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to obtain the academic degree
Doctor of Science (Dr. rer. nat.)
approved dissertation

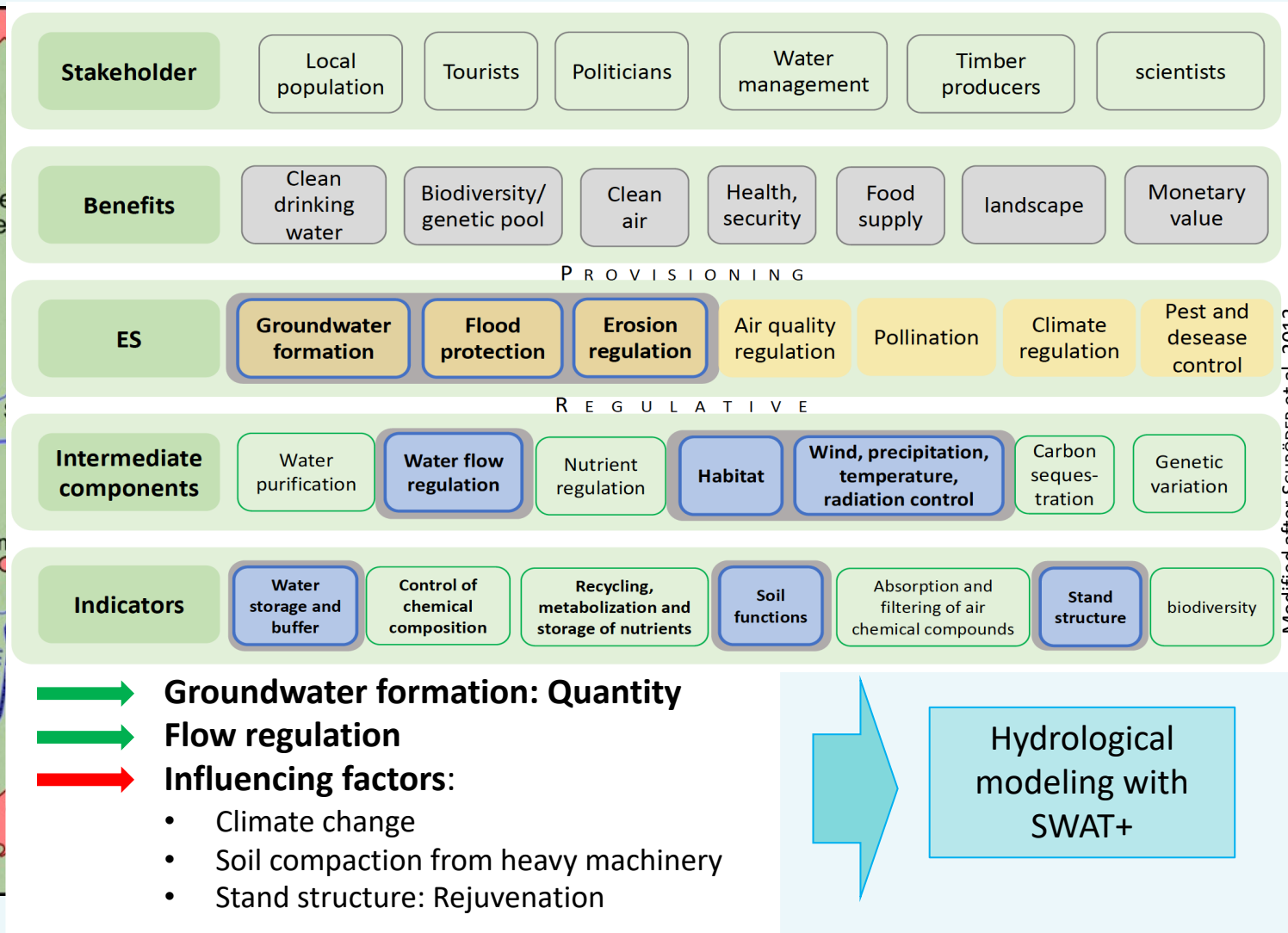
ANALYSIS OF FOREST-SPECIFIC ECOSYSTEM SERVICES WITH REGARD TO WATER BALANCE COMPONENTS: RUNOFF AND GROUNDWATER RECHARGE IN THE FOREST

by

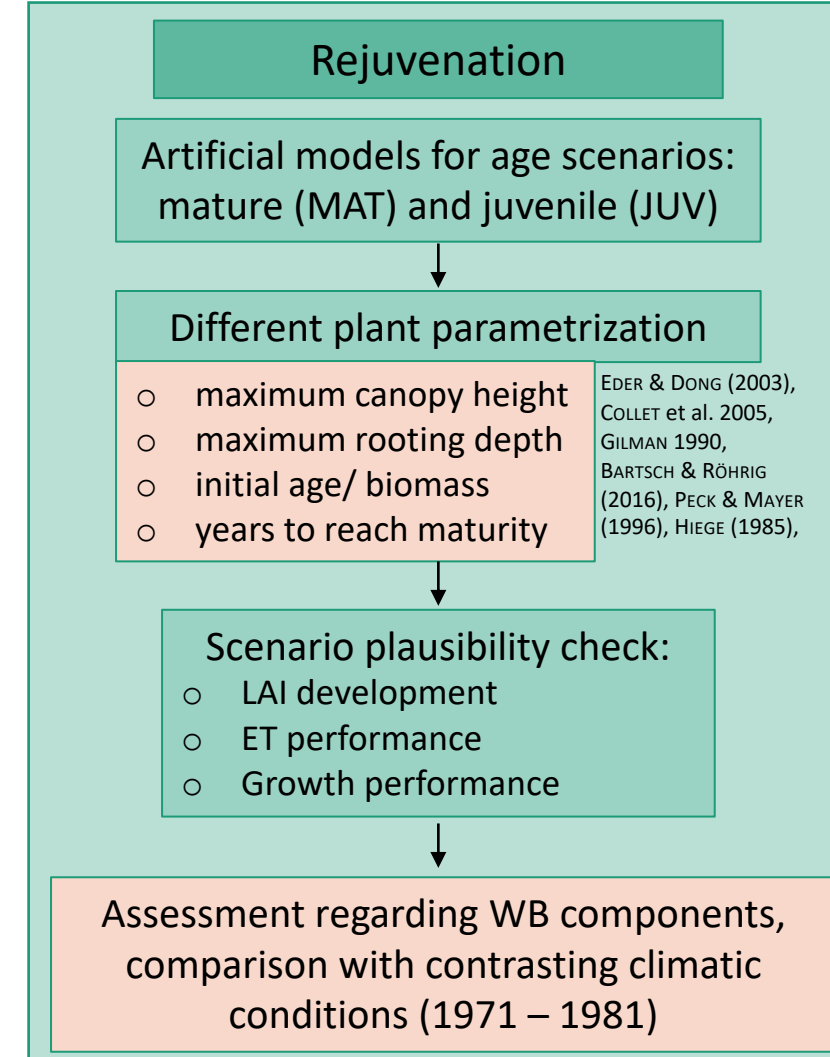
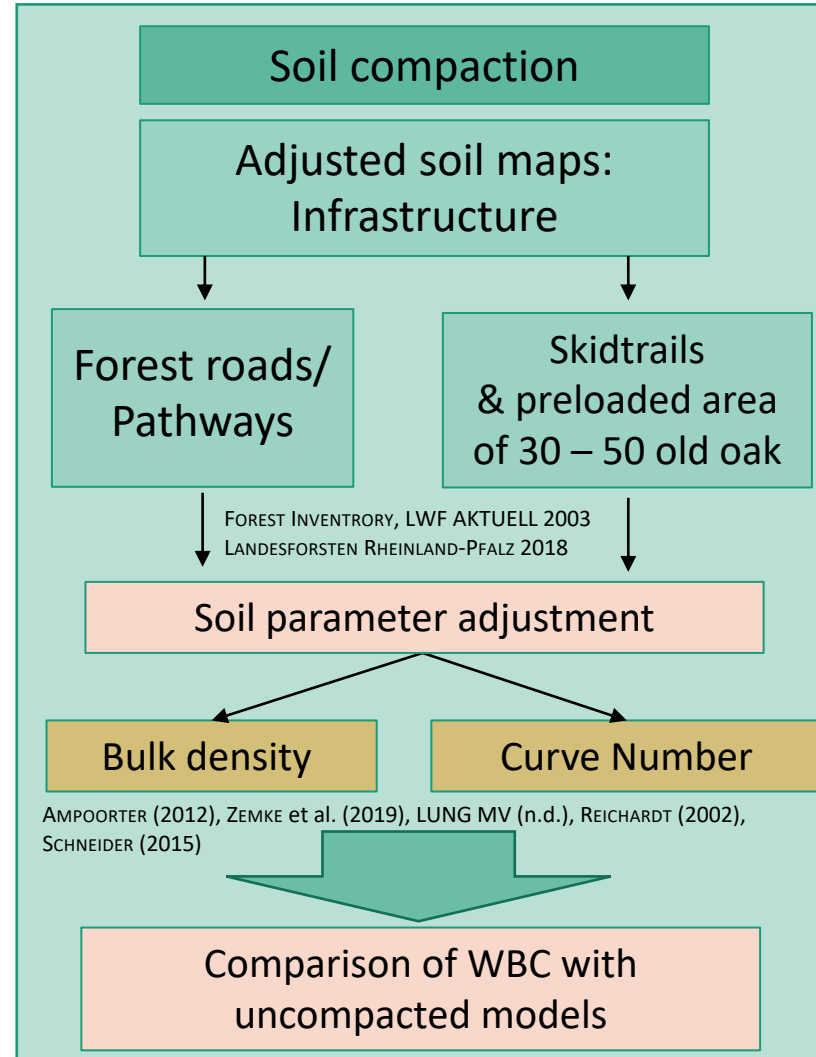
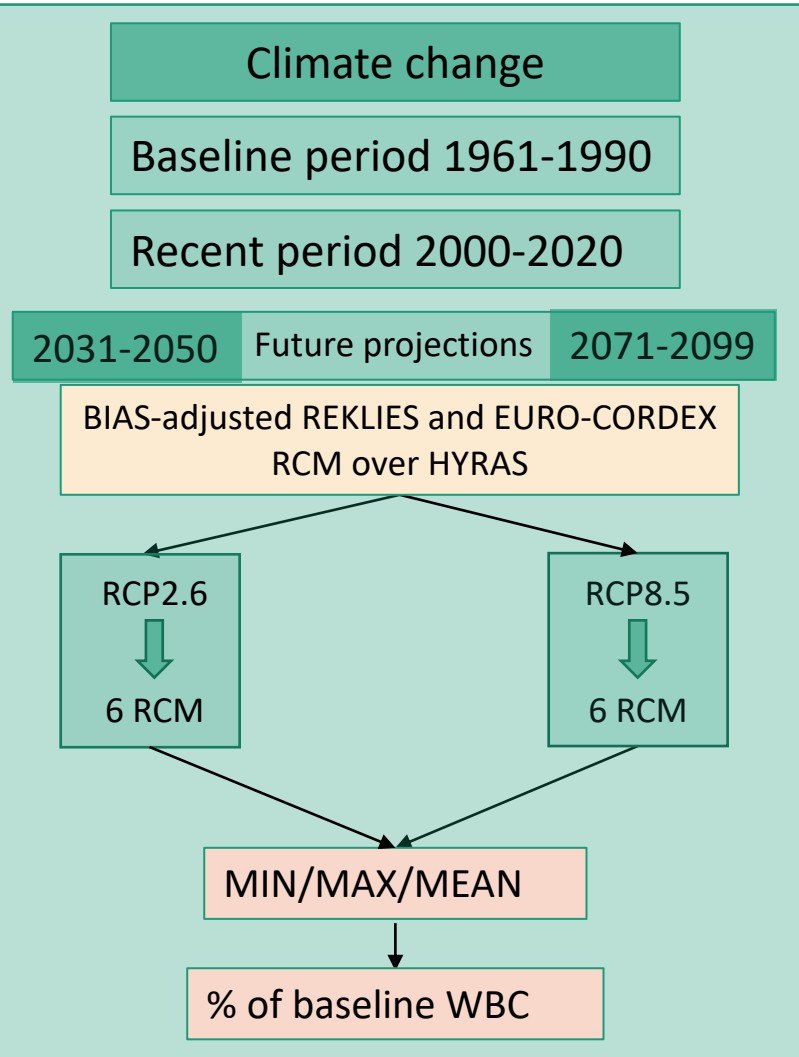
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Introduction: Water-related Ecosystem Services (ES) of the forest



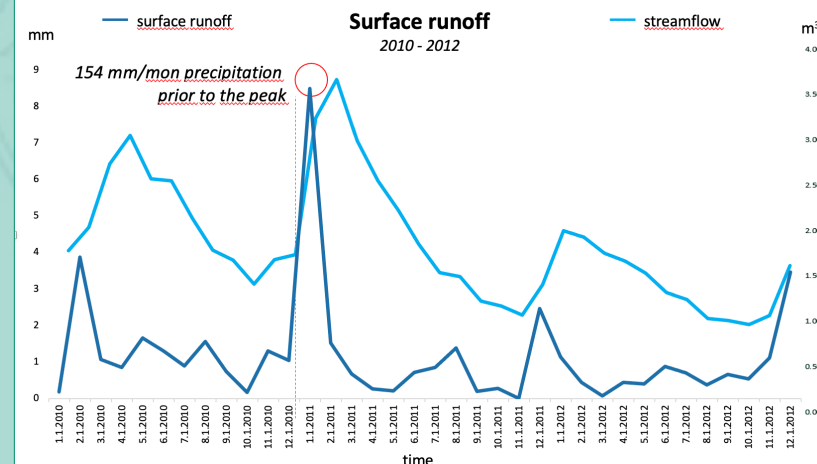
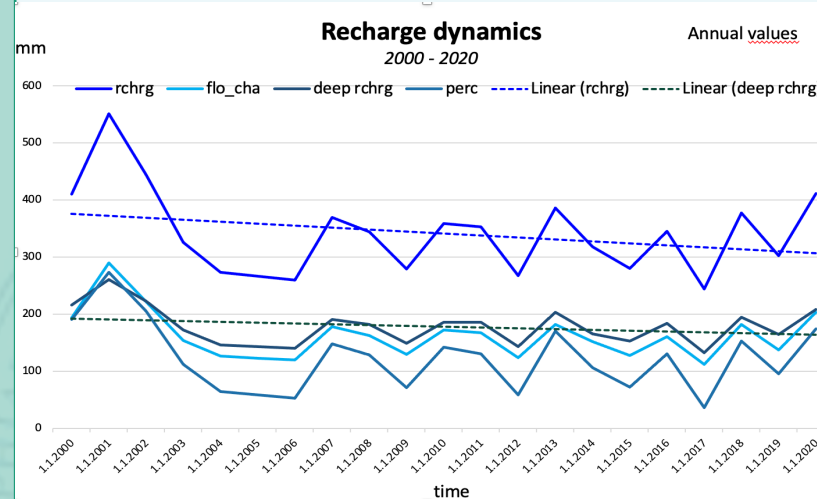
Modified after SCHRÖDER et al. 2012



Water balance

Parameter	Water balance 2000-2020	
	mm/aa	% of baseline
Precipitation	821	-30
Actual ET	635	-10
Surface runoff	12.5	-60
GW recharge	177	-37

- High GW recharge amounts: favorable retention function (soil/geology, land use)
- Falling trends in Precip, GW, soil wetness, percolation, surface runoff since 2000
- Low overland flow volumes due to favorable retention function
- Short circuit drain reaction with elevated precipitation amounts



Indicators

- Adjustable to catchment conditions
- Depictable in model

Intermediate components

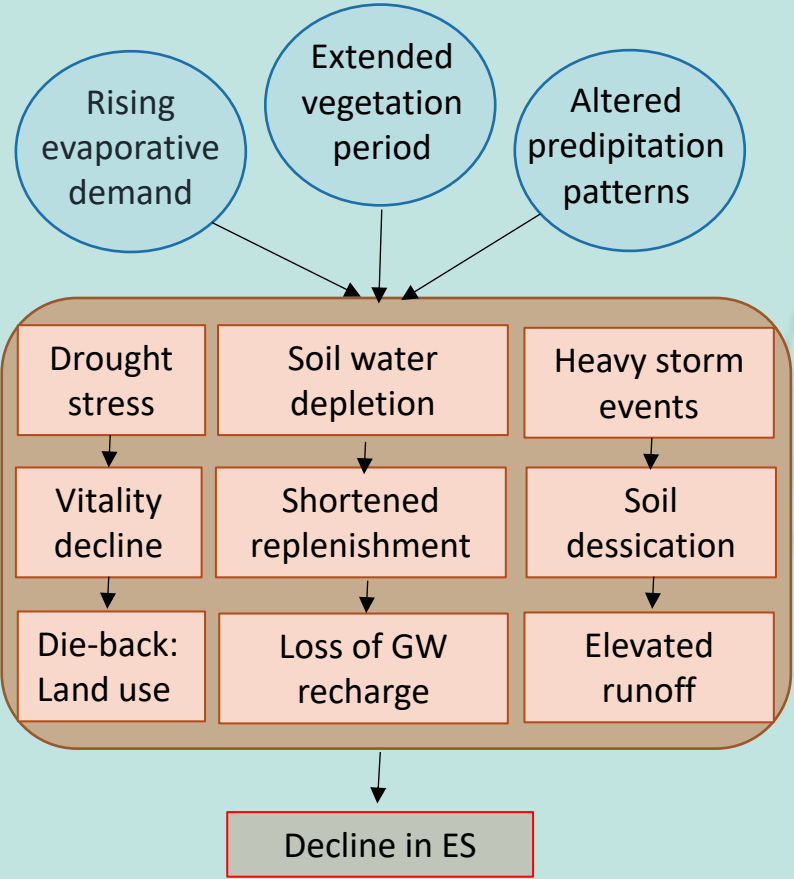
- Sensitive character of forest-water-cycle-interactions

ES

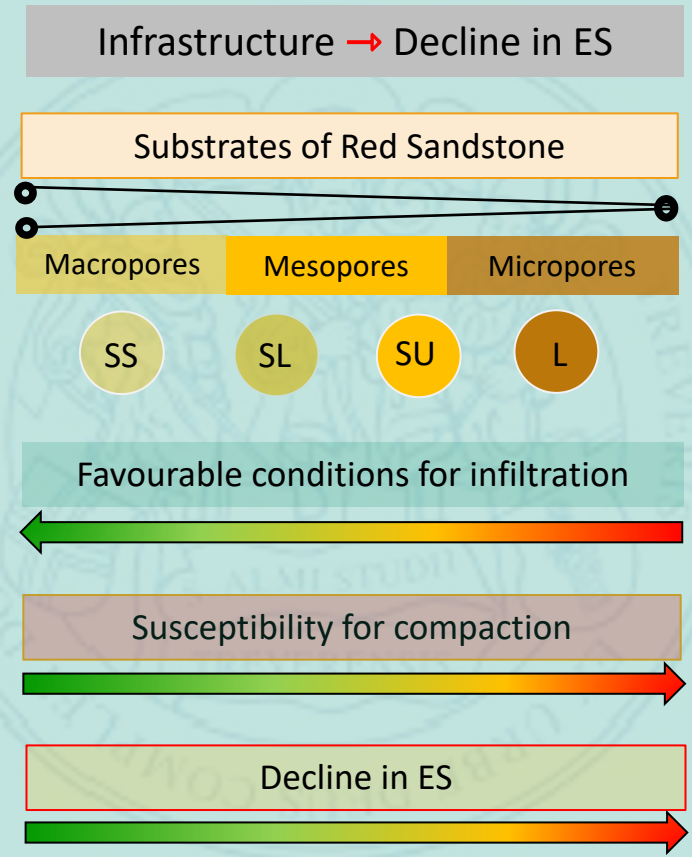
- Favorable conditions: for groundwater formation, and mitigation of overland flow

- Sensitive to stressors
- Susceptible to functional changes/loss
- Short circuit drain reaction

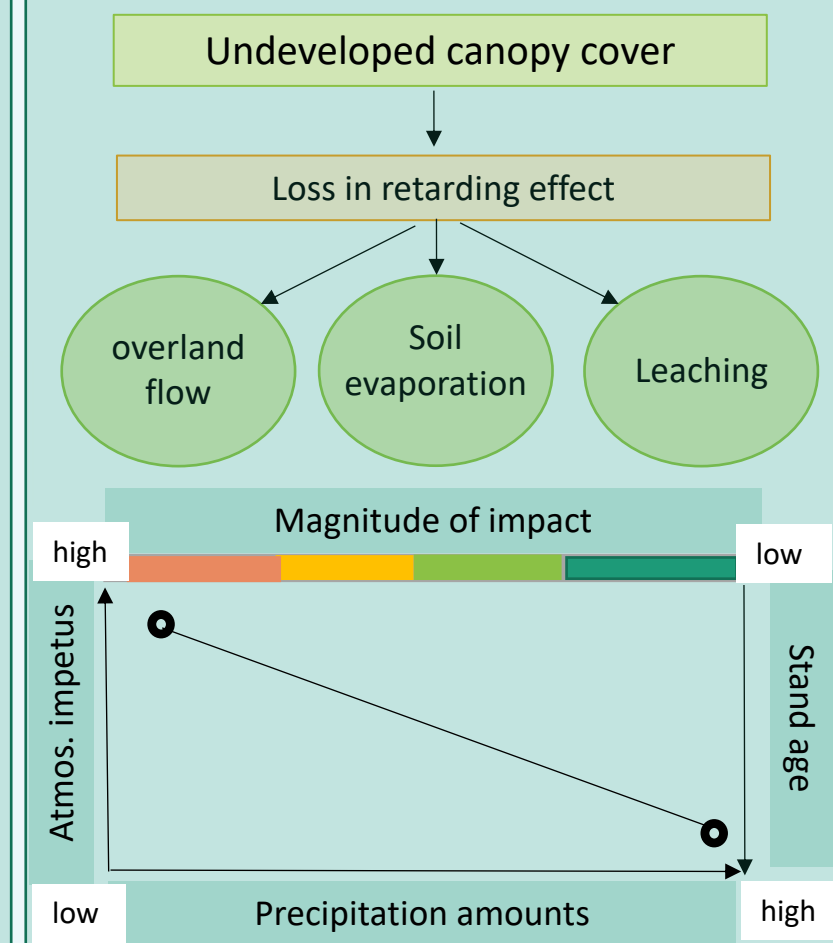
Climate Change



Soil Compaction



Rejuvenation



- Adaptation of tree species composition (isohydr. species, litter)
- Preservation of the forest interior climate (stand structure)
- Increase retention potential
- Improvement hydrologic effectiveness (stand structure)
- Rejuvenation of bare fallen areas
- Adaptation of road network: redrainage into stocks, increase in retention potential
- Skid-trails: Redraining measures, identification of CSA
- Minimize traffic intensities based on vulnerability maps (substrate, previous load, slope >20%)



Thank you for your attention

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