USDA United States Department of Agriculture
Agricultural Research Service

Overview of USDA-ARS Pecan Weevil Research

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Research Areas

PHEROMONE

DISPERSAL

DIAGNOSTIC TOOL

Pecan Weevil Pheromone Background

- Identified by Hedin et al. (1997)
- Same four components as boll weevil pheromone but with different ratio (7:16:3:3 vs 3:4:1.5:1.5)
- Only produced by male weevils
- 80% of females attracted to pheromone
- <15% males attracted to pheromone
- Commercial pecan weevil pheromone lure is available but deemed ineffective

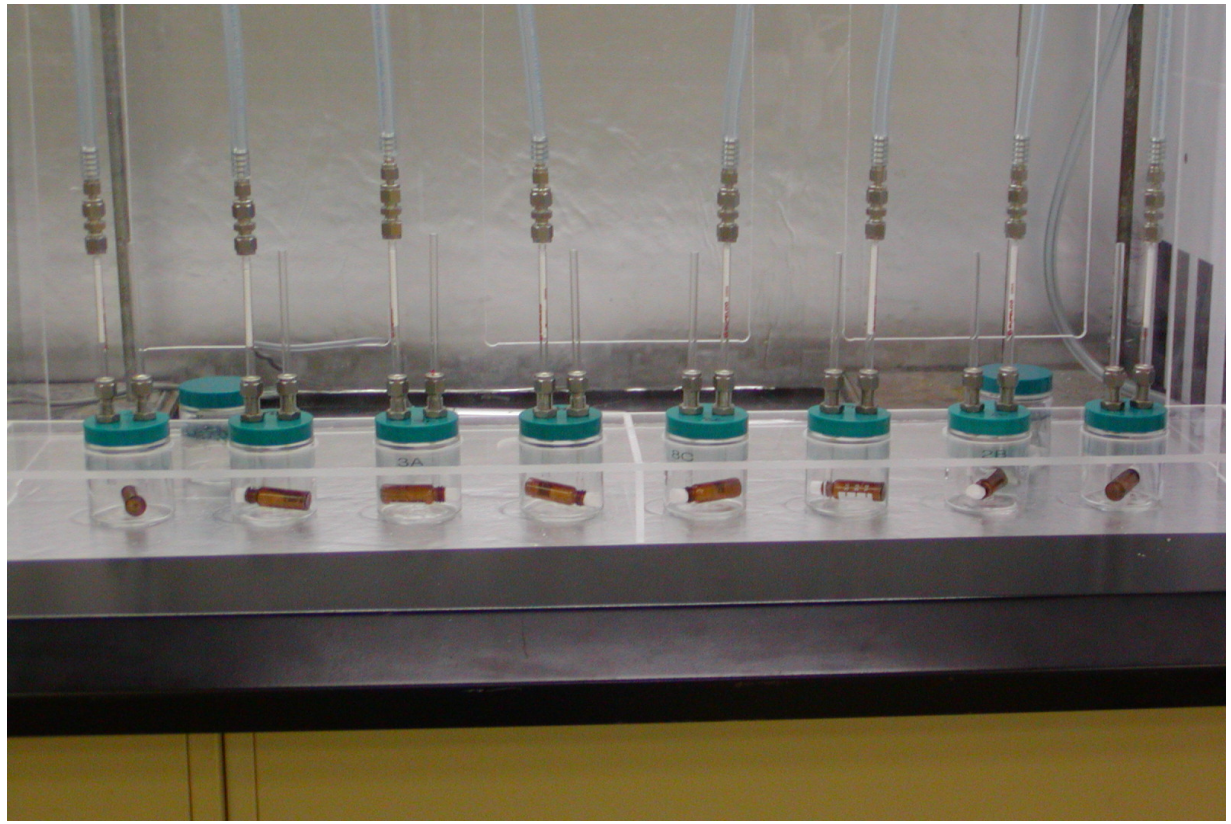

Untitled Map
Write a description for your map.
Legend
Feature 1
Old Don Moore Place
Tim Stallings
Lamkin
Site 2
Todd Denman
376
382
396
36
1702
278
274
276
272
390
392
388
260
284
286
394
109

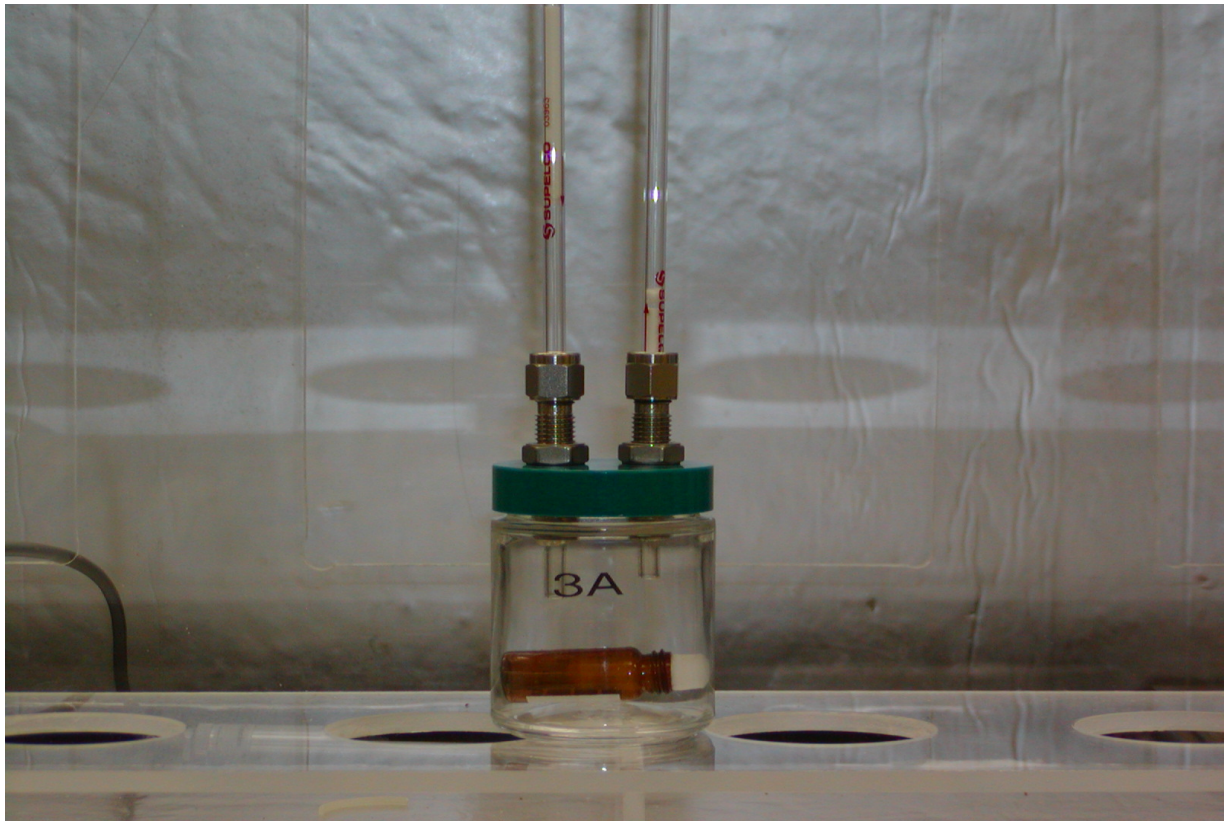
Experimental Approach

- Weevils sexed, held individually in mason jars, and provided fresh terminal with nut clusters and leaves (replaced MWF)
- Fed 6-8 days (2020); 7-9 days (2021); and 7-15 days (2022); held at 85°F and 14:10 h L:D
- Only weevils that fed at least five days were used for pheromone collection

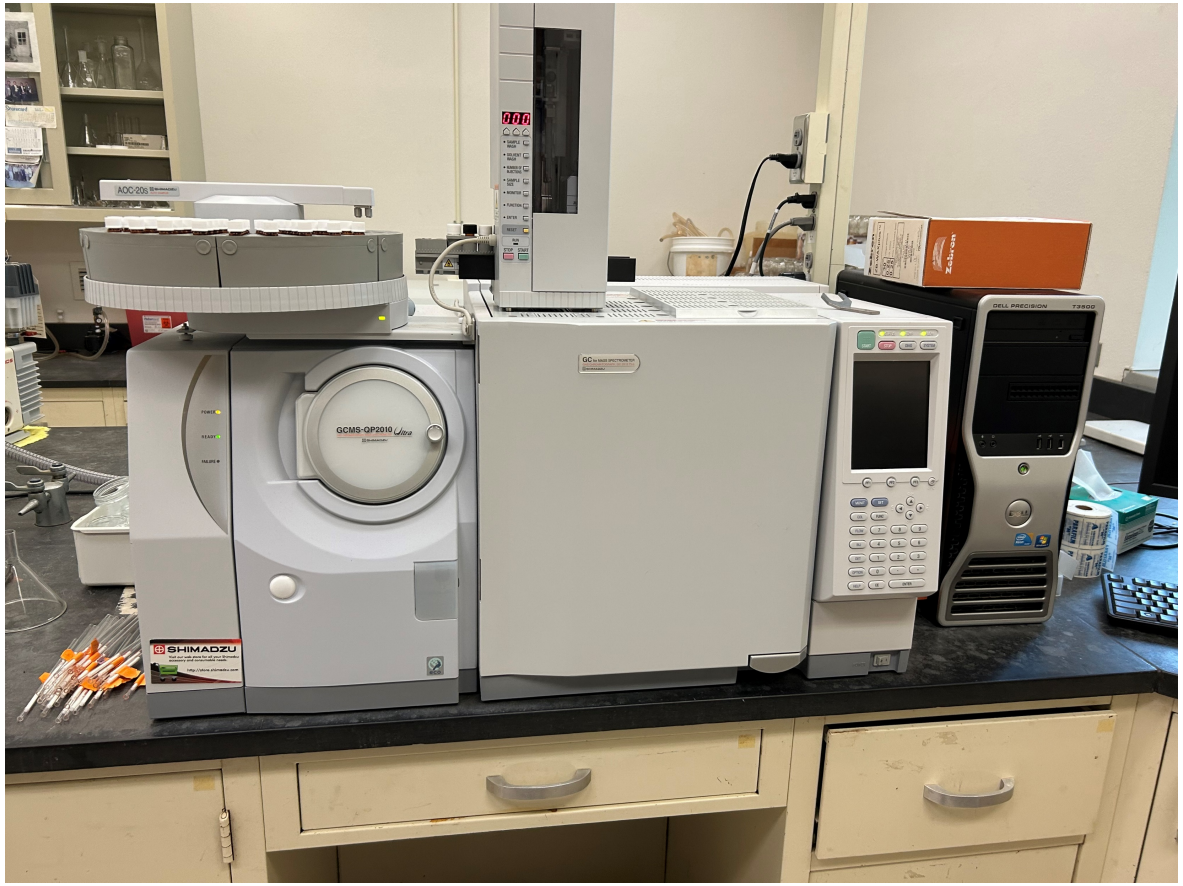
Pheromone Collection

- Headspace volatiles collected for 24 hours





Pheromone Analysis



Sample Size

Year	# of weevils captured	Males	Females
2020	68	20	0
2021	92	18	4
2022	200+	35	24

Key Findings

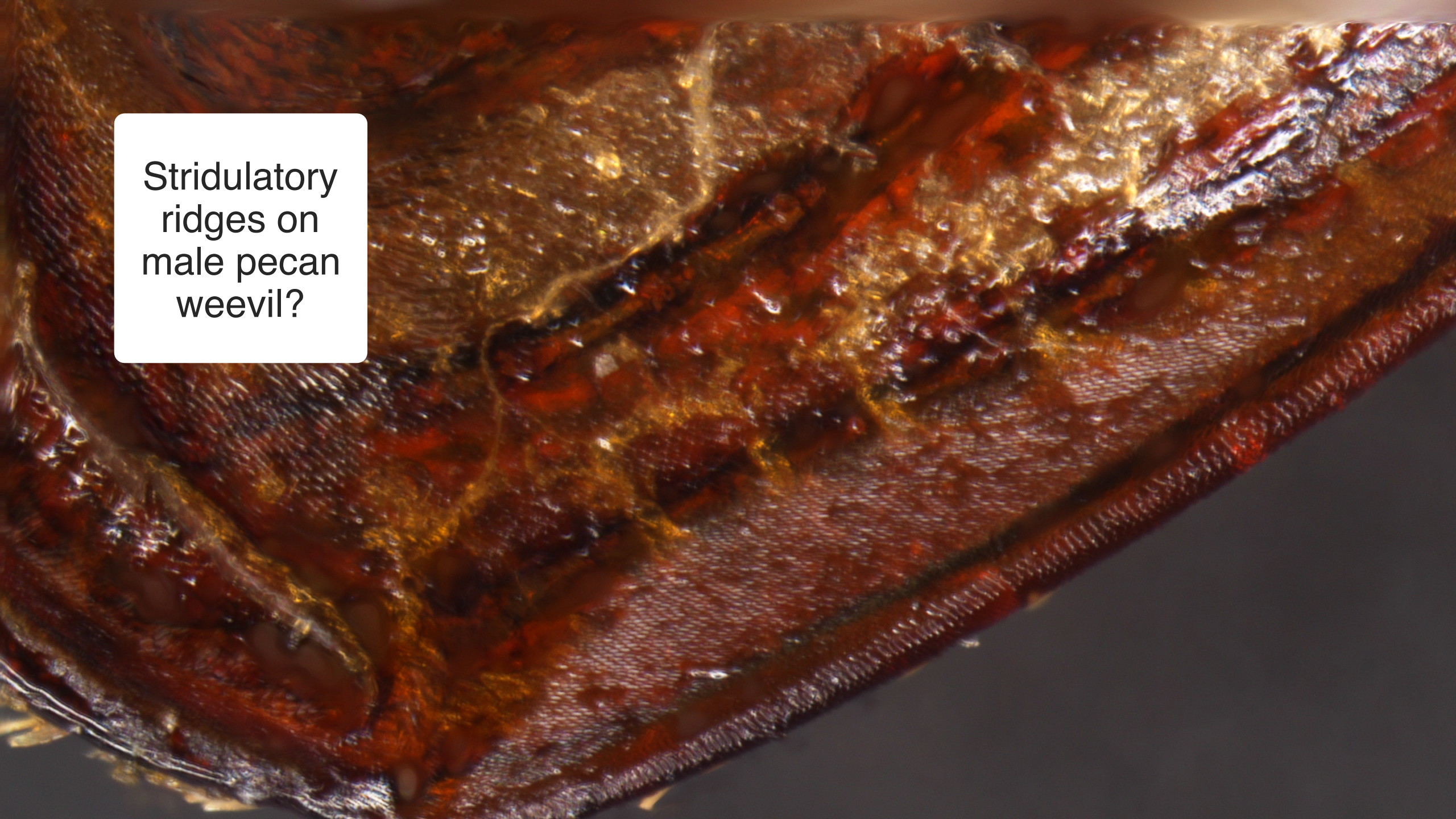
- None of the four pheromone components were detected in any of the headspace volatile collections (73 males and 28 females volatile) or body extractions (35 males and 24 females)

- If pecan weevils produced the four pheromone components, volatized quantity was too low to detect with our system (0.29 μg/pecan weevil vs >100 μg/boll weevil)

- Notable compounds detected:
  - elemene (primer pheromone in ants)
  - aromadendrene (guava weevil pheromone)
  - ylangene (pheromone component of Asian longhorn beetle)

Outside the Box

- *Conotrachelus naso* (Gibson 1968)
- Communicate by sound (stridulation - rub one body part against another part)
- Maybe how male and female pecan weevils find each other?


Stridulatory ridges on male pecan weevil?

Next Steps?

- Pheromone
- Test weevils collected directly from canopy (best chance of getting pheromone-producing weevils)?
- Analyze pecan weevil pheromone lures (what's in lures)?
- Genomic projects
- Stink bugs and associated pathogen transmission

Genomic projects

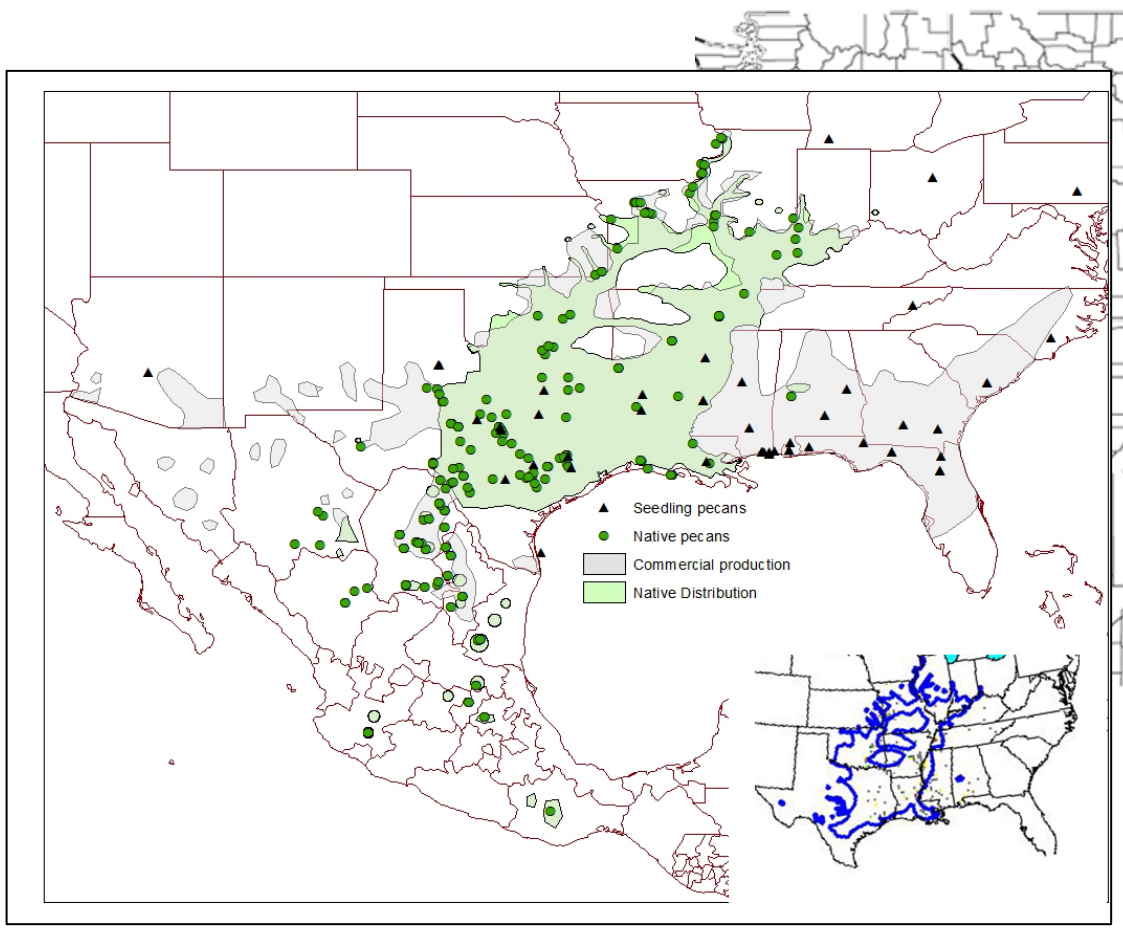
- Genome sequencing work to examine weevil population structure and dispersal
  - Preli
- Develop
areas in
- Survey
  - Colle

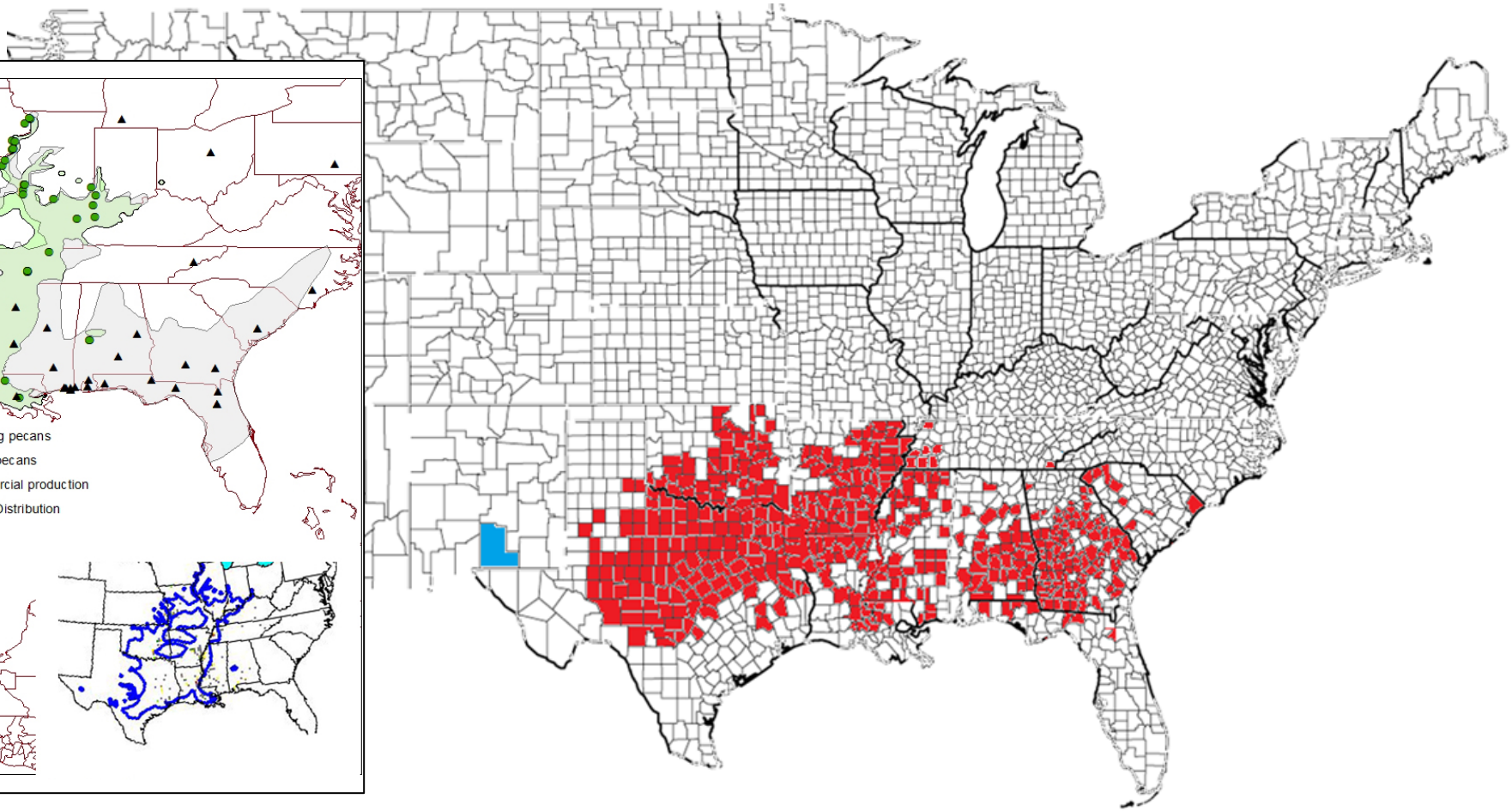
omanche Co.

nt" weevils from different

wing regions

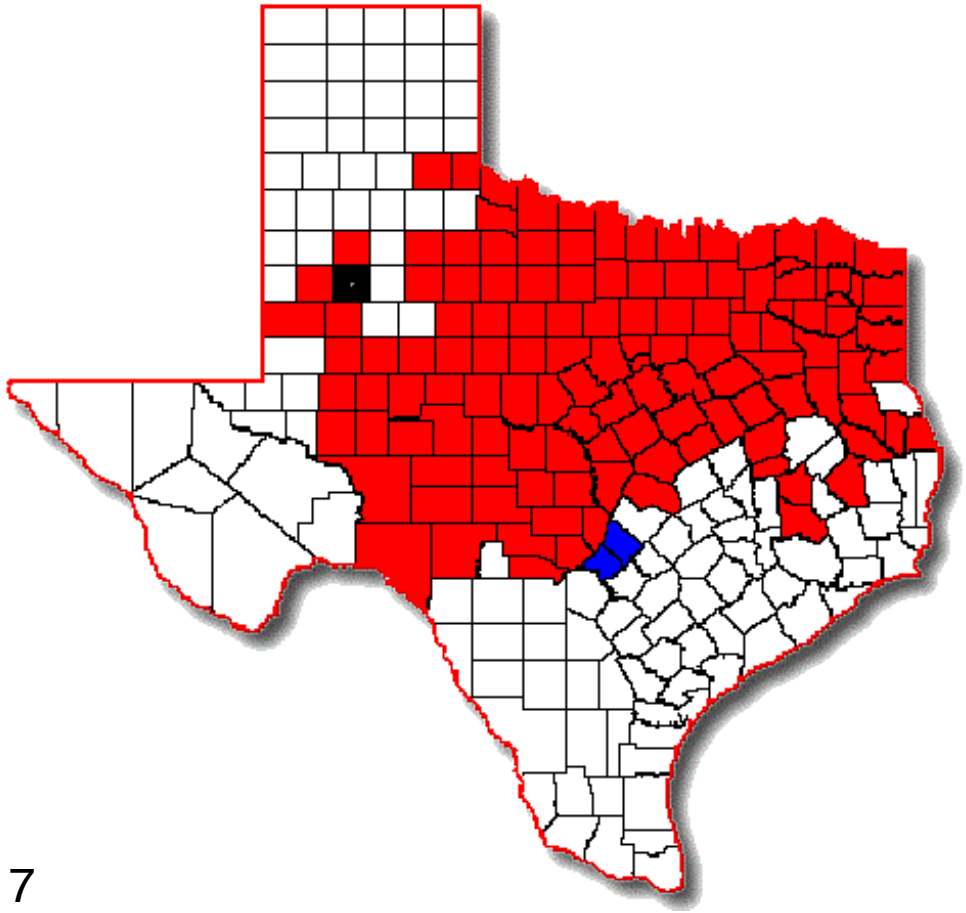
Collections



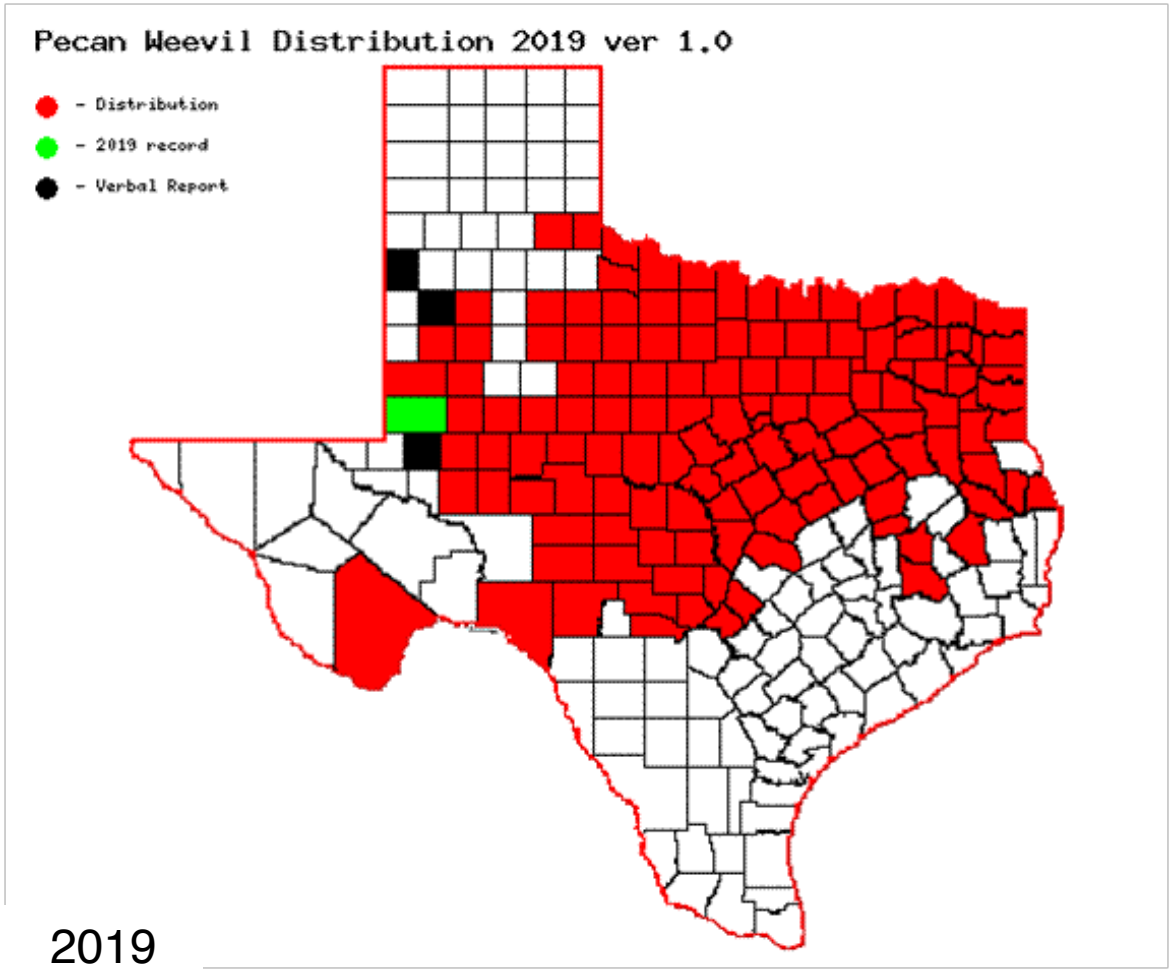


Pecan weevil distribution – 2017

Future Collections



2017



2019

Acorn Weevils

- Are “acorn” weevils feeding on pecans?
  - Analyze gut content to identify plants
- If no, is a diagnostic tool to distinguish species of interest?

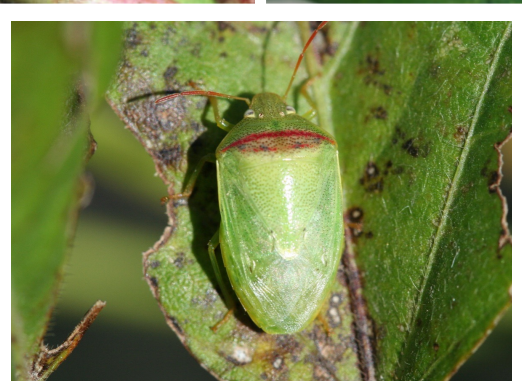
Conotrachelus naso
Hawthorn & Oak spp.

Curculio fulvus
Live oak

Curculio caryae
Pecan & native hickories

Stink Bugs

- Survey stink bugs coming to pecan orchards
- Are they carrying pathogens?



What's Next?

- Improve pecan weevil collections both in Texas and across all pecan growing areas in the U.S.
- Collect "acorn weevils" from traps and canopy to determine diet
- Usefulness of acorn/pecan weevil diagnostic test
- Interest in stink bug survey and studies

Discussions with NMDA and TDA
(Brad Lewis and Patrick Dudley)

- Publish our pecan weevil pheromone work this fall/winter
- Genomic work to “fingerprint” pecan weevil populations across U.S. to help identify potential sources of infestations, and to develop diagnostic tool to distinguish pecan and acorn weevils
- Revisit cold treatment/storage requirements for in-shell pecan nuts

- TDA regulations: 0° F for 7 consecutive days or 12.2° F for 14 consecutive days or longer

Discussions with NMDA and TDA

- Cold bath studies to determine acute freezing (supercooling) points of pecan weevil adults and larvae
  - ➢ Boll weevil adults with food in guts: 3 to 21° F; average of 12.4° F
  - ➢ Boll weevil adults with empty guts: -4.4 to 14° F; average of 3.2° F
- In conjunction, monitor temperatures inside pecans to see how long it takes to get to the freezing points of pecan weevils
- Renew Texas Pecan Board agreement in FY 2025 to continue supporting research
- Add pecan weevil research objective in next 5-year project plan

Acknowledgements

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