

Western Bark Beetle Research Group

Accomplishments Report: Jan. 2009-Dec. 2009

Group Products

Publications

- (1) **Bentz, B. J.** (editor), Allen, C. D., Ayres, M., Berg, E., Carroll, A., **Hansen, M.**, Hicke, J., Joyce, L., Logan, J., MacFarlane, W., MacMahon, J., Munson, A. S., **Negrón, J. F.**, Paine, T. D., Powell, J., Raffa, K. F., Régnière, J., Reid, M., Romme, W., **Seybold, S. J.**, Six, D. L., Tomback, D., Vandygriff, J., Veblen, T., White, M., Witcosky, J., and Wood, D. L. 2009. Bark Beetle Outbreaks in Western North America: Causes and Consequences. University of Utah Press, ISBN 978-0-87480965-7, 42 pp.
- (2) **Fettig, C. J.**, McKelvey, S. R., Borys, R. R., Dabney, C. P., Hamud, S. M., Nelson, L. J., and **Seybold, S. J.** 2009. Efficacy of verbenone for protecting ponderosa pine stands from western pine beetle (Coleoptera: Curculionidae, Scolytinae) attack in California. *J. Econ. Entomol.* 102: 1846–1858.
- (3) **Gillette, N. E.**, Erbilgin, N., **Hansen, E. M.**, Kelly, M., Mehmel, C. J., Mori, S. R., Murray, W., Owen, D. R., Pederson, L., Stein, J. D., Webster, J. N., and Wood, D. L. 2009. Managing bark beetles in a changing climate. Proceedings of the IUFRO meeting, Forest Insects and Environmental Change, September 27–October 2, 2009, Jackson Hole, Wyoming, published by Utah State University, Logan, Utah.
- (4) **Hayes, J. L.** and **Lundquist, J. E.** (compilers). 2009. The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.
- (5) Lee, J. C., Aguayo, I., Aslin, R., Durham, G., Hamud, S. M., Moltzan, B. D., Munson, A. S., **Negrón, J. F.**, Peterson, T., Ragenovich, I. R., Witcosky, J. J., and **Seybold, S. J.** 2009. Co-occurrence of the invasive banded and European elm bark beetles (Coleoptera: Scolytidae) in North America. *Ann. Entomol. Soc. Am.* 102:426–436.
- (6) Lee, J. C., Aguayo, I., Aslin, R., Durham, G., Hamud, S. M., Moltzan, B., Munson, A. S., **Negrón, J. F.**, Peterson, T., Ragenovich, I. R., Witcosky, J. J., and **Seybold, S. J.** 2009. Trend of two invasives: The banded and European elm bark beetles. pp. 43, in K. McManus and K. W. Gottschalk (eds.). Proceedings, 19th U.S. Department of Agriculture Interagency Research Forum on Gypsy Moth and Other

Invasive Species 2008; Gen. Tech. Rep. NRS-P-36. Newtown Square, Pennsylvania: USDA, Forest Service, Northern Research Station, January 2009.

(7) **Lundquist, J. E. and Bentz, B. J.** 2009. Bark beetles in a changing climate. pp. 39–49, *in* Hayes, J.L. and Lundquist, J.E. (compilers). The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.

(8) **Progar, R. A., Eglitis, A., and Lundquist, J. E.** 2009. Some ecological, economic, and social consequences of bark beetle infestations. Fire and bark beetle interactions. pp. 71–83, *in* Hayes, J.L. and Lundquist, J.E. (compilers). The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.

Technical Conferences and Workshops Organized

(1) **Hayes, J. L., Fettig, C. J., and Seybold, S. J.** Co-organizers: The Challenges of Developing and Implementing IPM Programs for Bark Beetle Infestations in Western North America, 6th Annual International IPM Symposium, March 26, 2009, Portland, Oregon.

Contributed and Invited Presentations and Posters at Scientific Meetings and Workshops

(1) **Bentz, B. J., Fettig, C. J., Gillette, N., Hansen, E. M., Hayes, J. L., Kelsey, R. G., Lundquist, J. E., Lynch, A. M., Negrón, J. F., Progar, R. A., and Seybold, S. J.** Formation of the Western Bark Beetle Research Group-USDA Forest Service Research and Development. 6th International IPM Symposium, March 26, 2009, Portland, Oregon (poster presentation by Hayes).

(2) **Fettig, C. J., Hayes, J. L., and Seybold, S. J.** The challenges of developing and implementing IPM programs for bark beetle infestations in western North America. 6th International IPM Symposium, March 26, 2009, Portland, Oregon (poster presentation by Hayes).

(3) **Fettig, C. J. and Gillette, N. E.** Applied research on bark beetles in the West. 2009 Annual Meeting of the Northern California Society of American Foresters, January 2009, Sacramento, California (oral presentation by Fettig).

(4) **Gillette, N. E., Hansen, E. M., Mehmel, C. J., Erbilgin, N., Webster, J. N., Mori, S. R., and Wood D. L.** Verbenone flakes for control of mountain pine beetle in whitebark pine stands. Workshop Contribution at the 60th Annual Western Forest Insect Work Conference, March 23–27, 2009, Spokane, Washington (oral presentation by Gillette).

(5) **Gillette, N. E., Erbilgin, N., Hansen, E. M., Kelly, N. M., Mehmel, C. J., Mori, S. R., Murray, W., Owen, D. R., Pedersen, L., Stein, J. D., and Wood, D. L.** Managing bark beetles in a changing climate. IUFRO meeting on Forest Insects and Environmental Change, September 27–October 2, 2009, Jackson Hole, Wyoming (oral presentation by Gillette).

(6) **Lee, J. C., Aguayo, I., Aslin, R., Durham, G., Hamud, S. M., Moltzan, B. D., Munson, A. S., Negrón, J. F., Peterson, T., Ragenovich, I. R., Witcosky, J. J., and Seybold, S. J.** A summary of recent research on the banded elm bark beetle in the western U.S. Workshop Contribution to “Hard Times for Hardwoods: New Problems for Walnuts, Oaks, and Elms in the Western U.S.” 60th Annual Western Forest Insect Work Conference, March 24, 2009, Spokane, Washington (oral presentation by Seybold).

(7) **Stein, J. D., Gillette, N. E., Erbilgin, N., Mehmel, C.J., Hansen, E. M., Mori, S. R., Webster, J. N., and Wood, D. L.** Semiochemical-releasing flakes protect conifers from bark beetles. 6th International IPM Symposium, March 26, 2009, Portland, Oregon (poster presentation by Stein).

Briefings and Testimony

(1) **Bentz, B. J. and Fettig, C. J.** Climate change and bark beetles in the western United States. Briefing of the Chief of the USDA Forest Service and Dr. Carlos Rodriguez-Franco, April 2009, Davis, California (oral presentation).

(2) **Klepzig, K., Negrón, J. F., and Bentz, B. J.** Vegetation management and bark beetles in the United States. Conversation with USDA Forest Service Chief Tidwell (teleconference) October 8, 2009.

Environmental Protection Agency Product Registrations

(1) **Gillette, N. E. and Hansen, E. M.** Registration submitted for Disrupt-Bioflake VBN, which is the first biodegradable aerially applied release system for bark beetle

control. Gillette and Hansen provided efficacy data and nontarget data for this product registration.

Individual Member Products

Publications

- (1) **Cain, R. J. and Hayes, J. L. 2009.** Bark beetle conditions in western forests and formation of the western bark beetle research group. pp. 1–23, *in* Hayes, J.L. and Lundquist, J.E. (compilers). *The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon.* USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.
- (2) **Davis, C.S., K.E. Mock, and Bentz, B. J.,** S.M. Bromilow, N.V. Bartell, B.W. Murray, A.D. Roe and J.E.K. Cooke. 2009. Isolation and characterization of 16 microsatellite loci in the mountain pine beetle *Dendroctonus ponderosae* Hopkins (Coleoptera: Curculionidae: Scolytinae). *Permanent Genetic Resources Note*, doi: 10.1111/j.1755-0998.2009.02579.x.
- (3) **Fettig, C. J. 2009.** Effects of fuel reduction treatments on levels of delayed tree mortality attributed to bark beetle attack in western coniferous forests, *in* Rideout-Hanzak, S, Oswald, B.P., and Beierle, M. (compilers). *Fourth Annual International Congress on Fire Ecology and Management: Fire as a Global Process.* Savannah, Georgia.
- (4) **Fettig, C. J., McKelvey, S. R., Dabney, C. P., Borys, R. R., and Huber, D. P. W. 2009.** Response of *Dendroctonus brevicomis* to different release rates of nonhost angiosperm volatiles and verbenone in trapping and tree protection studies. *J. Appl. Entomol.* 133:143–154.
- (5) **Fettig, C. J., Munson, A. S., McKelvey, S. R., and DeGomez, T. E. 2009.** Deposition from ground-based sprays of carbaryl to protect individual trees from bark beetle attack in the western United States. AZ1493. Tucson, Arizona: University of Arizona, College of Agriculture and Life Sciences Bulletin, 4 pp.
- (6) **Gandhi, K. J. K., Gilmore, D. W., Haack, R. A., Katovich, S.A., Krauth, S. J., Mattson, W.J., Zasada, J.C., and Seybold, S.J. 2009.** Application of semiochemicals to assess the biodiversity of subcortical insects following an ecosystem disturbance in a sub-boreal forest. *J. Chem. Ecol.* 35: 1384–1410. DOI-10.1007-s10886-009-9724-3.

- (7) **Gibson, K., Kegley, S., and Bentz, B. 2009.** Mountain pine beetle. USDA Forest Service, Forest Insect and Disease Leaflet No. 2, May 2009, 12 pp., <http://www.fs.fed.us/r6/nr/fid/fidls/fidl-2.pdf>
- (8) **Gibson, K. and Negrón, J. F. 2009.** Fire and bark beetle interactions. pp. 51–69, *in* Hayes, J.L. and Lundquist, J.E. (compilers). The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.
- (9) **Gillette, N. E., del Rio Mora, A. A., Mori, S. R., and Stein, J. D. 2009.** Semiochemicals for monitoring and control of *Conophthorus* spp. cone beetles (Coleoptera: Scolytinae) in Michoacán, Mexico. Proceedings of the IUFRO meeting, Forest Insects and Environmental Change, September 27–October 2, 2009, Jackson Hole, Wyoming, published by Utah State University, Logan, Utah.
- (10) **Gillette, N. E., Erbilgin, N., Webster, J. N., Pederson, L., Mori, S. R., Stein, J. D., Owen, D. R., Bischel, K. M., and Wood, D. L. 2009.** Aerially applied verbenone-releasing flakes protect *Pinus contorta* stands from attack by *Dendroctonus ponderosae* in California and Idaho. *For. Ecol. Manage.* 257:1405–1412.
- (11) **Gillette, N. E., Mehmel, C. J., Webster, J. N., Mori, S. R., Erbilgin, N., Wood, D. L., and Stein, J. D. 2009.** Aerially applied methylcyclohexenone-releasing flakes protect *Pseudotsuga menziesii* stands from attack by *Dendroctonus pseudotsugae*. *For. Ecol. Manage.* 257:1231–1236.
- (12) **Gillette, N. E. and A. S. Munson. 2009.** Semiochemical sabotage: Behavioral chemicals for protection of western conifers from bark beetles. pp. 85–109, *in* Hayes, J.L. and Lundquist, J.E. (compilers). The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.
- (13) **Graves, A. D., Coleman, T. W., Flint, M. L., and Seybold, S. J. 2009.** Walnut twig beetle and thousand cankers disease: Field identification guide, UC-IPM Website Publication, 2 pp., Nov. 21, 2009, http://www.ipm.ucdavis.edu/PDF/MISC/thousand_cankers_field_guide.pdf
- (14) **Grulke, N. E., Minnich, R. A., Paine, T. D., Seybold, S. J., Chavez, D., Fenn, M. E., Riggan, P. J., and Dunn, A. 2009.** Air pollution increases forest susceptibility to wildfires: A case study in the San Bernardino Mountains in southern California, pp. 365–403, *in* Bytnerowicz, A., Arbaugh, M., Riebau, A., and Anderson, C. (eds.). Air Pollution and Fire, Developments in Environmental Science, Vol. 8: Elsevier, Amsterdam, The Netherlands.

(15) **Hayes, C. J., Fettig, C. J., and Merrill, L. D. 2009.** Evaluation of multiple funnel traps and stand characteristics for estimating western pine beetle-caused tree mortality. *J. Econ. Entomol.* 102: 2170–2182.

(16) **Jenkins, M. J., Fettig, C. J., and Hebertson, E. G. 2009.** Bark beetles, fuels and fire: A synthesis of our present understanding and implications for management, *in* Rideout-Hanzak, S, Oswald, B.P., and Beierle, M. (compilers). Fourth Annual International Congress on Fire Ecology and Management: Fire as a Global Process. Savannah, Georgia.

(17) **Lundquist, J. E. 2009.** Forest pest insects along a latitudinal transect in Alaska. Proceedings of the 2009 Annual Convention of the Society of American Foresters, Orlando, Florida. Abstract.

(18) **Lundquist, J. E. 2009.** The influence of climate on spruce beetle in Alaska – A white paper. Unpublished Report. Region 10 Forest Health Protection, Anchorage, Alaska, 24 pp.

(19) **McMillin, J. D. and Fettig, C. J. 2009.** Bark beetle responses to vegetation management treatments. pp. 25–38, *in* Hayes, J.L. and Lundquist, J.E. (compilers). The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.

(20) **Munson, A. S., Steed, B., and Fettig, C. J. 2009.** Individual tree protection using carbaryl insecticide for western conifer-infesting bark beetles. Ogden, Utah: USDA Forest Service, Forest Health Protection, Intermountain and Northern Regions, 2 pp.

(21) **Powell, J. A. and Bentz, B. J. 2009.** Connecting phenological predictions with population growth rates for mountain pine beetle, an outbreak insect. *Landscape Ecology* 24:657–672.

(22) **Raffa, K. F., Aukema, B., Bentz, B. J., Carroll, A., Erbilgin, N., Herms, D., Hicke, J., Hofstetter, R., Katovich, S. A., Lindgren, B. S., Logan, J., Mattson, W., Munson, A. S., Robison, D. J., Six, D. L., Tobin, P., Townsend, P., and Wallin, K. 2009.** A literal use of “Forest Health” safeguards against misuse and misapplication. *J. For.* 5:276–277.

(23) **Ruiz, E. R., Rinehart, J. E., Hayes J. L., and Zúñiga, G. 2009.** Effect of geographic isolation on genetic differentiation in Douglas-fir beetle, *Dendroctonus pseudotsugae* Hopkins (Coleoptera: Curculionidae: Scolytinae). *Hereditas* 146: 79–92.

(24) **Ruiz, E. R., Victor, J., Hayes J. L., and Zúñiga, G. 2009.** Molecular and morphological analysis of *Dendroctonus pseudotsugae* (Coleoptera: Curculionidae:

Scolytinae): An assessment of the taxonomic status of subspecies. *Ann. Entomol. Soc. Am.* 102: 982–997.

(25) **Schwilk, D. W., Keeley, J. E., Knapp, E. E., McIver, J., Bailey, J. D., Fettig, C. J., Fielder, C. E., Harrod, R. J., Moghaddas, J. J., Outcalt, K. W., Skinner, C. N., Stephens, S. L., Waldrop, T. A., Yaussey, D. A., and Youngblood, A. 2009.** The National Fire and Fire Surrogate study: effects of alternative fuel reduction methods on forest structure. *Ecol. Appl.* 19:285–304.

(26) **Schwilk, D. W., Keeley, J. E., Knapp, E. E., McIver, J., Bailey, J. D., Fettig, C. J., Fielder, C. E., Harrod, R. J., Moghaddas, J. J., Outcalt, K. W., Skinner, C. N., Stephens, S. L., Waldrop, T. A., Yaussey, D. A., and Youngblood, A. 2009.** The National Fire and Fire Surrogate study: effects of alternative fuel reduction methods on forest structure, *in* Rideout-Hanzak, S, Oswald, B.P., and Beierle, M. (compilers). Fourth Annual International Congress on Fire Ecology and Management: Fire as a Global Process. November 30–December 4, 2009, Savannah, Georgia.

(27) **Seybold, S. J. and Downing, M. 2009.** What risk do invasive bark beetles and woodborers pose to forests of the western U.S.?: A case study of the Mediterranean pine engraver, *Orthotomicus erosus*, pp. 111-134, *in* Hayes, J.L. and Lundquist, J.E. (compilers). The Western Bark Beetle Research Group: A Unique Collaboration with Forest Health Protection. Proceedings of a Symposium at the 2007 Society of American Foresters Conference, October 23–28, 2007, Portland, Oregon. USDA Forest Service Gen. Tech. Rep., GTR–PNW–784, 134 pp.

(28) **Utley, C., Cranshaw, W., Seybold, S. J., Graves, A. D., Leslie, C. A., Jacobi, W., and Tisserat, N. 2009.** Susceptibility of *Juglans* and *Carya* species to *Geosmithia*; a cause of thousand cankers disease [Abstract]. *Phytopathology* 99:S133.

(29) **Venette, R. C., Walter, A. J., and Seybold, S. J. 2009.** Comparing risks from native and exotic bark beetles to the health of Great Lakes forests. *In* Proceedings Society of American Foresters 2008 Annual Meeting. Reno, Nevada. CD-ROM. Society of American Foresters, Bethesda, MD.

Editorial Activity

Agricultural and Forest Entomology (J. L. Hayes)

Forest Ecology and Management and *Forest Science* (C. J. Fettig)

Journal of Chemical Ecology (S. J. Seybold)

Technical Conferences and Workshops Organized

- (1) **Bentz, B. B., Wegensteiner, R. and Six, D. L. Co-organizers:** “Forest Insects and Environmental Change.” Joint meeting of IFURO Working Parties 7.03.05 Integrated Control of Scolytid Bark Beetles and 7.03.07 Population Dynamics of Forest Insects, 28 September -2 October 2009, Jackson Hole, Wyoming.
- (2) **Fettig, C. J., Coyle, D. R., and Nowak, J. T. Co-Organizers:** “What’s New in Forest Entomology.” 57th Annual Meeting of the Entomological Society of America, December 16, 2009, Indianapolis, Indiana.
- (3) **Gillette, N. E. Organizer:** New Methods for Semiochemical Management of Bark Beetle Infestations. 60th Annual Western Forest Insect Work Conference, March 23–26, 2009, Spokane.
- (4) **Hayes, J. L., Scott, D. W., and Survis, P. Co-Organizers.** “Lesson Learned from the Upper Imnaha Integrated Western Pine Beetle Management Project 2005-2008.” January 19, 2009, La Grande, Oregon (16 participants from PNW, Wallowa Valley RD, Hells Canyon NRA, and W-W NF).
- (5) **Lundquist, J. E. Moderator.** “Forest Insects and Climate Change.” Plenary Session, 60th Annual Western Forest Insect Work Conference, March 26, 2009, Spokane, Washington.
- (6) **Lundquist, J. E. Organizer and Moderator.** “Beyond the Science of Climate Change – Where do we go from here?” Panel Discussion. 60th Annual Western Forest Insect Work Conference, March 26, 2009, Spokane, Washington.
- (7) **Progar, R. P. and Shaw, D. Co-Organizers.** “Emerging Issues and Technologies for Managing Insects and Diseases in Southeastern Forests.” D5 Working Group, Insects and Diseases Technical Session, Society of American Foresters Annual Meeting, September 29–October 4, 2009, Orlando, Florida.
- (8) **Seybold, S. J. and Liu, A. Co-Organizers.** “Thousand Cankers Disease Affecting Black Walnut Trees.” An Information and Field Identification Meeting, Audubon Center at Debs Park, Ernest E. Debs Regional Park, December 8, 2009, Los Angeles, California (workshop attended by approx. 40 arborists, city employees, and resource managers).

Contributed and Invited Presentations and Posters at Scientific Meetings and Workshops

- (1) **Adams, A., Adams, S., Boone, C., Currie, C., Bohlmann, J., Gillette, N., and Raffa, K.** Role of symbiotic bacteria in the reproductive success of bark beetles.

IUFRO WP 7.03.05 and 7.03.07, Forest Insects and Environmental Change, September 27–October 2, 2009, Jackson Hole Wyoming (oral presentation by Adams).

(2) **Beh, M. M., Seybold, S. J., and Rizzo, D. M.** Ambrosia beetles show an increased attraction to burned, sudden oak death-infected tanoak trees in the Big Sur Region. 58th Annual Meeting of the California Forest Pest Council, November 17–18, 2009, Woodland, California, (poster presentation by Beh).

(3) **Bentz, B. J.** Geographic variability in mountain pine beetle fitness traits: Climate change implications. University of Utah, February 2, 2009, Salt Lake City, Utah (invited oral presentation).

(4) **Bentz, B. J.** Geographic variability in mountain pine beetle fitness traits: Climate change implications. University of Wisconsin, February 6, 2009, Madison, Wisconsin (invited oral presentation).

(5) **Bentz, B. J.** Bark beetles and climate change. USDA Forest Service Region 1 Climate Change Reading Group, Missoula, Montana. Presented via Video Conference. February 13, 2009 (invited oral presentation).

(6) **Bentz, B. J.** Mountain pine beetle adaptation to local environments. IUFRO WP 7.03.05 and 7.03.07, September 27–October 2, 2009, Jackson Hole Wyoming (oral presentation).

(7) **Bentz, B. J.** Will the *Real* Mountain Pine Beetle Please Stand Up? Plasticity in Climate-Influenced Phenological Strategies. EarthTalks Seminar Series, The Department of Geosciences and The Entomology Department, Pennsylvania State University, November 2, 2009, State College, Pennsylvania (invited oral presentation).

(8) **Bentz, B. J., Boone, C., and Raffa, K. F.** Mountain pine beetle outbreak dynamics in high elevation forests: Influence of climate change and tree chemistry. International Union of Forest Research Organizations, Working Unit 7.03.11, Università di Padova Field Station, August 2009, San Vito di Cadore, Italy (oral presentation by Bentz).

(9) **Bentz, B. J. and Régnière, J.** Climate warming and cold tolerance: Predictions for the mountain pine beetle. Special Symposium: Cold Case Files: Integrative Perspectives on Physiological and Molecular Responses of Insects to Low Temperature, Entomological Society of America Annual Meeting, December 13–17, 2009, Indianapolis, Indiana (invited oral presentation by Bentz).

(10) **Bentz, B. J., Schen, G., Boone, C., and Raffa, K. F.** Mountain pine beetle outbreak dynamics in high elevation forests: Influence of climate change and tree chemistry. North American Forest Ecology Workshop, June 2009, Logan, Utah (invited oral presentation).

(11) **Bracewell, R. and Bentz, B. J.** What is a mountain pine beetle anyway? A synthesis of recent research involving divergent populations. IUFRO WP 7.03.05 and

7.03.07, September 27 – October 2, 2009, Jackson Hole Wyoming (oral presentation by Bracewell).

(12) **Burbano, E., Wright, M., Mori, S. R., and Gillette, N. E.** Improved traps and semiochemical lures for *Xylosandrus compactus*, the black twig borer, and associated ambrosia beetles in Hawaii, IUFRO Meeting on Forest Nursery Insects and Diseases, July 12–17, 2009, Hilo, Hawaii, (oral presentation by Burbano).

(13) **Del Rio Mora, A.A., Mori, S. R., and Gillette, N. E.** Semiochemicals for *Conophthorus edulis* and *C. michoacanae* in Mexico. IUFRO WP 7.03.05 and 7.03.07, September 27 – October 2, 2009, Jackson Hole Wyoming (poster presentation by Gillette).

(14) **Fettig, C. J.** The history and value of forestry research at Blacks Mountain Experimental Forest. Documentary prepared by the USDA on the importance of Experimental Forests and Ranges, April 2009, Blacks Mountain, California (oral presentation).

(15) **Fettig, C. J.** Effects of fuel reduction treatments on levels of delayed tree mortality attributed to bark beetle attack in western coniferous forests. 4th International Fire Ecology and Management Congress: Fire as a Global Process. 30 November-4 December, 2009, Savannah, Georgia (oral presentation).

(16) **Fettig, C. J., Coyle, D. L., and Nowak, J. T.** What's new in forest entomology? 57th Annual Meeting of the Entomological Society of America, December 2009, Indianapolis, Indiana (oral presentation by Fettig).

(17) **Fettig, C. J., DeGomez, T. E., McMillin, J. D., Anhold, J. A., Hayes C. J., and McKelvey, S. R.** Managing slash to minimize colonization of residual trees by *Ips* and other bark beetle species. 58th Annual Meeting of the California Forest Pest Council, November 17–18, 2009, Woodland, California (oral presentation by Fettig).

(18) **Fettig, C. J., Munson, A. S., Grosman, D. M., Bush, P., Hayes C. J. and McKelvey, S. R.** Emamectin benzoate and propiconazole for protection of lodgepole pine from mountain pine beetle. Bark Beetle Technical Working Group Meeting, October 2009, Tucson, Arizona (poster presentation by Fettig).

(19) **Gandhi, K. J. K., Gilmore, D. W., Haack, R. A., Katovich, S. A., Krauth, S. J., Mattson, W. J., Zasada, J. C., and Seybold, S. J.** Interactions between a catastrophic wind-disturbance event, subsequent fuel-reduction activities, and sub-boreal insects in northeastern Minnesota, Superior National Forest Research Symposium, The Future of Fire and Wind in Northern Minnesota Forests: Lessons Learned from the 1999 Blowdown, February 18, 2009, Cloquet, Minnesota, (invited presentation by Gandhi). URL: http://www.fs.fed.us/r9/forests/superior/documents/Gandhi_000.pdf.

- (20) **Gillette, N. E.** Pheromone flakes: Semiochemical sabotage of bark beetles. Forest Vegetation Management Conference, January 19–22, 2009, Redding, California (invited oral presentation).
- (21) **Gillette, N. E.** Pheromone flakes for area-wide control of *Dendroctonus* spp. bark beetles. SERG International Meeting, February 9–12, 2009, Winnipeg, Canada (invited oral presentation).
- (22) **Gillette, N. E.** Verbenone flakes: Semiochemical sabotage of mountain pine beetle. Meeting of NGO: For the Forest, March 2, 2009, Aspen, Colorado (invited oral presentation).
- (23) **Gillette, N. E., Lu, M., Sun, J. H., Owen, D. R., and Wingfield, M.** The boomerang project: *Dendroctonus valens* and its Ophiostomatoid hitch-hikers . 60th Annual Western Forest Insect Work Conference, March 23–26, 2009, Spokane, Washington (oral presentation by Gillette).
- (24) **Gillette, N.E.** Bark beetle management with anti-aggregation pheromones. Staff Seminar at USDA Forest Service PSW Research Station, April 24, 2009, Albany, California.
- (25) **Gillette, N.E.** Sustainable, area-wide bark beetle management using anti-aggregation semiochemicals. Pacific Branch Meeting of the Entomological Society of America, March 30, 2009, San Diego, California (invited oral presentation).
- (26) **Gillette, N. E.** Verbenone in integrated pest management of bark beetles. Community meeting, June 10-11, 2009, Carbondale, Colorado (invited oral presentation).
- (27) **Gillette, N. E., Murray, W. J., Webster, J. N, Kelly N. M., Mori, S. R, and Wood, D. L.** Silvicultural and pheromone treatments at Smuggler Mountain. Briefing provided for foresters/funders from White Mountain National Forest, City of Aspen, Aspen Valley Land Trust, For the Forest, and Pitkin County, of 300-acre verbenone demonstration project conducted at Smuggler Mountain, December 16, 2009, Aspen, Colorado (oral presentation by Gillette).
- (28) **Gillette, N. E., Murray, W. J., Webster, J. N, Kelly N. M., Mori, S. R, and Wood, D. L.** Silvicultural and pheromone treatments at Smuggler Mountain: Preliminary findings. Invited guest speaker at NGO-sponsored symposium, “Place-Based Strategies: The Pine Beetle & Forest Health,” December 17, 2009, Aspen, Colorado (invited oral presentation by Gillette).
- (29) **Graves, A. D., Grulke, N. E., Rizzo, D. M., Demmig-Adams, B., Adams, W. W., and Seybold, S. J.** Defining a mechanistic link in Jeffrey pine among stand thinning, drought, and risk of mortality from Jeffrey pine beetle, *Dendroctonus jeffreyi*, 60th Annual Western Forest Insect Work Conference, March 23–26, 2009, Spokane, Washington (poster presentation by Graves).

(30) **Graves, A. D., Grulke, N. E., Rizzo, D. M., Demmig-Adams, B., Adams, W. W., Nelson, L. J., and Seybold, S. J.** Defining a mechanistic link in Jeffrey pine drought stress and susceptibility to Jeffrey pine beetle. USDA NRI Managed Ecosystems Program Director Meeting, October 13, 2009, Pittsburgh, Pennsylvania (poster presentation by Grulke).

(31) **Graves, A. D., Hishinuma, S., Hamud, S. M., and Seybold, S. J.** Host colonization behavior of the walnut twig beetle, *Pityophthorus juglandis* Blackman, in California Hinds walnut. Workshop Contribution to “Hard Times for Hardwoods: New Problems for Walnuts, Oaks, and Elms in the Western U.S., 60th Annual Western Forest Insect Work Conference, March 24, 2009, Spokane, Washington (oral presentation by Graves).

(32) **Grulke, N. E. and Seybold, S. J.** Elevated N deposition and moisture availability: Interacting impacts on Jeffrey pine in California. The 94th Annual Meeting of the Ecological Society of America, August 6, 2009, Albuquerque, New Mexico (oral presentation by Seybold).

(33) **Hansen, E. M.** Bark beetles in Utah forests. Live webcast, Utah State University Forestry Extension. November 17, 2009,
http://extension.usu.edu/forestry/Presentations/webcasts_beetles.html

(34) **Hasey, J. K. and Seybold, S. J.** Thousand cankers disease of walnut: Status in California. 58th Annual Meeting of the California Forest Pest Council, November 17–18, 2009, Woodland, California (oral presentation by Hasey).

(35) **Hayes, C. J., Fettig, C. J., and Merrill, L. D.** Evaluation of multiple funnel traps and stand characteristics for estimating western pine beetle-caused tree mortality. 58th Annual Meeting of the California Forest Pest Council, November 17–18, 2009, Woodland, California (oral presentation by Hayes).

(36) **Hayes, J. L., Smith, S. E., Halbrook, K., Spiegel, L., Moffitt, L., Hayes, C., and DeGomez, T.** Determining the effective sampling area of a western bark beetle trap. 6th International IPM Symposium, March 23-26, 2009. Portland, Oregon (poster presentation by Hayes).

(37) **Jenkins, M. J., Fettig, C. J., and Hebertson, E. G.** Bark beetles, fuels and fire: A synthesis of our present understanding and implications for management. 4th International Fire Ecology and Management Congress: Fire as a Global Process. November 30–December 4, 2009, Savannah, Georgia (poster presentation by Hebertson).

(38) **Liu, D. -G., Coleman, T. W., Bohne, M., Flint, M. L., and Seybold, S. J.** The impact of wildfire on invasive bark and woodboring beetles in periurban forests of Southern California. 15th Annual Forest Health Monitoring Workgroup Meeting,

Georgia Forestry Commission and the USDA Forest Service, Forest Health Monitoring Program, February 23–27, 2009, Savannah, Georgia (poster presentation by Liu).

- (39) **Lu, M., Wingfield, M. J., Sun, J. -H., Mori, S. R., and Gillette, N. E.** The boomerang project: *Dendroctonus valens* and its fungal hitch-hikers. 58th Annual Meeting of the California Forest Pest Council, November 17–18, 2009, Woodland, California (oral presentation by Gillette).
- (40) **Lundquist, J. E.** A history of spruce beetles on the Kenai Peninsula. Association of Consulting Foresters National Convention, June 30, 2009, Anchorage, Alaska.
- (41) **Lundquist, J. E.** Spruce beetles in Alaska's changing climate. Alaska Regional Leadership Team Meeting, December 10, 2009, Juneau, Alaska.
- (42) **Lundquist, J. E.** Forest Insects on the Kenai. University of Alaska, Fairbanks Field Course, May 15, 2009, Cooper Landing, Alaska.
- (43) **McKelvey, S. R., Fettig, C. J., and Huber, D. P. W.** Verbenone-Plus: A new tool for protecting trees from bark beetle attack. 58th Annual Meeting of the California Forest Pest Council, November 17–18, 2009, Woodland, California (oral presentation by McKelvey).
- (44) **Pitt, C., Seybold, S. J., Thommasen, A. T., and Huber, D. P. W.** Functional characterization of California fivespined ips, *Ips paraconfusus* (Coleoptera: Scolytidae) cytochrome P450 exhibiting up-regulation with feeding. Annual Meeting of the Entomological Society of Canada, October 19, 2009, Winnipeg, Manitoba, Canada (oral presentation by Pitt).
- (45) **Schwilk, D. W., Keeley, J. E., Knapp, E. E., McIver, J., Bailey, J. D., Fettig, C. J., Fielder, C. E., Harrod, R. J., Moghaddas, J. J., Outcalt, K. W., Skinner, C. N., Stephens, S. L., Waldrop, T. A., Yaussey, D. A., and Youngblood, A.** The National Fire and Fire Surrogate Study: effect of alternative fuel reduction methods on forest vegetation, structure, and fuels. 4th International Fire Ecology and Management Congress: Fire as a Global Process. November 30–December 4, 2009, Savannah, Georgia (oral presentation by Schwilk).
- (46) **Seybold, S. J.** Indigenous exotic forest insects in North American forests: Supplemental homegrown biodiversity or forest management nightmare. Invited teaching lecture, Forestry Sciences 495, Department of Forest Sciences, Faculty of Forestry, University of British Columbia, March 19, 2009, Vancouver, BC, Canada (invited oral presentation).
- (47) **Seybold, S. J.** Host colonization behavior of bark beetles: A perennially fruitful area for basic and applied research in forest entomology. Invited presentation, Department of Forest Sciences, Faculty of Forestry, University of British Columbia, March 20, 2009, Vancouver, BC, Canada (invited oral presentation).

(48) **Seybold, S. J.** Introductions and pathways of non-native forest insects and diseases in the western United States. Keynote Speaker at the Continental Dialogue on Non-Native Forest Insects and Diseases. Fifth Dialogue Meeting, San Francisco, California, October 27, 2009 (invited oral presentation).

(49) **Seybold, S. J.** An overview of the walnut twig beetle and thousand cankers disease in California. Thousand Cankers of Black Walnut National Conference, November 3, 2009, St. Louis, Missouri (invited oral presentation).

(50) **Seybold, S. J., Coleman, T. W., and Graves, A. D.** It's getting harder to be a hardwood: Thousand cankers disease/walnut twig beetle and the goldspotted oak borer in the western U.S. 15th Annual Forest Health Monitoring Workgroup Meeting, Georgia Forestry Commission and the USDA Forest Service, Forest Health Monitoring Program, February 23–27, 2009, Savannah, Georgia (invited oral presentation by Seybold).

(51) **Seybold, S. J., Coleman, T. W., and Graves, A. D.** The impact of invasive organisms on hardwoods in California urban landscapes with emphasis on the goldspotted oak borer. Pacific Branch Meeting of the Entomological Society of America, April 1, 2009, San Diego, California, (invited oral presentation by Seybold).

(52) **Seybold, S. J. and Graves, A. D.** Bark beetle host selection behavior: The theory and practice behind protecting forest trees with repellent semiochemicals.” Pacific Branch Meeting of the Entomological Society of America, March 30, 2009, San Diego, California (invited oral presentation by Seybold).

(53) **Seybold, S. J., Liu, D. –G., Venette, R. C., Munson, A. S., Bulaon, B. M., and Flint, M. L.** A stranger in a strange land: Dispersal behavior of the Mediterranean pine engraver in California's Central Valley. Workshop Contribution to “Invasives on our Doorstep,” 60th Annual Western Forest Insect Work Conference, March 25, 2009, Spokane, Washington (oral presentation by Seybold).

Briefings and Testimony

(1) **Bentz, B. J.** Mountain pine beetle and climate change. Expert Witness before the Subcommittee on National Parks, Forests and Public Lands, and Subcommittee on Water and Power, Natural Resources Committee, United States House of Representatives Hearing on Mountain pine beetle – Strategies to protect the west. June 16 2009, Washington, DC.

(2) **Fettig, C. J.** Expert Testimony in Sierra Forestry Legacy, et al. (plaintiffs) v. Mark Rey, in his official capacity as Under Secretary of Agriculture (federal defendants) and Tuolumne County Alliance for Resources and Environment, California Ski Industry Association, Quincy Library Group, and California Cattlemen's Association (Case No.

CIV-S-05-0205-MCE-GGH) in the U.S. District Court for the Eastern District of California, September-October 2008.

Media Recognition

(1) **Gillette, N. E.** Development of pheromone products for area-wide control of damaging insect pests. USDA Forest Service Research and Development 2008-2009 Highlights. 2009. FS-942, p. 11. http://www.fs.fed.us/research/RD_Highlights_2009-12.pdf

(2) **Gillette, N. E.** “Beetle project near Aspen a success,” article authored by Janet Urquart. <http://www.aspentimes.com/article/20091218/NEWS/912189981>

(3) **Gillette, N. E.** Aspen symposium to put focus on forest health: Results of beetle project on Smuggler Mountain slated for release,” article authored by Janet Urquart

<http://www.aspentimes.com/article/20091204/NEWS/912049989&parentprofile=search>

(4) **Gillette, N. E.** Are you smarter than a pine beetle? Not likely, article authored by Andy Stone

<http://www.aspentimes.com/article/20091216/LETTER/912159995&parentprofile=search>

(5) **Seybold, S. J.** Beetles threaten walnuts, June 26, 2009, *Davis Enterprise* A1, A10. Article authored by Kathy Keatley Garvey.

<http://search.davisenterprise.com/display.php?id=50519>

(6) **Seybold, S. J.** Beetle and fungus one-two punch threatens black walnut trees, scientists warn, July 2, 2009, UC-Davis Department of Entomology Online New Release. Article authored by Kathy Keatley Garvey.

<http://entomology.ucdavis.edu/news/walnuttwigbeetle.html>

(7) **Seybold, S. J.** Fungal disease attacks black walnut trees in eight western states, August 26, 2009, *Sacramento Bee*, B1, B4. Article authored by Li Lou.

<http://www.sacbee.com/ourregion/story/2139130.html>

(8) **Seybold, S. J.** Walnut trees are dying off: New disease takes its toll on Davis’ urban forest, August 30, 2009, *Davis Enterprise*, A9. Op-Ed article authored by Seybold and C. A. Leslie.

<http://search.davisenterprise.com/display.php?id=56102>

(9) **Seybold, S. J.** New disease wreaks havoc on western walnut trees, September-October 2009, *The American Gardener*, 50. Article authored by Amanda Griesser and Viveka Neveln.

http://www.ahs.org/publications/the_american_gardener/pdf/09/09/Gardeners_Notebook_50-52.pdf