

STINK BUG POPULATIONS IN AN ACTIVE BOLL WEEVIL ERADICATION ZONE IN CENTRAL TEXAS

John K. Westbrook and Ritchie S. Eyster
Agricultural Research Service
U. S. Department of Agriculture
College Station, TX

Abstract

Stink bugs have emerged as an increasingly significant pest complex in the Mid-South and Southeastern regions of the Cotton Belt following reductions in use of broad-spectrum insecticides. Reductions in broad-spectrum insecticide use have been attributed to increased adoption of transgenic cotton containing *Bacillus thuringiensis*, increased use of selective insecticides, widespread success of the Boll Weevil Eradication Program with concomitant reductions in Malathion applications, and increased conservation reserve areas. Stink bugs are highly polyphagous and many of their hosts are found in the Southern Blacklands zone of the Texas Boll Weevil Eradication Program. A field study was conducted to determine seasonal patterns and species composition of stink bugs in various habitats within this active zone of the Boll Weevil Eradication Program. Only seven stink bugs were collected from twice-weekly sweep net samples in cotton, where an average of 7.4 Malathion applications were made during the 12 May – 24 July sampling period. Southern green stink bugs were more numerous than brown stink bugs, green stink bugs, and rice stink bugs in soybeans and alfalfa. The geographic distribution, suitability, and diversity of host crops and weeds will present a challenging landscape for protection of cotton against stink bugs when the Boll Weevil Eradication Program advances to a maintenance stage. Future research should be directed at patterns of host utilization and dispersal by stink bugs.

Introduction

The stink bug complex (Heteroptera: Pentatomidae) is highly polyphagous and typically feed on the seeds and fruit of field crops, tree crops, and numerous wild hosts (McPherson and McPherson 2000). The southern green stink bug (SGSB), *Nezara viridula*, green stink bug (GSB), *Acrosternum hilare* (Say), brown stink bug (BSB), *Euschistus servus* (Say), and rice stink bug (RSB), *Oebalus pugnax* (F.) are the predominant stink bug species found in cotton fields in the southern U.S. The recently increased importance of stink bugs as an economic pest of U.S. cotton has been attributed to the replacement of broad-spectrum insecticides with selective insecticides such as those for Lepidoptera pests, increased use of Bt cotton, increased conservation reserve acreage, and reduced insecticide applications in post boll weevil eradication zones (Leonard and Emfinger 2002, Greene and Capps 2003). The emerging pest status of stink bugs has been noted from South Carolina (Turnipseed et al. 2003) through Mississippi (Steede et al. 2003) to Oklahoma (Karner and Goodson 2002). The objective of this study was to determine the stink bug species composition and seasonal patterns of stink bug infestations in cotton, soybeans, and alfalfa during an active Boll Weevil Eradication Program.

Materials and Methods

Three to four fields of cotton, soybeans, and alfalfa were sampled for stink bugs twice per week using 15-inch-diameter sweep nets. Initially, three sets of 50 sweeps were made on each sampling date, but this was later changed to eight sets of 25 sweeps for increased sample size and field coverage. Collected insects were placed into zip-lock plastic bags and stored in a freezer for a minimum of 2 h to kill the insects. The insects were identified in the laboratory using magnifying lamps. Geographic coordinates of endpoints of each sample segment were recorded using Garmin III GPS receivers. Sample segments and numbers of stink bugs in each sample were displayed on a map of each field using ESRI ArcGIS version 8.3. Two-sample t-tests (SAS version 8, SAS Institute, Cary, NC) were applied to determine significance of the numbers of stink bugs collected in the center versus the perimeter of fields.

Results

Stink bugs were collected in cotton, soybeans, and alfalfa in the Southern Blacklands of Texas during 2003 (Table 1). Only seven stink bugs (1 BSB, 5 RSB, and 1 SGSB) were collected in cotton from 12 May through 24 July, when sampling in cotton was concluded due to low numbers of stink bugs and frequent malathion applications by the Texas Boll Weevil Eradication Program (Table 1). An average of 7.4 malathion applications were applied to the cotton fields during the sampling period, and 12.4 malathion applications were applied after the sampling period. Southern green stink bugs were predominant in soybean and alfalfa fields. Brown stink bugs, green stink bugs, and rice stink bugs were found in successively fewer numbers in soybean, but vice versa in alfalfa. There was generally less than one nymph or adult for any stink bug species per 25 sweeps in alfalfa, except there were 5 SGSB nymphs on 18 September, 1.2 BSB adults on 2 June, and 2.3 SGSB adults on 22 September (Figs. 1 and 2). Peak activity in soybeans occurred when there were 8.6 BSB nymphs, 3.1 BSB adults, 65.0

SGSB nymphs, and 7.9 SGSB adults in soybeans on 21 August (Figs. 3 and 4). The three soybean fields had been harvested by 25 August, so one late-maturing soybean field was sampled for the remainder of the season. The late-maturing field had 79.9 SGSB and 3.0 BSB nymphs on 10 September, and 86.6 SGSB and 3.3 BSB nymphs and 2.0 BSB adults on 22 September. There was no significant edge effect in the location of stink bug collections within alfalfa fields, but there were significantly more stink bugs in the outer 100 m of a 27.9-ha soybean field shown in Fig. 5 ($t = 2.75$, $df = 177$, $P = 0.0067$ using a two-sample t-test with Satterthwaite's method for unequal variances).

Discussion

Malathion treatments by the Texas Boll Weevil Eradication Program apparently maintain a collateral defense against stink bug infestations in the Southern Blacklands zone. However, areas within the Southern Blacklands Zone support the growth of diverse crops and weeds that are known hosts for stink bugs. In addition to cotton, soybeans, and alfalfa examined in this study, corn, sorghum, watermelons and pecans are also currently grown in the study area. The phenological development of these hosts establishes a vegetative foundation on which stink bugs can develop, reproduce, and perpetuate their damage to cotton and other crops. Availability of alfalfa throughout the growing season provides a nominal host for stink bugs, but timely mowing of the alfalfa crop may significantly retard the development of stink bug populations. Management of stink bug infestations in soybeans may significantly reduce the threat of late-season infestations in cotton. Additional research is needed about the seasonal pattern of host utilization by stink bugs relative to the cotton production season. Further, knowledge of the timing and pattern of dispersal between and within habitats will be useful in deriving pest management tactics.

Acknowledgment

The authors are grateful for the field and laboratory assistance of Sam Jones, Brittany Collins, Tomi Sappington, Derrick Hall, Travis Fohn, Sharon Mowery, and Justin Sladek. Chris Parker provided valuable assistance with insect identification. Thanks are expressed to several producers who supported the field sampling, and to personnel from the Southern Blacklands Zone office of the Texas Boll Weevil Eradication Program who provided information about Program applications of malathion.

Disclaimer

Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement by the U. S. Department of Agriculture.

References

- Greene, J.K., and C.D. Capps. 2003. Management considerations for stink bugs. Proceedings 2003 Beltwide Cotton Conf. 2: 113-120.
- Karner, M., and J. Goodson. 2002. Stink bugs – an emerging pest in Oklahoma cotton fields. Proceedings 2002 Beltwide Cotton Conf., National Cotton Council, Memphis, TN.
- Leonard, B.R., and K. Emfinger. 2002. Insects in low spray environments and modified cotton ecosystems. Proceedings 2002 Beltwide Cotton Conf., National Cotton Council, Memphis, TN.
- McPherson, J.E., and R.M. McPherson. 2000. Stink Bugs of Economic Importance in America North of Mexico. CRC Press, Boca Raton, FL. 253 pp.
- Steede, H.G., M.B. Layton, and J.L. Long. 2003. Seasonal occurrence of stink bugs and tarnished plant bugs in Mississippi cotton fields. Proceedings 2003 Beltwide Cotton Conf. 2: 986-991.
- Turnipseed, S.G., M.J. Sullivan, A.M. Hegarty, and A.L. Gibson. 2003. Boll damage by the stink bug/plant bug complex in South Carolina. Proceedings 2003 Beltwide Cotton Conf. 2: 1015-1201.

Table 1. Species composition of stink bug adults and nymphs in cotton, soybean, and alfalfa in an active boll weevil eradication zone (Burleson County, TX) in 2003.

| Crop | Sample Dates | Samples | BSB | GSB | RSB | SGSB | Total |
|---------|--------------|---------|-----|-----|-----|------|-------|
| Cotton | 5/12 – 7/24 | 585 | 1 | 0 | 5 | 1 | 7 |
| Soybean | 5/12 – 9/29 | 675 | 406 | 91 | 53 | 6979 | 7529 |
| Alfalfa | 4/3 – 9/29 | 788 | 19 | 20 | 61 | 283 | 383 |

Each sample was comprised of 25 sweeps using a 15-inch sweep net.

BSB = brown stink bug, GSB = green stink bug, RSB = rice stink bug, SGSB = southern green stink bug

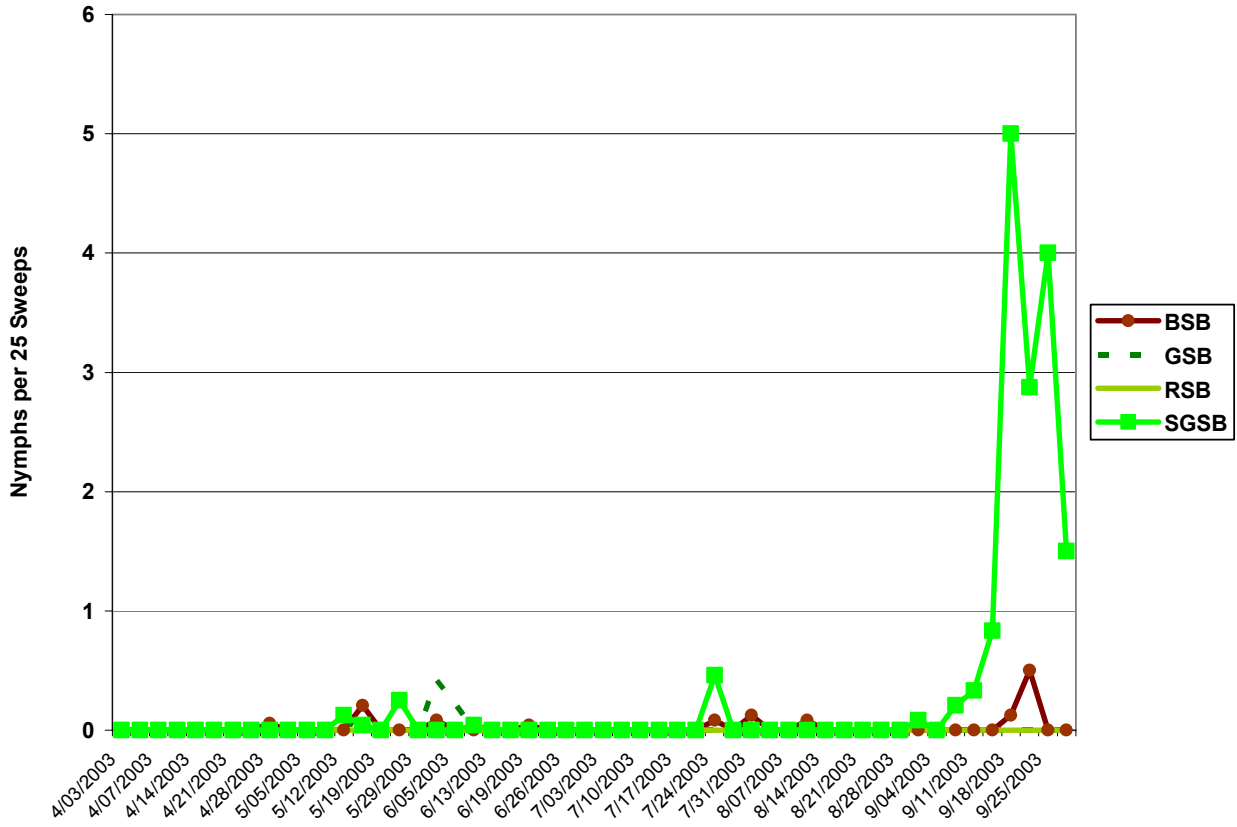


Figure 1. Number of stink bug nymphs collected in alfalfa in Burleson County, TX, 2003.

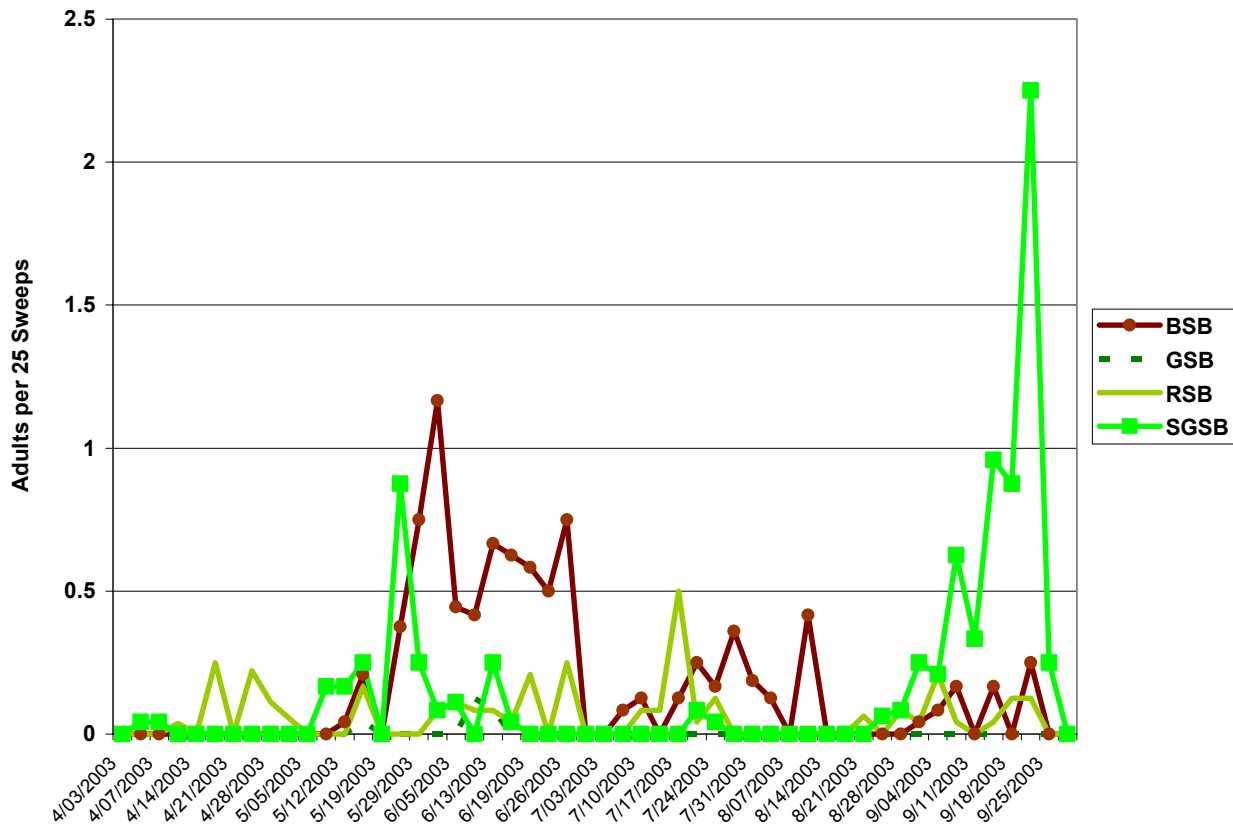


Figure 2. Number of stink bug adults collected in alfalfa in Burleson County, TX, 2003.

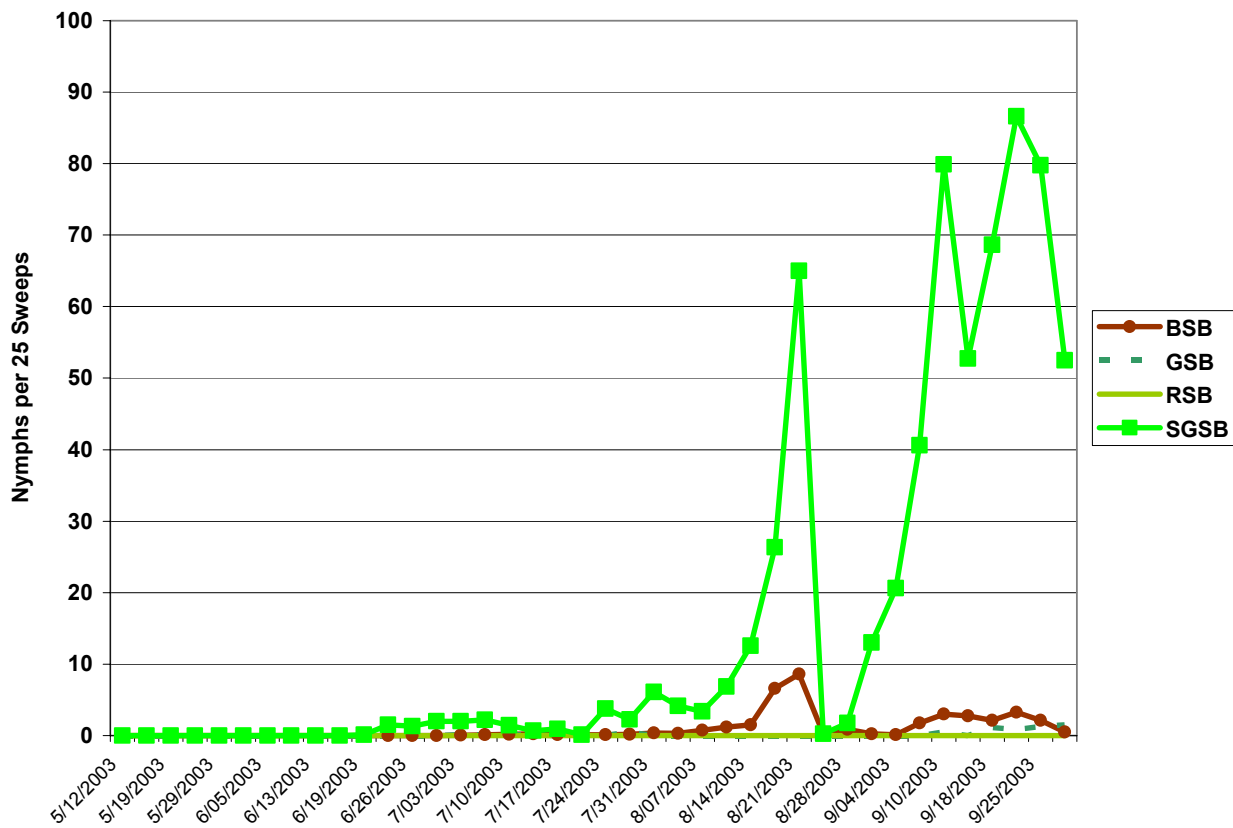


Figure 3. Number of stink bug nymphs collected in soybeans in Burleson and Robertson Counties, TX, 2003.

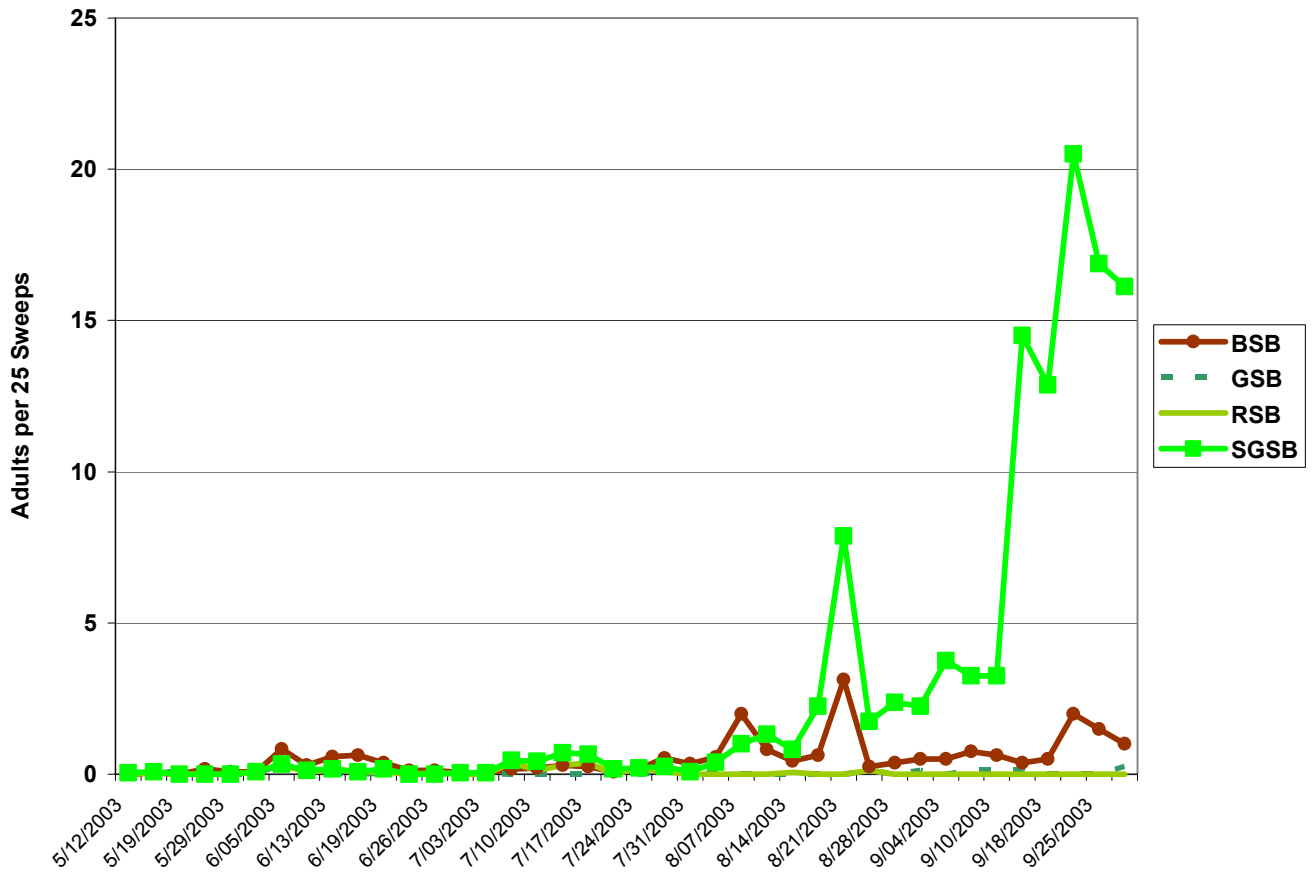


Figure 4. Number of stink bug adults collected in soybeans in Burleson and Robertson Counties, TX, in 2003.

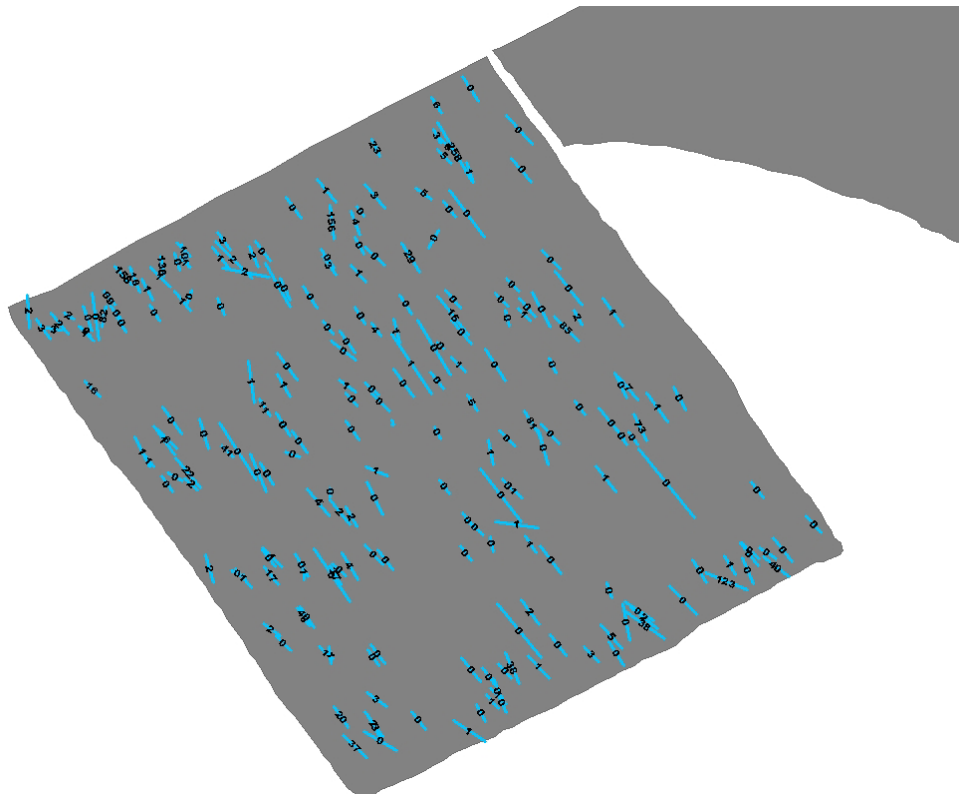


Figure 5. Spatial distribution of sweep net samples and number of stink bugs collected in a soybean field, Robertson County, TX, in 2003.