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National Assessment of Bed Bug Impacts and Demonstration of IPM in High-risk Elder/Disabled Housing Facility

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Participants

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List Actual FTEs for this reporting period

Scientist Dawn 10%, Al 6%

Professional Shujuan 50%, Shaku 8%

Technical Kevin 1%,

Administrative

Other NPIC 2%, NCAP 2%, MPAC 2%, Housing staff 2%, Naomi 1%

Target Audience

The target audience(s) you describe should include only those that your efforts reached during the current reporting period; this may mean that the audiences you list are only a subset of the all those you included on your project initiation.

Target audiences include individuals, groups, market segments, or communities that will be served by the project. Where appropriate, you should also identify population groups such as racial and ethnic minorities and those who are socially, economically, or educationally disadvantaged.

Efforts include acts or processes that deliver science-based knowledge to people through formal or informal educational programs. Examples include: formal classroom instruction, laboratory instruction, or practicum experiences; development of curriculum or innovative teaching methodologies; internships; workshops; experiential learning opportunities; extension and outreach.

Residents, facility managers, facility pest management teams, health care staff, pest management professionals, environmental health professionals, and other stakeholders working with elder/disabled housing facilities. IPM professional and scientific colleagues nationally that make use of the materials and knowledge the project develops.

Products

Report only the major publication(s) resulting from the work thus far under this project/award. If there is a publication that occurred any time throughout the life of the project but that you have NOT YET INCLUDED it on a previous progress report, then you should include it here. There is no restriction on the number. However, agencies are interested in only those publications that most reflect the work under this project/award. See definitions below for the categories of publications.

Publication Definitions:

Publications are the characteristic product of research. Agencies evaluate what the publications demonstrate about the excellence and significance of the research and the efficacy with which the results are being communicated to colleagues, potential users, and the public, not the number of publications.

Journal publications: Peer-reviewed articles or papers appearing in scientific, technical, or professional journals. Include any peer-reviewed publication in the periodically published proceedings of a scientific society, a conference, or the like. A publication in the proceedings of a one-time conference, not part of a series, should be reported under “Books or other non-periodical, one-time publications.”

Books or other non-periodical, one-time publications: Any book, monograph, dissertation, abstract, or the like published as or in a separate publication, rather than a periodical or series. Include any significant publication in the proceedings of a one-time conference or in the report of a one-time study, commission, or the like.

Other publications, conference papers and presentations: Identify any other publications, conference papers and/or presentations not reported above.

Publications:

Book Chapters

Books

Conference papers and presentations

Abstracts

1. Li, S., Gouge, D. H., Fournier, A. J. and Nair, S. 2014. Assessment of Bed Bug Impacts and Practical Methods of Controlling Bed Bugs at Home. Poster Abstract. College of Agricultural and Life Science Research Poster Forum. University of Arizona. November 10, 2014. Tucson, AZ.
2. Gouge, D. H., Li, S., Fournier, A. J., Stock, T., Romero, A., Young, D. J., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2015. Quality of life impacts of bed bugs (*Cimex lectularius* L.) infestations. Poster Abstract. 8th International IPM Symposium, March 23-26, 2015. Salt Palace Convention Center, 100 SW Temple, Salt Lake City, UT 84101.

3. Li, S., Gouge, D. H., Fournier, A. J., Stock, T., Romero, A., Young, D. J., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2015. Quality of life impacts of bed bugs (*Cimex lectularius* L.) infestations. Poster Abstract. 2015 University of Arizona College of Agriculture and Life Sciences Extension Conference. August 4-6, 2015. Tucson, AZ.
4. Li, S., Gouge, D. H., Fournier, A. J., Stock, T., Romero, A., Young, D. J., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2016. Bed Bug (*Cimex lectularius* L.) Infestations Impact Quality of Life. National Environmental Health Association (NEHA) Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, April 13-15, 2016.
5. Gouge, D. H., Li, S., Nair, S. and Stock, T. 2016. Bed bugs in Elderly and Disabled, Low-income Housing - Getting Real! National Environmental Health Association (NEHA) Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, April 13-15, 2016.
6. Li, S., Gouge, D. H., Fournier, A. J., Stock, T., Romero, A., Nair, S., Foss, C., Kerzee, R., Stone, D., Dunn, M. and Young, D. J. 2016. Life quality impacts of bed bug (*Cimex lectularius* L.) infestations. XXV International Congress of Entomology, Orlando, Florida, USA. September 25-30, 2016.
7. Gouge, D. H., Li, S., Nair, S., Wierda, M., Drake, K., Stock, T. and Fournier, A. J. 2016. Extreme pesticide use in response to bed bugs (*Cimex lectularius*) and German cockroach (*Blattella germanica*) Infestations. XXV International Congress of Entomology, Orlando, Florida, USA. September 25-30, 2016.

Conference Papers and Presentations

1. 10/04/14. Nair, S., Gouge, D. H., Li, S., Fournier, A. J., Ellsworth, P. C., Umeda, K., Schuch, U. K. and Kopec, D. M. Community IPM Integrated pest management for community environments. Poster presentation at Central Arizona Cooperative Extension Centennial Celebration Celebrating the Past Envisioning the Future, Phoenix, AZ. 500 participants.
2. 11/10/14. Li, S., Gouge, D.H., Fournier, A. J. and Nair, S. 2014. Assessment of Bed Bug Impacts and Practical Methods of Controlling Bed Bugs at Home. Poster presentation. College of Agricultural and Life Science Research Poster Forum. University of Arizona. Tucson, AZ. 120 participants.
3. 11/10/14. Nair, S., Gouge, D. H., Li, S., Fournier, A. J., Ellsworth, P. C., Umeda, K., Schuch, U. K. and Kopec, D. M. Community IPM Integrated pest management for community environments. Poster presentation. College of Agricultural and Life Science Research Poster Forum. University of Arizona. Tucson, AZ. 120 participants.
4. 3/24/15. Gouge, D. H., Li, S., Fournier, A., Stock, T., Romero, A., Young, D., Nair, S.,

- Foss, C., Kerzee, R., Stone, D. and Dunn, M. Quality of life impacts of bed bug (*Cimex lectularius* L.) infestations. Poster presentation. 8th International IPM Symposium, March 23-26, 2015. Salt Lake City, UT. 450 participants. <http://cals.arizona.edu/apmc/docs/Poster-for-the-8th-International-IPM-Symposium-vF.pdf>
5. 8/4/15. Li, S., Gouge, D. H., Fournier, A., Stock, T., Romero, A., Young, D., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. Quality of life impacts of bed bug (*Cimex lectularius* L.) infestations. Poster presentation. 2015 University of Arizona College of Agriculture and Life Sciences Extension Conference. August 4-6, 2015. Tucson, AZ. 300 participants.
 6. 4/14/16. Gouge, D. H., Li, S., Nair, S. and Stock, T. 2016. Bed bugs in Elderly and Disabled, Low-income Housing - Getting Real! National Environmental Health Association (NEHA) Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, April 13-15, 2016. 430 participants. 60 unique views.
 7. 4/14/16. Li, S., Gouge, D. H., Fournier, A. J., Stock, T., Romero, A., Young, D. J., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2016. Bed Bug (*Cimex lectularius* L.) Infestations Impact Quality of Life. National Environmental Health Association (NEHA) Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, April 13-15, 2016. 430 participants. 44 unique views.
 8. 4/14/16. Li, S., Gouge, D. H., Nair, S., Fournier, A. J., Walker, K. and Hurley, J. 2016. Mosquitoes and Mosquito-borne Pathogens. National Environmental Health Association (NEHA) Enhancing Environmental Health Knowledge (EEK): Vectors and Public Health Pests Virtual Conference, April 13-15, 2016. 430 participants. 49 unique views.
 9. 09/26/16. Gouge, D. H., **Li, S.**, Nair, S., Wierda, M., Drake, K., Stock, T. and Fournier, A. J. 2016. Extreme pesticide use in response to bed bugs (*Cimex lectularius*) and German cockroach (*Blattella germanica*) Infestations. XXV International Congress of Entomology, Orlando, Florida, USA. September 25-30, 2016.
 10. 09/26/16. **Li, S.**, Gouge, D. H., Fournier, A. J., Stock, T., Romero, A., Nair, S., Foss, C., Kerzee, R., Stone, D., Dunn, M., Young, D. J., Spurgeon, D. and LaMorte, R. 2016. Life quality impacts of bed bug (*Cimex lectularius* L.) infestations. XXV International Congress of Entomology, Orlando, Florida, USA. September 25-30, 2016.

Community Presentations (Extension Program Events and Presentations)

1. 09/16/14. D.H. Gouge. Biology and Control of Vectors and Public Health Pests: The Importance of Integrated Pest Management Training Program. Biology and Control of Vectors and Public Health Pests: The Importance of Integrated Pest Management Training Program, Richardson, TX. 51 participants.
2. 10/04/14. D.H. Gouge, S. Nair. Exhibit Pests in community environments – live demo. Presented public health IPM, live insects, including bed bugs, and various common

- cockroaches, spiders, scorpions, etc. and IPM education. Central Arizona Cooperative Extension Centennial Celebration Celebrating the Past Envisioning the Future, Phoenix, AZ. 500 participants.
3. 10/17/14. D.H. Gouge. Scary and Scaly Museum Overnight. Arizona Museum of Natural History – general public outreach event, Mesa, AZ. 52 participants.
 4. 10/29/14. Li, S., Gouge, D. H., Fournier, A. J. and Nair, S. Bed Bugs Biology, Behavior and Control. Univar Pest Management Professionals Training. Black Canyon Conference Center, Phoenix, AZ. 100 participants/100 CEUs.
 5. 10/30/14. Nair, S., Gouge, D. H. and Li, S. Bed bugs. Univar Pest Management Professionals Training. Holiday Inn, Tucson, AZ. 110 participants/110 CEUs.
 6. 11/05/14. D.H. Gouge. Biology and Control of Vectors and Public Health Pests: The Importance of Integrated Pest Management Training program. Biology and Control of Vectors and Public Health Pests: The Importance of Integrated Pest Management Training program, Glendale, CO. 51 participants.
 7. 11/13/14. Li, S. and Gouge, D. H. Integrated Pest Management (IPM) in Community Environments. 38th Annual Women Involved in Farm Economics Convention. Best Western International Airport Inn, Phoenix, AZ. 35 participants.
 8. 02/04/15. D.H. Gouge. Bed Bugs – Love at First Bite An American Love Story. 2015 ACDEHSA Annual Conference Arizona County Directors of Environmental Health Services Association, Laughlin, NV. 121 participants.
 9. 02/14/15. D.H. Gouge, S. Nair, N. Pier. Presented public health IPM, live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education. "I Love Science" Arizona Museum of Natural History Outreach event, Mesa, AZ. 200 participants.
 10. 2/20/15. Nair, S. and Li, S. Gila River Indian Community Department of Environmental Quality staff Field tour of Maricopa Agricultural Center, Maricopa, AZ. Presented public health IPM, live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education. 18 participants.
 11. 2/25/15. Gouge, D. H., Li, S., and Nair, S. Stop School Pests for School Nurses. Topics included bed bugs, head lice, and other public health pests and IPM education. Course for Apache Junction Unified School District school nurses. Superstition Mountain Elementary School, 550 S. Ironwood Dr. Apache Junction, AZ 85120. 9 participants.
 12. 3/28/15. Li, S. and Pier, N. Presented live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education at the 11th Annual Salsa Festival, Maricopa, AZ 85139. 10,000 participants.

13. 4/22/15. Li, S., Nair, S., and Pier, N. Presented public health IPM, school IPM, live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education at the Gila River Earth Day celebration, Ira H. Hayes Memorial Park, Sacaton, AZ. 700 participants.
14. 4/24/15. Li, S. and Nair, S. Presented public health IPM, school IPM, live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education at the Ak-Chin Earth Day Event, Maricopa, AZ 85139. 750 participants.
15. 5/8/15. Li, S. Presented public health IPM updates to IPM Coordinating Committee, University of Arizona, Maricopa, AZ 85138. 26 participants.
16. 7/23/15. Li, S. Bed bugs; Head lice (2 presentations). IPM for Tribal Schools Workshop, July 23-24, 2015. Wild Horse Pass Resort and Hotel, Chandler, AZ. 25 participants.
17. 9/16/15. Li, S. and Nair, S. Presented bed bugs, head lice, spiders, scorpions, cockroaches and IPM. Agriculture, Gardening & Water Day! At Starshine Academy, Phoenix, AZ. 120 Youth participants. Invited.
18. 9/20/15. Gouge, D.H., Li, S., Nair, S., Warren, P. Pier, N. et al. Presented public health IPM, school IPM, live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education at the 5th AZ Annual Insect Festival. 5000 participants.
19. 9/22/15. Gouge, D.H., Li, S., Nair, S. Itchy bug update: Training for school nurses, ESS facilitators, maintenance and administrative staff. Phoenix Union High School District Support Facility, Phoenix AZ. 26 participants. Invited.
20. 10/2/15. Gouge, D.H. and R. LaMorte. Interactions with Arthropods. Arizona Museum of Natural History, Mesa, AZ. 241 participants. Invited.
21. 10/15/16. Gouge, D. Itchy Bugs and Adult Day Health Center. Phoenix, AZ. 12 participants. Invited.
22. 10/26/15. Gouge, D. Mosquitoes, Bed bugs and other itchy bugs. State Signature Program Initiative School IPM Workshop. Pima Cooperative Extension Office, Tucson, AZ. 19 participants/38 AZ OPM CEUs. Speaker and Event Co-Coordinator.
23. 10/26/15. Li, S. Head Lice. State Signature Program Initiative School IPM Workshop. Pima Cooperative Extension Office, Tucson, AZ. 19 participants/38 AZ OPM CEUs. Speaker and Event Co-Coordinator.
24. 10/29/15. Gouge, D. Mosquitoes, Bed bugs and other itchy bugs. State Signature Program Initiative School IPM Workshop. Maricopa Cooperative Extension Office, Phoenix, AZ. 52

- participants/ 104 AZ OPM CEUs. Speaker and Event Co-Coordinator.
25. 10/29/15. Li, S. Head Lice. State Signature Program Initiative School IPM Workshop. Maricopa Cooperative Extension Office, Phoenix, AZ. 52 participants/ 104 AZ OPM CEUs. Speaker and Event Co-Coordinator.
 26. 11/4/15. Gouge, D. Bed Dread – Human Health Impacts of Bed Bugs. Arizona Department of Health Services Conference for Registered Sanitarians, Phoenix, AZ. 51 participants/50 NEHA CEUs. Invited.
 27. 11/10/15. Gouge, D. Mosquitoes, Bed bugs and other itchy bugs. State Signature Program Initiative School IPM Workshop. Maricopa Cooperative Extension Office, Phoenix, AZ. 15 participants/ 30 AZ OPM CEUs. Speaker and Event Co-Coordinator.
 28. 11/10/15. Li, S. Head Lice. State Signature Program Initiative School IPM Workshop. Pinal Cooperative Extension Office, Casa Grande, AZ. 15 participants/30 AZ OPM CEUs. Speaker and Event Co-Coordinator.
 29. 11/21/15. Li, S., Gouge, D. H., Fournier, A. and Nair, S. 2015. Bed Bugs Integrated Pest Management. Poster presentation. Maricopa Agricultural Center Farm Family Field Day, University of Arizona. Maricopa, AZ. 2000 participants.
 30. 11/21/15. Gouge, D. H., Li, S., Fournier, A., Stock, T., Romero, A., Young, D., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2015. Quality of life impacts of bed bug (*Cimex lectularius* L.) infestations. Poster presentation. Maricopa Agricultural Center Farm Family Field Day, University of Arizona. Maricopa, AZ. 2000 participants.
 31. 11/21/15. Li, S. Cricket Spitting Contest and Pests in community environments live demo – outreach display featuring live insects and other arthropods and their management measures. Maricopa Agricultural Center Farm Family Field Day, University of Arizona. Maricopa, AZ. 2000 participants.
 32. 12/10/15. Gouge, D. Bites, Stings and Crazy Things. Arizona Pest Professionals – Southern Chapter. Tucson, AZ. 10 participants/8 AZ OPM CEUs. Invited.
 33. 2/11/16. Gouge, D. Bites, Stings and Crazy Things. Arizona Pest Professionals – Northern Chapter. Phoenix, AZ. 29 participants/26 AZ OPM CEUs. Invited.
 34. 2/13/16. Gouge, D. I Love Science Day. Arizona Museum of Natural History, Mesa, AZ. 271 youth and adult participants. Invited.
 35. 2/23/16. Li, S. Good bugs and bad bugs in Agriculture and Community Environments. Desert Ag-ventures MAC Farm Tour 2016, Maricopa, AZ. 38 Participants. Invited.

36. 2/25/16. Li, S. Insects: Friend or Foe? Desert Ag-ventures MAC Farm Tour 2016, Maricopa, AZ. 38 Participants. Invited.
37. 2/25/16. Gouge, D. General IPM Philosophy; Non-target toxicological concerns; Modes of Action. Pesticide Safety Education Workshop. Sierra Vista, AZ. 55 participants/30 AZ OPM CEUs & 9 AZ ADA CEUs.
38. 2/27/16. Cricket Spitting Contest and Pests in agriculture and community environments live demo – outreach display featuring live insects and other arthropods and their management measures. MAC/ALARC Farm Science Day. Maricopa, AZ. 700 participants.
39. 2/27/16. Li, S., Gouge, D. H., Fournier, A. and Nair, S. 2016. Bed Bugs Integrated Pest Management. Poster presentation. MAC/ALARC Farm Science Day. Maricopa, AZ. 700 participants.
40. 2/27/16. Gouge, D. H., Li, S., Fournier, A., Stock, T., Romero, A., Young, D., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2016. Quality of life impacts of bed bug (*Cimex lectularius* L.) infestations. Poster presentation. MAC/ALARC Farm Science Day. Maricopa, AZ. 700 participants.
41. 3/2/16. Gouge, D. Mosquitoes, Bed bugs and other itchy bugs. State Signature Program Initiative School IPM Workshop. Mohave County Cooperative Extension Office, Kingman, AZ. 32 participants/36 AZ OPM CEUs. Speaker and Event Co-Coordinator.
42. 3/2/16. Li, S. Head Lice. State Signature Program Initiative School IPM Workshop. Mohave County Cooperative Extension Office, Kingman, AZ. 32 participants/36 AZ OPM CEUs. Speaker and Event Co-Coordinator.
43. 3/2/16. Nair, S. Bed bugs. State Signature Program Initiative School IPM Workshop. Mohave County Cooperative Extension Office, Kingman, AZ. 32 participants/36 AZ OPM CEUs. Speaker and Event Co-Coordinator.
44. 3/10/16. Gouge, D. Working with bed bugs. Phoenix Housing Maintenance Staff IPM Education Moring. Phoenix, AZ. 48 participants. Invited.
45. 3/29/16. Gouge, D. Subsidized Housing IPM. Northwestern Annual Education Conference. Tucson, AZ. 83 participants/166 AZ OPM CEUs. Invited.
46. 3/31/16. Gouge, D. Medically Significant Venomous Insects and Arachnids (2 presentations). Arizona Public Service (APS) Occupational Health and Safety Education. Phoenix, AZ. 52 participants. Invited.
47. 4/15/16. Bed Bug Adventure Game. Resident Outreach Event. City of Phoenix Housing. Phoenix, AZ. 19 + 1 youth participant. Speaker and Event Coordinator.

48. 4/22/16. Li, S. and Pier, N. Presented public health IPM, school IPM, live insects, including bed bugs, and various common cockroaches, spiders, scorpions, etc. and IPM education at the Gila River Earth Day celebration, Sacaton, AZ. 650 participants.
49. 4/22/16. Gouge, D. and Pier, N. Interactions with Arthropods. Arizona Museum of Natural History, Mesa, AZ. 812 participants. Invited.
50. 5/5/16. Gouge, D. Mosquitoes, biting midges, ticks; Rodents. State Signature Program Initiative School IPM Workshop. Cochise County Cooperative Extension Office, Sierra Vista, AZ. 27 participants/18 AZ OPM CEUs. Speaker and Event Co-Coordinator.
51. 5/5/16. Li, S. Head Lice. State Signature Program Initiative School IPM Workshop. Cochise County Cooperative Extension Office, Sierra Vista, AZ. 27 participants/18 AZ OPM CEUs. Speaker and Event Co-Coordinator.
52. 5/5/16. Nair, S. Bed Bugs. State Signature Program Initiative School IPM Workshop. Cochise County Cooperative Extension Office, Sierra Vista, AZ. 27 participants/18 AZ OPM CEUs. Speaker and Event Co-Coordinator.
53. 5/12/16. Gouge, D. Science Café –Bed Bugs - National Pest Management Month. Phoenix, AZ. 22 participants. Invited.
54. 5/13/16. Gouge, D. Injury or Death from Arboviruses Vectedored by Mosquitoes. Eagle International Associations Lawyer Conference. Phoenix, AZ. 63 participants. Invited.
55. 7/12/16. Gouge, D. Mosquitoes and Arbovirus Risk – Ever More Interesting by the Day. Pima School Nursing Staff Health Conference. Tucson, AZ. 44 participants. Invited.
56. 8/5/16. Li, S. and Nair, S. All about Bugs. Residents Outreach event. City of Phoenix Housing. Phoenix, AZ. 25 participants.
57. 8/19/16. Gouge, D. Medically Significant Venomous Insects and Arachnids. Arizona Public Service (APS) Occupational Health and Safety Education, Cottonwood, AZ. 38 participants. Invited.
58. 8/31/16. Gouge, D. Medically Significant Venomous Pests. Inter-Tribal Council of Arizona (ITCA) IPM Workshop, Chandler, AZ. 37 participants/11 AZ OPM CEUs. Speaker and Event Co-Coordinator.
59. 8/31/16. Li, S. IPM – Why schools and other sensitive environments choose to use IPM. Inter-Tribal Council of Arizona (ITCA) IPM Workshop, Chandler, AZ. 37 participants. Speaker and Event Co-Coordinator.
60. 8/31/16. Nair, S. Bed Bug History and Biology; Bed Bug Management. ITCA IPM Workshop, Chandler, AZ. 37 participants. Speaker and Event Co-Coordinator.

61. 11/2/16. Li, S. and Nair, S. All about Bugs. Residents Outreach event. City of Phoenix Housing. Phoenix, AZ. 20 participants. Speaker and Event Co-Coordinator.
62. 11/19/16. Gouge, D. H., Li, S., Fournier, A., Stock, T., Romero, A., Young, D., Nair, S., Foss, C., Kerzee, R., Stone, D. and Dunn, M. 2016. Quality of life impacts of bed bug (*Cimex lectularius* L.) infestations. Poster presentation. MAC Family Farm Day. Maricopa, AZ. 1530 estimated attendance.
63. 11/19/16. Li, S., et al. Desert arthropods – interactive display with live desert arthropods. MAC Family Farm Day. Maricopa, AZ. 1530 estimated attendance. Speaker and Event Co-Coordinator.
64. 11/19/16. Li, S., Gouge, D. H., Fournier, A. and Nair, S. 2016. Bed Bugs Integrated Pest Management. Poster presentation. MAC Family Farm Day. Maricopa, AZ. 1530 estimated attendance.
65. 12/9/16. Li, S. and Gouge, D.H. Implementation of IPM in High-risk Elder/Disabled Housing Facilities. IPM Coordinating Committee meeting, Arizona Pest Management Center, Maricopa, AZ. 21 participants.
66. 1/14/17. Biting Bugs Workshop for Teachers. Maricopa, AZ. 17 participants. Instructor.
67. 2/11/17. Gouge, D. H. I Love Science Day. Arizona Museum of Natural History, Mesa, AZ. 415 youth and adult participants. Invited.
68. 2/22/17. Li, S. Bed Bugs Biology and Control. Integrated Pest Management Workshop for Tohono O’odham Department of Health and Human Services, Inter-Tribal Council of Arizona (ITCA) in collaboration with University of Arizona and Tohono O’odham Nation, Sells, AZ. 43 participants. Speaker and Event Co-Coordinator.
69. 2/23/17. Li, S. Bed Bugs Biology and Control. Integrated Pest Management Workshop for Tohono O’odham Department of Health and Human Services, Inter-Tribal Council of Arizona (ITCA) in collaboration with University of Arizona and Tohono O’odham Nation, Sells, AZ. 32 participants. Speaker and Event Co-Coordinator.
70. 3/16/17. Gouge, D. H. Bites, Stings, & Crazy Things in Arizona. 2017 Vector Control Workshop, Phoenix, AZ. 185 participants. Invited.
71. 3/20/17. Li, S. Bugs in Arizona. Desert Ag-ventures MAC Farm Tour 2017, Maricopa, AZ. 38 Participants. Invited.
72. 3/22/17. Gouge, D. H. Biology and Behavior of the Perfect Ectoparasite. Target Specialty Products. Gilbert, AZ. 62 participants/64 CEUs. Instructor.

73. 3/29/17. Gouge, D. H. Working Around Wild Honey Bees and Other Stinging Pests. Tempe, AZ. 51 participants/14 CEUs. Invited.
74. 4/7/17. Li, S. and Nair, S. All about Bugs. Residents Outreach event. City of Phoenix Housing. Phoenix, AZ. 17 participants.
75. 4/19/17. Gouge, D. H. Health Impacts Bed Bugs & German Cockroaches – Resident Survey Results and Research Findings; Bed Bug and German Cockroach Pest Management Programs – Experiences in Housing; Pesticide Risk – Discouraging Hazardous Chemical Use. Stop Pests in Housing Workshop, Maricopa, AZ. 56 participants/48 CEUs. Instructor and Event Coordinator.
76. 4/19/17. Li, S. Successful Bed Bug Policies for Housing. Stop Pests in Housing Workshop, Maricopa, AZ. 56 participants/48 CEUs. Speaker and Event Co-Coordinator.
77. 4/25/17. Li, S. and Fournier, A. Integrated Pest Management (IPM) in Sensitive Community Environments - Research and Extension. Department of Entomology, China Agricultural University. Beijing. 15 participants. Invited.
78. 4/28/17. Gouge, D. and La Morte, R. Interactions with Arthropods. Arizona Museum of Natural History, Mesa, AZ. 1100 participants. Invited.
79. 5/16/17. Gouge, D. H. Health Impacts Bed Bugs & German Cockroaches – Resident Survey Results and Research Findings; Bed Bug and German Cockroach Pest Management Programs – Experiences in Housing; Pesticide Risk – Discouraging Hazardous Chemical Use. Stop Pests in Housing Workshop, Maricopa, AZ. 66 participants/16 CEUs. Instructor and Event Coordinator.
80. 5/16/17. Li, S. Successful Bed Bug Policies for Housing. Stop Pests in Housing Workshop, Phoenix, AZ. 66 participants/16 CEUs. Speaker and Event Co-Coordinator.
81. 8/28/17. Gouge, D.H. Wild Bees. SHADE Conference. Phoenix, AZ. 56 participants/69 CEUs. Instructor.
82. 8/30/17. Li, S. Public Health IPM in Community Environments. IPM Coordinating Committee meeting, Arizona Pest Management Center, Maricopa, AZ. 21 participants.
83. 9/22/17. Li, S. Cockroaches Biology and Management. IPM for Tribal Communities Workshop, Inter-Tribal Council of Arizona (ITCA) in collaboration with University of Arizona and Maricopa County Vector Control Division, Chandler, AZ. 45 participants. Invited.
84. 10/06/17. Li, S. Bed Bugs Biology and Control. Dorothy Nolan Senior Center, Town of Florence, Florence, AZ. 22 participants. Invited.

85. 11/16/17. Gouge, D.H. Reducing Risks Associated with Pests and Pest Management and IPM in Utah. NEHA/EPA Webinar. 28 participants. Instructor.

Journal Articles

- Gouge, D. H. and M. L. Lame. 2015. Environmental Health Professionals Work the Bugs Out - School Integrated Pest Management. *Journal of Environmental Health*. *Journal of Environmental Health* 77 (10): 42–44.
- Zhang, L., H. Li, S. Li, A. Zhang, F. Kou, H. Xun, P. Wang, Y. Wang, F. Song, J. Cui, D. H. Gouge, and W. Cai. 2015. Phylogeographic structure of cotton pest *Adelphocoris suturalis* (Hemiptera: Miridae): strong subdivision in China inferred from mtDNA and rDNA ITS markers. *Scientific Reports*. 5, 14009; doi: 10.1038/srep14009. <http://www.nature.com/articles/srep14009>
- Misbah-ul-Haq, M., I. A. Khan, A. Farid, M. Ullah, D. H. Gouge, and P. B. Baker. 2016. Efficacy of Indoxacarb and Chlorfenapyr against Subterranean Termite *Heterotermes indicola* (Isoptera: Rhinotermitidae) in the Laboratory. *Turkish Journal of Entomology*. 40 (3): 227-241.
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3. Sutherland, A., D-H Choe, V. Lewis, D. Young, A. Romero, H. Spafford, D. Gouge. Sep 2015. Capturing the ABCs of professional bed bug management in low-income multi-unit housing: a summary of survey responses. Trade Magazine article: Pest Control Technology Magazine. <https://www.pctonline.com/article/pct0915-bed-bugs-multi-unit-housing>.
4. Quiroga T. 2015. Women in Pest Control and Entomology: Gaining Momentum in a Male Dominated Industry. Insight Pest Solutions. Entomology department members Associate Specialist Dr. Dawn Gouge and Assistants in Extension Dr. Shujuan Li, Dr. Shaku Nair, and Lydia Brown for their leadership as recognized by “Women in Pest Control and Entomology”. <http://www.insightpest.com/women-in-pest-control/>
5. Li, S., Gouge, D. H. and Fournier, A. 2014. Practical Methods of Controlling Bed Bugs at Home. University of Arizona Cooperative Extension. <http://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1642-2014.pdf>
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7. Gouge D.H. 2016. Bed bugs are drawn to certain colors study finds Article by Carina Storrs Special to CNN. <http://www.cnn.com/2016/04/25/health/bedbugs-dark-color-sheets/>
8. **Reports:**
Bed bug survey report in Sep 2014
<http://cals.arizona.edu/apmc/docs/Bed-bug-survey-reports-Sep2014.pdf>

Bed bug survey report in Nov 2014
<http://cals.arizona.edu/apmc/docs/Bed-bug-survey-reports-Nov2014.pdf>

Bed bug survey report in June 2015

<http://cals.arizona.edu/apmc/docs/Bed-bug-survey-reports-June2015.pdf>

Bed bug survey report in Nov 2015

<http://cals.arizona.edu/apmc/docs/Bed-bug-survey-reports-Nov2015.pdf>

Whole building assessment at Site A in Phoenix <http://cals.arizona.edu/apmc/docs/Whole-building-assessment-siteA.pdf>

Pesticide Residue testing reports from ADA <http://cals.arizona.edu/apmc/docs/GCMS-Results-Summary.pdf>

2016 NEHA EEK: Vectors and Public Health Pests Virtual Conference Presentation: Bed bugs in Elderly and Disabled, Low-income Housing - Getting Real!

http://neha.org/sites/default/files/news-events/workshop/Dawn_Gouge.pdf

2016 NEHA EEK: Vectors and Public Health Pests Virtual Conference Presentation: Bed Bug (*Cimex lectularius* L.) Infestations Impact Quality of Life.

http://neha.org/sites/default/files/news-events/workshop/Lucy_Li_Bedbugs.pdf

Bed bug adventure game

<http://cals.arizona.edu/apmc/docs/Bed-bug-adventure-game.pdf>

Bed bug journey learning objectives:

<http://cals.arizona.edu/apmc/docs/Bed-Bug-Journey-Learning-Objectives.pdf>

A total of **21 monthly newsletters** are produced on seasonal hot topics. The content is aimed at residents and facility management teams. Topics are selected based on stakeholder requests and identified needs. The newsletter reaches more than 5,000 readers nationwide. At this point it is the most widely distributed monthly IPM communication constructed for both home and school environments.

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2. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2015. School IPM and Fig Beetles. School and Home Integrated Pest Management IPM Newsletter October 2015. Newsletter. University of Arizona, Arizona Pest Management Center. <http://cals.arizona.edu/apmc/docs/2015OctoberAZschoolandhomeIPMNewsletter.pdf>

3. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2015. Rodents IPM. School and Home Integrated Pest Management IPM Newsletter November 2015. Newsletter. University of Arizona, Arizona Pest Management Center.
<http://cals.arizona.edu/apmc/docs/2015NovemberAZschoolandhomeIPMNewsletter.pdf>
4. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Kissing Bugs. School and Home Integrated Pest Management IPM Newsletter January 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (1/19/16)
<http://cals.arizona.edu/apmc/docs/2016JanuaryAZschoolandhomeIPMNewsletter.pdf>
5. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Pesticide Application Notification in Schools and Zika Virus. School and Home Integrated Pest Management IPM Newsletter February 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (2/12/16)
<http://cals.arizona.edu/apmc/docs/2016FebruaryAZschoolandhomeIPMNewsletter.pdf>
6. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Pesticide Safety and IPM Weed Control. School and Home Integrated Pest Management IPM Newsletter March 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (3/14/16)
<http://cals.arizona.edu/apmc/docs/2016MarchAZschoolandhomeIPMNewsletter.pdf>
7. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Zika and IPM Weed Control. School and Home Integrated Pest Management IPM Newsletter April 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (4/11/16)
<http://cals.arizona.edu/apmc/docs/2016AprilAZschoolandhomeIPMNewsletter.pdf>
8. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Wild Honey Bees in Community Environments. School and Home Integrated Pest Management IPM Newsletter May 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (5/13/16)
<http://cals.arizona.edu/apmc/docs/2016MayAZschoolandhomeIPMNewsletter.pdf>
9. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Online IPM Resources. School and Home Integrated Pest Management IPM Newsletter June 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (6/9/16) <http://cals.arizona.edu/apmc/docs/2016JuneAZschoolandhomeIPMNewsletter.pdf>
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11. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, D.M. Kopec, P.L. Warren, M. Wierda. 2016. Mosquitoes. School and Home Integrated Pest Management IPM Newsletter August 2016. Newsletter. University of Arizona, Arizona Pest Management Center. (8/15/16)
<http://cals.arizona.edu/apmc/docs/2016AugustAZschoolandhomeIPMNewsletter.pdf>
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<http://cals.arizona.edu/apmc/docs/2016SeptemberAZschoolandhomeIPMNewsletter.pdf>
13. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, K. Umeda, D.M. Kopec, P.L. Warren, M. Wierda. 2017. CDC On-line Courses. School and Home Integrated Pest Management IPM Newsletter January 2017. Newsletter. University of Arizona, Arizona Pest Management Center.
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<https://cals.arizona.edu/apmc/docs/2017MarchAZschoolandhomeIPMNewsletter.pdf>
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<https://cals.arizona.edu/apmc/docs/2017AprilAZschoolandhomeIPMNewsletter.pdf>
17. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, K. Umeda, D.M. Kopec, M. Wierda. 2017. Human Disease-Causing Viruses Vectored by Mosquitoes. School and Home Integrated Pest Management IPM Newsletter May 2017. Newsletter. University of Arizona, Arizona Pest Management Center.
<https://cals.arizona.edu/apmc/docs/2017MayAZschoolandhomeIPMNewsletter.pdf>

18. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, K. Umeda, D.M. Kopec, M. Wierda. 2017. 2017 Great Arizona Mosquito Hunt. School and Home Integrated Pest Management IPM Newsletter June 2017. Newsletter. University of Arizona, Arizona Pest Management Center.
<https://cals.arizona.edu/apmc/docs/2017JuneAZschoolandhomeIPMNewsletter.pdf>
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20. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, K. Umeda, D.M. Kopec, M. Wierda. 2017. IPM for Microorganisms: Cleaning, Disinfecting, and Sanitizing. School and Home Integrated Pest Management IPM Newsletter August 2017. Newsletter. University of Arizona, Arizona Pest Management Center.
<https://cals.arizona.edu/apmc/docs/2017AugustAZschoolandhomeIPMNewsletter.pdf>
21. Li, S., D.H. Gouge, S. Nair, A.J. Fournier, U.K. Schuch, K. Umeda, D.M. Kopec, M. Wierda. 2017. Increase in Rabies Cases in Animals. School and Home Integrated Pest Management IPM Newsletter September 2017. Newsletter. University of Arizona, Arizona Pest Management Center.
<https://cals.arizona.edu/apmc/docs/2017SeptemberAZschoolandhomeIPMNewsletter.pdf>

Theses/Dissertations

Websites

Public Health IPM in Community Environments <http://cals.arizona.edu/apmc/public-health-IPM>. This website hosts the ARDP project - Gouge 2014 “National Assessment of Bed Bug Impacts and Demonstration of IPM in High-risk Elder/Disabled Housing Facility”, including the purpose and background, team members, bed bug impact assessment survey and survey reports, and project-related outputs and materials.

The website is maintained constantly and updated regularly. Some examples of outputs are as follows:

- 2016 NEHA EEK: Vectors and Public Health Pests Virtual Conference Presentation: Bed bugs in Elderly and Disabled, Low-income Housing - Getting Real!
http://neha.org/sites/default/files/news-events/workshop/Dawn_Gouge.pdf
- 2016 NEHA EEK: Vectors and Public Health Pests Virtual Conference Presentation: Bed Bug (*Cimex lectularius* L.) Infestations Impact Quality of Life.
http://neha.org/sites/default/files/news-events/workshop/Lucy_Li_Bedbugs.pdf
- Bed bug survey report in November 2015
<http://cals.arizona.edu/apmc/docs/Bed-bug-survey-reports-Nov2015.pdf>
- Poster for general public – Bed Bugs Integrated Pest Management

<http://cals.arizona.edu/apmc/docs/Bed-Bugs-IPM.pdf>

- Bed bug adventure game
<http://cals.arizona.edu/apmc/docs/Bed-bug-adventure-game.pdf>
- Bed bug journey learning objectives:
<http://cals.arizona.edu/apmc/docs/Bed-Bug-Journey-Learning-Objectives.pdf>

Other Products

Other Products/Outputs are activities, events, services, and products that reach people.

- **Activities** include: conducting and analyzing experiments or surveys, assessments, facilitating, teaching, or mentoring.
- **Events** include: conferences, demonstration sites, field days, symposia, workshops, and trainings.
- **Services** include: consulting, counseling, and tutoring.
- **Products** include: audio or video products; curricula; data or databases; equipment or instruments; models; networks and/or collaborations fostered by the project or activity; physical collections or resources, new animal germplasm, or genetic maps; software; technology, methods, or techniques; train-the-trainer manuals; website(s) with the appropriate URL(s); information, skills, and technology for individuals, communities, and programs; or students graduated in agricultural sciences.

The description of the product/output should be succinct, yet detailed. About 1-3 short sentences should be used to describe what the product is, what activity it resulted from, and whom it benefitted.

Audio or Video

Newly created videos:

- Bed bug infested units at site A in Phoenix <http://cals.arizona.edu/apmc/docs/Phoenix-Bedbugs.mp4>. This video has been produced to visually explain the bed bugs infestation level at site A in Phoenix.
- Cockroach infested units at site A in Phoenix <http://cals.arizona.edu/apmc/docs/Phoenix-Cockroach.mp4>. This video has been produced to visually explain the cockroaches infestation level at site A in Phoenix.
- Over the counter (OTC) pesticides used by residents at site A in Phoenix <http://cals.arizona.edu/apmc/docs/Phoenix-Site1-Pesticides.mp4>. This video has been produced to visually explain the over-the-counter pesticides used by residents at site A in Phoenix.

Data and Research Material

Databases

Educational Aids or Curricula

We have developed this bed bug adventure game and the associated bed bug journey learning objectives specifically for trainings and outreach events at the elder/disabled housing facilities.

- Bed bug adventure game
<http://cals.arizona.edu/apmc/docs/Bed-bug-adventure-game.pdf>
- Bed bug journey learning objectives:
<http://cals.arizona.edu/apmc/docs/Bed-Bug-Journey-Learning-Objectives.pdf>

We have created this poster targeting the general public to learn more about bed bugs and bed bugs IPM.

<http://cals.arizona.edu/apmc/docs/Bed-Bugs-IPM.pdf>

Evaluation Instruments
Instruments or Equipment
Models
New Germplasm
Other
Physical Collections
Protocols
Software or NetWare

Survey Instruments

A national online bed bug survey was launched in 2014 (1) to identify risk factors most associated with bed bug infestations; (2) to document specific stresses attributed to dealing with bed bugs by people who have experienced infestations; and (3) to examine and compare pest management practices, including pesticide use, of people who have and have not experienced bed bug infestations. The anonymous online survey was implemented on SurveyMonkey following Institutional Review Board (IRB) approval of the survey instrument and methods.

Up to 11/19/17, about 762 responses have been obtained. Information and documentation can be found at <http://cals.arizona.edu/apmc/public-health-IPM>.

As a result of suicidal ideation entries and feedback from EPA bed bug IPM specialists the survey questions were modified upon the approval of IRB in August 2016. View the most recent survey <http://cals.arizona.edu/apmc/docs/Bed-bug-Survey-new-2016Sep.pdf>