TREMBLINGS

NEWSLETTER & BULLETIN BOARD

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"…partnering to preserve and restore healthy aspen ecosystems."

NOTICE: The WAA is a user-driven organization. Please send news items and announcements, contributions, **recent reports & publications**, photos, and commentary ideas to Paul Rogers: p.rogers@usu.edu. We encourage you to share *Tremblings* with your friends and colleagues. **New members welcome!**

WAA HAPPENINGS

Passing of an Aspen Friend—David A. Burton (1943-2014) passed away nearly a year ago. David spent ten years as volunteer coordinator of the Aspen Delineation Project, a collaborative effort of the USFS, BLM, and California Fish & Game. He coauthored "Ecology, Biodiversity, Management, and Restoration in the Sierra Nevada" (USFS, 2006) and "Field Guide to Diseases and Insects of Quaking Aspen in the West: Part I: Wood and Bark Boring Insects" (USFS, 2015). He received USFS and BLM National Volunteer Awards, while also raising $100,000s to fund aspen projects. David compiled a database of aspen citations which comprised the seed from which the online Aspen Bibliography clone sprouted. Safe to say, the current status of knowledge in California is due more to David's efforts than to any other individual. David and his irrepressible spirit will be greatly missed.

Silviculture Faculty Position—The Université du Québec en Abitibi-Témiscamingue would like to fill a contract professor position in silviculture to complement the teaching and research activities of the Forest Research Institute. Candidates should have a PhD with a specialization in silviculture, applied forest ecology or forest management, with an ability to develop silvicultural techniques and management scenarios based on natural forest dynamics. Candidates should also have a significant scientific output, be competent in French, or have the intention to learn French. Post-doctoral, industrial or governmental experience would be considered assets. See announcement details here.

Aspen Insect Guide—USDA, Forest Service, Northern Rockies Region has published a new handbook for aspen "Wood and bark boring insects." The first printing is already nearly depleted, but a second run is underway. Download the PDF version by clicking here.

Fencing constructed from logging slash successfully restricts ungulate herbivory long enough for ramets to reach above "browse level" of two meter/six feet (Photo: Paul Rogers, New Mexico).

NRCS and WAA Pen Partnership—The Natural Resource Conservation Service and Western Aspen Alliance recently signed off on a 5-year memorandum of understanding for, in part, "assessing ecosystem conditions; conducting analyses, inventory, monitoring, data acquisition and dissemination; supplementing management guidance; providing conservation planning and mapping; and, other scientific, analytical, training,

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outreach, and management activities necessary to conserve aspen ecosystems." While this MOU is still taking shape, we look forward to sharing resources to accomplish progressive goals for the betterment of aspen communities nationally.

UPCOMING EVENTS

Wyoming Workshop—Wyoming Game & Fish and WAA will be presenting the 4th "Aspen Days" August 10-11 at Pinedale, WY. There will be an evening presentation followed by a one-day field trip. The event will address aspen ecology, fire, climate, wildlife uses and impacts, and exurban interface issues. All are welcome. Contact Eric Maichak or Jill Randall for further information.

Restoring the West 2015—Save the dates: Oct. 28-29, Utah State University, Logan, Utah. This annual conference addresses prominent science and management issues in the western U.S. This year's theme will be "Fire ecology and restoration in the Interior West" and will feature aspen and cohort forest communities, as well as other vegetation zones. Once again, we will host a **WAA members reception to kick off RTW on Oct. 27 from 5:30-7:30 p.m. You're all invited!** Check the Restoring the West website as details continue to be posted in the coming months.

Aspen Webinar Series—The WAA will again be partnering with Utah State University Forestry Extension to host aspen-related webinars during the upcoming academic year. Check the WAA website for specific dates as they become available. Depending on timing, we may resort to special announcements (via WAA membership email) of these webinars.

COMMENTARY

Aspen and climate change: Recent mortality portends bad news

William R. L. Anderegg, NOAA Climate & Global Change Postdoctoral Fellow Princeton Environmental Institute Princeton University

I grew up camping, fishing, and hunting in the aspen forests of southwestern Colorado. When I returned to these forests for my Ph.D. research, however, I saw that broad regions of the forests I remembered were dying, white-bark skeletons standing still against the blue mountain sky. I remember staring in shock at these forests and thinking, "What is going on here? What does this mean for the future of aspen?"

Over the past eight years, we (and others) have been studying the recent, synchronous mortality of aspen stems that have been observed from Arizona to Alberta. After ruling out alternate hypotheses, a broad range of evidence indicates that drought and hot temperatures, driven by human-caused climate change, have triggered mortality in more than 500,000 acres of aspen forest in Colorado alone. Understanding the physiology and ecology of this mortality will be crucial for predicting the future of aspen forests in the West and guiding management options.

What have we learned so far? First, heat matters. The early 2000s drought that triggered mortality wasn't drier in terms of lack of precipitation than other non-lethal droughts since 1900, like the Dust Bowl droughts, but it was a lot hotter. This is bad news for the future. Modeling efforts based on the suitable climate for aspen show major shrinking (often 45-90% reductions by 2085-2095) of suitable

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areas, particularly at lower latitudes, lower elevations, and more marginal sites.

Second, the roots are dying too. As far as we can tell, root mortality appears to keep pace or potentially even precede canopy mortality. As you'd expect, this means that most of these dying stands aren't showing anything remotely near healthy regeneration rates and herbivory could be exacerbating this. This also implies that for timber harvest solutions to be effective in regenerating aspen stands, they probably need to happen before the canopy (and thus the roots) have experienced much mortality.

Third, trees die over several years from the failure of the water transport system due to small air bubbles entering into transport cells, a process known as embolism. This physiological mechanism is probably the main way that drought kills trees around the globe, but aspen stems seem to take several years to die after drought and in concert with normally non-lethal pathogen and insect infestations. Thus, while the drought in Colorado peaked in 2002, mortality continued through around 2009, and more mortality may be on the way from the 2012 drought.

What does the future hold? We are still unraveling the physiology of the recent mortality event with the goal of developing models to predict which regions and clones may be most vulnerable to drought and climate change. While it certainly won't disappear altogether from the West, it's very likely that climate change will drive aspen past the brink in many areas. Management practices encouraging aspen development at higher elevations and northern-facing slopes can help retain these forests. Yet, ultimately, the single most important factor in maintaining these beautiful trembling forests in the West is how quickly we address human-caused climate change.

RECENT ASPEN PUBLICATIONS

Anderegg, W. R., A. Flint, C.-y. Huang, L. Flint, J. A. Berry, F. W. Davis, J. S. Sperry, and C. B. Field. 2015. Tree mortality predicted from drought-induced vascular damage. Nature Geoscience 8:367-371.

Bell, D. M., J. B. Bradford, and W. K. Lauenroth. 2015. Scale dependence of disease impacts on quaking aspen (*Populus tremuloides*) mortality in the southwestern United States. Ecology **96**:1835-1845.

Bose, A. K., B. D. Harvey, and S. Brais. 2015. Does partial harvesting promote old-growth attributes of boreal mixedwood trembling aspen (Populus tremuloides Michx.) stands? Forest Ecology and Management **353**:173-186.

Edenius, L. and G. Ericsson. 2015. Effects of ungulate browsing on recruitment of aspen and rowan: a demographic approach. Scandinavian Journal of Forest Research **30**:283-288.

Higgins, A. M., K. M. Waring, and A. E. Thode. 2015. The effects of burn entry and burn severity on ponderosa pine and mixed conifer forests in Grand Canyon National Park. International Journal of Wildland Fire **24**:495-506.

Hogg, E. H. and M. Michaelian. 2015. Factors affecting fall down rates of dead aspen (Populus tremuloides) biomass following severe drought in west-central Canada. Global change biology **21**:1968-1979.

Jamieson, M. A., E. G. Schwartzberg, K. F. Raffa, P. B. Reich, and R. L. Lindroth. 2015. Experimental climate warming alters aspen and birch phytochemistry and performance traits for an outbreak insect herbivore. Global change biology 21: 2698-2710.

Kay, C. E. 2015. Long-term vegetation change in Utah's Henry Mountains: a study in repeat photography. USDI, Bureau of Land Management, Salt Lake City, Utah. 274 p.

LaManna, J. A., A. B. Hemenway, V. Boccadori, and T. E. Martin. 2015. Bird species turnover is related to changing predation risk along a vegetation gradient. Ecology 96(6):1670-1680.

Martin, T. E. 2014. Consequences of habitat change and resource selection specialization for population limitation in cavity nesting birds. Journal of Applied Ecology **52**:475-485.

Mason, C. J., K. F. Rubert-Nason, R. L. Lindroth, and K. F. Raffa. 2015. Aspen Defense Chemicals Influence

Midgut Bacterial Community Composition of Gypsy Moth. Journal of chemical ecology **41**:75-84.

Randriamanana, T. R., A. Lavola, and R. Julkunen-Tiitto. 2015. Interactive effects of supplemental UV-B and temperature in European aspen seedlings: Implications for growth, leaf traits, phenolic defense and associated organisms. Plant Physiology and Biochemistry 93:84-93.

Rehfeldt, G. E., J. J. Worrall, S. B. Marchetti, and N. L. Crookston. 2015. Adapting forest management to climate change using bioclimate models with topographic drivers. Forestry **0**:1-12.

Rogers, P. C. C., J.; Jones, A.; Shuler, J.; Morris, A.; Kuhns, M. 2015. Quaking Aspen at the Residential-Wildland Interface: Elk Herbivory Hinders Forest Conservation. Natural Areas Journal **35**:416-427.

Shinneman, D. J., K. D. Krasnow, and S. K. McIlroy. 2015. The role of fire in aspen ecology and restoration. Western Aspen Alliance, Utah State University, Logan, Utah. WAA Briefs #3. 2 p.

Steed, B. E. and D. A. Burton. 2015. Field guide to diseases and insects of quaking aspen in the West - Part I: Wood and bark boring insects. R1-15-07, USDA, Forest Service, Forest Health Protection Northern Region, Missoula, MT.

Villalba, J. J., E. A. Burritt, and S. B. S. Clair. 2014. Aspen (*Populus tremuloides* Michx.) Intake and Preference by Mammalian Herbivores: The Role of Plant Secondary Compounds and Nutritional Context. Journal of chemical ecology **40**:1135-1145.

Walker, S. C., V. J. Anderson, and R. A. Fugal. 2015. Big Game and Cattle Influence on Aspen Community Regeneration Following Prescribed Fire. Rangeland Ecology & Management **68**:354-358.

Yang, J., P. J. Weisberg, D. J. Shinneman, T. E. Dilts, S. L. Earnst, and R. M. Scheller. 2015. Fire modulates climate change response of simulated aspen distribution across topoclimatic gradients in a semi-arid montane landscape. Landscape Ecology **30**:1055-1073.

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