

A. GRANT DATA

Title: DEVELOPMENT OF A PEST PROFILE AND A STRATEGIC PLAN FOR THE RESURGENCE OF BED BUGS IN THE UNITED STATES

Type: Survey

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States Involved: All US except Alaska, Hawaii, and Puerto Rico/US Virgin Islands.

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B. SUMMARY:

Bed bugs are an important economic pest that occur in the many places where people sleep, including homes, rental units, hotels, and college dormitories. Risks associated with bed bugs include sleeplessness, itchy bites, anemia, stress, and possible overexposure to pesticides used for bed bug control. The recent increase in bed bug complaints across the U.S. indicates a need for a national survey of the problem and the development of a pest profile and strategic plan to

understand the current status of bed bugs as a pest problem and to address this emerging pest situation with research and outreach.

This survey was designed to characterize the status of bed bugs as a pest of significance in the United States. A survey was developed by a national group of entomologists familiar with bed bugs in their region, with help from a professional survey research group. The survey was administered to the pest control industry in five regions of the United States to gather information about the prevalence of bed bugs, and to determine the most successful management options, and innovative techniques used by companies. The survey will be used to help develop priorities for future research and outreach efforts to address the issue. A best management practices program can be developed to address many audiences within the pest control industry, municipal housing agencies, college dormitory managers, private multi-unit owners and dwellers, departments of health and travelers. Our goals are to direct scientific and public interest toward bed bugs as a significant (non-vector) public health issue, and to foster development of standardized best management practices while improving public awareness and reducing human health and economic risks associated with bed bug infestations.

C. OBJECTIVES (FUNDED)

- Quantify and characterize the extent of the current bed bug outbreak.

This objective was successfully accomplished through the development and implementation of a survey of the pest control industry in the United States. Information about bed bug problems was gathered by region, including such data as technician hours spent, call backs, application methods and chemical pesticides used, and criteria for determining whether management practices were successful. A total of 225 surveys were completed, in addition to 22 pilot surveys.

- Characterize the adoption of specific chemical and non-chemical pest management practices, as well as innovations in control.

The survey gathered information about the most and least successful chemical pesticides and non-pesticide management practices (according to the pest control company contact). Information about unusual locations where bed bugs were found, as well as typical inspection locations and methods and tools used for inspection were obtained.

Survey results will be used as follows:

- Set priorities for research and outreach efforts for bed bugs.
- Determine the best management practices for the mitigation of infestations, particularly for multiple unit dwellings.
- Encourage the adoption of reduced risk, effective best management options in the pest control industry.

D. APPROACH

Cornell University and the University of Massachusetts teamed with Spokane Falls Community College, the University of Minnesota, Oklahoma State University and North Carolina State University to survey pest control companies from five geographical areas of the United States about their experiences with bed bugs, a re-emerging household pest problem. The purpose of

the survey is to gain information about the scope of the problems people are having with bed bugs throughout the U.S.

The Survey Research Institute (SRI) of Cornell University was contracted to administer the phone survey instrument using its Computer-Assisted Telephone Interviewing (CATI) system. Eligible participants were the owners/managers/supervisors from individual pest control companies that provide bed bug management within their accounts. Regions were modeled after the regions of the Entomological Society of America but adjusted to create more equal populations for each region (summarized below). Participating companies were selected at random from lists obtained through state regulatory agencies, the Yellow Pages, the National Pest Management Association, or other means. Announcement letters describing the scope and purpose of the project were sent in advance of calling.

Pilot interviews began on March 14, 2005 and finished on March 22, 2005. In total, 22 surveys were completed. The survey was then revised and fully administered beginning April 25, 2005 and ending on June 16, 2005. A total of 225 surveys were completed, amounting to 45 in each of the 5 geographic regions.

Region 1. North Eastern – Maine, Vermont, New Hampshire, New York, Connecticut, Massachusetts, Rhode Island, New Jersey, Pennsylvania, Maryland, Delaware, West Virginia.

Region 2. South Eastern – Virginia, Kentucky, Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi.

Region 3. North Central – Ohio, Indiana, Michigan, Wisconsin, Iowa, Illinois, North Dakota, South Dakota, Nebraska, Minnesota.

Region 4. South Central – Missouri, Arkansas, Louisiana, Texas, Oklahoma, Arizona, New Mexico, Colorado, Kansas.

Region 5. Pacific – Oregon, Washington, Idaho, Montana, Wyoming, Utah, Nevada, California.

E. RESULTS

During the process of developing and administering the survey several unanticipated changes were made. The regions were reduced from the original six to five, due to the difficulty in finding a sixth regional cooperator. We believe that this made little difference in the results. The 225 completed surveys was lower than 360 planned. We expected a total of 360 completed surveys, 72 for each of five regions (originally 60 for each of six regions). It is not clear what impact fewer surveys will have on statistical analysis of the results but we expect little effect, as 225 surveys provides a substantial database. The databases, mainly collected from state regulatory agencies, were surprisingly inaccurate. Many phone numbers were invalid, resulting in wasted time and money for SRI, and ultimately for our project. This was the biggest factor in the reduced number of completed surveys. Administration of the survey was delayed by a couple of months and the delay may have contributed to a reduced number of completed surveys due to

the increased workload of pest control companies in the spring. Otherwise, the project proceeded as expected.

Information gathered from the survey includes many ranked questions plus a few open-ended questions where we wanted to know as much as possible. Highlights of the survey are as follows:

- Q1. Two-thirds of the companies report an increase in bed bugs calls during the past 12 months.
- Q2. More than 61% of companies do not service multiple-family dwellings or hotels. Over 90% of companies do not service dormitories or vacation rentals.
- Q3. The majority of responses (79.6%) claimed that inspection time per bedroom was less than 1 hour.
- Q4. Nearly all companies reported that bed bugs are sometimes or always found on mattresses (98.2%), box springs (93.6%), and bed frame/headboards (92.2%).
- Q5. Unusual locations for bed bugs included inside automobiles, radios, VCRs, cable boxes, and a shower head, as well as on a person.
- Q6. Innovative monitoring techniques included a heating pad plus a sticky trap and occasionally carbon dioxide (dry ice) was used to attract bed bugs.
- Q8. Almost two-thirds of the companies made two or three visits to solve the problem. Only 6% reported that bed bugs problems were solved with one visit.
- Q9. Respondents were divided between never, sometimes, and always, for the use of aerosol and dust insecticides, but indicated that crack-and-crevice and liquid sprays of baseboards/floors were sometimes or always used (more than 58%).
- Q10. The bed frame, box spring, and mattress were commonly treated. It is an interesting result that mattresses are often treated (75% said sometimes or always).
- Q11. Insecticides most commonly used for managing bed bugs were pyrethroids.
- Q12-13. Pyrethroids appear to be working well despite reports from other countries of insecticide resistance.
- Q15. Most companies do not use alternative bed bug control methods such as steaming the mattress, heating the mattress or other property, freezing belongings, encasing the mattress and applying insecticide, or placing a sticky barrier on furniture legs. However, sticky traps and vacuuming were sometimes or always used about two-thirds of the time.

See attached Bed Bug Survey Results for more detail about percentages of responses to questions:

Bed Bugs Survey Results

Answers are presented as percentages % and by the actual number of responses (like this). Percentages do not include responses of “I don’t know” or questions that were refused.

1. Have you noticed an increase in bed bug calls in the past 12 months?

Yes 66.6% (150)

No 33.3% (75)

2. How many bed bug accounts have you serviced during the past 12 months **by percent**?

_____ Single family homes

- _____ Multiple family dwellings
- _____ Hotels/motels
- _____ Vacation rentals
- _____ Dormitories
- _____ Other

total = 100

(THE ANSWERS TO THIS QUESTION CANNOT BE PRESENTED CONCISELY, BUT WILL BE CORRELATED WITH OTHER DATA FROM THE SURVEY IN A FINAL ANALYSIS)

Inspection evaluation

3. How many technician-hours do you spend on inspection of a typical bedroom?

30.5% (N=67) Less than 1/2 hour

49.1 (108) 1/2 to 1 hour

15.5 (34) more than 1 but less than 2 hours

3.6 (8) more than 2 but less than 3 hours

1.4 (3) more than 3 hours

4. In a bed bug account, do you find bed bugs in the following locations?

	Never	Sometimes	Always
Bedroom	-----	-----	-----
Mattress	1.8 (4)	27.9 (62)	70.3 (156)
Box spring	6.4 (14)	40.2 (88)	53.4 (117)
Bed frame/headboard	7.8 (17)	45.2 (98)	47.0 (102)
Dresser/nightstand	17.4 (38)	73.4 (160)	9.2 (20)
Ceiling/light fixtures	51.6 (111)	42.8 (92)	5.6 (12)
Electrical outlets/switch plates	36.4 (79)	55.8 (121)	7.8 (17)
Baseboards/carpets	5.9 (13)	52.5 (115)	41.6 (91)
Walls or wallpaper	31.6 (68)	60.5 (130)	7.9 (17)
Other non sleeping rooms	36.1 (79)	61.2 (134)	2.7 (6)

5. What is the strangest location where bed bugs were found in an account?

Answers included: Dresser drawer, living room, closets, cosmetics drawer, laundry room, curtains, wallpaper, cable box on TV, basement, on a person, in the shower, stereo speakers, in cars, toy box, computer desk, hollow doors, floor lamp, rim of a hat, bathroom and kitchen, microwave oven, behind pictures, in a box of books, air conditioning duct, shower rods, suitcases, and the list goes on and on...

6. Which of the following methods are used for inspecting? Check all that apply

	Never	Sometimes	Always
Report of infestation	9.9 (22)	20.3 (45)	69.8 (155)
Sticky traps	32.1 (72)	43.3 (97)	24.6 (55)
Bed bug odor	55.0 (122)	36.0 (80)	9.0 (20)
Evidence of bed bug bites	6.7 (15)	45.1 (101)	48.2 (108)
Fecal specks/cast skins	11.8 (26)	30.8 (68)	57.5 (127)

Live bugs	3.1 (7)	29.0 (65)	67.9 (152)
Other, please specify _____	78.0 (170)	8.7 (19)	13.3 (29)

“Other” includes: flashlight, CB-80 (aerosol pyrethrin flushing agent), heating pad, heated adhesive traps, sometimes with CO2 (dry ice and Alka seltzer in water were both mentioned), mirrors, visual inspection, bat droppings (for bat bugs, rolled up ticking).

7. What criteria do you use to determine whether the problem has been solved?

	Never	Sometimes	Always
Lack of customer complaints	16.0 (36)	32.4 (73)	51.6 (116)
Follow up communication	3.6 (8)	18.7 (42)	77.8 (175)
Follow up inspections	8.9 (20)	30.7 (69)	60.4 (136)
Use of sticky traps	38.2 (86)	34.7 (78)	27.1 (61)
No additional bites	16.5 (37)	39.3 (88)	44.2 (99)
No live bugs	11.2 (25)	28.3 (63)	60.5 (135)
Lack of smell	59.3 (131)	26.7 (59)	14.0 (31)
Other, please specify:	92.2 (201)	1.4 (3)	6.4 (14)

“Other” included: doctor visits, vacuum cleaner, monitor traps, fecal matter, residue, blood stains on a cleaned mattress, sleep in the room, house fire.

Control

8. How many visits on average, including initial and follow up visits, do you typically make until the problem is solved?

Visits	Percent answered	Number answered
1	6.1	13
2	26.2	56
3	36.4	78
4	15.9	34
5	6.5	14
6	4.2	9

9. When using insecticides to control bed bugs how often are you using these types of application methods?

	Never	Sometimes	Always
Aerosol fogging	39.8 (88)	38.5 (85)	21.7 (48)
Crack and crevice treatment-(liquid or dust)?	1.4 (3)	11.3 (25)	87.4 (194)
General dusting	42.7 (94)	30.0 (66)	27.3 (60)
Liquid spray of baseboard, floors, or other surfaces	7.7 (17)	30.2 (67)	62.2 (138)

10. Which of the following do you treat directly with insecticides of any sort?

	Never	Sometimes	Always
Bed frame	6.3 (14)	20.7 (46)	73.0 (162)

Box spring	12.7 (28)	27.3 (60)	60.0 (132)
Mattress	24.9 (55)	27.1 (60)	48.0 (106)

11. What pesticides do you use to control bed bugs?

Open-ended question, 195 answers, 30 refused.

12. Which insecticide works best for you?

Open-ended question, 183 answers, 42 refused.

13. Which insecticide that you have tried does not kill bed bugs?

Open-ended question, 44 answers, 181 refused or had no answer

14. How many technician hours does it take to **treat** an average bedroom?

14.4 (32) Less than ½ hour

43.7 (97) ½ to 1 hour

26.6 (59) more than 1 but less than 2 hours

9.5 (21) more than 2 but less than 3 hours

5.9 (13) more than 3 hours

15. How often do you use the following techniques for bed bug control?

	Never	Sometimes	Always
Steam mattress	82.4 (182)	10.9 (24)	6.8 (15)
Heating mattress or other locations	89.1 (197)	9.0 (20)	1.8 (4)
Vacuuming	29.5 (65)	31.4 (69)	39.1 (86)
Sticky traps	35.9 (79)	36.4 (80)	27.7 (61)
Freezing belongings	86.8 (190)	11.0 (24)	2.3 (5)
Dispose of mattress	21.7 (47)	62.2 (135)	16.1 (35)
Encase mattress and apply insecticide	62.8 (137)	26.6 (58)	10.6 (23)
Sticky barriers on furniture legs	75.5 (166)	20.5 (45)	4.1 (9)
Other, please specify:	84.0 (179)	4.7 (10)	11.3 (24)

“Other” includes: Pray, blast them, liquid barrier under furniture legs, fogging, fumigate mattress, communication, wash all clothes in hot water, discarding items, burn down the house.