Simulating the Forest of the Future: Real-Time Decision Support for Site-Specific Adaptation

Ulrike Hiltner[1,2], Jonas Glatthorn[3], Andreas Keberer[4], Harald Bugmann[1]

1 Chair of Forest Ecology, Department of Environmental Systems Science, ETH Zürich, Switzerland

2 Group of Silviculture, Department of Environmental Systems Science, ETH Zürich, Switzerland

3 Swiss Federal Institute for Forest, Snow and Landscape Research WSL, Birmensdorf, Switzerland
4 WeValCo GmbH, Oberasbach, Germany

Abstract: The forestry decisions made today will determine the landscape for decades to come. However, practitioners often lack the tools necessary to assess how their specific stands will react to novel climate regimes. Although the scientific community has powerful process-based models that can project drought stress and species dynamics, these tools rarely leave the academic realm due to their complexity and data requirements.

This presentation introduces the ForClim app, a solution for operationalizing ecosystem modeling. This tool uses a machine-learning "Translator" framework that enables forest managers to instantly convert basic inventory data into high-resolution model inputs. It enables real-time simulation of forest dynamics, including volume trajectories, species composition shifts, and stability metrics, under various climate scenarios (RCP 4.5/8.5). By shifting from static decision support concepts like yield tables to dynamic, site-specific simulations, we equip stakeholders to evaluate their management strategies in the face of future uncertainty. Finally, I will discuss the next phase of our research, ProForest-DSS, which aims to couple these dynamic simulations with formal decision support methods to help stakeholders navigate the trade-offs of adaptive management.