

# Large Old Tree Declines at Broad Scales: A More Complicated Story

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## Keywords

Broad scale; Europe; forest inventory; large trees; old forest; Sweden; United States.

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## Received

1 September 2013

## Accepted

17 October 2013

## Editor

Andrew Knight

doi: 10.1111/conl.12075

Lindenmayer *et al.* (2013) contend that large old trees are “undergoing major declines in a wide range of ecosystems worldwide” and “will vanish” from many systems without changes in policy. Although, I agree that these organisms have high ecological and conservation value and are in decline in some areas, data from national and continent-wide forest inventories suggest a more complicated story of large old tree dynamics at broad scales.

In the European boreal forest, the Swedish National Forest Inventory (SNFI) reports that percentage of area in old forest (>121 years) declined from 18% in 1926 to 13% in 2009, but that volume of large trees ( $\geq 45$  cm DBH) /forest area increased sixfold during the same time period (Swedish University of Agricultural Sciences 2013). Number of the largest trees ( $\geq 60$  cm DBH) was 238% higher in 2010 than in 1985 (Swedish Forest Agency 2013). Large trees also appear not to be declining in many European temperate forests according to Forest Europe (2013). Four out of five countries (Spain, Hungary, Italy, and Switzerland) for which there were data reported larger growing stocks above 60 cm diameter in uneven-aged forests in 2010 than in 1990.

In temperate forests of North America, the United States Forest Service Inventory (USFIA) reports relatively

small declines in large tree ( $\geq 73.7$  cm DBH) volume in two forest regions and large increases in two other regions (Oswalt *et al.* 2013). Estimates of large tree volume/timberland area in the Pacific Coast region (4 states) were greater in 1953 than in 2012 by a factor of 1.4, but volume estimates trended upward over the past 25 years. In the Rocky Mountains region (12 states), large tree volume/area was marginally higher in 1953 than in 2012 (by a factor of 1.06). Across the Eastern Deciduous Forest, however, estimates of large tree volume/timberland area were much higher in 2012 than in 1953—sixfold in the 20 states of the Northern region and fivefold in the 13 states of the Southern region.

I acknowledge that the USFIA, SNFI, and Forest Europe do not address large old tree declines in nonforested areas, which the authors discuss in detail. However, the inventories raise questions about the extent to which large old tree populations are in decline at broad scales in the world's forests. Fragmentation, disease/insects, drought, harvesting, and fire can seriously impact large old trees (Lindenmayer *et al.* 2013); however, such disturbances can be offset by continuous forest growth and recovery from past disturbances at large scales (Thompson *et al.* 2011).

Several long-term studies in tropical forests report recent increases in large trees or forest biomass (Fashing *et al.* 2004; Laurance *et al.* 2004; Lewis *et al.* 2009). The authors themselves acknowledge that large old trees may be increasing in undisturbed tropical forests because of higher growth rates, perhaps from elevated carbon dioxide levels (Lindenmayer *et al.* 2012). Data from other national and biome-scale inventories could further inform discussions of large old tree dynamics in tropical forests and other ecosystems of the world.

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