

## New Visualization of Browse Impacts Points to Restoration Challenges in Deciduous Forests of the Midwest and Northeast

By Will McWilliams



Browse damage by white-tailed deer on black cherry (*Prunus serotina* Ehrh.). Photo: Manfred Mielke, US Forest Service, Bugwood.org

Forest managers and policymakers rely heavily on broad-scale spatial information to better channel scarce funds to address important issues, especially those related to restoration. The abundance of white-tailed deer (*Odocoileus virginianus*) and their impact on young-forest habitat (YFH) establishment and development qualifies as such an issue. Restoring broadleaf deciduous forests in the Midwest and Northeast has become nearly impossible in many areas, because deer are devouring the next generation of trees. With YFH increasingly rare and invasive plants and pests expanding, foresters are faced with a serious challenge.

The difficulty of establishing healthy YFH (defined as 20 years or younger) has come to the forefront of policy because YFH comprises only 7 percent of each region's forestland. Maple/beech/birch and oak/hickory are the most prevalent forest-type groups in terms of acreage, but only 3 percent and 4 percent, respectively, is YFH. Such low percentages send up red flags for restoration efforts. It takes a lot of time to develop acceptable advance regeneration in these forests, and restorative prescription options, such as control of

overabundant invasive plants or building and maintaining an exclusion fence, are expensive. The issue is exacerbated because private owners control 72 percent of forestland, and these treatments are economically challenging for most of them.

### Browse Impact Monitoring

Monitoring results for large ungulate effects on forest regeneration were obtained using new measurement protocols covering regeneration and browse as part of the three-phase forest inventory conducted by US Forest Service's Forest Inventory and Analysis (FIA) branch. In Phase 3, data for a suite of enhanced ecological indicators are collected during the summer season. A regeneration indicator (RI) was added as a Phase 3 component in 2012 (McWilliams et al. 2015). The RI protocols include browse-impact severity evaluation and seedling measurements. (The core FIA national standard is to count all seedlings at least one foot tall.)

A team of specialists used the browse data to predict the probability of moderate or high impacts on regeneration (see Figure 1). The predictions are in the form of a visualization (visual display) of the

results. Moderate or high impacts signal to forest managers the need to consider site-specific conditions prior to making stand-regeneration prescriptions.

### What Is Revealed?

About 60 percent of the 182.4 million acres of forestland inventoried in the Northeast and Midwest were estimated to have moderate or high browse impacts. Ecological provinces of the Mid-Atlantic region ranked highest among ecological subdivisions, with 79 percent of the forestland in this region in these impact categories. The maple/beech/birch and oak/hickory forest-type groups were above average, with 65 percent and 69 percent, respectively, with moderate or high browse impacts.

Assessing trends in browse impacts across large areas is fraught with difficulties because such studies are typically too small in scale or limited to thematic results that lack detail and repeatability. One approach is to examine the earliest subcontinental-scale visualization and look for broad trends. In 1947, Aldo Leopold and others identified problem areas in the United States where overpopulation

of deer was likely to lead to overbrowsing (Figure 2). The concern was that plant species with little or no nutritive value would gain a competitive advantage.

Our new approach shows that areas of concern have expanded to Illinois, Indiana, Ohio, West Virginia, Maryland, Delaware, New Jersey, and the southern New England states. Comparing the Leopold map to the more-recent map (Figure 1) indicates that there are no areas where concern was reduced or disappeared entirely.

### What This Means for Restoration

These results were recently published in US Forest Service General Technical Report NRS-182. The report includes a review of the implications of browse impacts for managers attempting to restore YFH in areas under browse stress. The authors affirmed three broad realities for restoration management during the stand initiation phase:

1. The scope and persistence of herbivory has long-term, wide-ranging implications.
2. Less-palatable tree species will

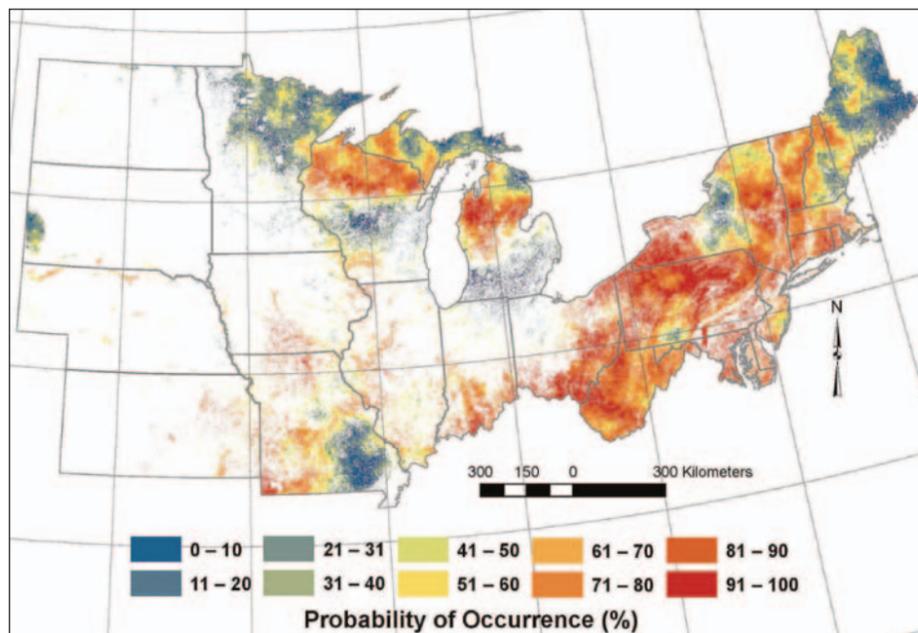


Figure 1. Probability of occurrence for moderate or high browse impacts on forest land, Midwest and Northeast, 2017.

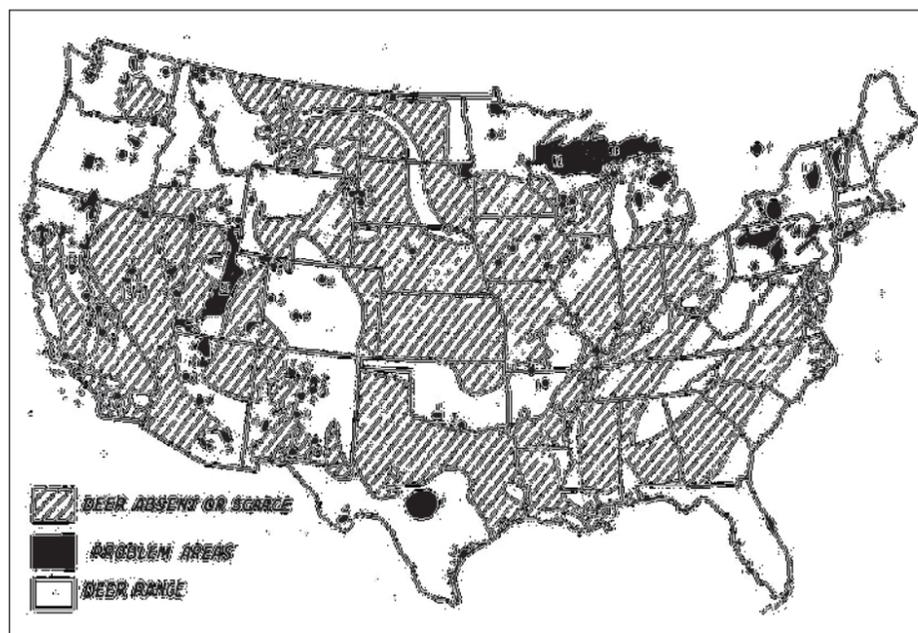


Figure 2. Areas with overpopulations of deer as of 1947 (Leopold et al. 1947). Numbers refer to case histories. Used with permission of Wiley Inc., with copyright retained by The Wildlife Society.

continue to have a competitive advantage during the regeneration phase and are likely to be different species from current canopy dominants.

3. Success will require more emphasis on ungulate-compatible prescriptions, novel approaches, and adaptive science.

The visualization and underlying data fill a critical information gap for policymakers and managers tasked with understanding where overbrowsing has obliterated habitat for young-forest obligate animal species and where regeneration needs to be better managed to restore high-canopy species. Opportunities for further research to better describe relationships across browse impacts, forest conditions, and regeneration security offer promise for helping to sustain forest values and services.

All of the data used in this study are publicly available from the FIA data portal, at [tinyurl.com/y78dw6g9](http://tinyurl.com/y78dw6g9). Copies of the full report can be ordered by visiting [www.nrs.fs.fed.us/pubs/](http://www.nrs.fs.fed.us/pubs/). **FS**

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### Letters to the Editor

Agree? Disagree? *The Forestry Source* welcomes letters to the editor. Send letters to Steve Wilent at [wilents@safnet.org](mailto:wilents@safnet.org) or 10100 Laureate Way, Bethesda, MD 20814.

## "It Looked like a War Zone." Recovery Efforts Underway after Typhoon Yutu

By Andrea Watts



On October 24, 2018, Super Typhoon Yutu slammed into the Northern Mariana Islands. The US Forest Service deployed an urban forest strike team to assist with the recovery efforts. Photographs courtesy of the US Forest Service Pacific Southwest Region 5.

With much of the country still focused on the damage assessments from Hurricane Michael, Super Typhoon Yutu's devastating effects upon the Commonwealth of the Northern Mariana Islands (CNMI) didn't receive much coverage. According to NASA's Earth Observatory, Super Typhoon Yutu tied Super Typhoon Mangkhut "as the strongest storm on Earth this year and is likely the strongest to make a direct hit on the Mariana Islands since modern record-keeping began." Wind sensors recorded maximum sustained winds of around 180 miles per hour.

CNMI is a commonwealth of the United States; it was the scene of a crucial battle between the US and Japan in World War II. Of its 14 islands, Saipan, Tinian, and Rota are where the majority of the population lives. Collectively across the CNMI, there is 60,206 acres of forestland, 4,000 acres of which are nonindustrial private forestland. I e-mailed Martin Pangelinan Jr., the state forester for CNMI, asking him to share the state of CNMI's forests after Super Typhoon Yutu and the recovery efforts underway.

#### What was the extent of the damage to the trees or forests? Did every neighborhood lose trees?

Our trees here in the CNMI suffered extensive damage from Super Typhoon Yutu. The islands of Saipan and Tinian were hit with 180-plus-mile-per-hour winds that almost wiped out everything in their path. Trees with weak root systems fell down or were uprooted due to the extreme winds and flying debris. After the storm, branches were nonexistent, and trunks were snapped off or twisted. Lush, green forests became bare, brown, naked trees.

Most neighborhoods lost a majority of [their] trees, but some are still standing.

#### What was your reaction to seeing the destruction?

I was devastated and speechless upon seeing the destruction. This was the worst typhoon our islands have encountered. When I walked outside my home after the 10-plus-hour storm, it was overwhelm-

ing to see the damage that Yutu caused. It looked like a war zone; it was almost like we were at war with Mother Nature, and we lost tremendously. Trees were broken in half or uprooted, power poles and lines were down and blocking roadways, and homes were torn or ripped apart.

#### What work did the US Forest Service urban strike team undertake?

The urban strike team played an important role in recovery efforts. They helped fill overhead positions, cleared debris, removed downed trees, and helped make primary roads accessible. We are thankful for their assistance.

#### Did some tree species survive the wind better than others?

From our general observation, we saw that some tree species survived the wind better than others. We noticed that trees smaller in diameter, such as the palm tree family (coconut trees), sustained less damage compared to the trees that are bigger in diameter, such as mango trees and pine trees. After some thought, it was clear that the Arecaceae family [palms] sustained the winds better because of the large number of roots that are secured into the ground, the flexible spine of the tree, and there are no branches that are widespread.

#### How will you proceed with reforestation efforts?

Our short-term goals are to thoroughly assess the damage to our trees throughout the islands and resupply our nursery with beneficial plants and trees for the CNMI. Our nursery and most of our equipment and supplies suffered damages from the storm. As a result of the damages, we do not have nursery stock available for the community. We plan to have a plant giveaway to our community to replace lost and/or damaged plants/trees. We will continue our mission and duties as CNMI Forestry.

Our long-term goals are to fully restore our forests and plant life in the hopes