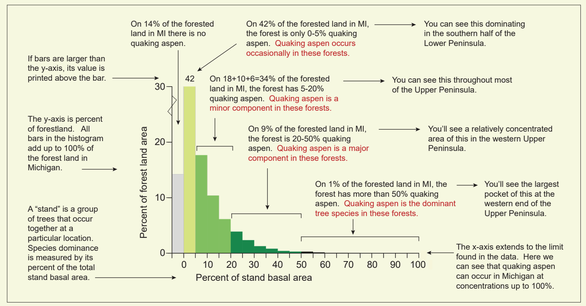
Modeled distributions of 10 tree species in Michigan

Rachel Riemann, Barry T. Wilson, Andrew J. Lister, Oren Cook,
and Sierra Crane-Murdoch

Map Description
These maps depict the distribution of 10 tree species across Michigan. The maps show where these trees do not occur (gray), occasionally occur (pale green), are a minor component (medium green), are a major component (dark green), or are the dominant species (black) in the forest, as determined by that species' total basal area. **Basal area** is the area of a cross-section of the trunk at 1.37 meters (4.5 feet) above ground (breast height). Basal area is a way of measuring how dominant a particular species is in a stand because of the way large trees contribute more to the total basal area than small trees. The map at the top of the circle (red maple) is the species with the greatest amount of basal area in Michigan. All other maps are generally arranged to group species that commonly occur together. Of the 99 tree species recorded in Michigan in the 2005-2009 inventory, the species presented here are the top 10 in the state by total basal area, and together represent 66% of the total live tree basal area and 67% of the tree count in Michigan. The center map shows where forest, nonforest, and water are present. In all maps, white is nonforest and water is blue.

Each map has an associated histogram in which the colors and the range of values they span serve both as the legend for interpreting the map and provide additional information about the distribution of that species in Michigan (MI). Because of the small pixel size of the data relative to the scale of the maps, the exact shade of green in the maps may appear to be a blend of classes in areas where pixels of many colors/classes occur close together. Below is a description of the histogram corresponding to the quaking aspen map and some examples of how it relates to the map.



You can see that some species, such as red maple frequently occur in Michigan as a large proportion (> 20%) or even a majority (> 50%) of the forest stands in which it occurs (more areas in darkest green and black). Other species more typically occupy less than 20% of the total tree basal area where it occurs because of its tendency to be a minor stand component in this region (e.g. hemlock).

Methods:
These maps are created from data that is part of a larger dataset covering the entire contiguous United States (Wilson et al. 2012). The data were modeled from tree data collected on U.S. Forest Service Forest Inventory and Analysis (FIA) field plots (12924 plots in Michigan), in combination with vegetation phenology derived from MODIS satellite imagery, climate data derived from daily surface weather data by the Oak Ridge National Laboratory, topographic data from the U.S. Geological Survey, and finer resolution tree canopy cover data derived from the National Land Cover Database (NLCD) which was produced by a consortium of federal agencies.

The tree species distributions were modeled at a 250-m grid cell size using imputation and canonical correspondence analysis techniques. Much of the species covariance found on the forest inventory plots is retained in the datasets, which means that each grid cell in the modeled datasets contains close to the same mix and proportion of species as found on the ground in the field data. Regionwide and neighborhood accuracy assessment results are available in Wilson et al. (2012), and are associated with each species in the online database (Wilson et al. 2013). In addition, we are currently working on methods to calculate measures of per-pixel model uncertainty to accompany the datasets.

Field data were collected during 2005-2009 by: Charles Paulson, Adam Morris, Kris Williams, Jerrod Moilanen, Gary Inhelder, Michael Downs, Devin Post, John Shoup, Andrew Bird, Ian Diffenderfer, Brady Boyce, Dominic Lewer, Paul Castillo, Aimee Stephens, Marc Much, Ryan Ebbert, Nick Reynolds , Nathan Cochran, Steve Lorenz, Patrick Kilkenny, Michael Johnson, Karlis Lazda, Chris La Cosse, Earl Sheehan, Douglas Rollins, Gianna Evans, Paul Richards, Margaret Haas, Chris Roy, Mark Majewsky, Alison Dibble, Jeray Norman, Jason Stephens, Jamie Alvesteffer, Corey Magdiak, Joseph Meres, Travis Jones, Stephen Ochs, Betsy Meres, Ron Colatskie, Pat Nelson, Edward Kloehn, Patrick Blanzy, Matt Sedelbauer, Lacey Whitehouse, Keb Guralski, Adam Felts, Ryan Skeels, Joel Topham, Matthew Riederer, Richard Starr, John Benaszeski, Joe Kernan, Greg Pugh, Todd Renninger, Mike Whitehill, Todd Bixby, Peter Koehler, Cassandra Kurtz, and James Blehm. Field data were processed and compiled by: Carol Alerich, Chuck Barnett, Dale Gormanson, Mark Hatfield, Barbara O'Connell, and Paul Sowers.

Leaf images by Linda Ellis, Galena, MO.

The Authors:
Rachel I. Riemann is a research forester/geographer with the U.S. Forest Service, Northern Research Station, in Troy, NY.
Barry T. "Ty" Wilson is a research forester with the U.S. Forest Service, Northern Research Station, in St. Paul, MN.
Andrew J. Lister is a research forester with the U.S. Forest Service, Northern Research Station, in Newtown Square, PA.
Oren Cook is a former intern for the U.S. Forest Service and is currently founder/owner of Red Team Solar in Greenwich, NY. Sierra Crane-Murdoch is a former mapping technician for the U.S. Forest Service and currently is a freelance writer in Hood River, WA.

References:
Wilson, B.T., Lister, A.J. Riemann, R.I. 2012. A nearest-neighbor imputation approach to mapping tree species over large areas using forest inventory plots and moderate resolution raster data. Forest Ecology and Management. 271:182–198.

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For more information, contact:
Barry Wilson (barrywilson@fs.fed.us) or
Rachel Riemann (rriemann@fs.fed.us)
www.nrs.fs.fed.us/fia

Dataset Reference:
Wilson, B.T.; Lister, A.J.; Riemann, R.I.; Griffith, D.M. 2013. *Modeled tree species distributions across the contiguous United States*. Newtown Square, PA: USDA, Forest Service, Northern Research Station. [Dataset]. Archived at: http://dx.doi.org/10.2737/RDS-2013-0013. See also www.nrs.fs.fed.us/fia for additional links to datasets.