"Randi's Roundup": March, 2024

Selected New Publications, in Brief:

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FUEL MOISTURE-NEW TOOLS

→ Machine Learning and VIIRS Satellite Retrievals for Skillful Fuel Moisture Content Monitoring in Wildfire Management. J.S. Schreck, Petzke, W.; Jiménez, P.A.; et al. 2024. Remote Sens. 2023, 15, 3372. This National Science Foundation project, developing an algorithm to estimate fuel moisture content (10-hr dead and live) over CONUS was extended to Alaska. They used in-situ observations of 10-hr fuel sticks to calibrate the VIIRS spectral data for dead fuel moisture, combined with hourly gridded weather data from HRRR and pooled live fuel moisture estimates as available. The tool is now LIVE at NCAR, showing near-real time (and some historical data) estimated fuel moistures (10-hr and live): - https://ral.ucar.edu/tool/fuel-moisture-content-retrievals. Try it out this summer!

FIRE FEEDBACKS TO GLOBAL WARMING

The first study to account for both carbon loss and radiative forcing from tundra wildfires concludes it may be important to consider tundra fire feedbacks on warming.

→Carbon emissions and radiative forcings from tundra wildfires in the Yukon–Kuskokwim River Delta, Alaska. Moubarak, M., S. Sistla, S. Potter, S.M. Natali, and B.M. Rogers. Biogeosciences, 20, 1537–1557. The research team estimated the carbon released from 2015 tundra wildfires in southwest Alaska using field measurements of burn depth and bulk density, and then calculated how much impact those emissions would have on the atmospheric radiative warming. They estimated the entire fire-affected area (134,000 ac) lost 2 Tg of organic matter, contributing roughly 1.7 kg/m^2 of C, close to the range lost in the Anaktuvuk River Fire (Mack et al., 2010). Some greenhouse gasses persist in the atmosphere (CO_2), while others are short-lived climate forcers. The study concluded that the warming effect from the fire emissions (not counting post-fire increases in soil respiration) would persist 80 years. Bottom line: the 2015 YKD fire season alone released about a 10th of the carbon sequestered each year by tundra globally, so increasing tundra fires may be an important influence when assessing climate-fire-feedbacks.

→Forest composition change and biophysical climate feedbacks across boreal North America. Massey, Richard. B.M. Rogers, L.T. Berner, S. Cooperdock, M.C. Mack, X.J. Walker and S.J. Goetz. 2023. Nature Climate Change 13:1368–1375. Since deciduous forest cover is expected to expand compared to conifer forest with climate warming and more fire, there was anticipation that a "cooling" effect from increased surface albedo might result and help slow future warming (Potter et al. 2020). This effect is primarily due to more snow showing through deciduous canopies in spring and fall. However, Massey **et al.** did *not* find a significant summary albedo change across the whole of boreal North America in their recent study. While deciduous fraction was initially increased in may areas following fire, conifers were also succeeding into older burns (1950-1978) so that across the entire region, there was a small net *decrease* in deciduous fraction and tree canopy cover from 2000-2015.

WILDLIFE

→Movement ecology, survival and territorial dynamics in Canada lynx over a cyclic population decline. Derek Arnold. 2023. PhD Thesis, UAF, 98 pp. The study examined how lynx with GPS collars use variously aged burn scars from 2-78 years old. The snowshoe hare, their main prey, likes the abundant forage in young deciduous stands (>20 years) but also prefers intermediate-aged (30-60 years) spruce stands to

provide cover for hiding, so a patchy mosaic is ideal. Investigators found that lynx habitat selection peaked in stands aged 30-50 years, both conifer and deciduous. Lynx habitat selection is felt to be based on the best places to capture hares. See Derek give a 3-min talk on this work HERE.

PERMAFROST AND FIRE

→ Quantification of active layer depth at multiple scales in Interior Alaska permafrost. Brodylo, David, T.A. Douglas, and C. Zhang. 2024. *Environ. Res. Lett. 19(3).* The seasonal thaw depth (active layer) is increasing across much of Alaska due to warming climate, and it is strongly influenced by fire. Scaling up plot-level measurements to a whole management area or fire area has been challenging. This study, led by CRREL at Ft. Wainwright, used intensive plot measurements, airborne lidar, satellite data from NASA-ABoVE, and artificial intelligence to show the increased depth of the active layer around the greater Fairbanks area from 2016-2021. Changes were largest in forested areas. This method could be used to follow active layer change after large fires.

→ Black spruce (Picea mariana) seed availability and viability in boreal forests after large wildfires. Reid, K.A., N.J. Day, R. Alfaro-Sanchez, J.F. Johnstone, S.G. Cumming, M.C. Mack, M.R. Turetsky, X.J. Walker, J.L. Baltzer. 2023. *Annals of Forest Science* 80(4). 16 p. Black spruce has historically self-replaced following wildfire, but recent evidence suggests that this is changing. The amount of seed released ("seed rain") following fire promotes seedling establishment and the investigators found that "seed rain" in northwest Canada was greater in older stands, those near burn edges, and where canopy combustion was less severe. Projected increases in fire activity could therefore reduce levels of black spruce recruitment following fire.

POPULAR PRESS ARTICLES:

Austen, Ian. As 'Zombie Fires' Smolder, Canada Braces for Another Season of Flames. March 4, 2024. *The New York Times*.

Disclaimer: Randi's Roundup is AFSC's briefing of new publications we think are relevant to Alaska wildfire managers. *Short overviews of articles are by Randi Jandt—see the article links to review official abstracts.*

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