# Thermal biology and adult emergence of the red sunflower seed weevil, *Smicronyx fulvus* LeConte

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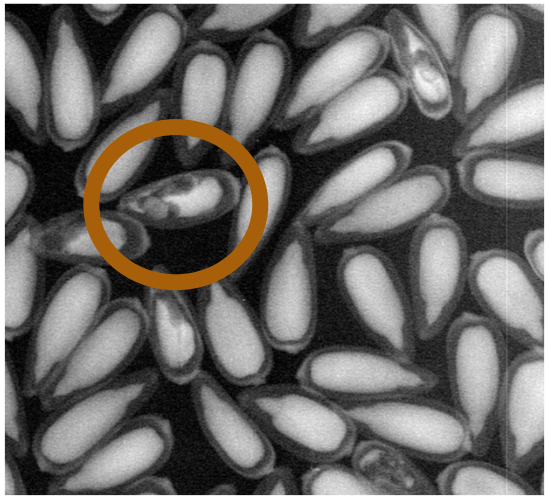
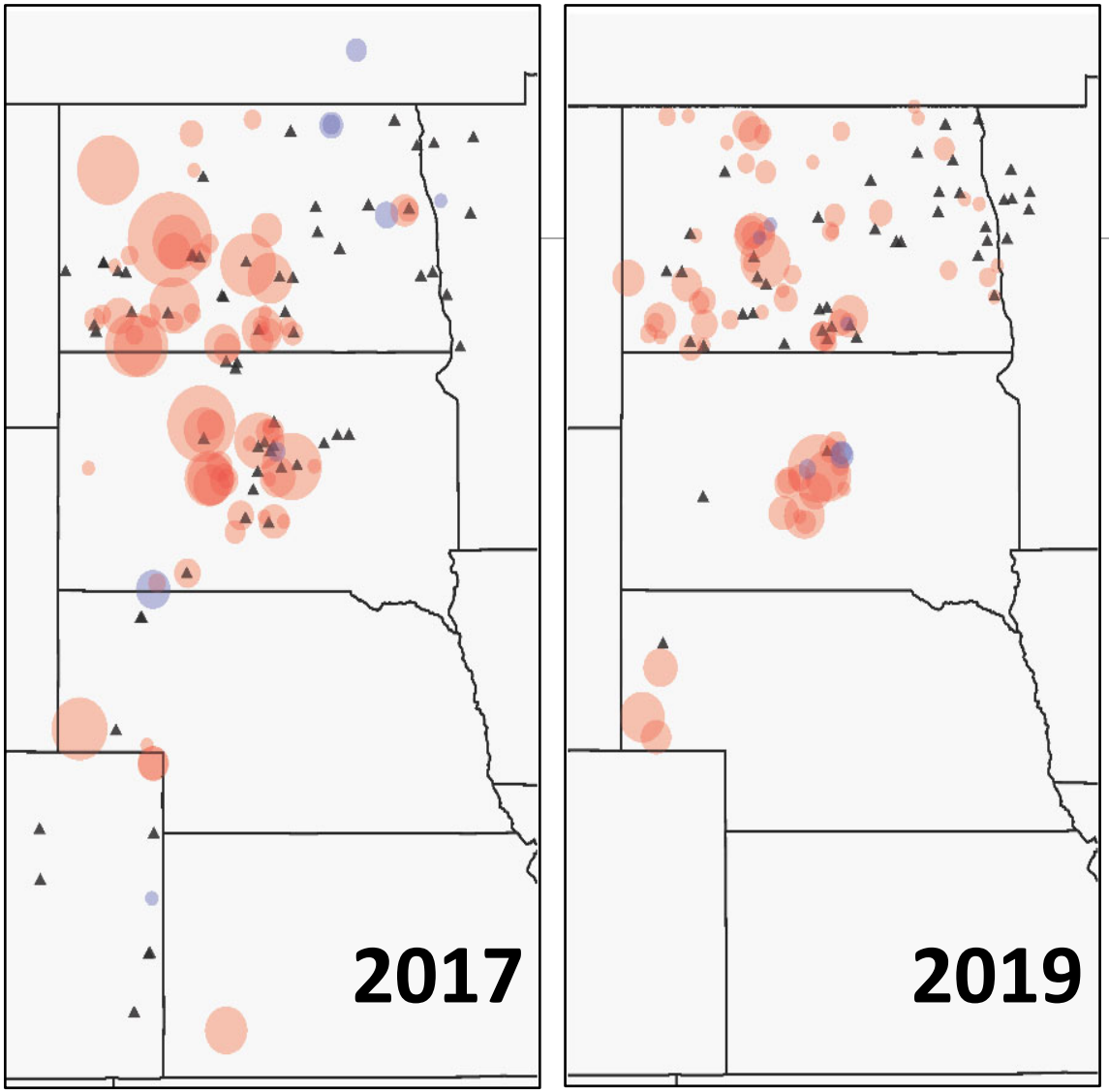
# Red Sunflower Seed Weevil

*Smicronyx fulvus* LeConte

- #1 seed feeding pest in NSA survey (2017, 2019)
- Reliance on insecticides
- One generation per year
- Overwinter in soil

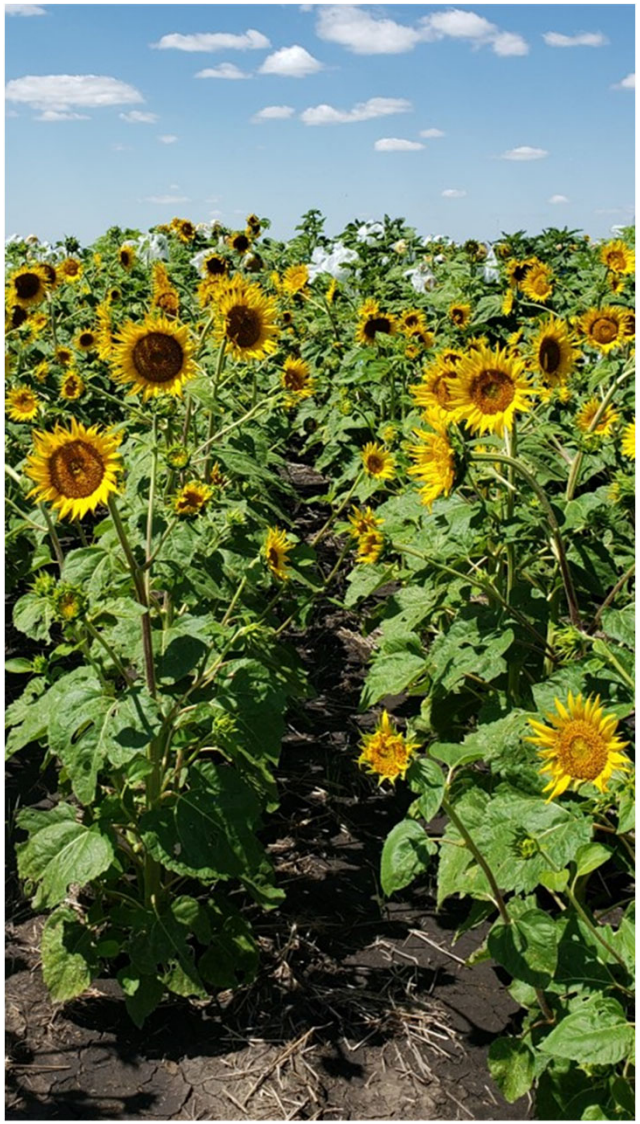





# Red Sunflower Seed Weevil

- Circles - % of damaged seed
- Triangles - fields with no damage
- **2017** – seed weevil, **83%** of damaged seed
- **2019** – seed weevil, **75%** of damaged seed

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
|  | | | | | | | | | | | |
| JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| overwinter in soil as larvae | overwinter in soil as larvae | overwinter in soil as larvae | soil thaws, break diapause | soil thaws, pupation starts | pupation | emerge as adults, lay eggs | emerge as adults, lay eggs | developing larvae feed on seed, exit head | larvae exit head, start overwintering | overwinter in soil | overwinter in soil |



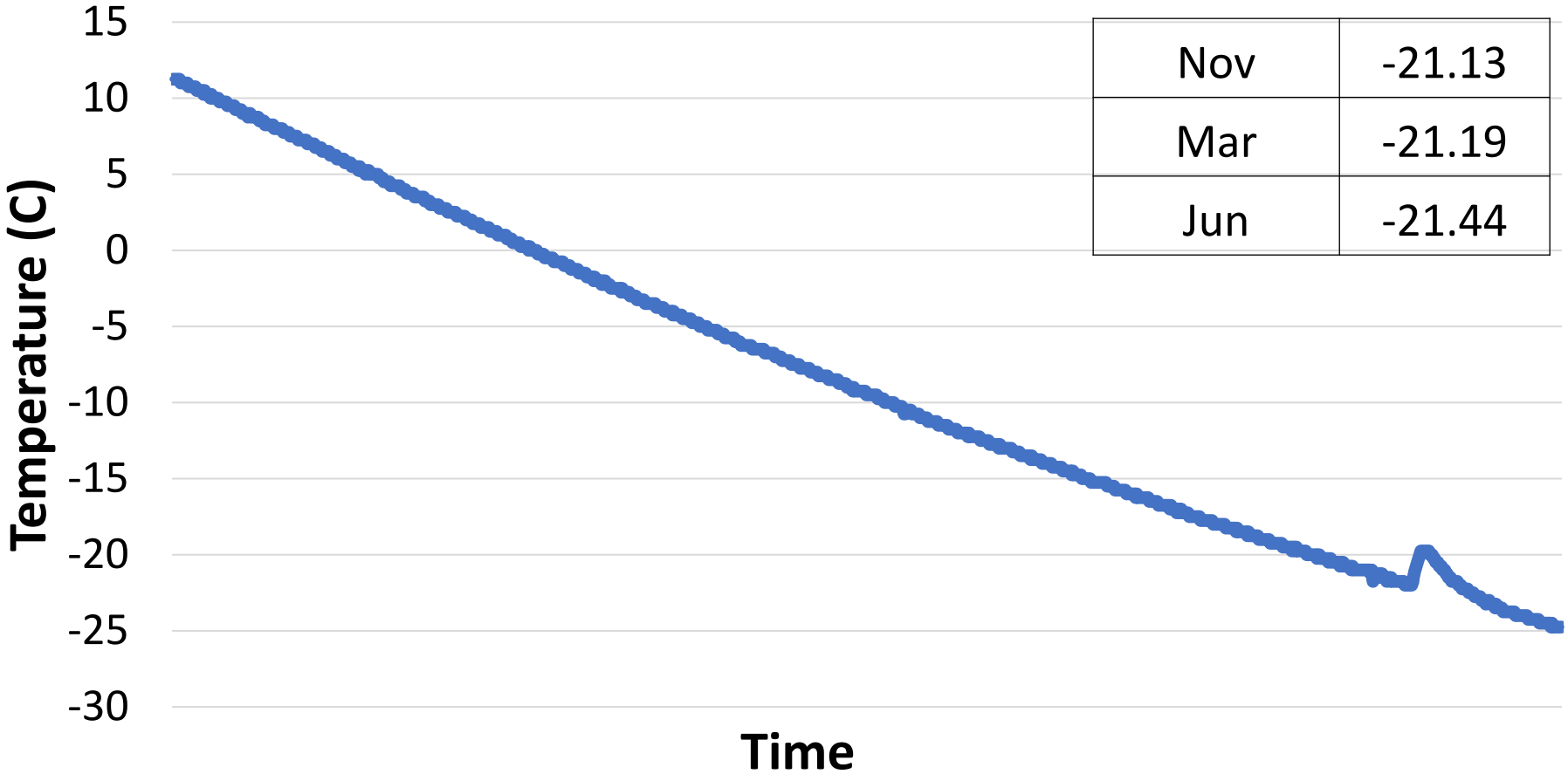
# Objectives

1) Determine the freezing point of larvae
2) Determine adult emergence dates
3) Determine soil depth of larvae during the winter

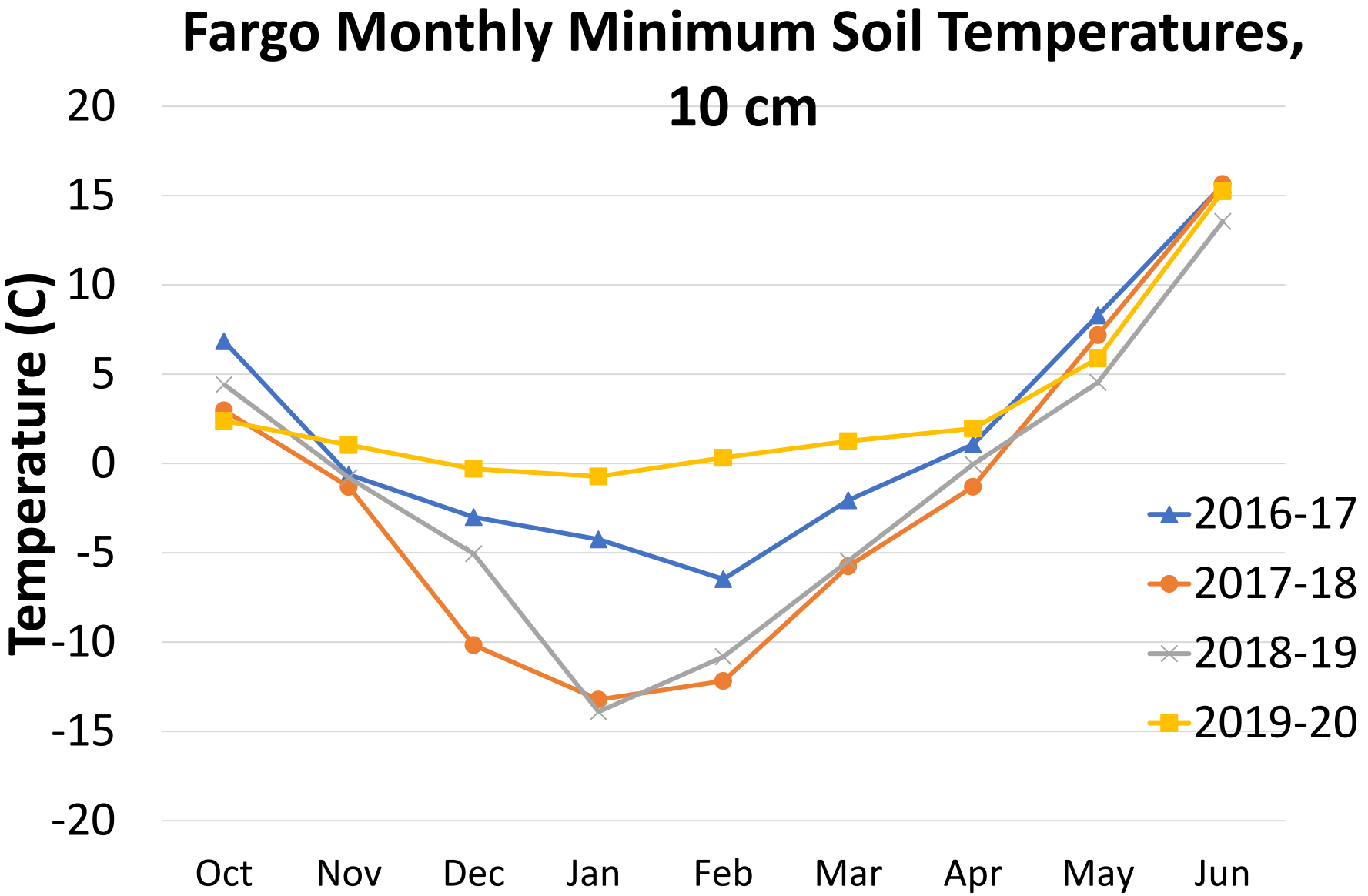

# Methods – Freezing Point

- Collection of weevil adults
- Artificial infestation in field plot
- Collection of larvae
- Cold storage indoors
- Freezing: November, January, April, June

# Red Sunflower Seed Weevil Freezing Point



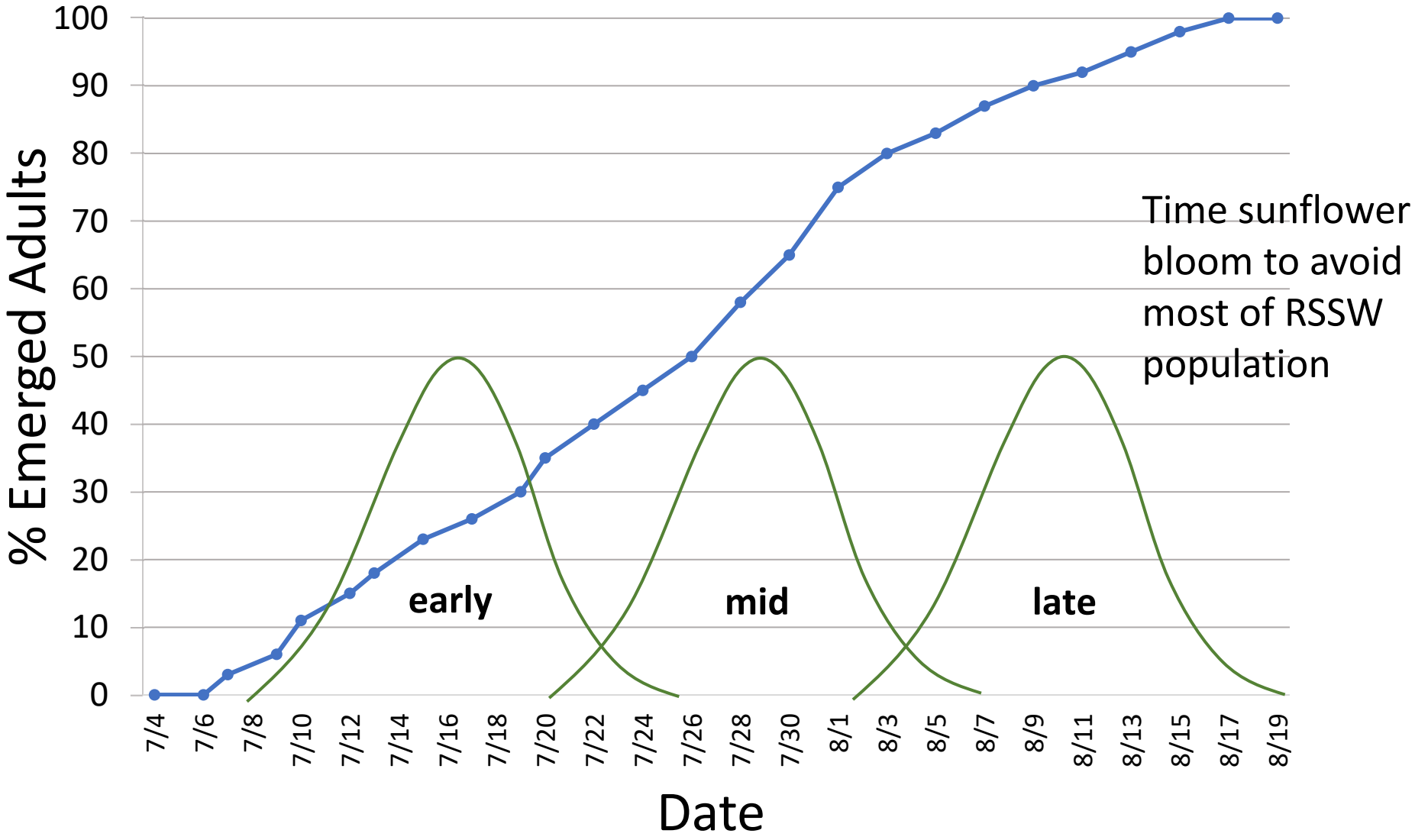

| | |
|---|---|
| Nov | -21.13 |
| Mar | -21.19 |
| Jun | -21.44 |


Fargo Monthly Minimum Soil Temperatures, 10 cm
Temperature (C)
20
15
10
5
0
-5
-10
-15
-20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2016-17
2017-18
2018-19
2019-20

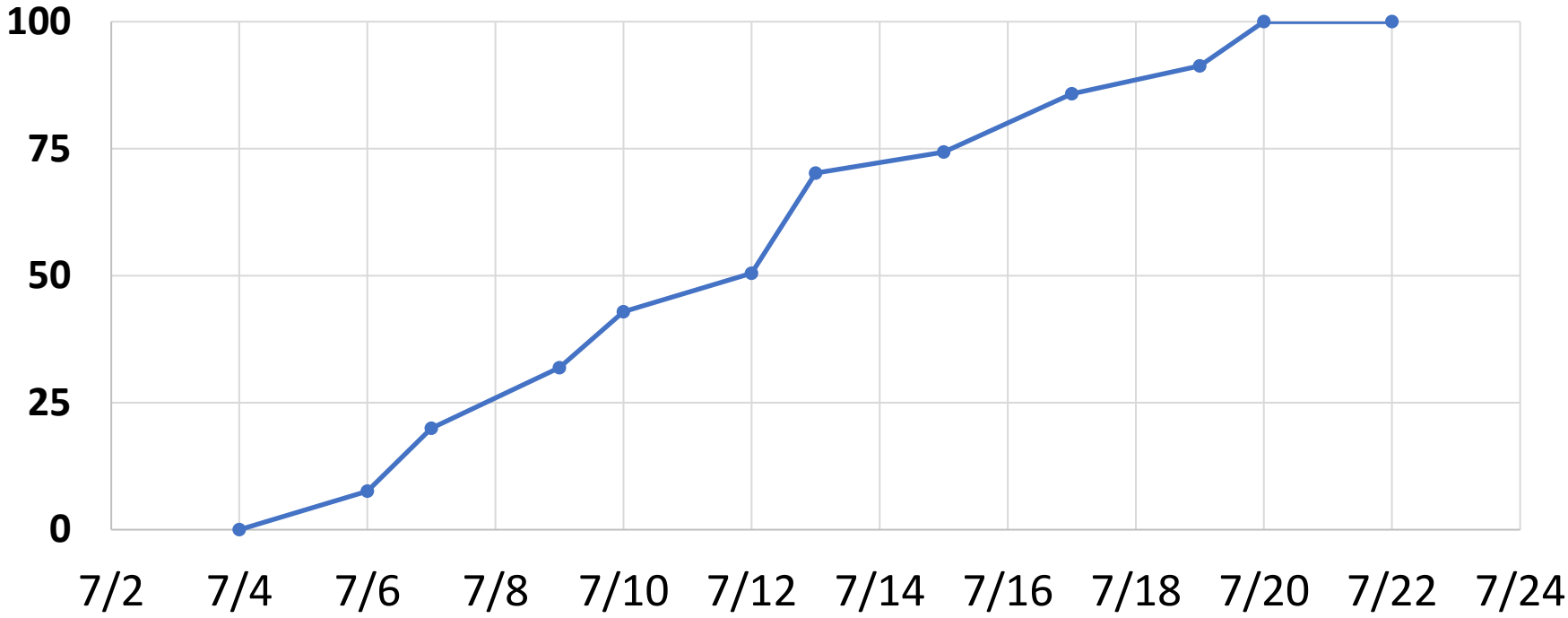

# Methods – Adult Emergence

- Weevil larvae in the field in September
- Overwinter in the field, traps put out in May
- Traps monitored for first emergence
- Adults collected and counted by date and trap

# Emerged Adults & Sunflower Bloom Date



# Percent Emerged



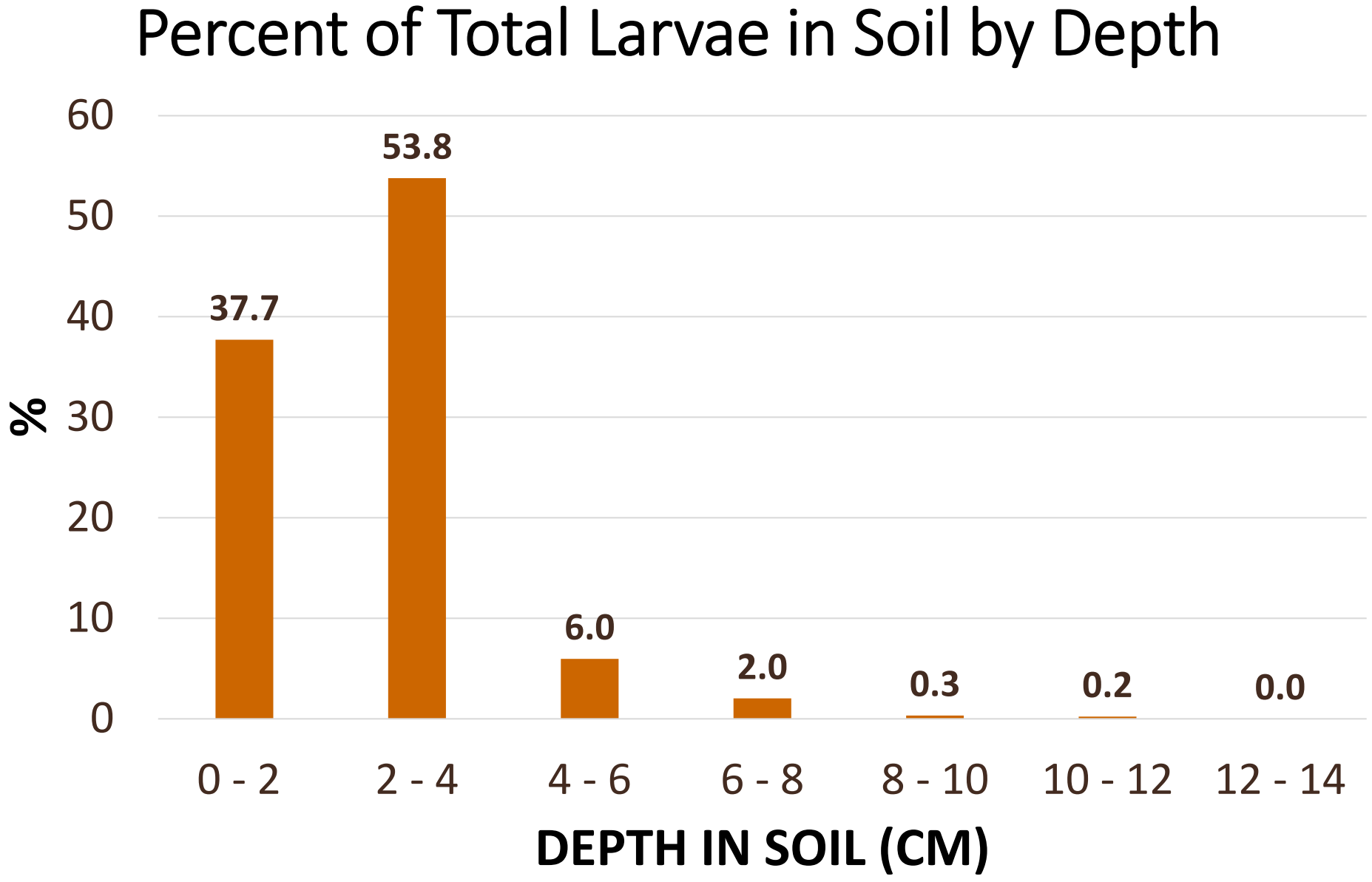

Trap A

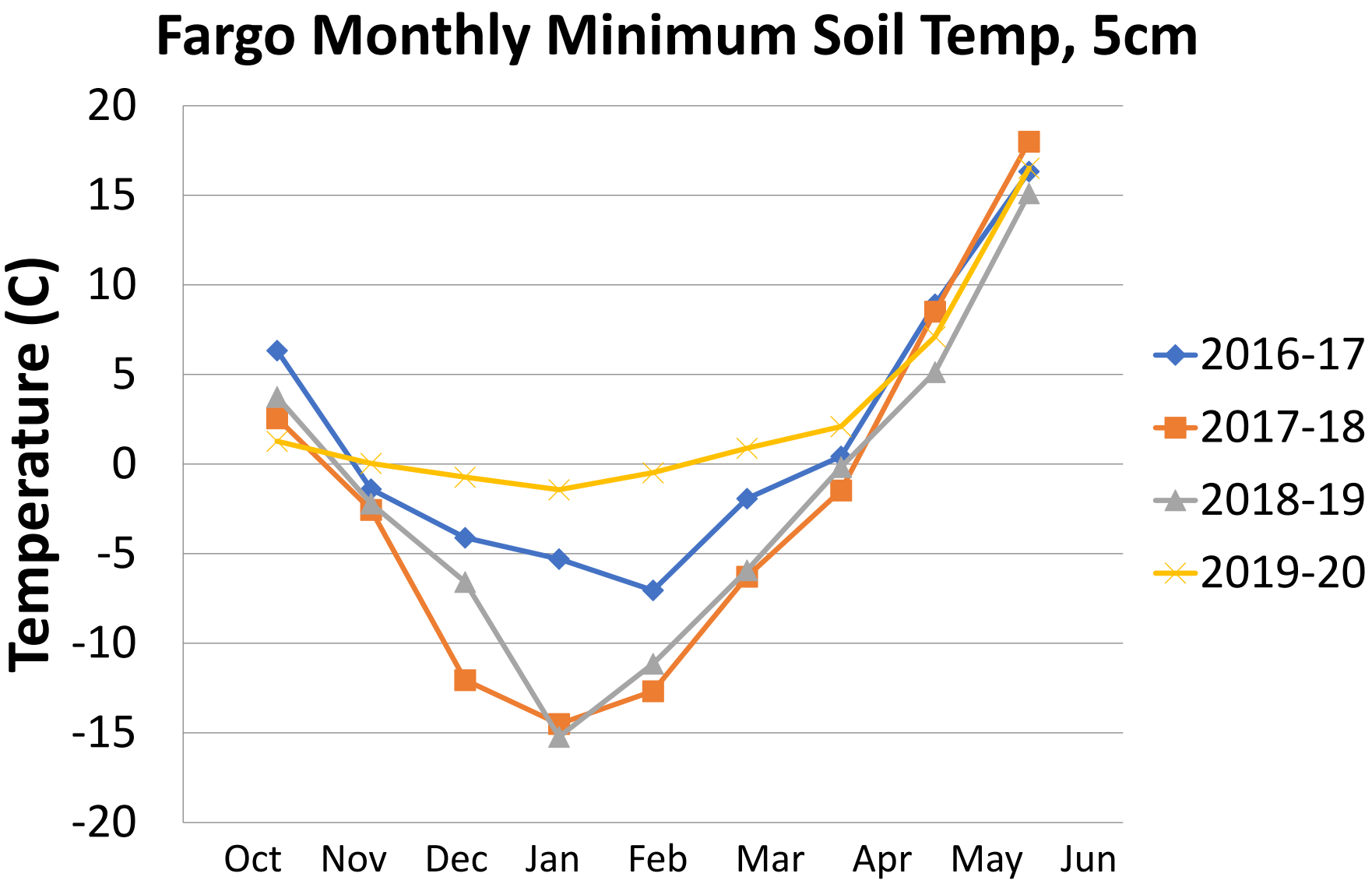
Trap B

# Methods – Soil Depth

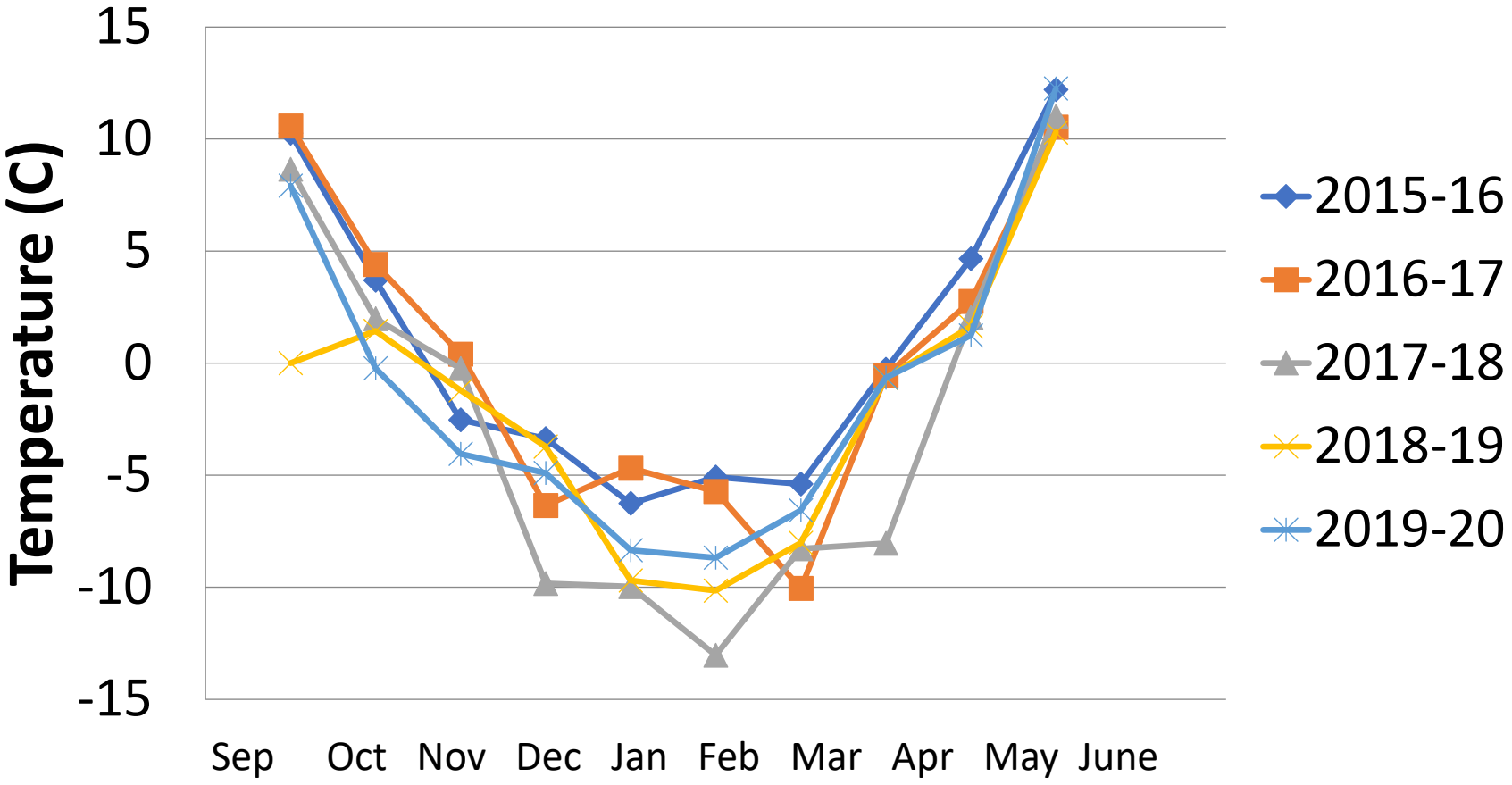
- Weevil larvae in the field in September
- Overwinter in the field, remove tubes 4 times a year
- Larvae collected and counted every 2cm


cm 1 2 3 4 5
INCH 1 16THS 2


Percent of Total Larvae in Soil by Depth
60
50
40
30
20
10
0
%
37.7
53.8
6.0
2.0
0.3
0.2
0.0
0 - 2
2 - 4
4 - 6
6 - 8
8 - 10
10 - 12
12 - 14
DEPTH IN SOIL (CM)

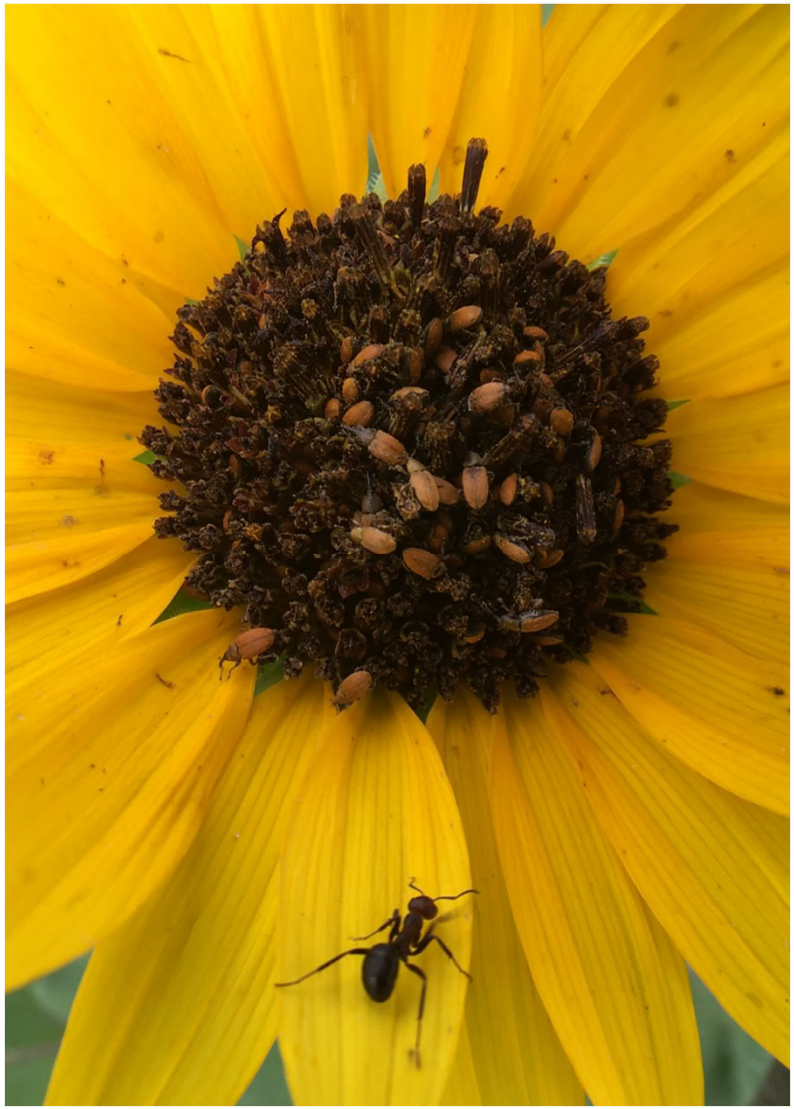

Fargo Monthly Minimum Soil Temp, 5cm
Temperature (C)
20
15
10
5
0
-5
-10
-15
-20
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
2016-17
2017-18
2018-19
2019-20

# Langdon Monthly Minimum Soil Temp, 5cm



# Conclusions

- RSSW larvae freeze at ≈ -21ºC (-5.8ºF)
- Most larvae overwinter at 0-5cm below the soil surface
- Adults in traps emerged over a two-week period (50% by July 12)
- Wild caught adults in ND appeared 10-14 days later
- Tillage and herbicide application can have significant damage



# Future Work

- Overwintering depth testing
- Emergence traps in spring wheat
- Developmental threshold and degree-day model
  - Difference between traps and wild emergence
  - Ground cover differences (spring wheat vs. bare soil)

# Acknowledgements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## Committee

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