

Climate Change & Forest Productivity

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Research suggests climate change will affect the productivity of our forests, in addition to the abundance and distribution of tree species.

Productivity & Site Index

Site index is a measure of potential productivity defined as the average total height that dominant and co-dominant trees attain at a specified base age in even-aged stands. Despite its limitations, particularly in regions dominated by mixed species even-aged stands, it is a common metric that does have utility.

Study Overview

In a recent study ([Jiang et al. 2015](#)), researchers successfully predicted current site index (base age 50) for 20 tree species (as well as hardwoods and conifers generally) across the eastern US using 15 soil and 37 climate variables, then used those site index models to estimate how things would change under a range of future climate conditions.

Note: See the full bulletin for more detail on methods and additional results. For a similar analysis in the western US, see [Weiskittel et al \(2011\)](#).

Click on the sub-headings to go to the corresponding section of the full bulletin, or read the complete bulletin online:
<http://climatesmartnetwork.org/2016/06/climate-change-forest-productivity/>

Key Findings

- There was a significant *increase* in average site index for conifers (+0.5 to +2.4m) and a significant *decrease* in average site index for hardwoods (up to -1.7m) over the 21st century.
- Variables important for changes in site index:
 - Ratio of growing-degree-days to summer precipitation
 - Start and length of the frost-free season
 - Average and accumulated growing-season temperatures
 - Changes in moisture index or summer temperatures in combination with changes in midwinter ambient temperatures
- Under low future emissions, more areas showed an increase in site index and fewer areas showed a decrease, whereas the higher emissions scenarios showed the opposite—suggesting an overall benefit for forest productivity under moderate warming that disappears at higher levels.

Conclusion

Results highlight that the forest response can be very different depending on the rate and level of warming, which suggests forest managers may want to keep their eye on those trends and potentially shift the mix toward species projected to experience increased productivity. This is an on-going area of research we will continue to monitor.