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A Basis for Understanding Responses to Global Change

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Long-Term Trends in Ecological Systems:

A Basis for Understanding Responses to Global Change

Debra P.C. Peters, Christine M. Laney, Ariel E. Lugo, Scott L. Collins, Charles T. Driscoll, Peter M. Groffman, J. Morgan Grove, Alan K. Knapp, Timothy K. Kratz, Mark D. Ohman, Robert B. Waide, and Jin Yao

Coweeta (CWT) [USFS, LTER]

http://coweeta.ecology.uga.edu/

The Coweeta Hydrologic Laboratory (CWT), a USDA Forest Service Research Station, was established in 1934 as a testing ground for certain theories in forest hydrology; it was established as an LTER site in 1980. The site is located in the Nantahala Mountain Range of western North Carolina, and consists of two adjacent east-facing, bowl-shaped basins. Coweeta Basin (1,626 ha) is the primary site for watershed experimentation, and Dryman Fork Basin (559 ha) is held in reserve for future studies.

The climate is humid subtropical at the lowest elevations and marine humid temperate at the higher elevations. Winters and summers are mild; there is little snowfall, and summer days with temperatures exceeding 30 °C are rare. Rainfall is evenly distributed throughout the year, with considerable spatial variability related to elevation and latitude. Precipitation generally increases about 5 percent per 100 m of elevation gain along an east-west axis. The dominant vegetation is temperate deciduous forest (figure A1-19), although the intermixing of "northern" and "southern" taxa results in one of the most biodiverse regions of North America.

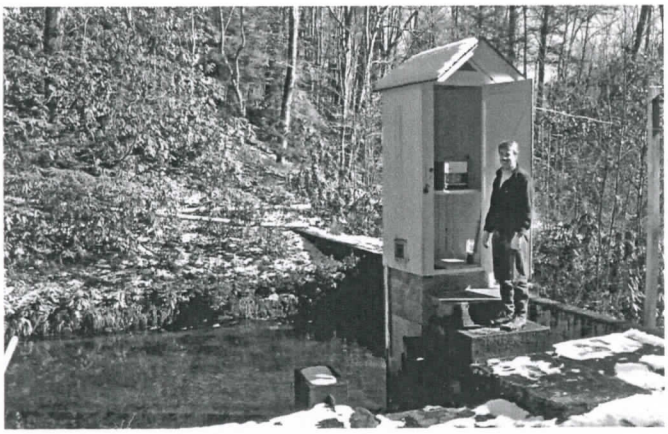

Figure A1-19. Temperate deciduous forest is the dominant vegetation at the Coweeta Long Term Ecological Research (CWT USFS/LTER) site in western North Carolina. (Photo from CWT photo gallery.)

Research focus. CWT research has contributed to the growing understanding of how human practices can influence forest and stream ecosystems at numerous scales. For example, bottom-up effects of nutrient enrichment in a detritus-based ecosystem can stimulate whole-community production and cause large changes in carbon balance and consumer productivity. These changes have important implications for the contemporary die-off of eastern hemlock *(Tsuga canadensis)* from the infestation by the hemlock woolly adelgid *(Adelges tsugae)*. The CWT LTER project has achieved an understanding of complex interactions between environmental gradients, disturbance, and land use that underpin the transformation of the Old South into the "New South" in ways that can accommodate the growing demand on research to provide solutions for environment and society.

Long-term research example. Research from CWT shows the importance of monitoring large numbers of individual trees and of measuring trees over long periods. Individual trees have been measured over time to estimate growth (figure A1-20). Both red maple and white pine trees show wide variation in growth of the basal area of the trunk through time. Some trees grow very little from one year to the next, whereas other trees of the same species located nearby show high growth rates. Thus, growth rates may be related to fine-scale variation in environmental conditions (such as soil properties) and within-species genetic variability rather than broad-scale climatic conditions.

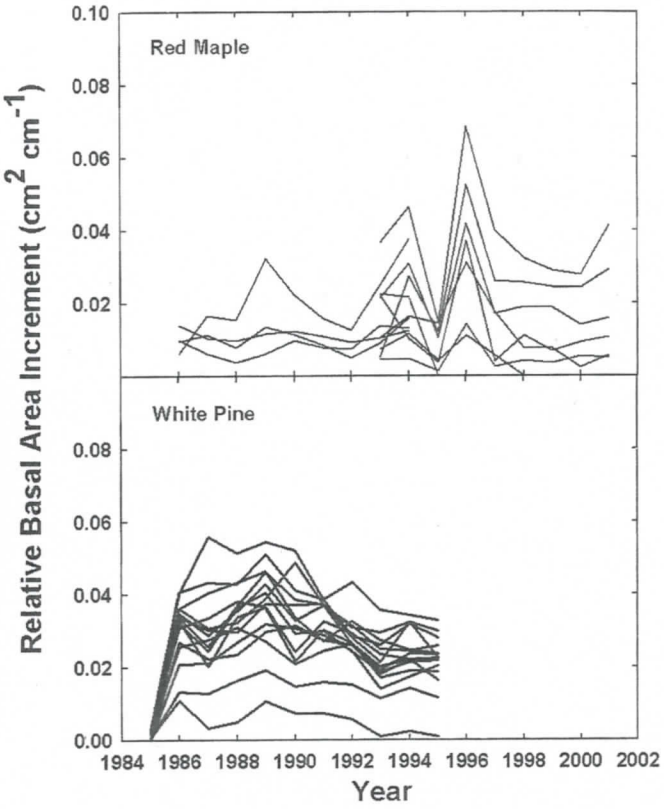

Figure A1-20. The relative basal area increment (cm^2 tree growth per cm tree diameter) of two selected species at Coweeta (CWT). Each connected line represents a single tree over the measurement period. The deciduous red maple *(Acer rubrum)* and the evergreen white pine *(Pinus strobus)* exhibit wide variation of relative basal area increment between trees (Kloeppel et al. 2003). Reprinted with permission from Oxford University Press.