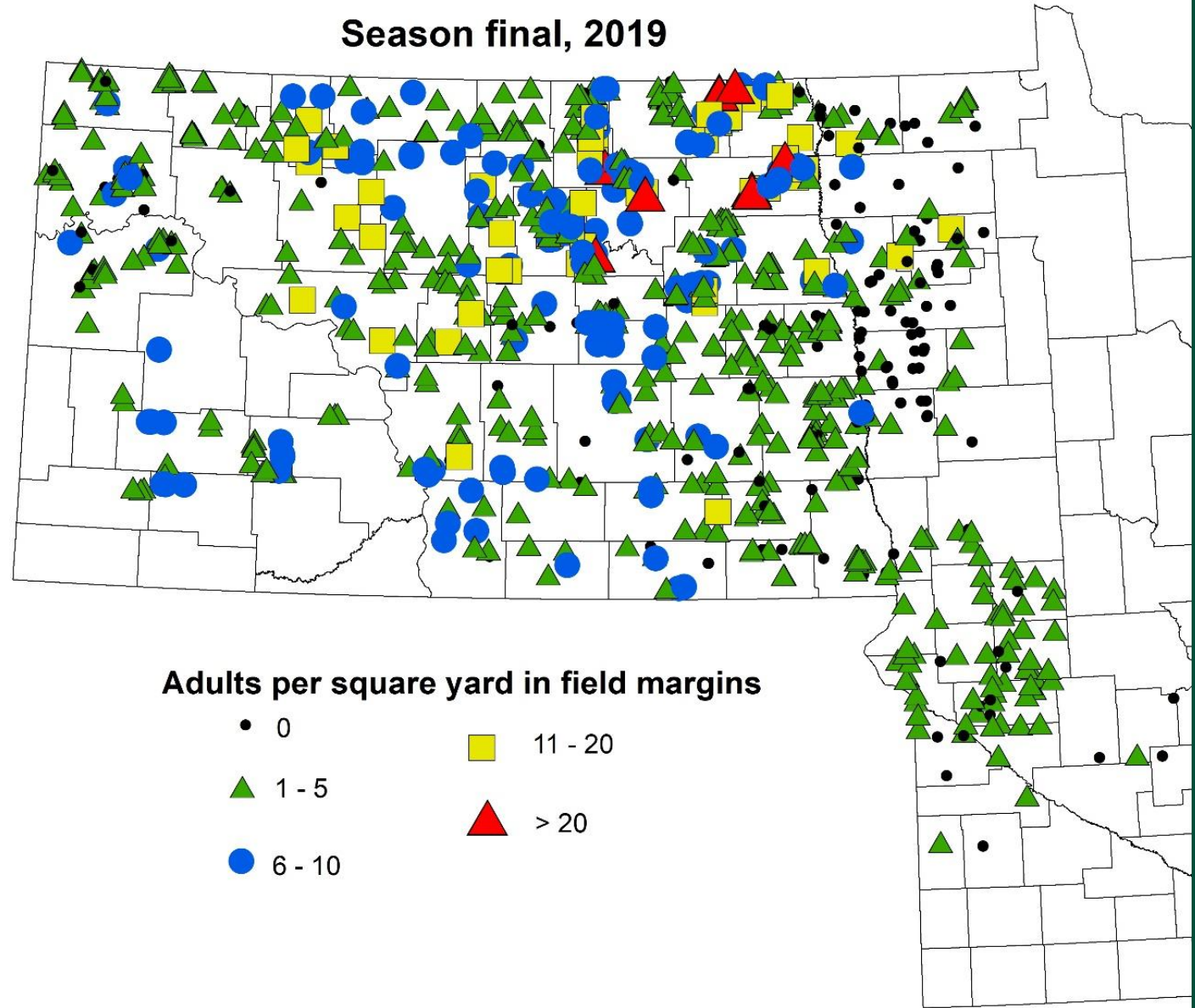


Grasshoppers



Grasshoppers

Season final, 2019



Grasshopper Infestation Ratings

Rating	Nymphs per square yard		Adults per square yard	
	Margin	Field	Margin	Field
Light	25–35	15–25	10–20	3–7
Threatening (action threshold)	50–75	30–45	21–40	8–14
Severe	100–150	60–90	41–80	15–28
Very severe	200+	120+	80+	28+



4 - 180 degree sweeps with sweep net = 1 square yard

Foliage-feeding Caterpillars



Thistle caterpillar



Alfalfa webworm



Green cloverworm



Veetbean caterpillar

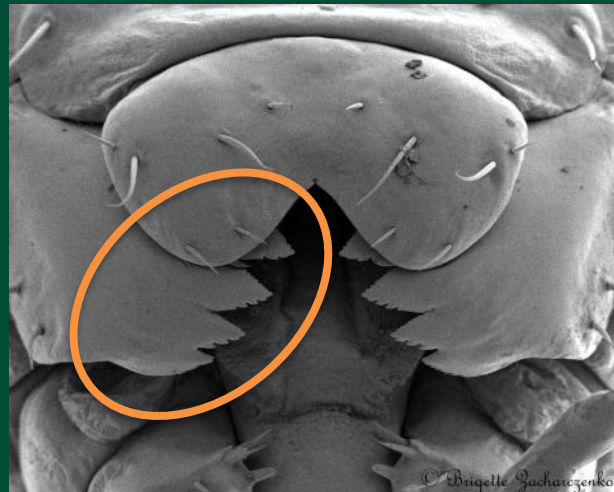
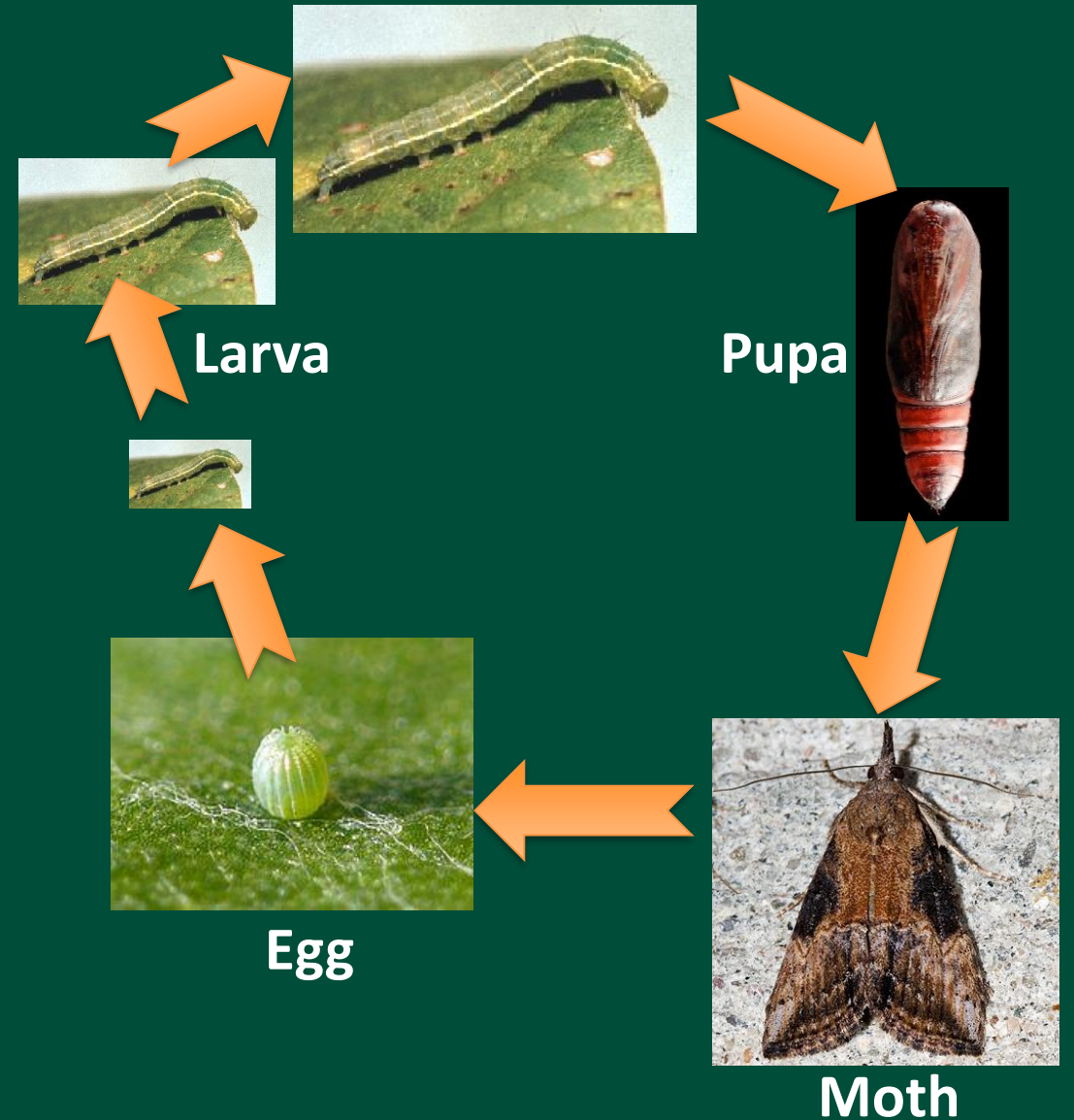


Soybean looper

Life Cycle of Foliage-feeding Caterpillars

- **Complete Metamorphosis**

- Egg to larval stages to pupae to adult
- Larvae look different from adult
 - Chewing mouthparts
- Pupal stage, called chrysalis for butterfly (inactive)
- Adult moth / butterfly emerges from pupa / chrysalis



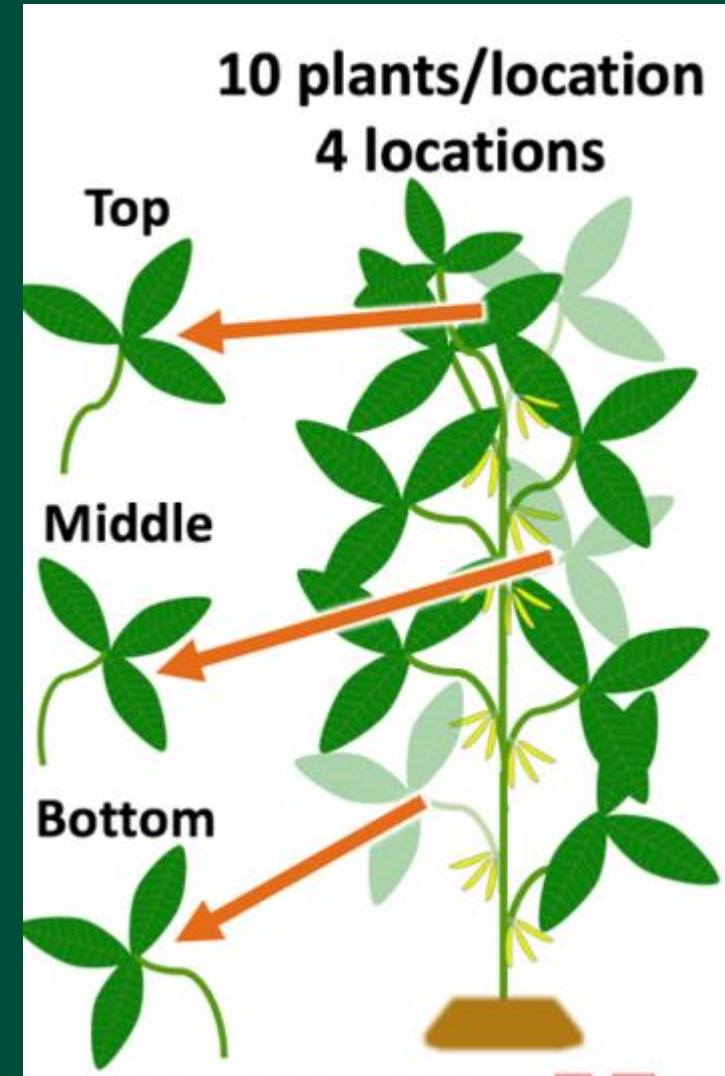
Sampling and Estimating Damage Caused by Defoliating Insects

- **Percent Defoliation**
 - Often overestimated by field scouts
- **Number of insect per foot row**
 - Drop cloth



Estimating Insect Defoliation in Dry Beans

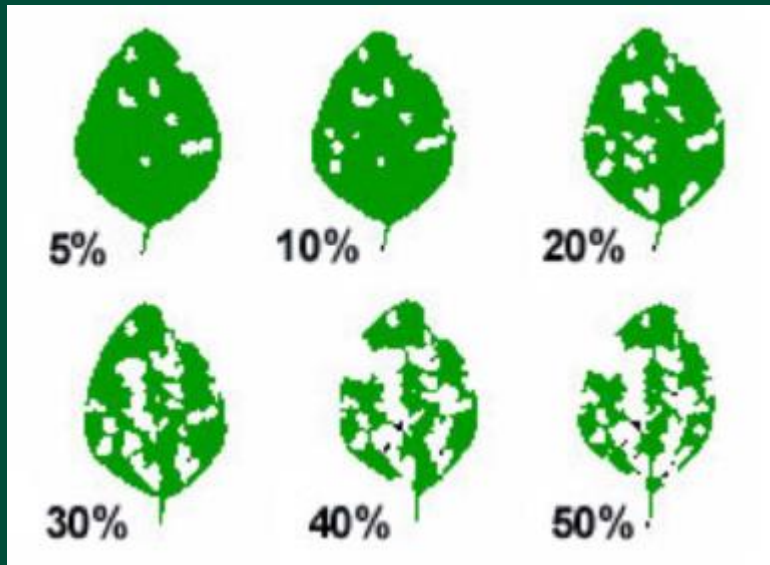
1. Scout from late vegetative to R6 crop stage
2. Walk at least 10 rows into field
3. W pattern in fields and sample 10 plants per location and 4 locations.
4. Remove leaves from top, middle and bottom of a randomly-selected plant.



Source: J. McMechan, UNE

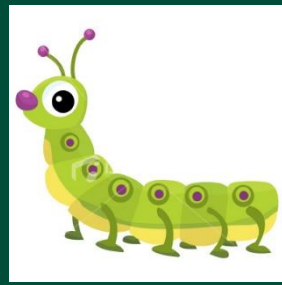
Estimating Insect Defoliation in Dry Beans

3. Remove highest and lowest defoliated trifoliate. Keep other leaflet.
4. Repeat 1-3 on remaining plants
5. Repeat at remaining locations and record defoliation of all 40 leaves.
6. Calculate the average defoliation per field



Economic Threshold

Foliage-feeding Caterpillars in Dry Beans



- 25-30% of defoliation
- Equivalent to:
10-15 larvae per foot of row



Thistle Caterpillar / Painted Lady Butterfly

Vanessa cardui (Nymphalidae)

- **Adults**

- Wing span 2.5-3.5 inches
- Forewings red–orange and brown with black and white spots.
- Hindwings orange-brown with 4 black "eye spots" along edge
- Feed on flower nectar and aphid honeydew

- **Eggs**

- Eggs are light green and barrel–shaped



By Alvesgaspar - Self-photographed, CC BY-SA 4.0,
<https://commons.wikimedia.org/w/index.php?curid=4636035>



Thistle Caterpillar / Painted Lady Butterfly

- **Caterpillar / larva**

- Mature larva 1¼ inch long
- Brown–black with yellow striping on both sides
- Branched, spiny hairs covering body give the caterpillar a prickly appearance
- Webbed nest of leaves where they feed
 - Black pellets are ‘frass’ of larva



Green Cloverworm

Hypena scabra (Erebidae)

- **Adult**

- Migrates into ND
- Overwinters south of 41° N latitude
- Dark brown moth with spots
- Wingspan of 1 inch

- **Caterpillar / larva**

- 3 pairs of prolegs
- Light green with 2 thin white stripes along each side of body
- Mature larva 1¼ inch long
- “Looping” like an inch worm
- Wiggle violently when disturbed



Green Cloverworm

- **Feeding Injury**

- **Leaves**

- Young larvae scrape leaf tissue creating a transparent skin or window on leaf and feed throughout plant canopy.
 - Older larvae eat holes in the leaves and feed in upper third of canopy

- **Pods**

- Uncommon to see pod-feeding in ND and MN
 - Observed in dry bean late 2019



(Courtesy of Dr. Ian MacRae, Crookston campus, UMN)

Natural Control

- Diseases

- Fungal (*Nomuraea rileyi*)
- Viral
 - Nuclear polyhedrosis virus
- Favored by high humidity and warm temperatures

- Parasitic wasps



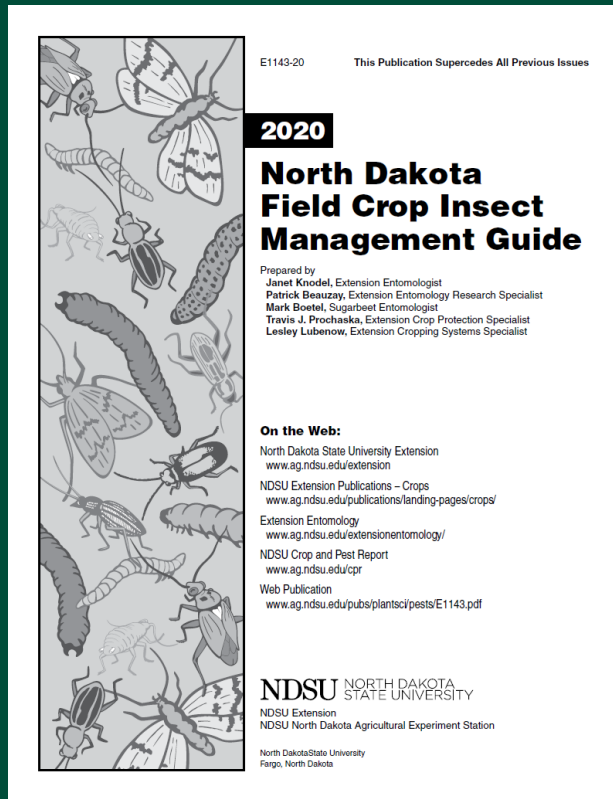
Natural Control

- **Predators**
 - Ground beetles, predaceous stink bugs, birds, frogs, rodents



Insecticides and Mode of Actions

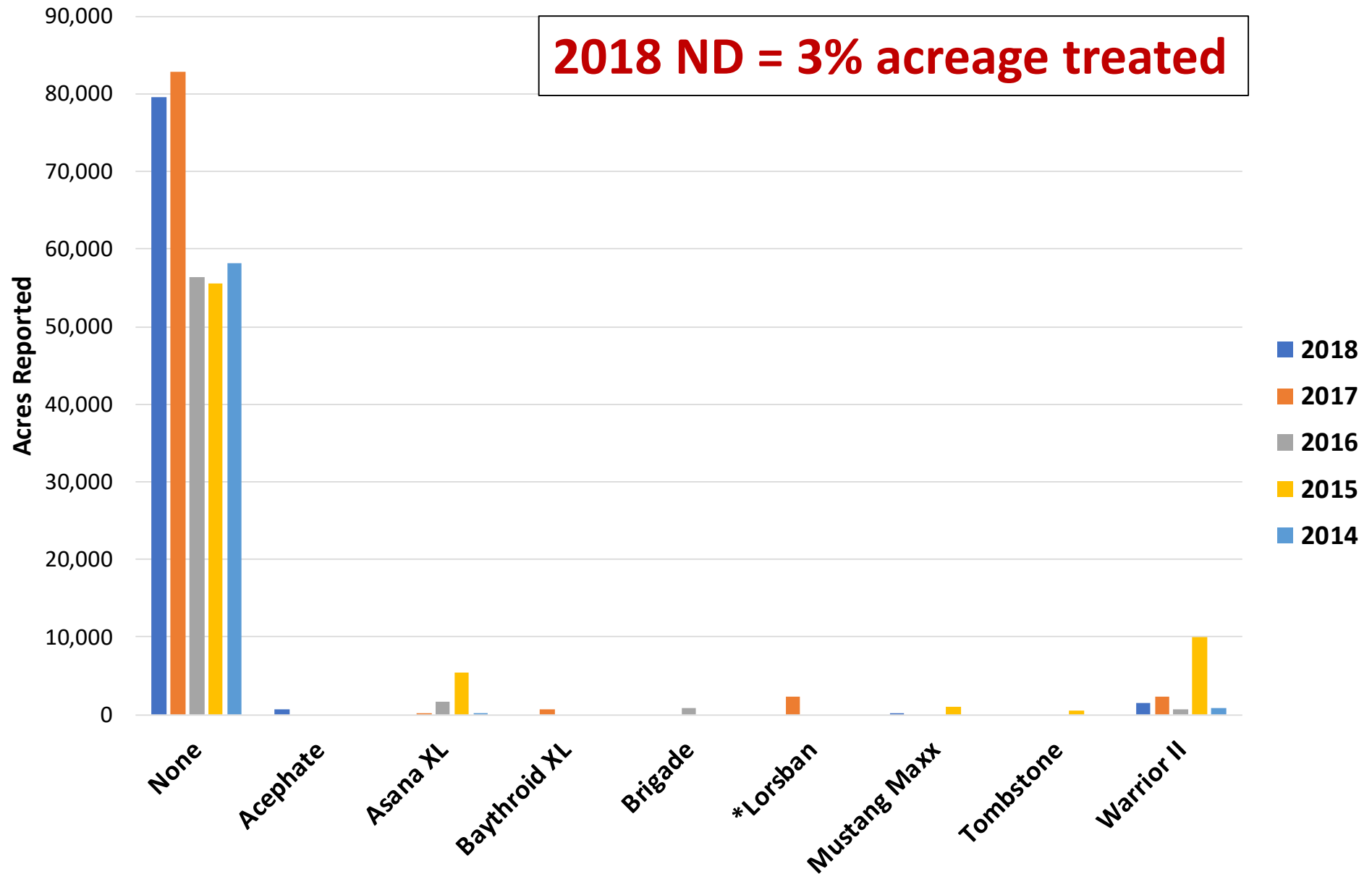
Crop – Dry Bean



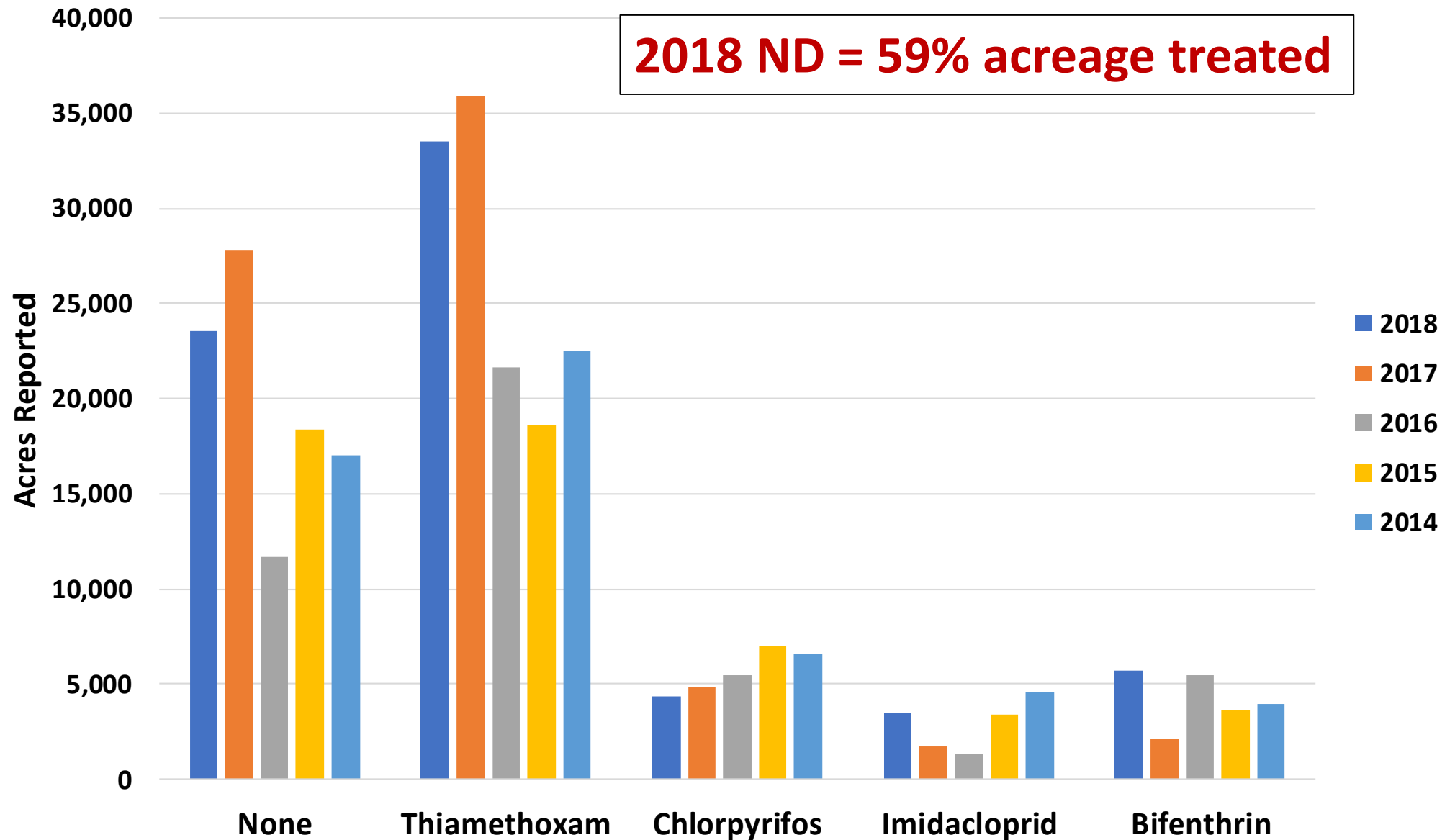
Always Read and Follow Labels.

Group #	Group	Active Ingredient	Product Examples (Trade Names)
1A	Carbamates	carbaryl	Sevin 4F, Sevin XLR Plus
		methomyl	Lannate LV, Nudrin LV, others
1B	Organophosphates	acephate	Acephate 97, Orthene 97, others
		dimethoate	Dimethoate 4E, Dimate 4E, others
3A	Pyrethroids and Pyrethrins	alpha-cypermethrin	Fastac CS
		beta-cyfluthrin	Baythroid XL
		bifenthrin	Bifender FC, Beifenture EC, Brigade 2EC, Discipline 2EC, Sniper, Tundra EC, others
		cyfluthrin	Tombstone Helios
		esfenvalerate	Asana, Zyrate, others
		gamma-cyhalothrin	Declare, Proaxis, Proaxis-Insecticide
		lambda-cyhalothrin	Grizzly Too, Karate, Lambda-Cy AG, LambdaStar, Province, Silencer, Warrior II, others
		zeta-cypermethrin	Mustang Maxx
4A	Neonicotinoids	imidacloprid	Admire Pro, Alisa 4F, Nuprid 4F Max, others (Leafhoppers only)
4B	Butenolides	flupyradifurone	Sivanto Prime (Leafhoppers only)

Foliar Insecticide Use in Dry Edible Bean in North Dakota, 2014 - 2018



Insecticide Seed Treatment Use in Dry Edible Bean in North Dakota, 2014 - 2018



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– <http://www.ag.ndsu.edu/cpr/>

