Louisiana Agricultural Technology & Management Conference
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Post-Harvest Rice Insect Pest Management

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Rice Mills and storage facilities

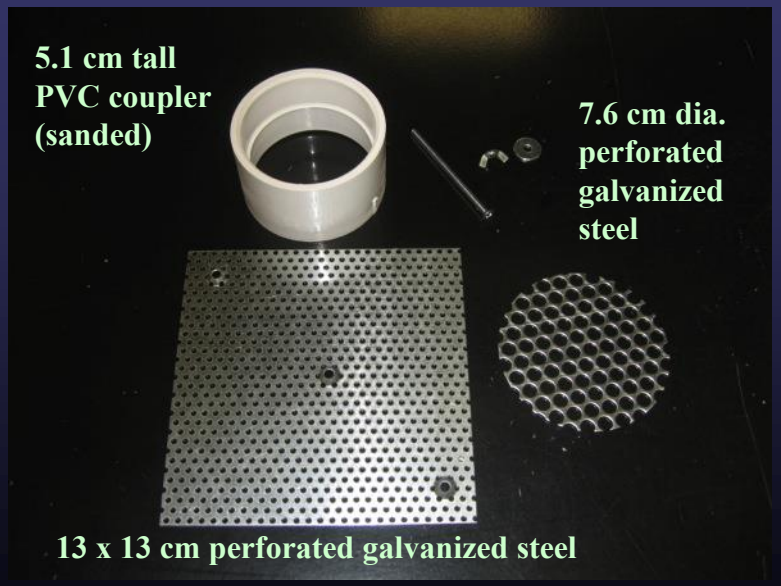
- Rice facilities are vulnerable to infestation by stored-product insects
- Insects cause economic costs due to damaged product, contamination, and management tactics

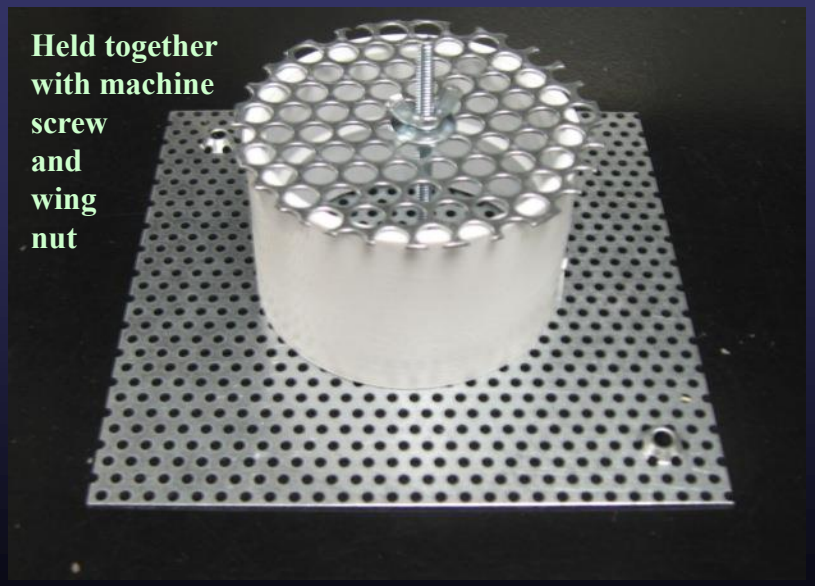
Stored-product insects

- A range of stored-product insect species are found associated with rice facilities
- Different community can be found in different areas of a facility
- Immigration from outside can contribute to pest problems inside storage and processing facilities

Refugia design

- Designed to allow insects to enter and leave, but prevent access by rodents and birds
- 50 g of brown rice added to inside of each refugia
- Some refugia were also setup with a Smart button data logger inside to record temperature



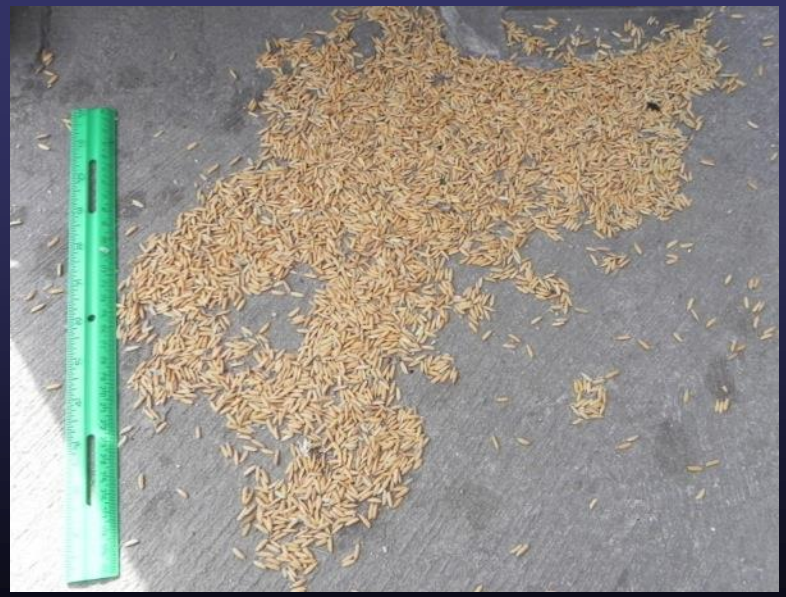


Sample processing

- Refugia placed in plastic bags when collected, at ASU transferred to plastic containers and shipped to CGAHR for further processing
- Rice condition recorded and sieved to remove adults if dry and manually processed if wet
- Adults were identified to species when possible, some groups were identified to genus or family

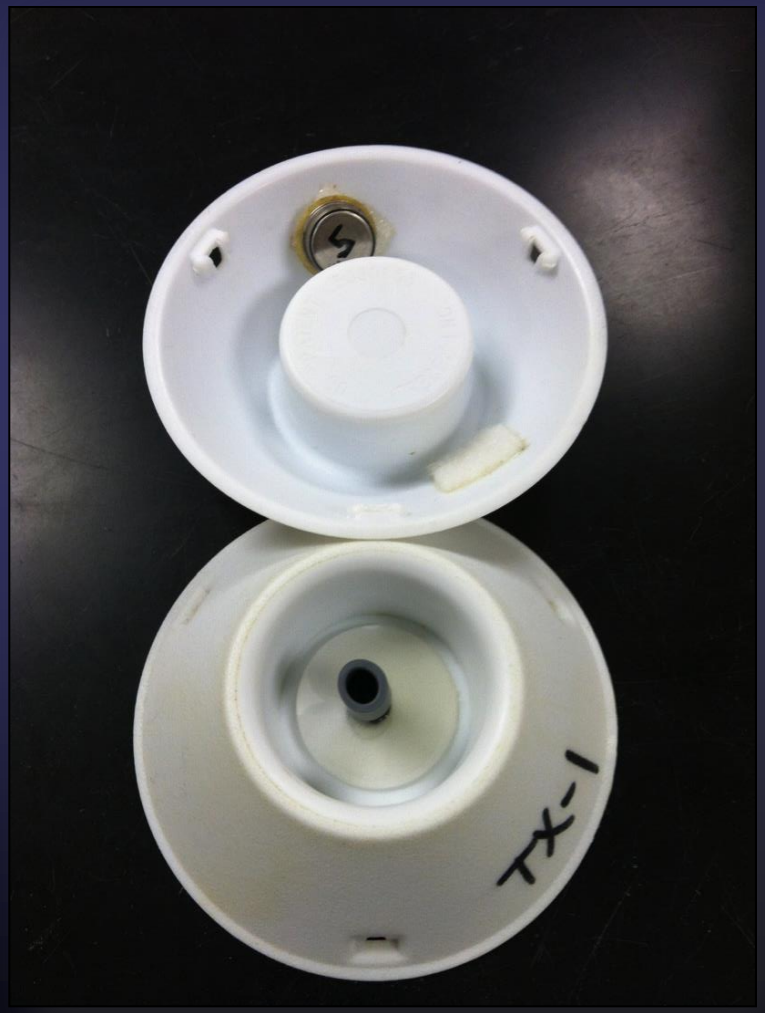
Spillage collection

- Each week, if available, 1 to 3 samples of rice or rice fraction spillage were also collected
- Collected ~50 g of spillage from 22 cm x 14 cm area
- Processed the same way as the refugia samples



Trapping

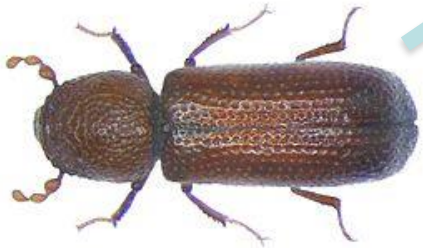
- **Use of Dome traps with pheromone and kairomone attractants**



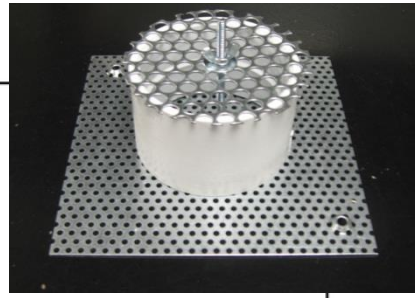
Facility 1- Adults

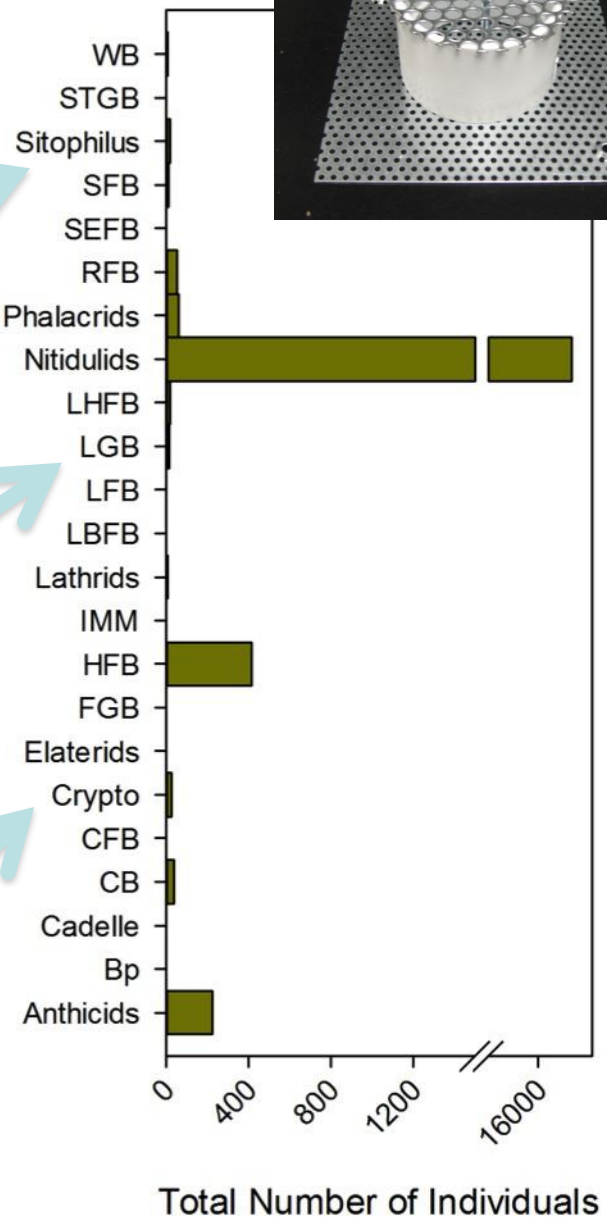
***Sitophilus* spp.**
grain weevils

Rhyzopertha dominica
lesser grain borer



***Cryptolestes* spp.**
grain beetles





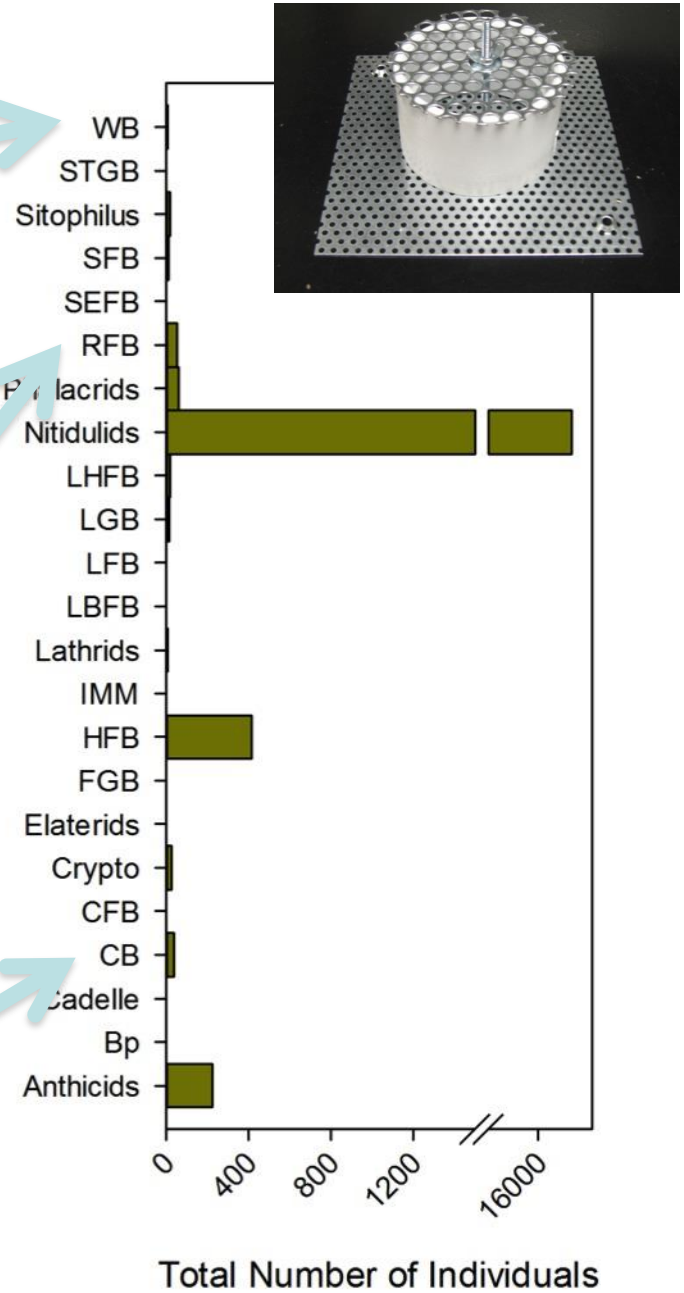
Images from BugGuide.net

Facility 1- Adults

Trogoderma variabile
Warehouse beetle

Tribolium castaneum
red flour beetle

Lasioderma serricorne
cigarette beetle

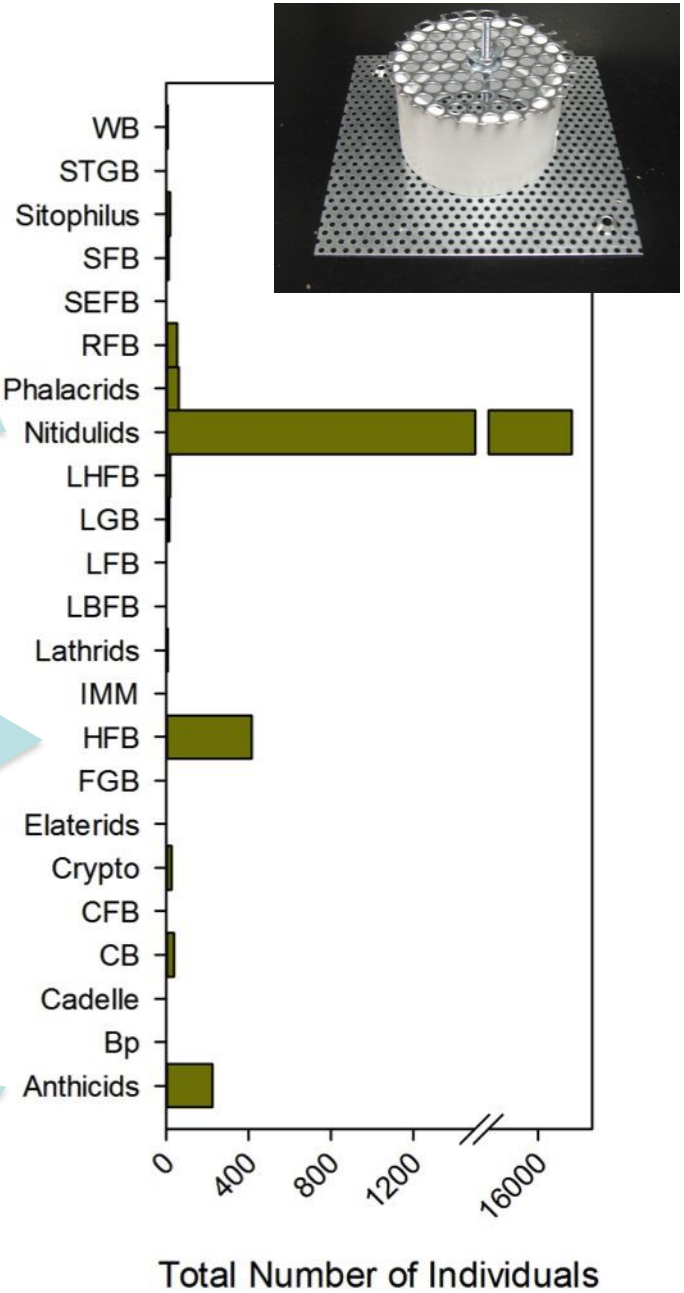


Facility 1- Adults

Nitidulidae
sap-feeding beetles

Typhaea stercorea
hairy fungus beetle

Anthicidae
ant-like flower beetle

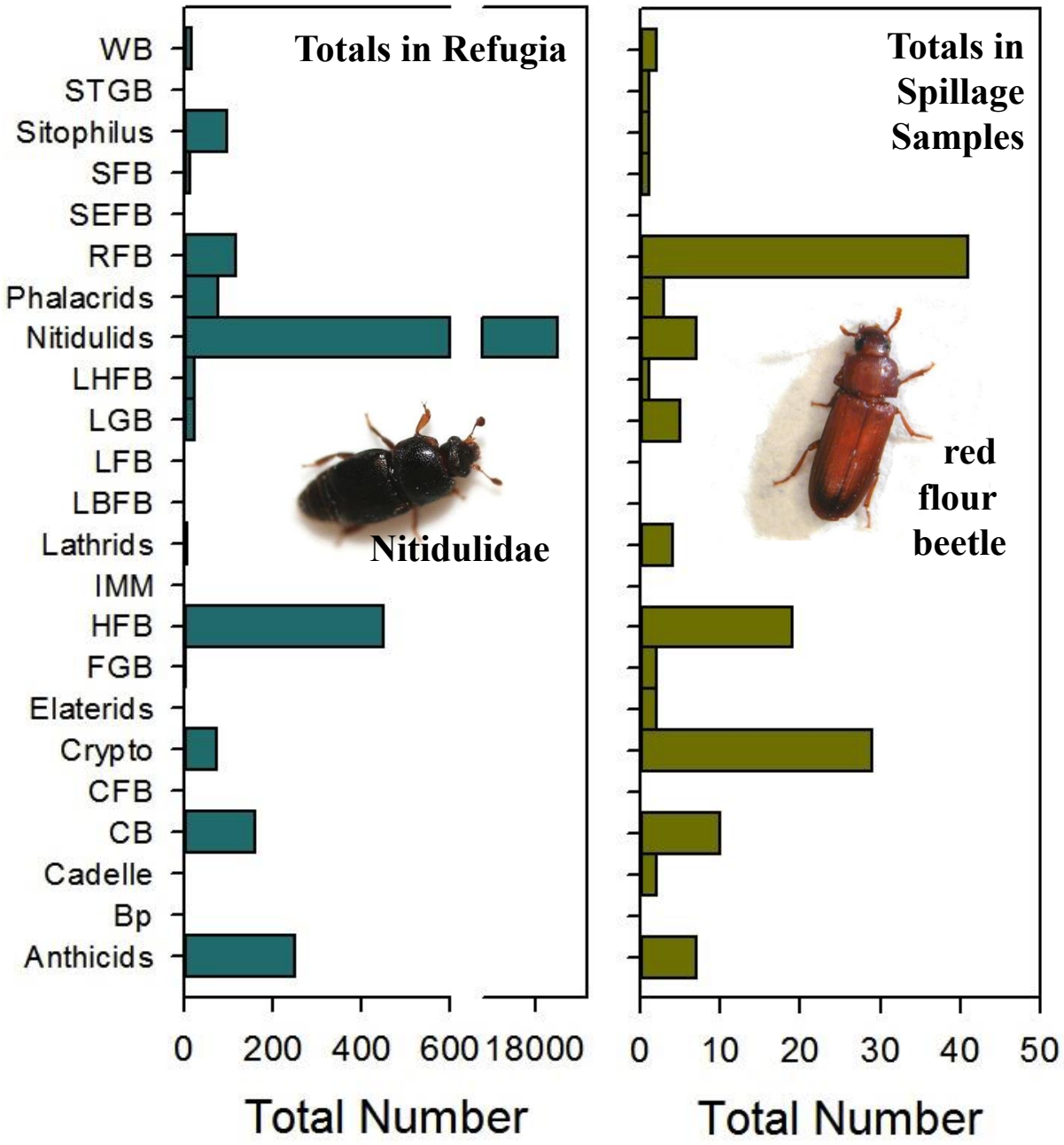


Images from BugGuide.net

Facility 1: Refugia vs. spillage

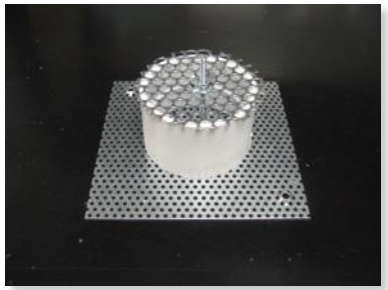
Refugia:
Average grain condition: 2.0 ± 0.1
Moderate mold

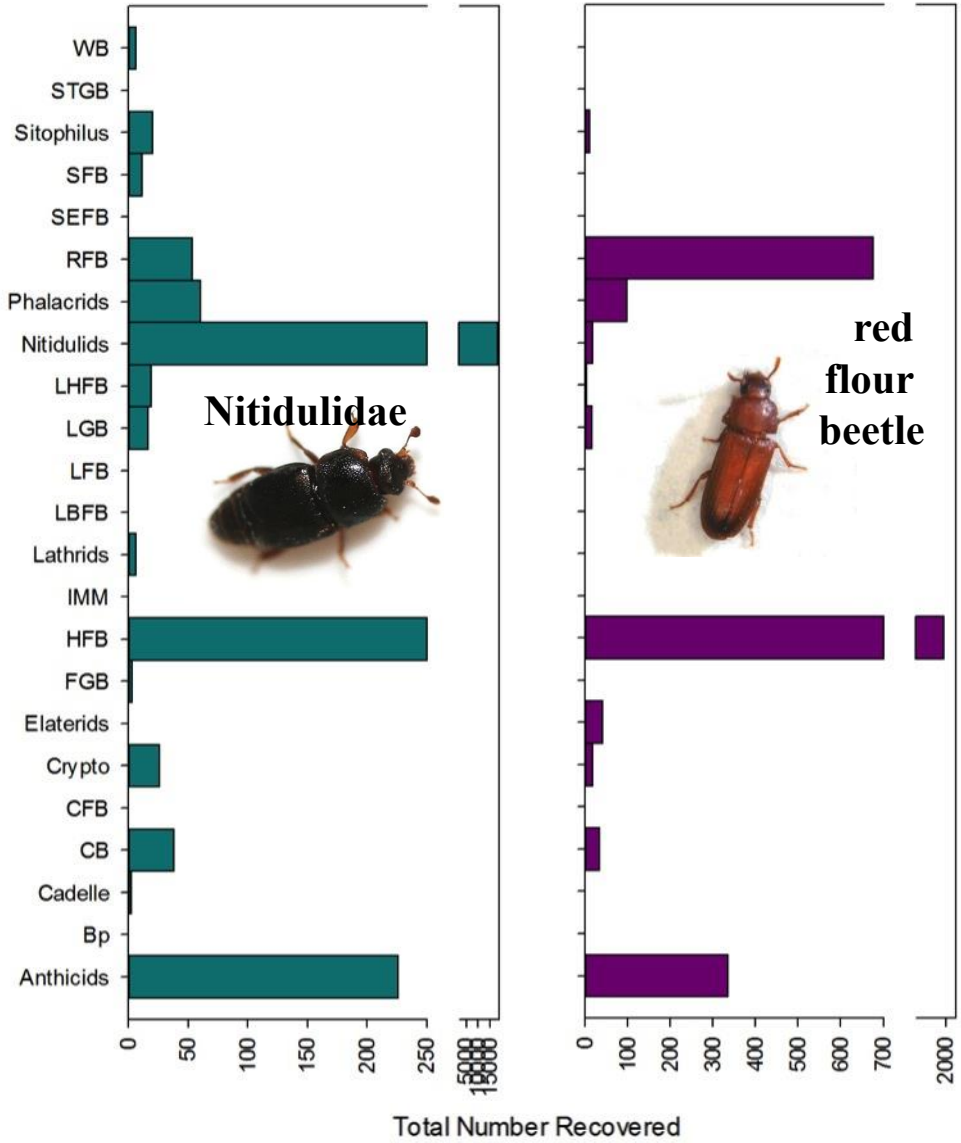
Spillage:
Average grain condition: 0.5 ± 0.2
Dry to slightly moldy



Facility 1: Outside vs. inside

Adults in Refugia Outside



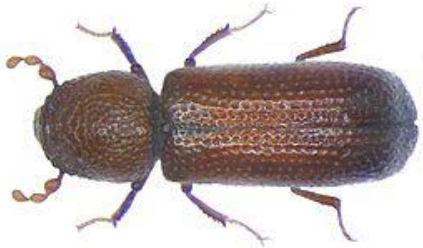


Adults in Dome Traps Inside

Facility 2 - Adults

Nitidulidae
sap-feeding beetles

Rhyzopertha dominica
lesser grain borer



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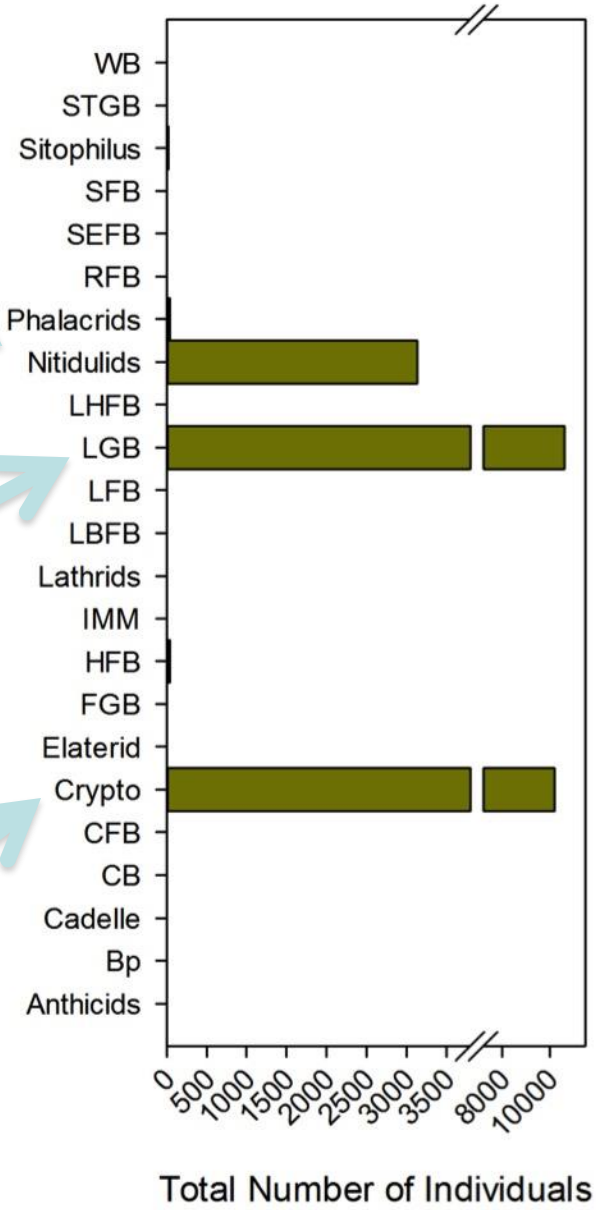
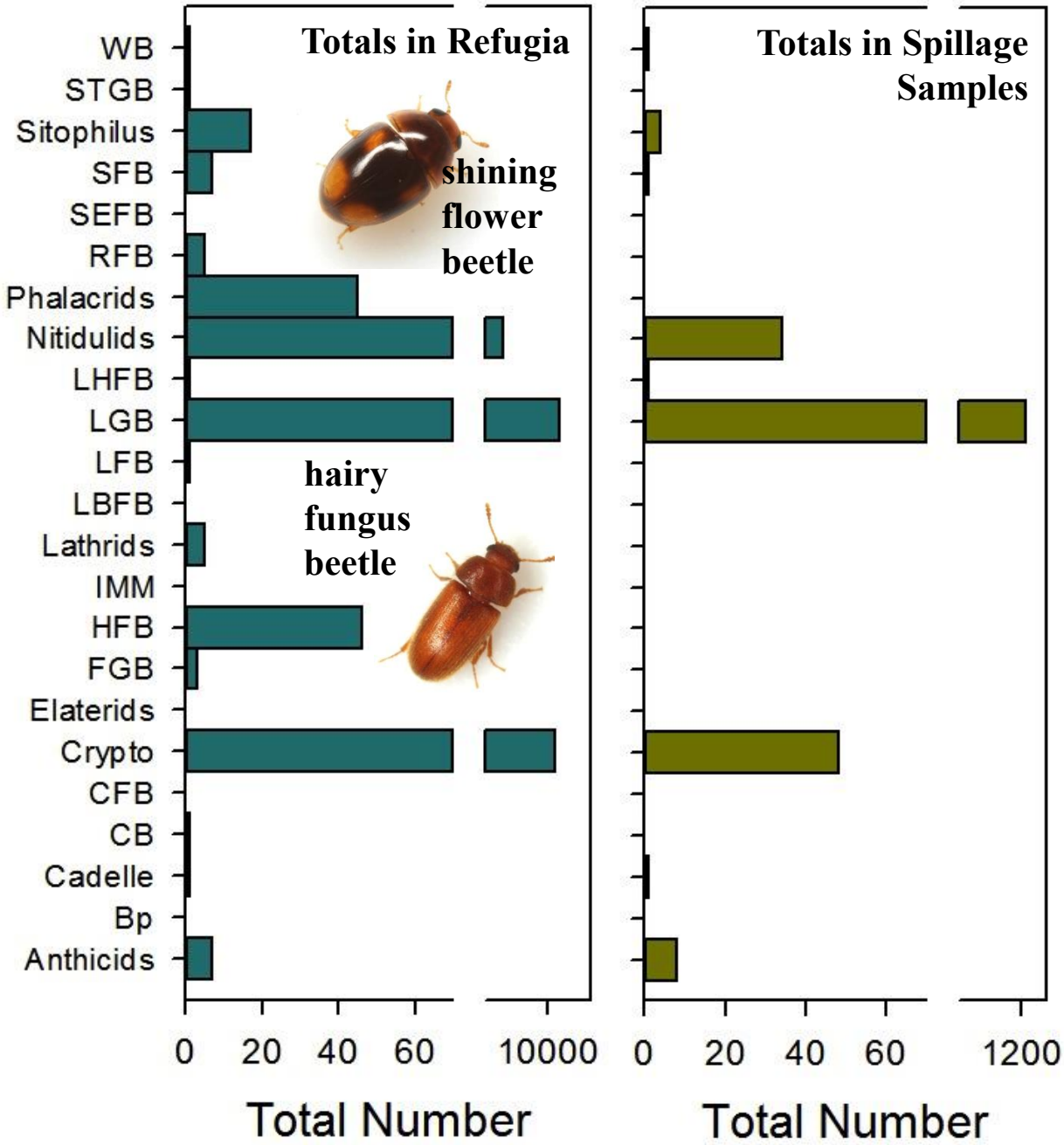


Facility 2: Refugia vs. spillage

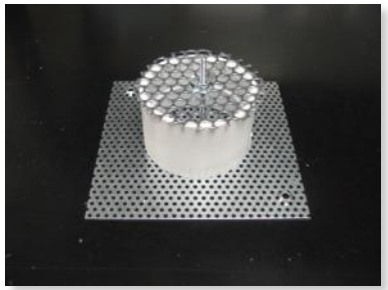
Refugia:
Average grain condition: 2.0 ± 0.0
Moderate mold

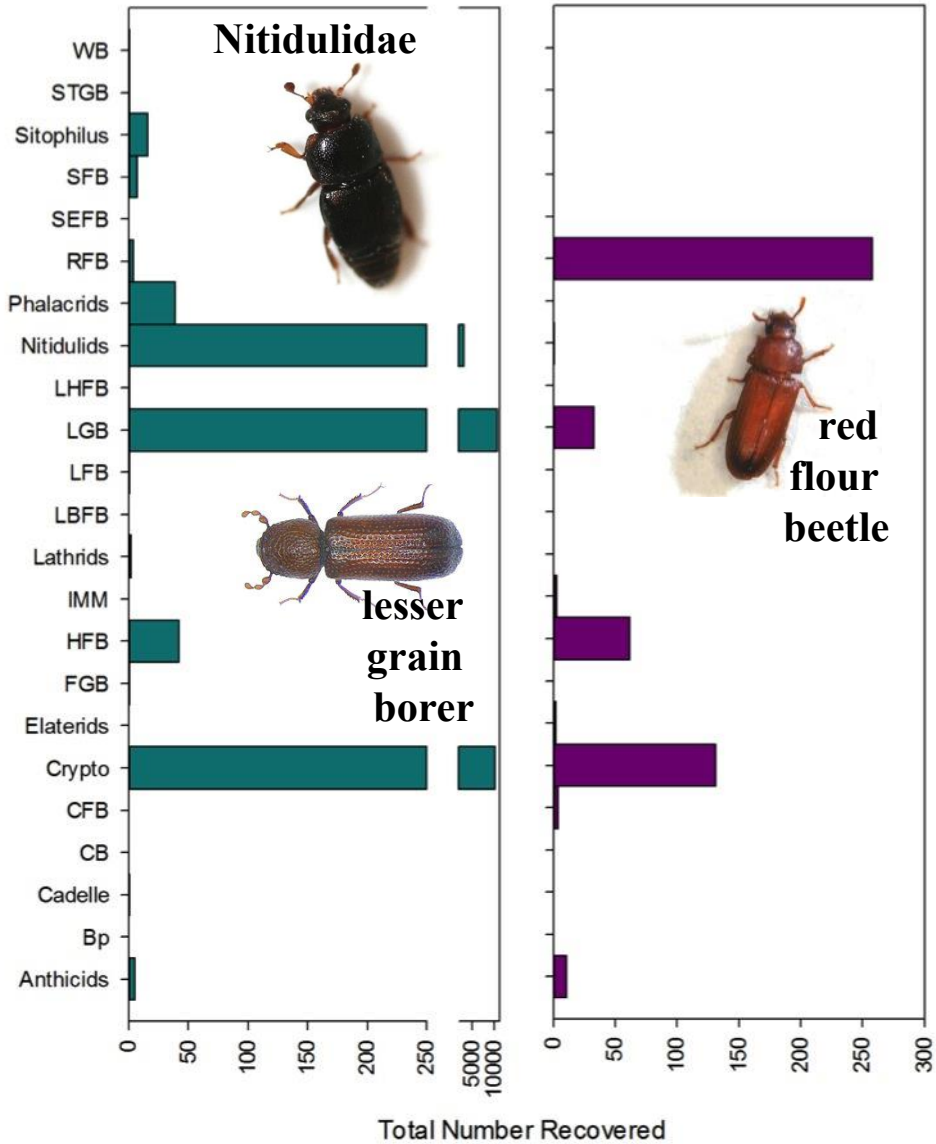
Spillage:
Average grain condition: 0.9 ± 0.2
Slightly moldy



Facility 2 – Outside vs. inside

Adults in Refugia Outside





Adults in Dome Traps Inside

Red Flour Beetle (RFB)
(*Tribolium castaneum*)

RFB development on rice fractions

- Because milling process generates fractions and hence potential infestations sites, five fractions were studied:

  - rice flour
  - milled broken kernels
  - brown rice
  - milled whole kernels
  - bran

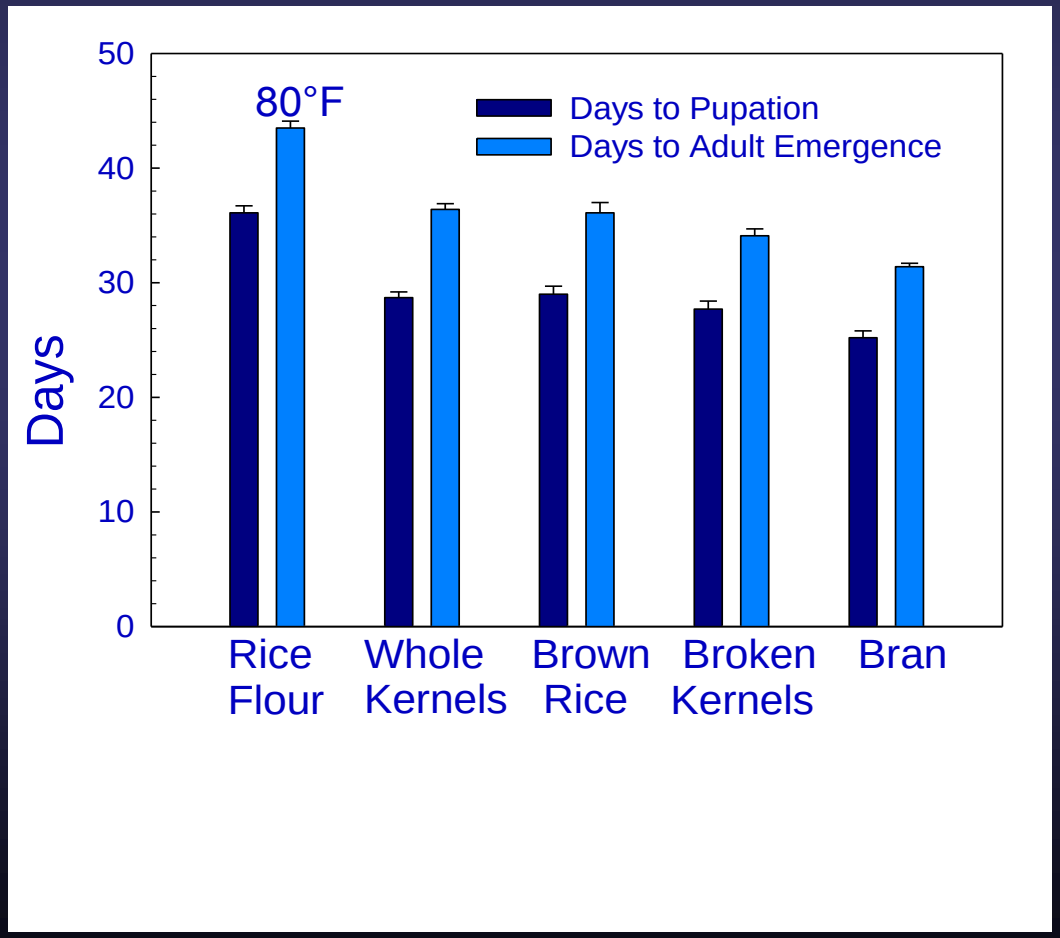
- RFB strain collected from an Arkansas rice mill was used

- Fractions collected from a commercial mill

- Assessed RFB development to the adult stage

RFB development duration at 80˚ F

- All fractions supported development to adulthood



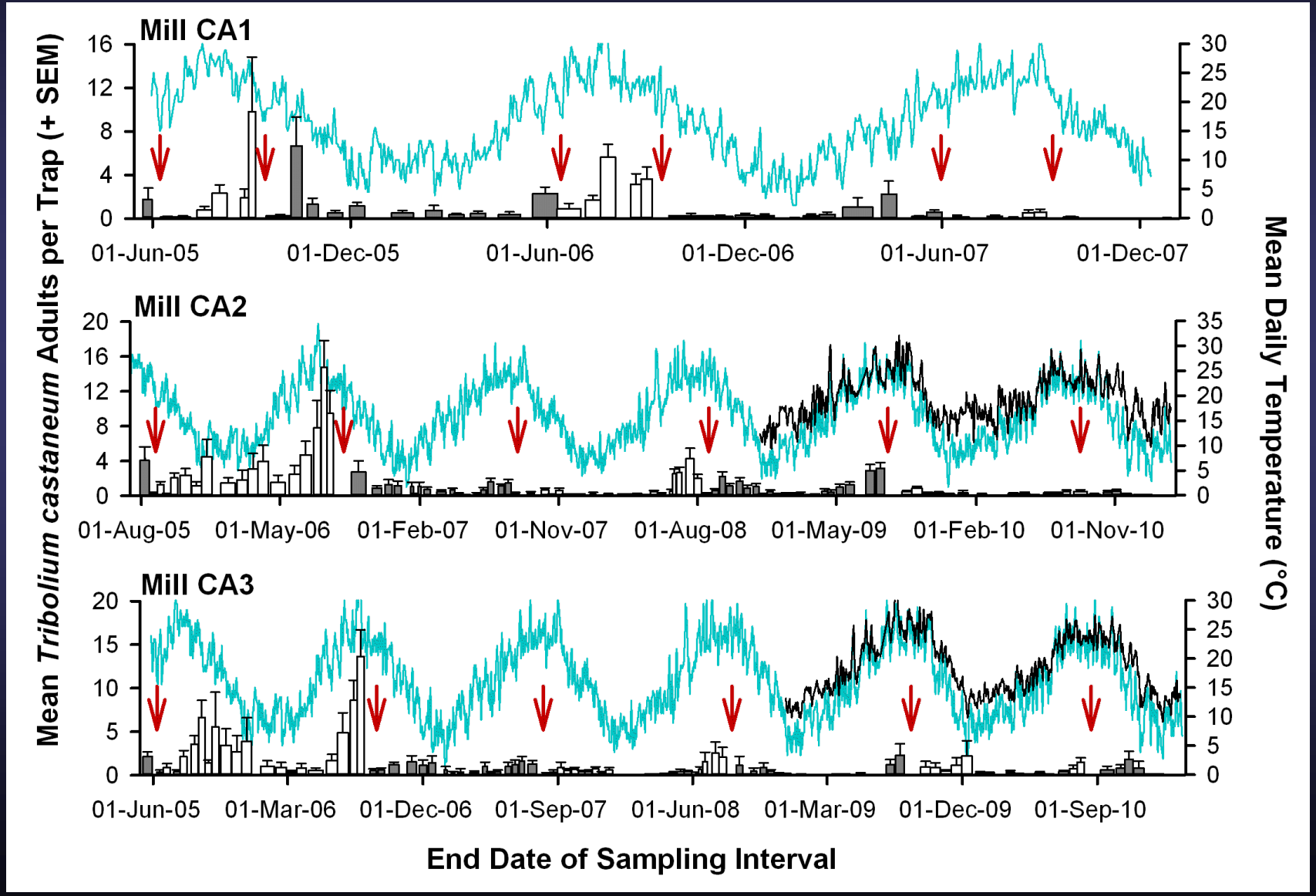
Fumigants for mill structures

- **Methyl bromide**
  - Historically most widely used
  - Phasing out worldwide under the Montreal Protocol on Substances that Deplete the Ozone Layer
- **Phosphine**
  - Used for commodity treatments
  - Corrosive effects limit use in mills
- **Sulfuryl fluoride**
  - Limited egg mortality may impact efficacy
  - Adopted by some rice mills

Evaluation of fumigant efficacy in commercial facilities

- Limited information on impact of fumigations on stored-product pest populations
  - Recently a growing amount of data on wheat mills
  - Less is know about other facility types
- Lack of information has hampered adoption of alternatives to methyl bromide fumigation
- Challenging to measure and interpret efficacy studies for a variety of reasons

Inside and outside temperatures, beetle captures followed a seasonal pattern



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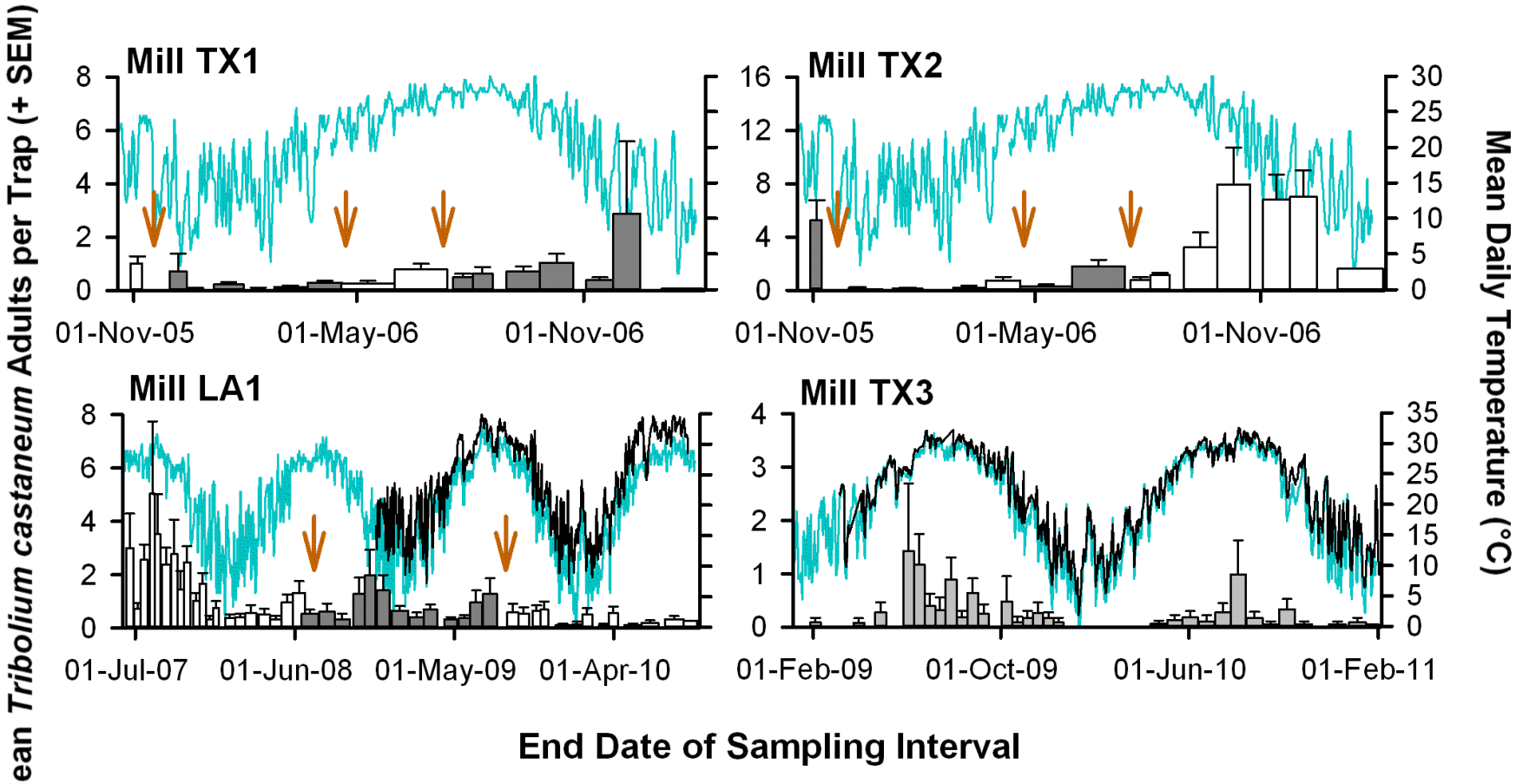
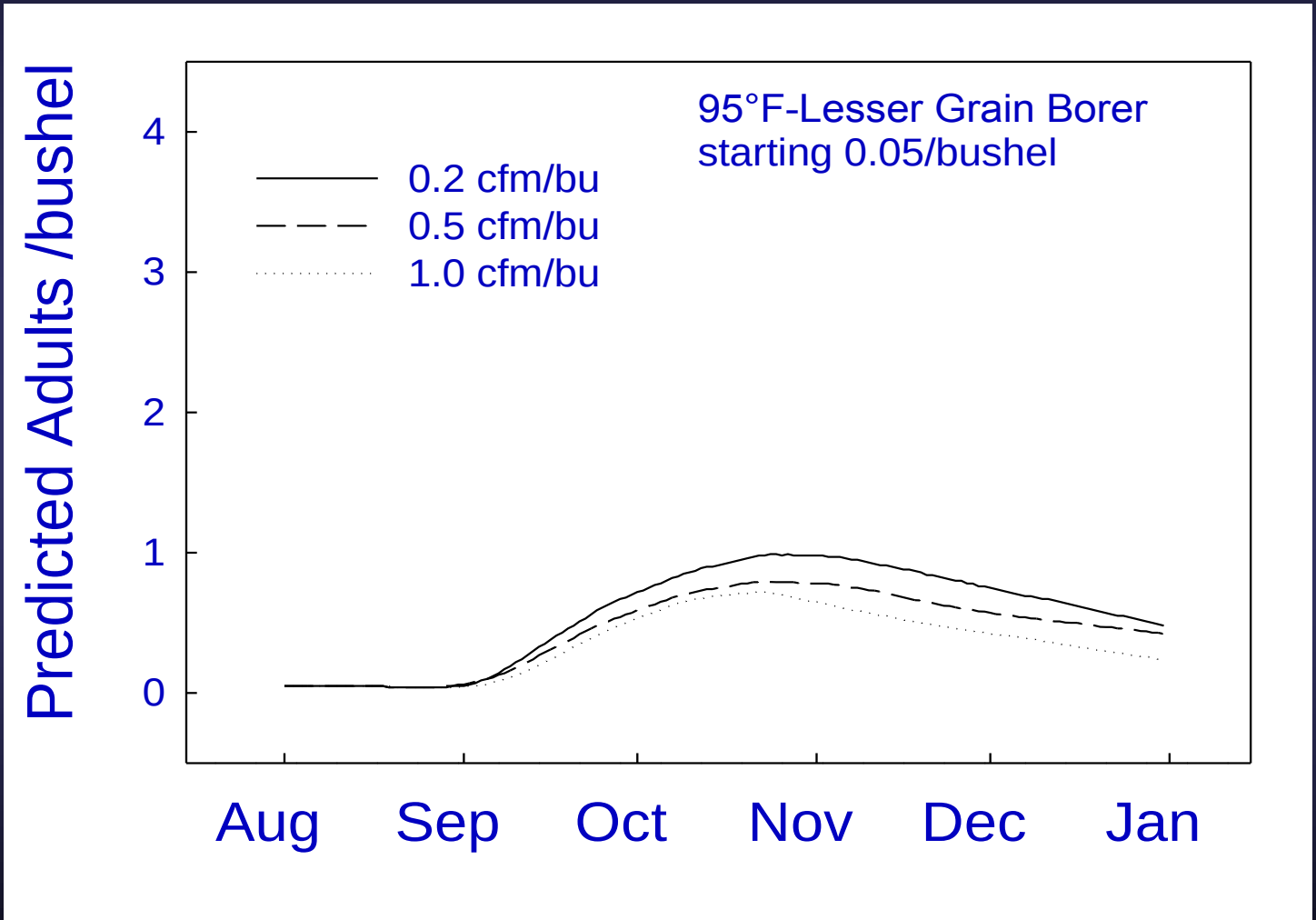


Fumigation efficacy

- On average, little change in captures between consecutive sampling periods without fumigation
- No difference among individual mills
- Limited evidence for difference between two regions

- 73 ± 6% for CA mills
- 47 ± 11% for Gulf Coast mills

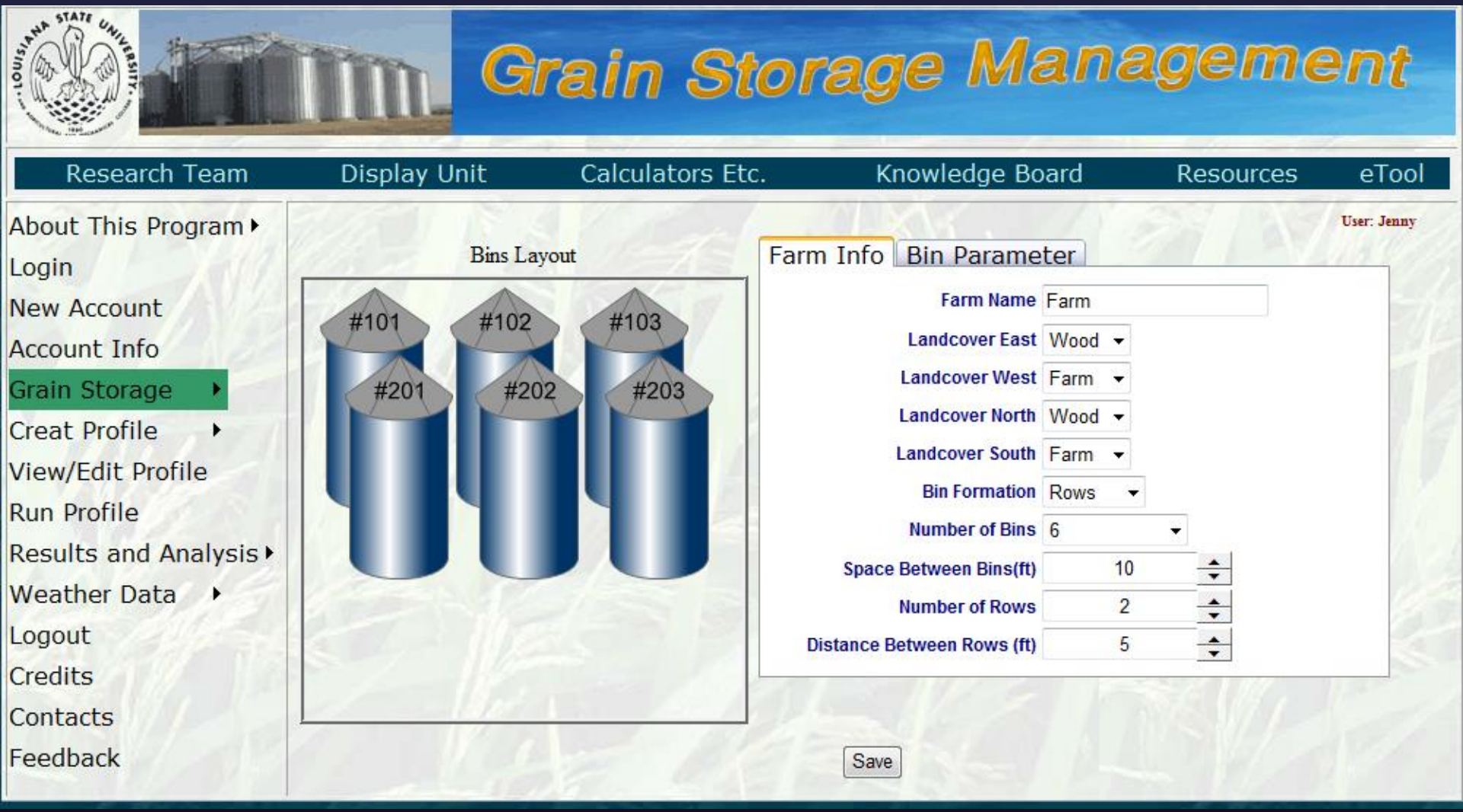
Aeration efficacy on lesser grain borer



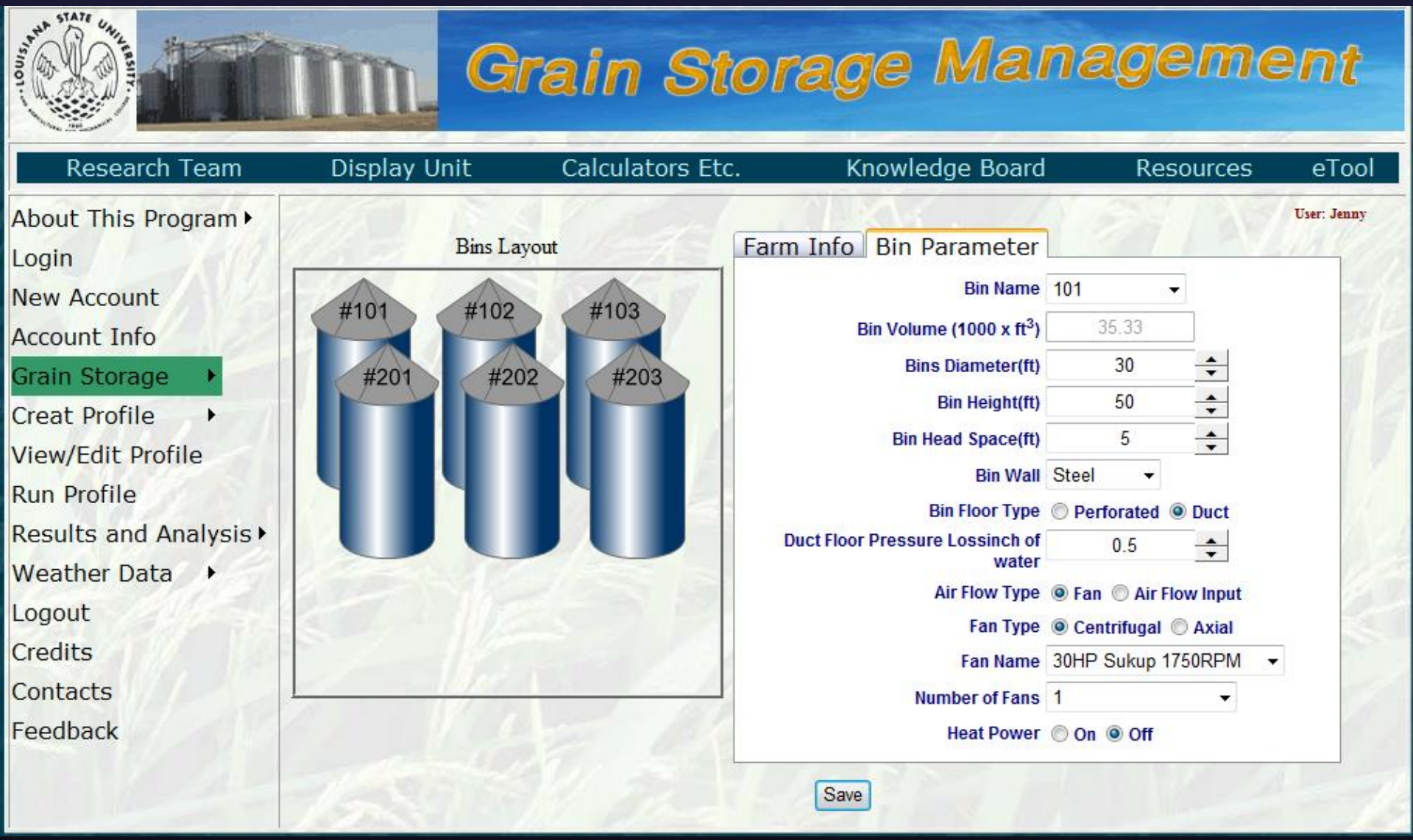
https://Beaumont.tamu.edu/GrainManagement

Farm Storage ... Rice Mill

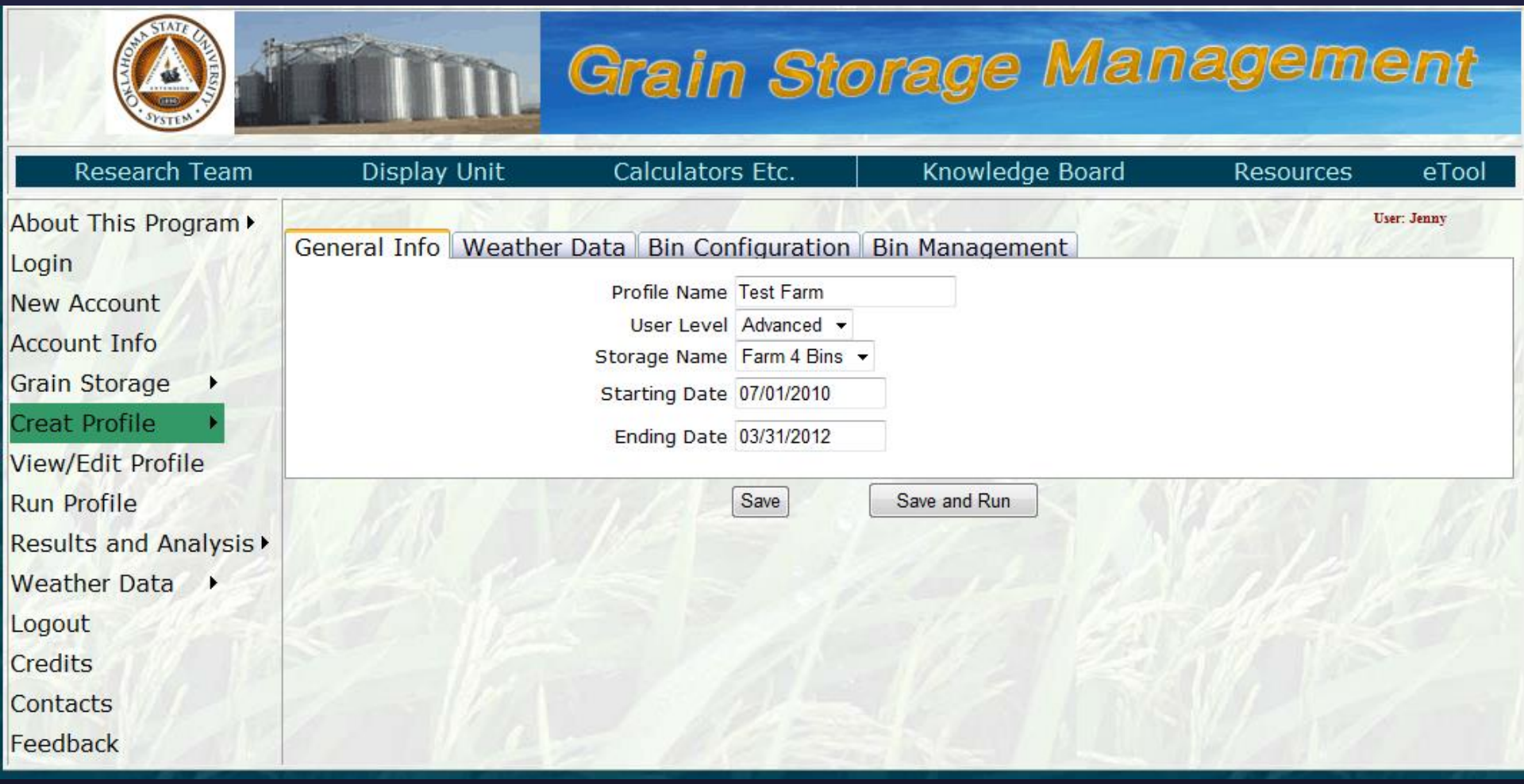
Farm Storage: Site Info



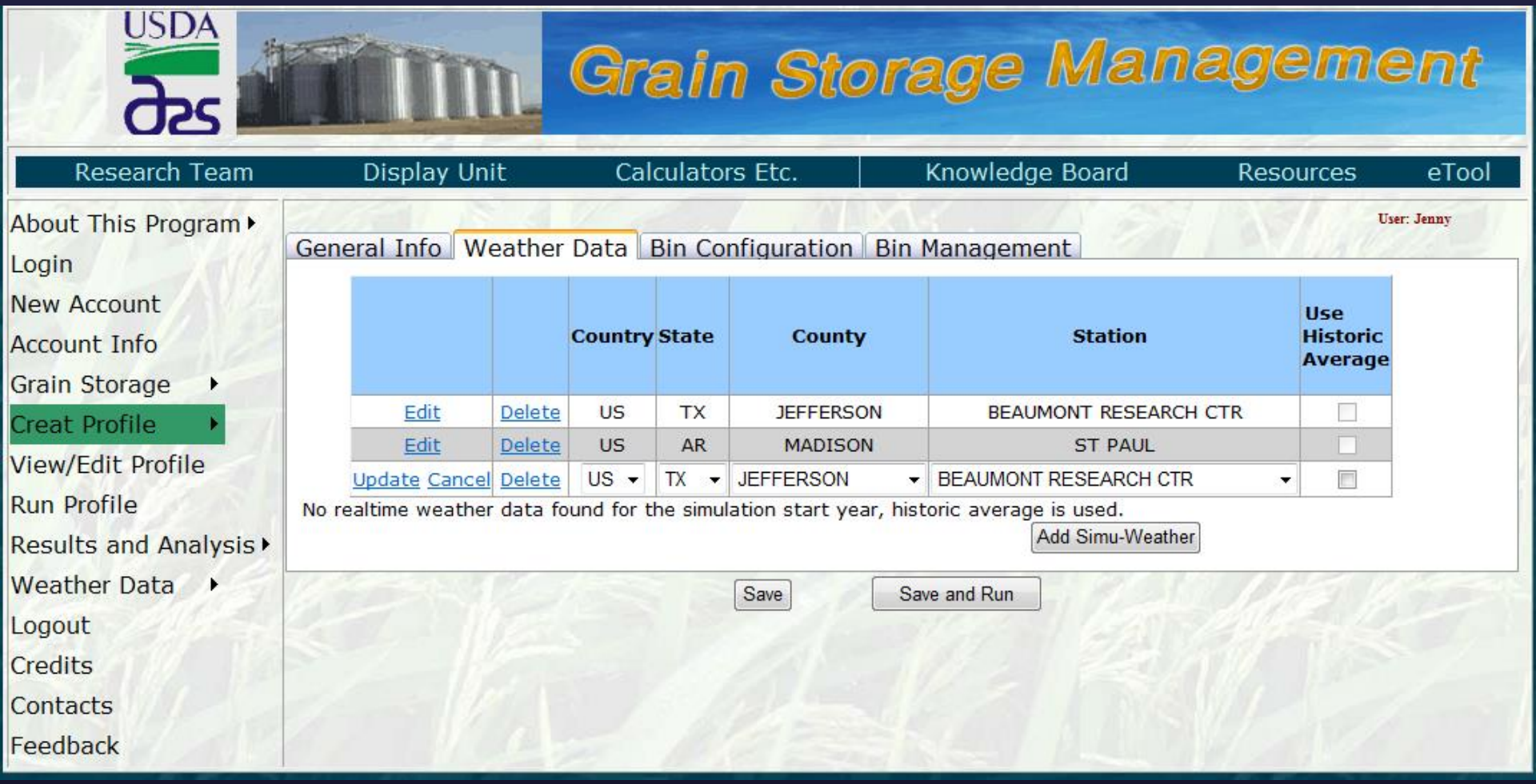
Farm Storage: Bin Info



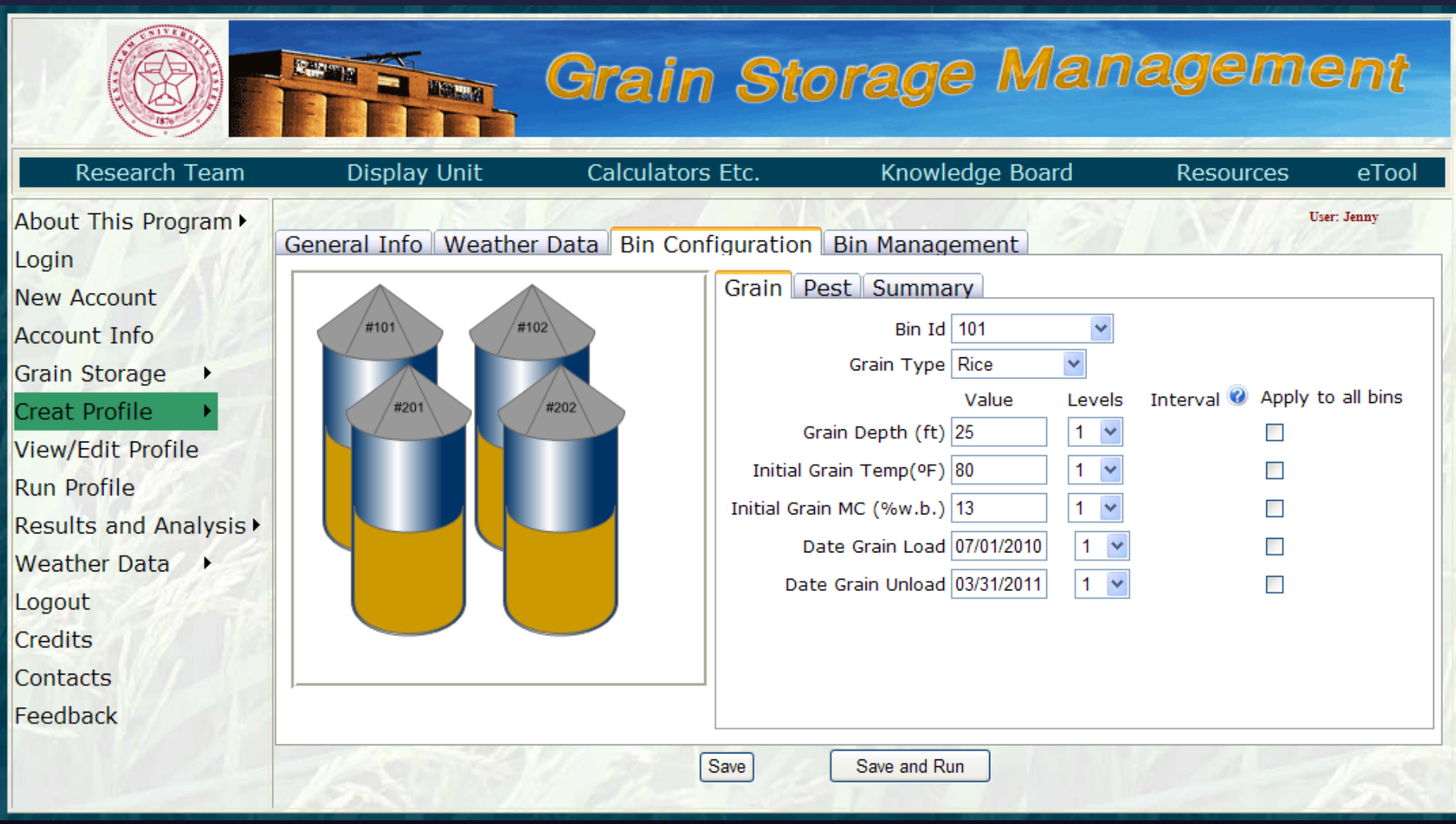
Farm Storage: Create Profile → General Info



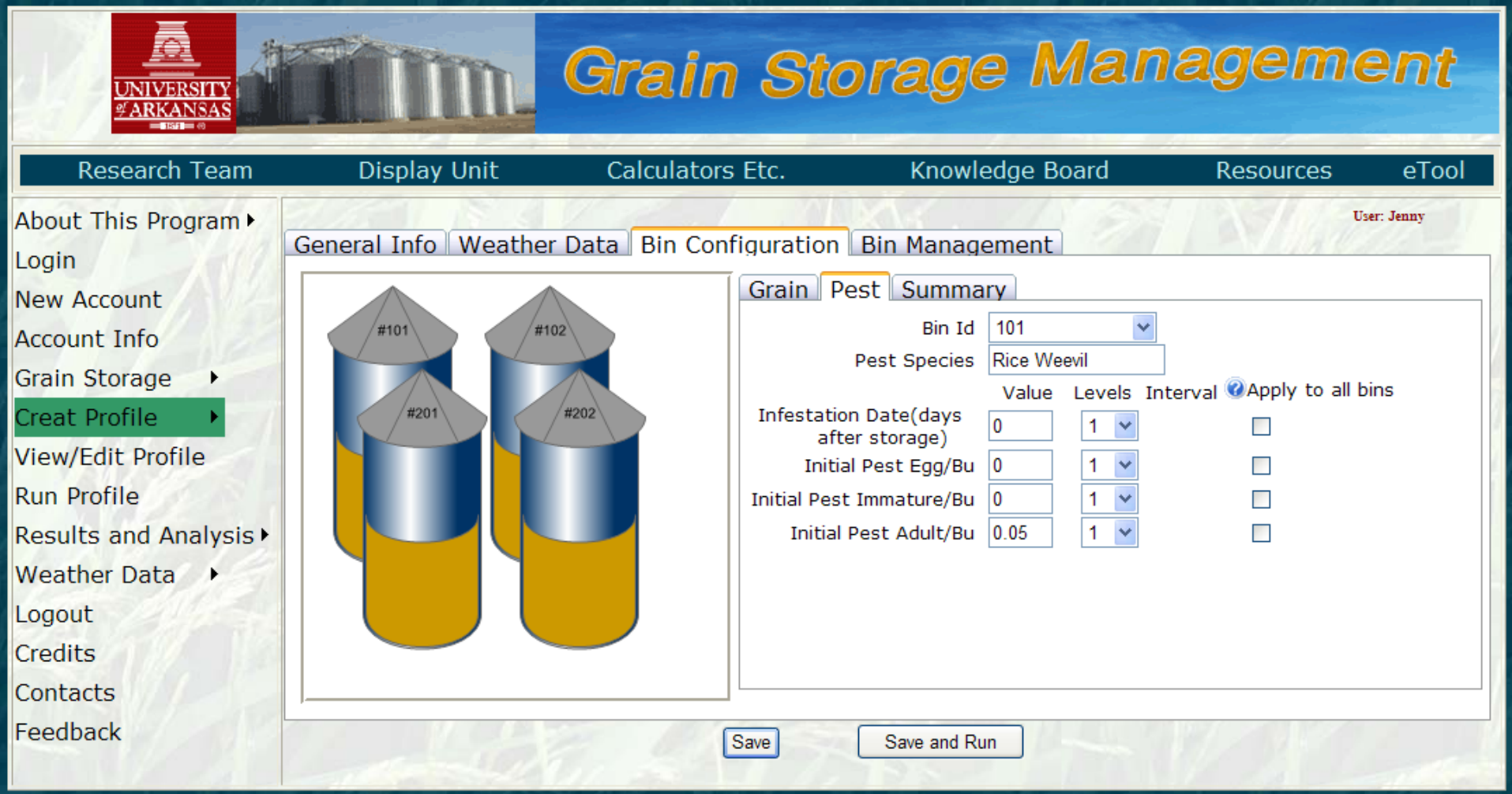
Farm Storage: Create Profile → Weather Data



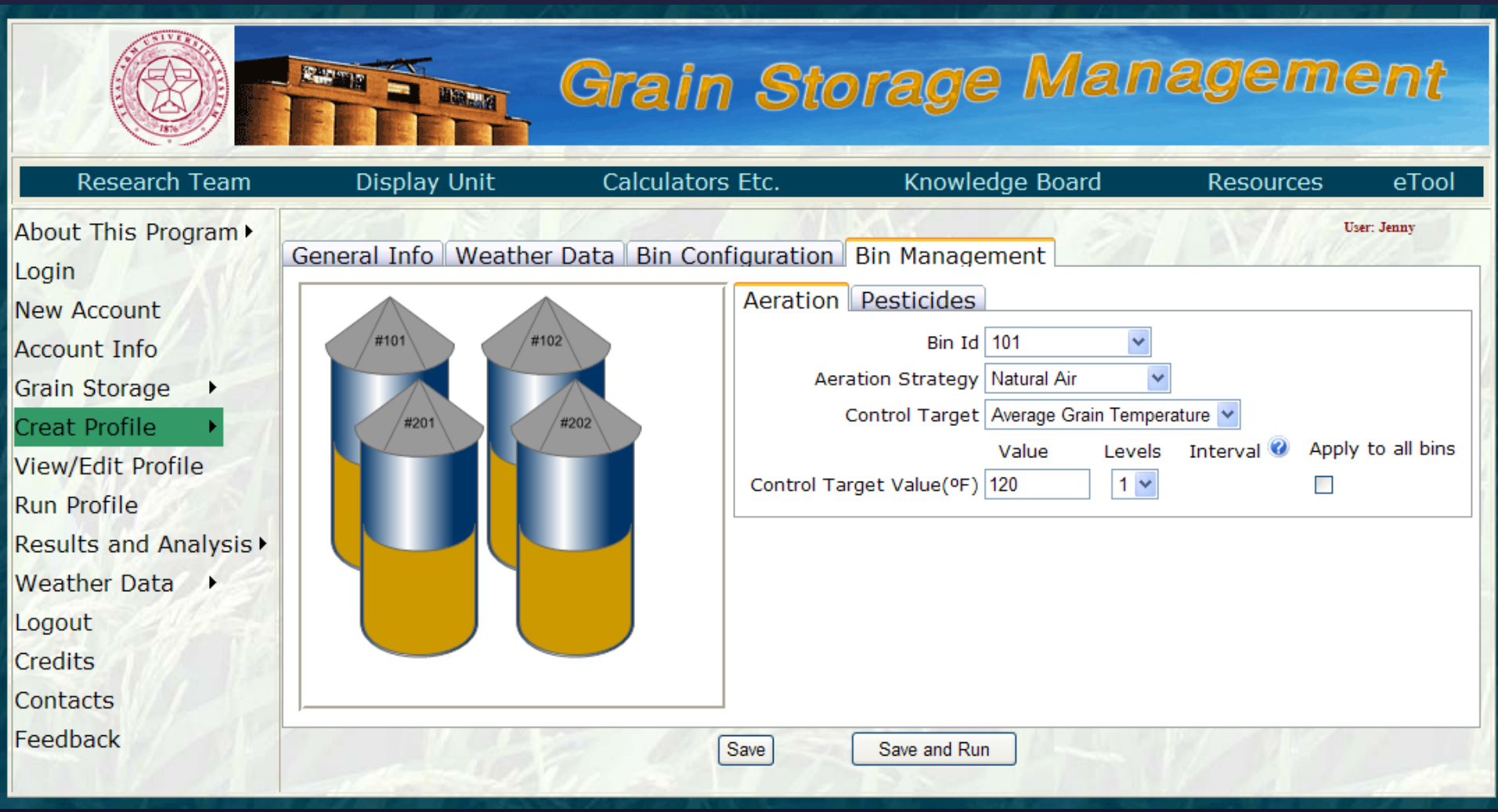
Farm Storage: Create Profile → Bin Grain



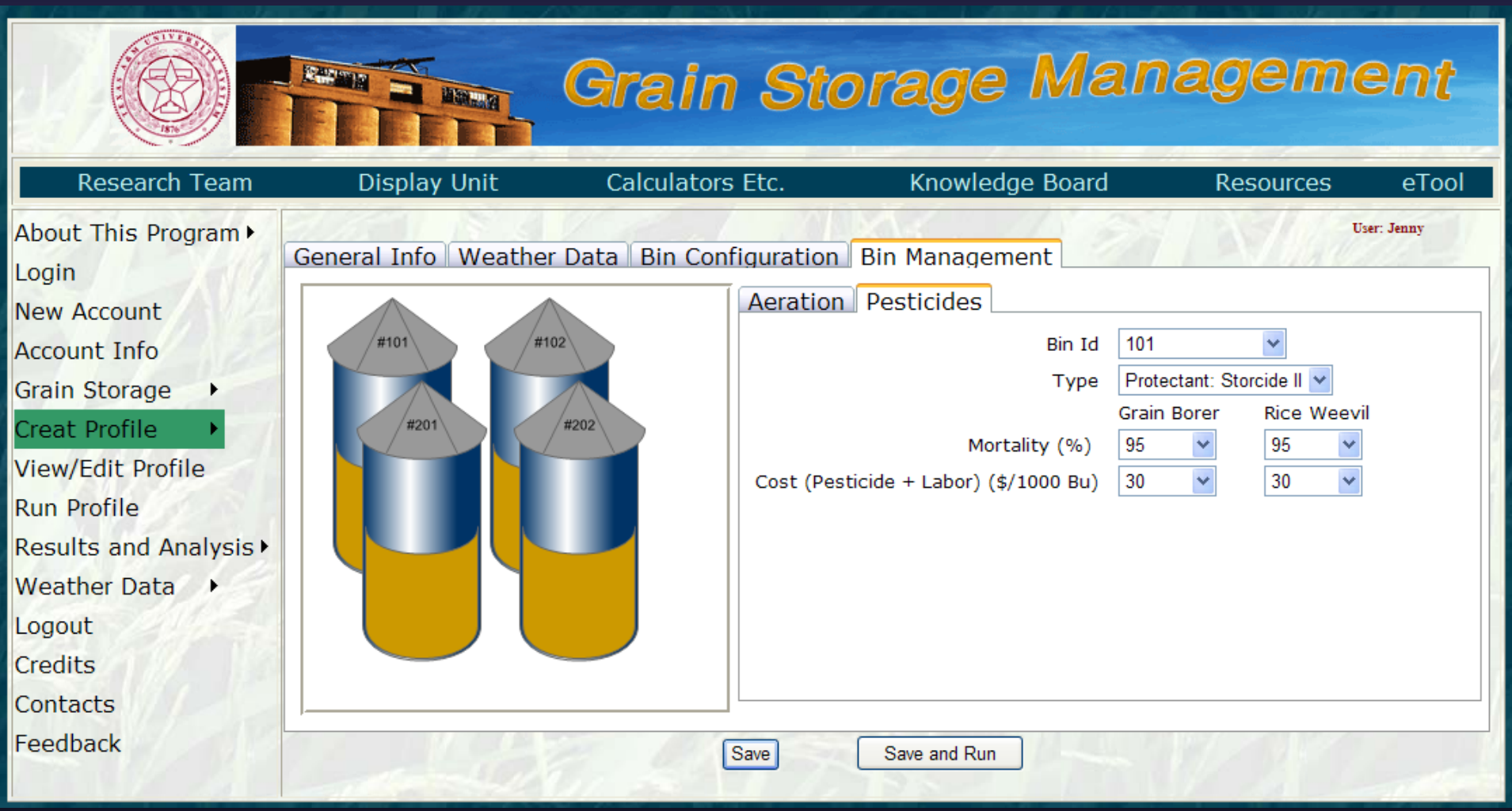
Farm Storage: Create Profile → Bin Pests



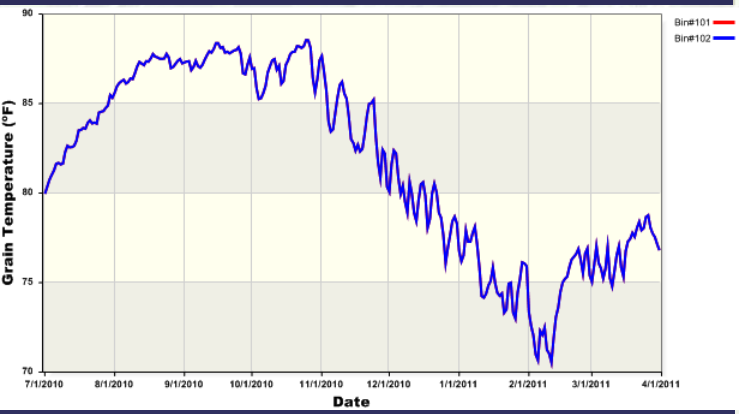
Farm Storage: Create Profile → Aeration

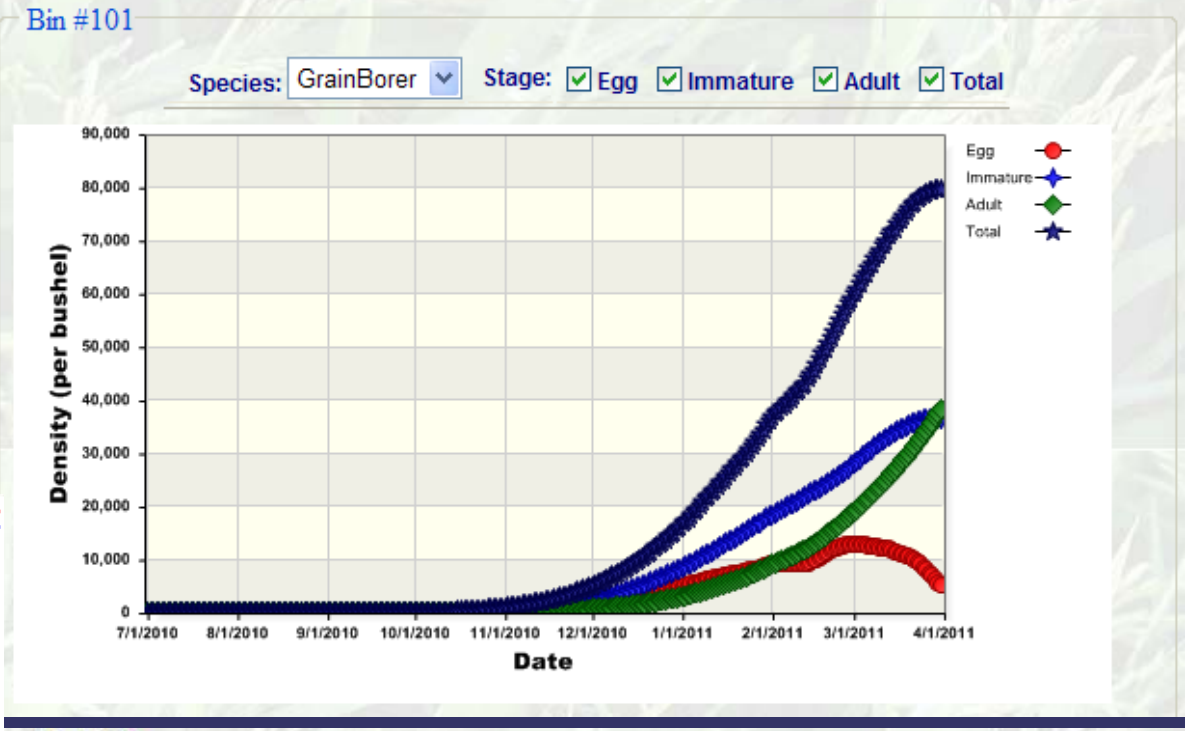


Farm Storage: Create Profile → Pesticide

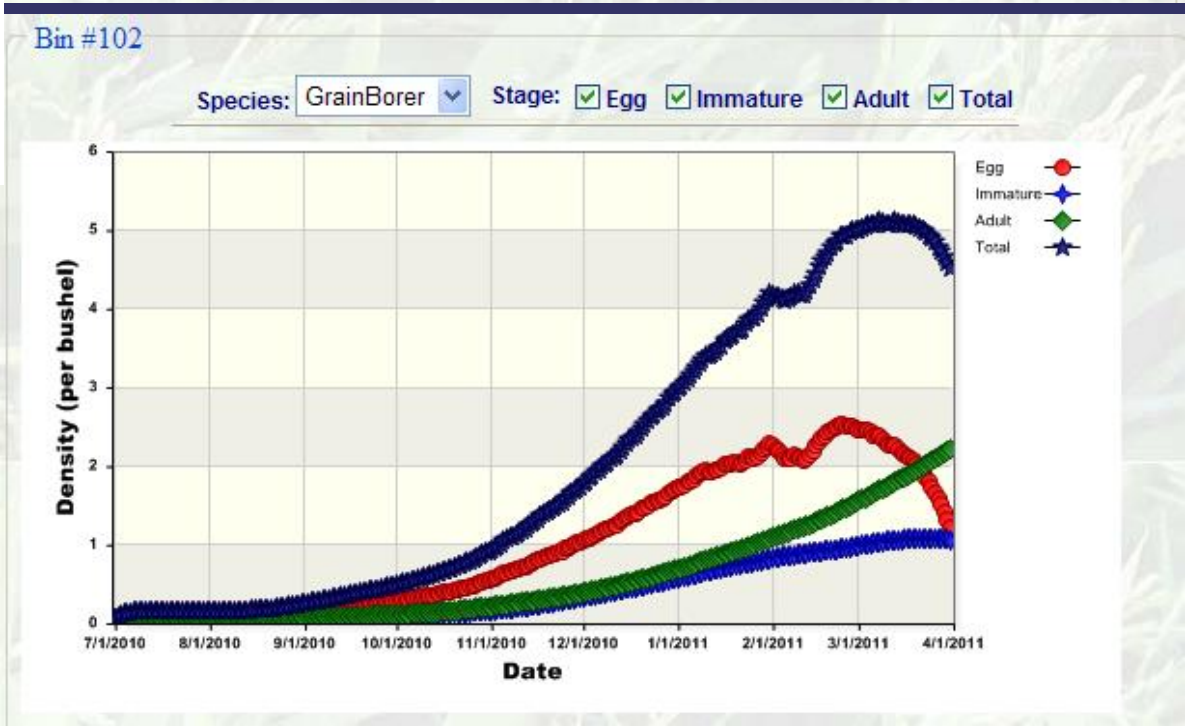


No Aeration →

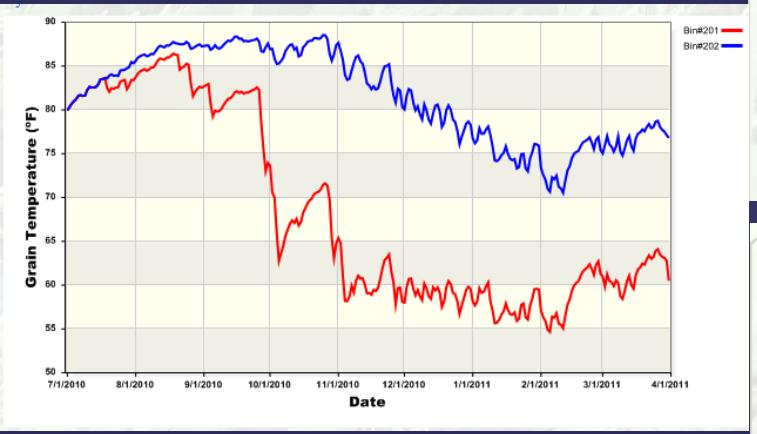


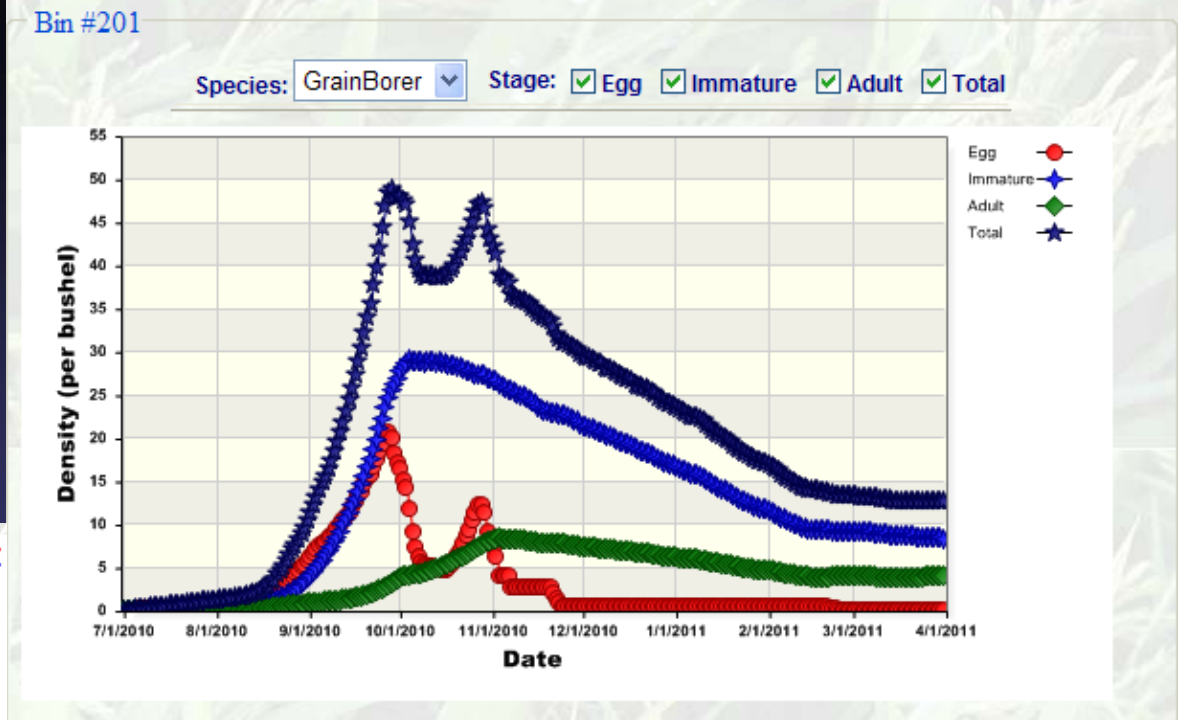


No Aeration, Diacon II →

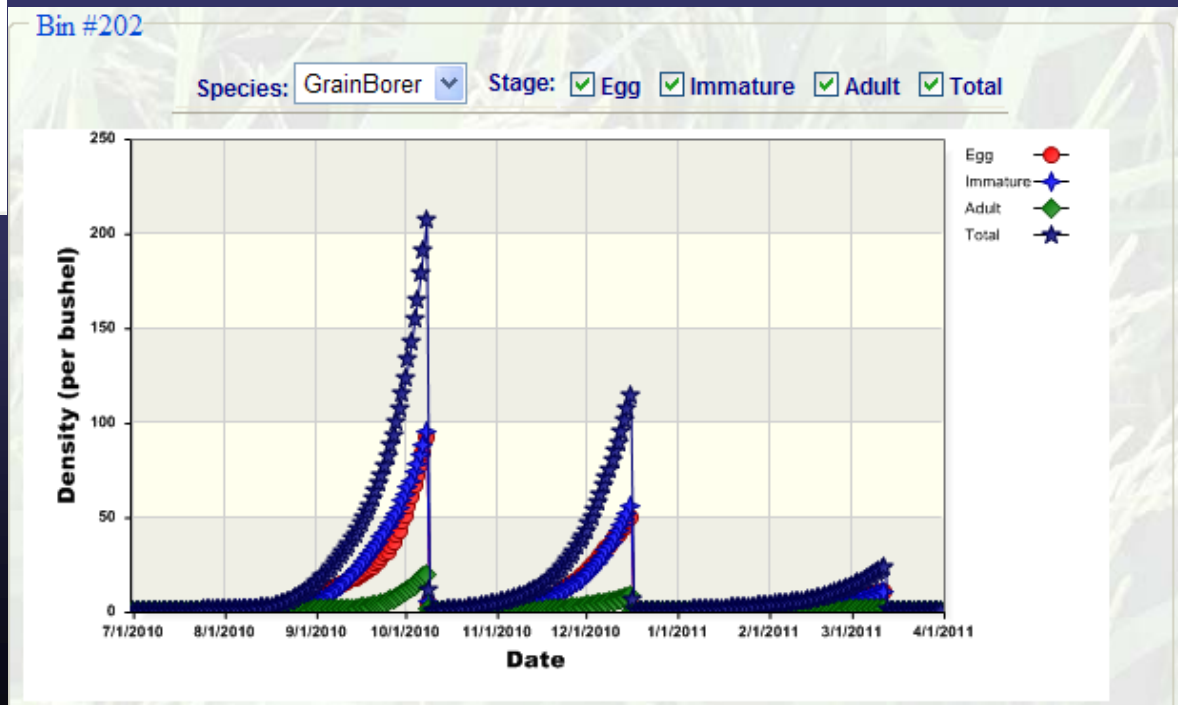


With Aeration →

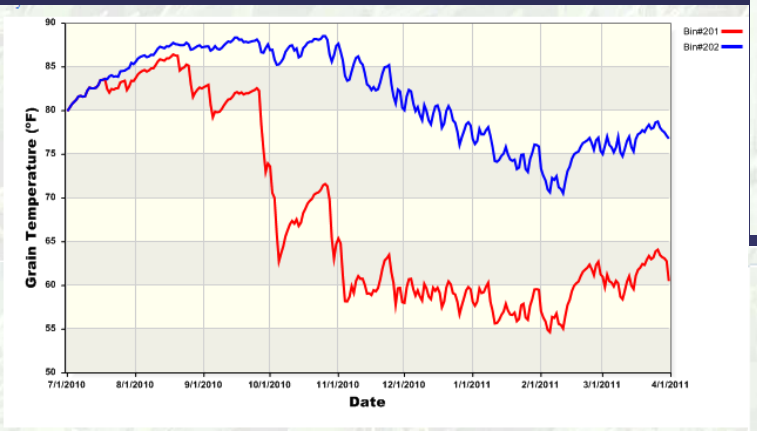


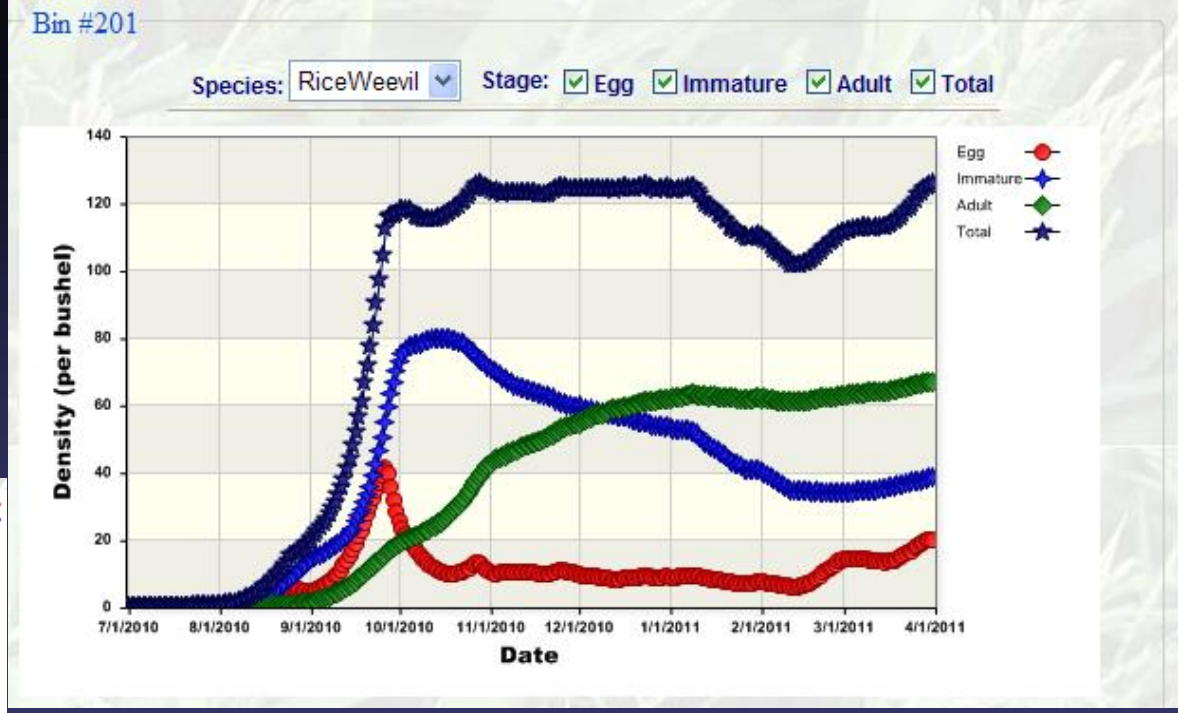


No Aeration, Profume →

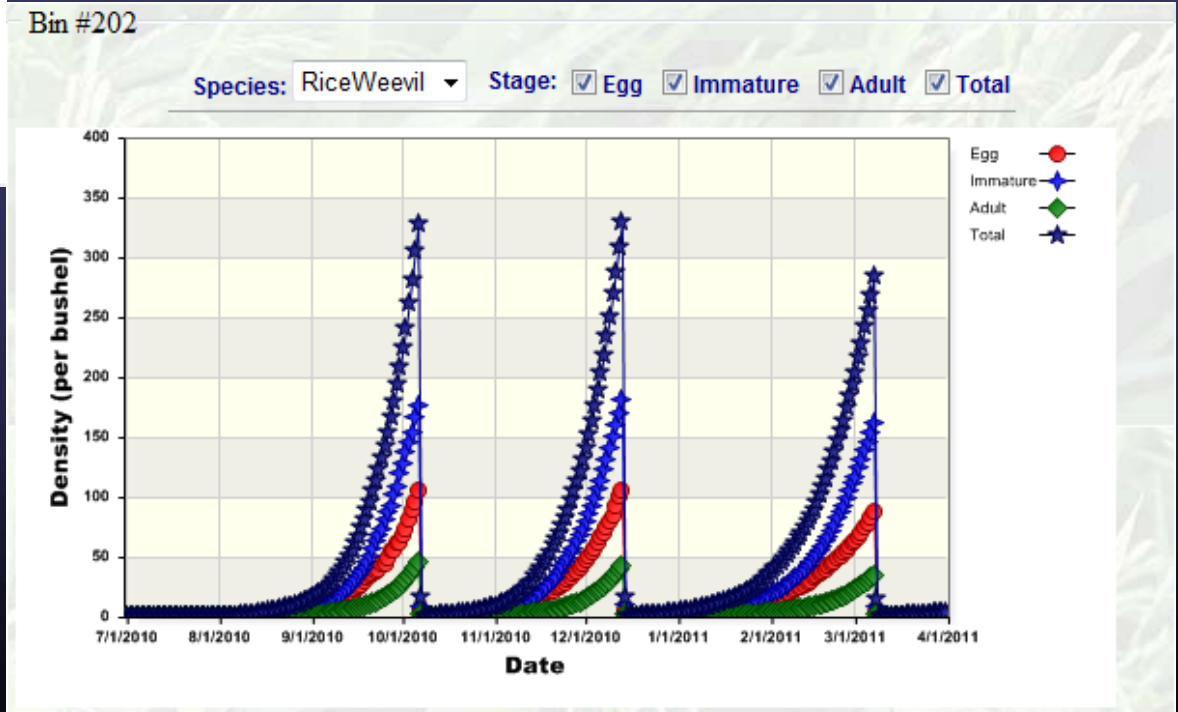


With Aeration →





No Aeration, Profume →



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Grain Storage Management

Research Team | Display Unit | Calculators Etc. | Knowledge Board | Resources | eTo

- About This Program
- Login
- New Account
- Account Info
- Grain Storage
- Creat Profile
- View/Edit Profile
- Run Profile
- Results and Analysis
- Weather Data
- Logout
- Credits
- Contacts
- Feedback

User: Jen

Display options

Profile: Test Farm

Aeration dynamics | Pest dynamics | Sensitivity Analysis

Bin Power Consumption

View Chart | View Data | Download Data

Show selected bins in a single figure | Show selected bins in seperated figures

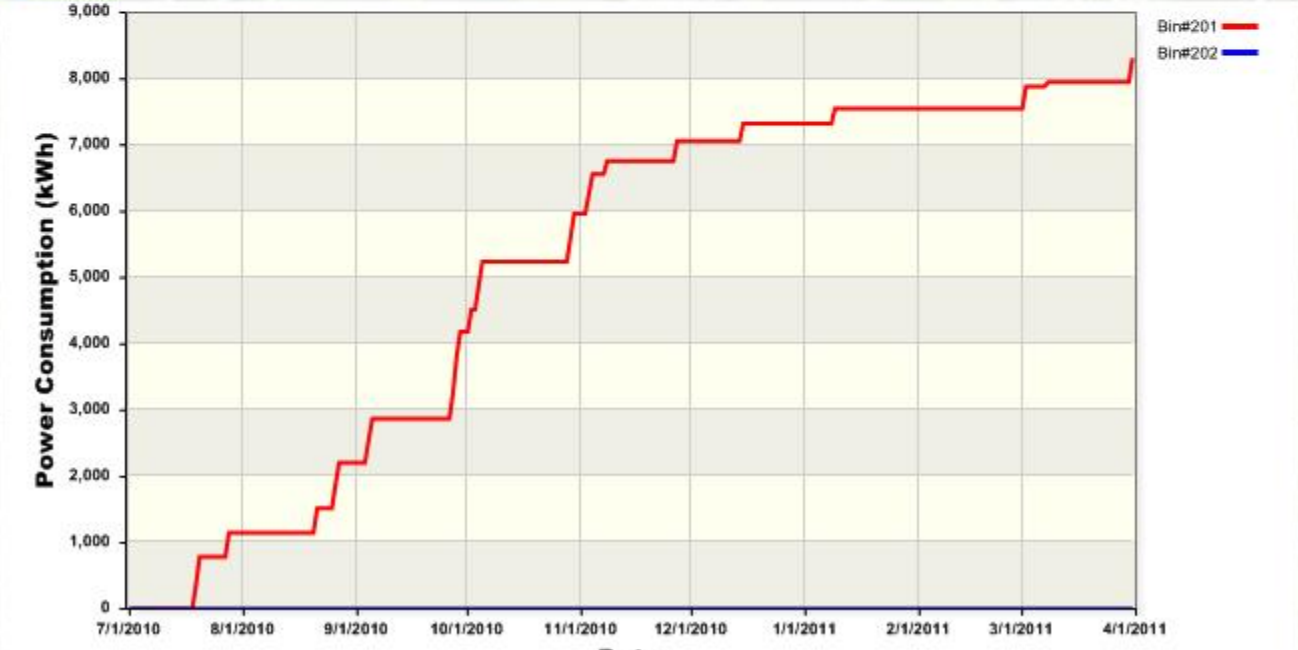
Select bins to display

☐ #101 ☐ #102 ☑ #201 ☑ #202

Select all | Clear

Hide parameters

Aeration Dynamics



Major features
(https://beaumont.tamu.edu/GrainManagement)

- Create, edit, run multiple farm or mill profiles
- Predict of grain temp and moisture dynamics as affected by weather
- Predict rice weevil and grain borer dynamics within bins/silos
- Predict pest dispersal in mills
- Evaluate different aeration and pesticide management strategies
- Graphic display of results for aeration/pest dynamics
- Dynamic integration with climatic data

Post-Harvest Rice Insect Pest Management

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