Bark Beetle Technical Working Group Priorities List – FY2013

Complied by C.L. Jorgensen from 2012 Meeting Attendees

1. Improve methods to predict where, when, and how much bark beetle activity will occur on forest landscape
    a. Evaluate methods for determining the relationship between tree physiology and susceptibility to bark beetle attack, including stress factors and constitutive and induced resistance.
        i. Bark beetle attraction to defoliated trees, at what levels of defoliation, for how many years of defoliation, at what source level of beetle populations, for what habitat types. Laura Lazarus FHP- Boise.
            1. Western spruce budworm and Douglas-fir beetle in Douglas-fir (Lazarus, Spiegel, Sturdevant, Carlson, Ross and Wallin).
            2. Western spruce budworm, BWA, and WBBB in subalpine fir
            3. Western spruce budworm and fir engraver in grand fir
    b. Define methods for predicting the occurrence, rate of spread, size, duration and impact of outbreaks for individual bark beetle species.
    c. Refine methods of evaluating landscape – level susceptibility to bark beetle outbreaks.
        i. Evaluate *D. rufipennis* and *D. ponderosae* outbreaks in the Interior West on ecological function and associated impacts. Steve Munson, FHP-Ogden
    d. Determine the role of climate change in predicting bark beetle outbreaks.
        i. Determine bark beetle populations across elevational gradient crossing multiple forest types (Jeffery pine>western white pine>Whitebark pine>foxtail pine) Cynthia Snyder R5 FHP
    e. Utilize information from all possible sources to define what constitutes an outbreak.
    f. Integrate all of the above into operational, predictive models for significant bark beetle – host systems.
        i. Develop a bark beetle and fire interactions models for Forest Vegetation Simulator that invoke outbreaks given a wildfire or prescribed burn, such as integrating Hood/Bentz papers for DFB to FVS, and similar for WPB (Lazarus, Hebertson, FHP-R4).

2. Clarify results and interactions between bark beetle populations, wildfires, and prescribed fire
    a. Define short & long-term ecological relationships associated with bark beetle populations, fuel loads, wildfires and prescribed fire.
        i. Roundheaded pine beetle response to fire. Joel McMillin. Andy Graves
    b. Projects should meet National Fire Plan objectives.
    c. Develop tech transfer tools for bark beetle/fire interactions for the general public.

3. Evaluate, quantify, and describe the effects of no action.
    a. What are post-outbreak conditions on treated versus untreated lands?
    b. Is it possible to see differences in species composition, diversity or species shifts as a result of not taking specific management actions?
    c. What are the consequences of bark beetle outbreaks to forest ecological function, e.g. 1990's spruce beetle outbreak in Alaska?
        i. Evaluate *D. rufipennis* and *D. ponderosae* outbreaks in the Interior West on ecological function and associated impacts. Steve Munson, FHP-Ogden
    d. What are the costs of "do nothing" alternatives?
    e. Document and summarize case histories.
        i. Historical outbreaks in southern New Mexico. Andy Graves
        ii. Comprehensive report on the Extent and Severity of the current MPB outbreak in Western US and direct comparison to other MPB outbreaks of the 1970s and 1930s, likely a "white paper" – Jorgensen Boise FHP

4. Develop additional technologies for using natural attractants and repellents such as pheromones to protect forest resources
    a. Summarize what is currently known about the effectiveness of semiochemicals.
    b. Develop an appropriate "clearing house" for semiochemical information (webpage, case studies, etc.)
    c. Develop new and improve existing semiochemical technologies
        i. Synergy Semiochemical and SRS are seeking collaborators to conduct field research with newly identified kairomones and pheromones of tree killing bark beetles and wood borers, particularly MPB, WPB, and SPB.
        ii. *Phloeosinus* spp. pheromones? Joel McMillin.
        iii. Improved anti-aggregation pheromone for spruce beetle. Joel McMillin. Andy Graves
        iv. Confirmation of (+)-endo-brevicomin as anti-aggregation pheromone across the distribution of western balsam bark beetle. Joel McMillin.
        v. Evaluate Verb Splat and Verb Plus formulations for MPB in outbreak populations – Steve Munson, FHP – Ogden
        vi. Conduct trapping bioassays for various antiaggregant compounds for *D. rufipennis* – Steve Munson, FHP – Ogden
        vii. What is the effectiveness of MCH treatments for stands with preexisting DFB populations (beetles are already in the green trees at some level)? Laura FHP Boise.

viii. Protect pines from MPB and WPB, especially after fires (Eckberg, Kegley)
ix. Evaluate further the use of verbenone and conophthorin to disrupt northern spruce engraver, *Ips perturbatus*, colonization of spruce slash. This could also involve comparisons of verbenone with other non-host volatiles as disruptants of *I. perturbatus* activity in slash (i.e., as lower-cost alternatives). Roger Burnside, AK DNR Forestry.
x.

d. Assess and/or develop an attractant for new invasive species (e.g. Polyphagous shot hole borer in southern California) Tom Coleman R5 FHP

5. Validate silvicultural techniques to meet various management objectives
    a. Evaluate and document current conditions of previously installed (10+ years) silvicultural treatments to determine risk to bark beetle (LPP)
        i. Assess the scale of tree mortality from bark beetles and interaction with predisposing agents in unmanaged areas and treatments for fuels and prevention thinning in southern California. Tom Coleman R5 FHP
        ii. Assess the scale of tree mortality from bark beetles and interaction with predisposing agents in unmanaged areas and treatments for fuels and prevention thinning in central Idaho. Laura Lazarus R4- FHP.
        iii.
    b. What are slash-treatment alternatives?
        i. Evaluate additional variables for potential management of the northern spruce engraver, *Ips perturbatus*, during forest management operations. Among others, look at the effects of timing of operations (e.g., spring vs. fall slash treatments) and effects of habitat condition (e.g., colonization of disturbed areas vs. closed, residual forest). Roger Burnside. AK DNR Forestry.
    c. What fuels treatments may change hazard ratings for bark beetles?
        i. Effects of fuel breaks surrounding Late Successional Reserves. LSRs protect or foster "old-growth" ecosystems. Cynthia Snyder R5 FHP
    d. "What are the effects of fuel reduction treatments, including thinning, on bark beetle populations"
        i. Evaluate *Ips perturbatus* response to major disturbances in the boreal forest to better understand factors that precipitate outbreaks, or not. This work has implications on how beetle populations are managed during fuel reduction treatments, long-term timber sales, or large-scale biomass/bioenergy projects and other forest management projects (there is high interest for this information in Alaska right now). Roger Burnside, AK DNR Forestry.
    e. Install demonstration areas where stands are silviculturally manipulated according to established risk rating to geographically refine risk models
    f. How do forest health restoration treatments affect bark beetle hazard rating?

i. Southwestern Region's new "Desired Conditions" for different forest types (e.g., mixed conifer forests). Joel McMillin.

g. Develop new strategies recognizing limitations on treatment availability due to wildlife concerns (e.g. lynx habitat) or society stigmas (e.g. clearcutting)
   i. What are the benefits of "individual tree culturing," "daylighting", similar treatments to reduce the risk of western pine beetle attack on large diameter ponderosa pine in the Pacific Northwest and Idaho? (Schaupp and Jorgensen).
   ii. Evaluate effects of daylighting (fixed distance for all selected trees; for fire mitigation) or radial thinning (variable distance based on tree diameter and SDI; for tree vigor) on bark beetle susceptibility, especially for whitebark pines, maybe ponderosa (Egan, Gannon, Steed, Sturdevant, Lazarus).

6. Develop additional technologies and strategies for using insecticides to selectively protect priority resource values on forest landscapes
   a. Evaluate new insecticides and delivery systems.
      i. Evaluate emamectin benzoate treatments for *D. rufipennis*. Steve Munson, FHP-Ogden
      ii. Develop NEW insecticides (critical if carbaryl is removed from tree-use registration, and the pyrethroids are not labeled for forest application), especially to protect pines form MPB. (This may include testing of delivery systems in part a.) (Steed or any of us in Region 1) and Flowers at ODF, Jorgensen FHP Boise.
      iii.
   b. Determine the effectiveness of insecticides for less studied conifer species.
   c. Determine the effectiveness of using lethal trap trees.
   d. Summarize what is currently known about the effectiveness of insecticides.

7. Facilitate technology transfer, improve communication with land managers, and inform the general public.
   a. Strengthen resource education and technology transfer.
   b. Strengthen taxonomy expertise and encourage training sessions to foster identification skills.
   c. Inform land managers and general public of the political/legal ramifications of what we do/don't do and should do/can't do.