Using tree rings to estimate the annual carbon sequestration of hardwood floodplain forests along the Middle Elbe

Heather Shupe, Kai Jensen, and Kristin Ludewig
Universität Hamburg, Universität Hamburg, Applied plant ecology, Hamburg, Germany (heather.shupe@gmail.com)

Anthropogenic land use and landscape change has dramatically decreased the presence of hardwood floodplain forests (HFF) globally. In Germany, it is estimated that only 1% of the former HFFs still exist today. Natural HFFs provide an abundance of ecosystem services such as the mitigation of climate change through the sequestration of atmospheric carbon. In order to confidently quantify global carbon fluxes, local in-situ investigations are required. This research aims to quantify and compare carbon sequestration rates (CSRs) of temperate HFFs at a local scale. Traditional dendrochronological methods are applied to tree cores collected from oak (Quercus robur) and elm (Ulmus laevis) trees located within 35 HFF plots differing in age classes and hydrological situations along 100 km of the Middle Elbe river. Tree ring widths (TRW) from both tree species are measured and used to estimate basal area increments (BAI) and CSRs. Preliminary results show that CSRs are higher in oaks than in elms. While CSRs seem not to differ between hydrological situations in trees with ages between 60 and 150 years, we found pronounced effects of hydrological conditions on CSRs in the oldest trees (> 180 years). Interestingly, highest mean CSRs were found for old trees in regularly flooded HFF with a dense canopy cover. These results are in agreement with recent research that have overturned the old paradigm that old forests are less productive than young forests. We conclude that HFFs remain active carbon sinks as they age and that the preservation or even expansion of HFFs can contribute to other global strategies for climate change mitigation.