

Forest Disturbances in a Changing Climate

SYNOPSIS / JULY 28, 2017 / BY JENNIFER HUSHAW

Wildfires, blowdowns, pests and other disturbance agents shape the character and composition of forest ecosystems. In a recent review, researchers noted that increases in the occurrence and severity of forest disturbance have been documented worldwide and they characterized global trends from hundreds of separate studies ([Seidl et al., 2017](#)).

Global Forest Disturbance Trends

Researchers synthesized results from over 670 studies (published since 1990) that assessed how forest disturbance changed in response to a change in climate. They focused on six disturbance agents (fire, drought, wind, snow and ice, insects, and pathogens) and evidence for direct, indirect, and interaction effects of climate change.

Direct effects are “unmediated impacts of climate variables on disturbance processes,” e.g. a change in frequency of drought.

Indirect effects are “a climate influence on disturbance through effects on vegetation and other ecosystem processes,” e.g. climate-mediated changes in forest structure that alter susceptibility to wind throw.

Interaction effects are “linked or compounding relationships between disturbance agents,” e.g. increased risk of bark beetle outbreaks due to drought.

TAKE HOMES

Climate Shapes

Disturbance Regimes

- Temperature was more influential nearer the poles, while water availability was more influential further from the poles.
- Interaction between agents tended to increase disturbance – posing an increased risk of crossing ecological tipping points.
- Indirect climate effects commonly had a dampening influence by reducing ecosystem vulnerability to disturbance over the long-term.
- It can take years to centuries for the disturbance regime to respond to a change in climate. Interaction effects had the most immediate impact and indirect effects were most delayed.

Forest Disturbance Likely to Increase in the Future

- Recently documented increases in disturbance are “likely to continue in the coming decades as climate warms further.”
- Disturbance activity will increase in all biomes and more for conifer forests than broadleaved and mixed forest types.
- Overall, disturbances from fire, drought, wind, insects, and pathogens are likely to ↑, while disturbances from snow and ice are likely to ↓.
- Under *warmer and drier* conditions, most studies show: ↑ fire, ↑ drought, ↑ insect activity
- Under *warmer and wetter* conditions, most studies show: ↑ wind & ↑ pathogen disturbance

Things to Do

MANAGEMENT

Forest management can ameliorate negative impacts, by actively promoting the characteristics of resilient forests and shifting species composition, stand density, etc. in a way that ensures damage is minimized when disturbance (inevitably) happens. Examples include...

- [Building wind firmness](#) in older and developing stands to minimize damage from wind and ice.
- [Increasing resilience to future drought](#) by promoting regeneration of drought-tolerant species and thinning to reduce stand density.
- [Reducing fuel loads and forest density](#) to decrease wildfire risk.

MONITORING

It will also be increasingly important to monitor changes in disturbance regimes, such as those outlined in the Seidl et al. (2017) study. We are addressing this need through the [Resiliency Assessment Framework](#), which is currently under development. Disturbance is a major category of information that will be collected, along with forests, climate, and operations. [See full bulletin for [example research questions and monitoring metrics](#).]

Click on the sub-headings above to go directly to the corresponding section of the full bulletin, or read the complete bulletin online: <http://climatesmartnetwork.org/2017/07/forest-disturbances-in-a-changing-climate/>