

Dynamics of non-structural carbohydrates (NSC) and radial rays in the stem sapwood of *Pinus sylvestris* to drought and long-term irrigation

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Data



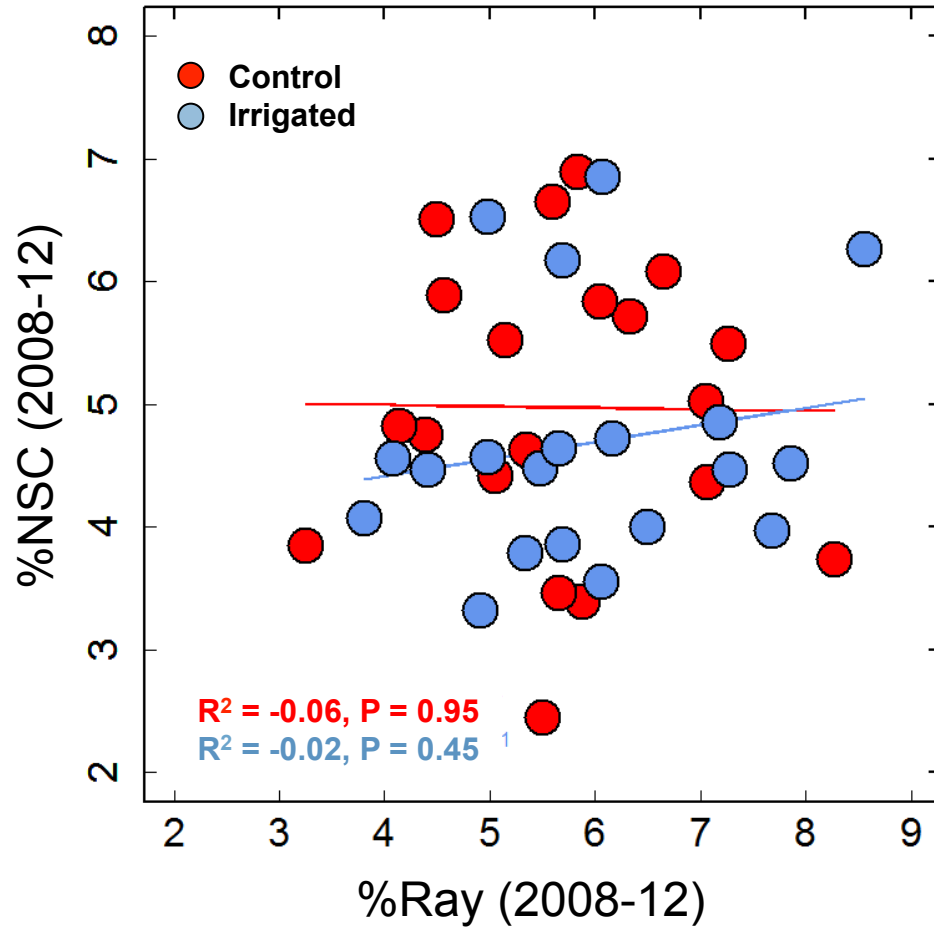
Sampling

- 20 mature trees of average health per treatment
- 4×5-mm cores for NSC analysis (March 2013)
- 1×10-mm core for ray analysis

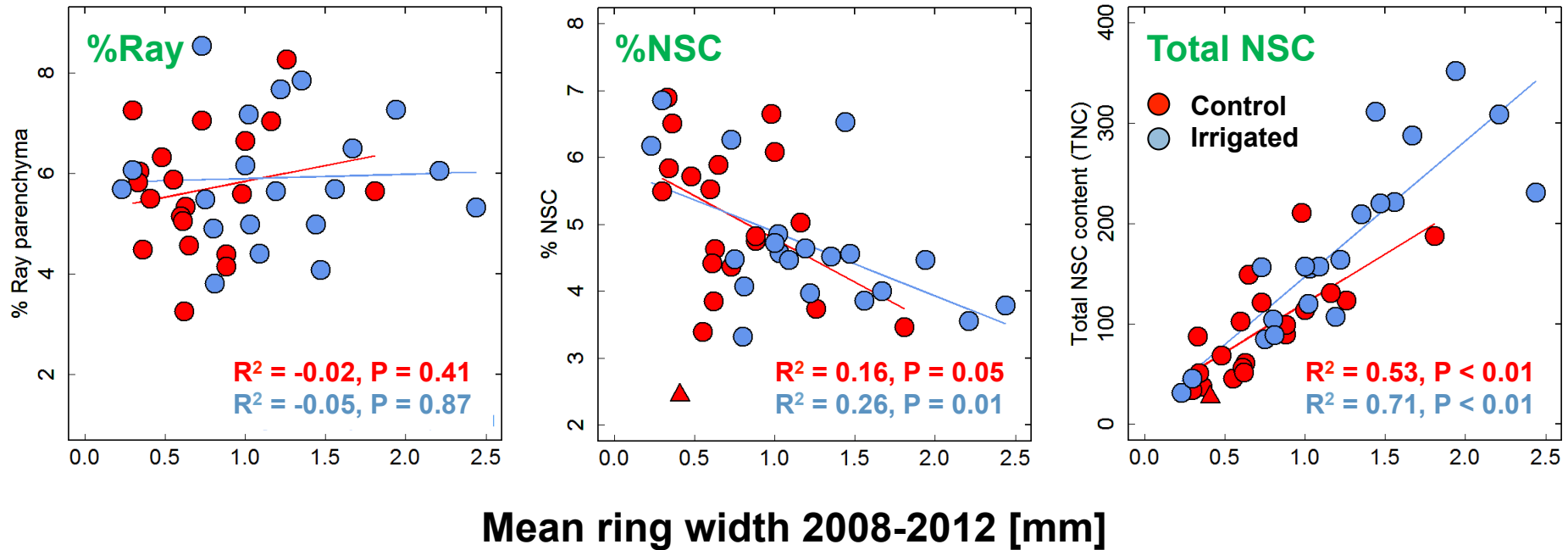
Analysis

- 5 sapwood blocks: 4×5-yr in outer & remaining inner sapwood
- RW, % **NSC** (all, soluble, insol.), % **ray** surface

%Ray is not limiting %NSC!



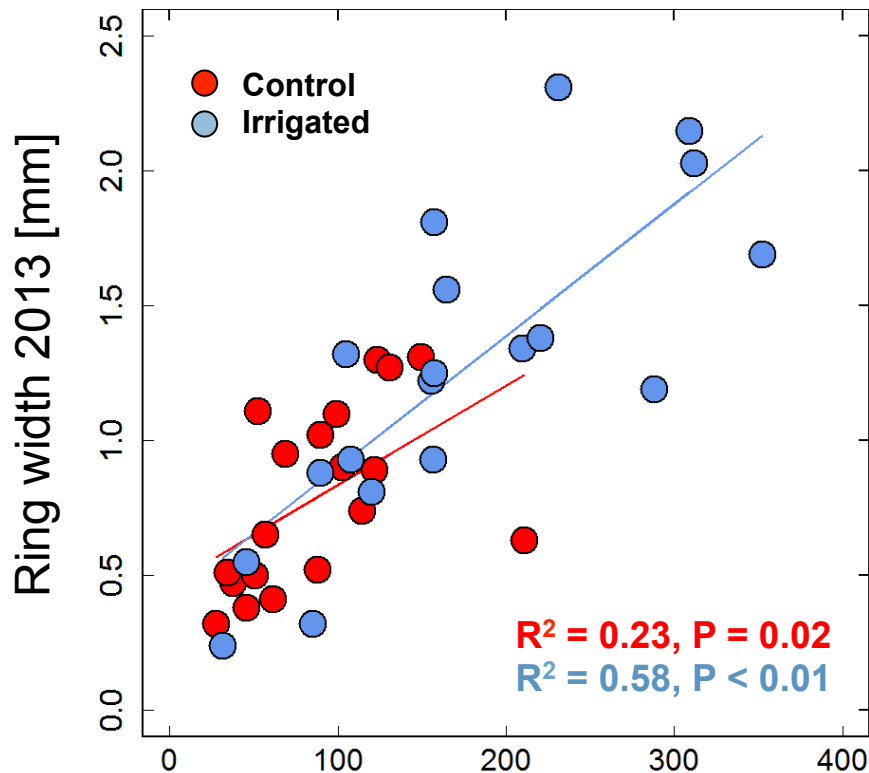
Do % Ray and NSC depend on RW and treatment?



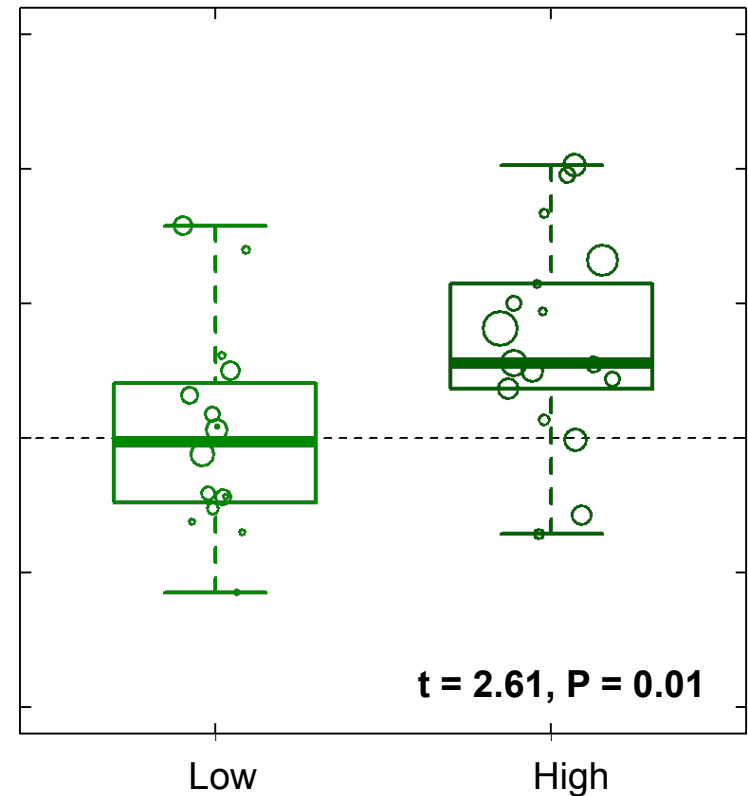
No.

%NSC decreased with increasing ring width, but Total NSC in wider rings was still larger because of the additional tissue.

Larger NSC pool promotes future growth



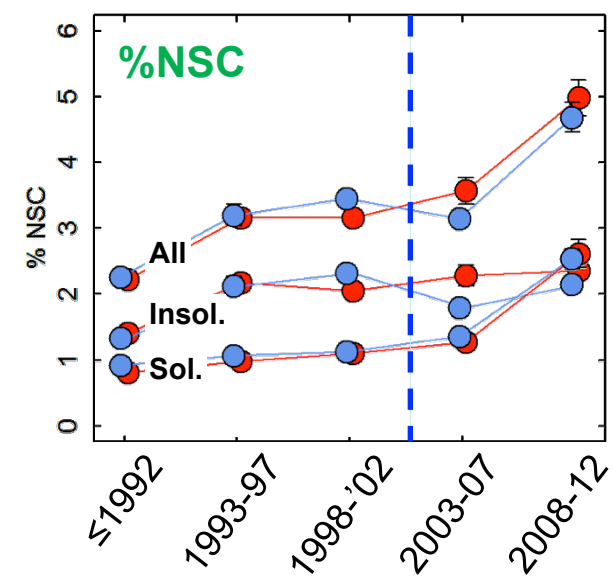
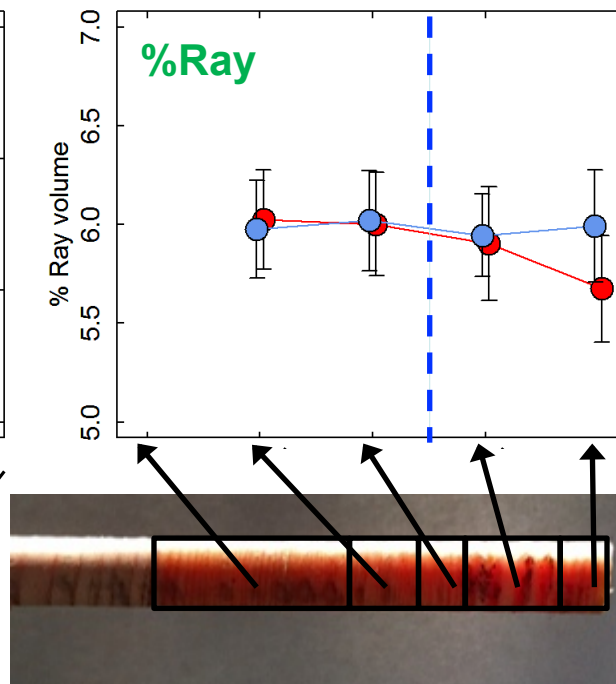
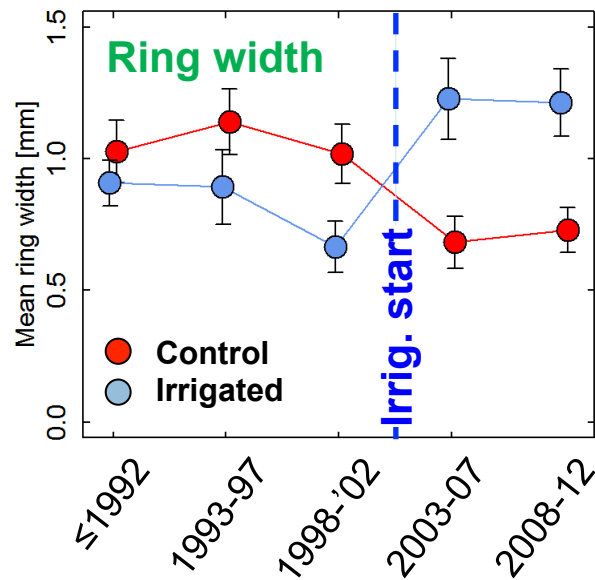
Total NSC (2008-12)



Total NSC (2008-12) in RW classes

Total NSC determined ring width in the next year, even when controlling for the previous years' growth.

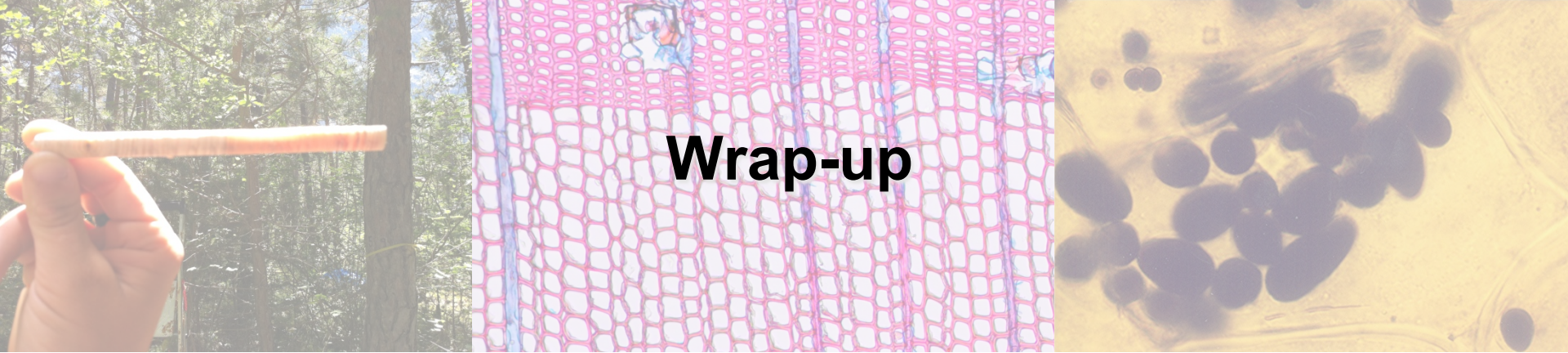
Radial profiles across the sapwood



Irrigation stimulated growth

Increased ambient dryness tended to reduce %Ray with a 5-yr lag

- %NSC highest close to bark
- Divergent gradients for sol. / insol. NSC

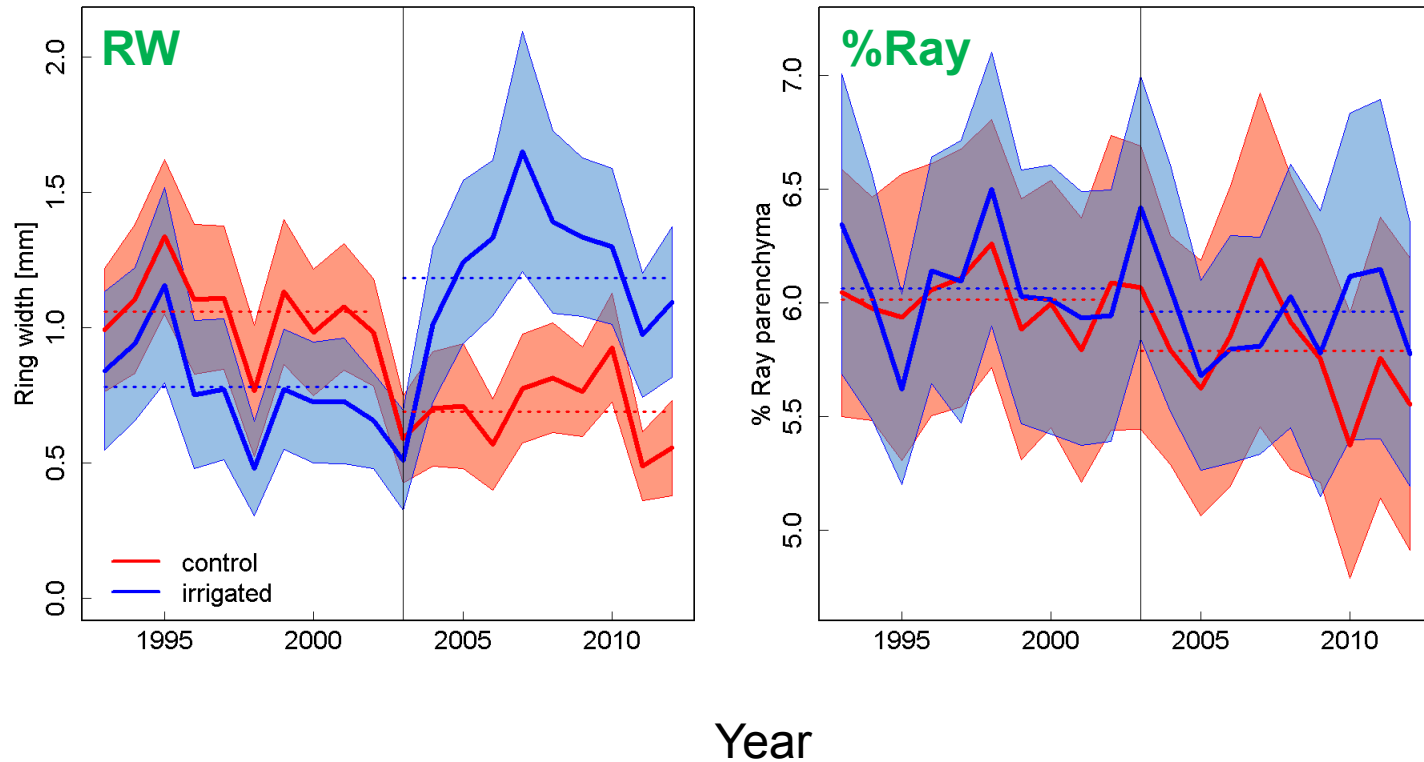


- (1) The amount of **ray parenchyma** in the stem sapwood of Scots pine responds to changes in general growth conditions only with **large delay**, if at all, and is **not limiting NSC storage**
- (2) The more vigorous Scots pine trees allocated relatively more NSC into ring growth than storage while still increasing their NSC pool.
=> short-term competitive ability & long-term resilience
- (3) The positive relationship between NSC pool and future ring width may represent a physiological basis for **auto-correlation in tree-ring growth**
- (4) **Favoring NSC storage over growth** to ensure long-term survival in suffering trees?

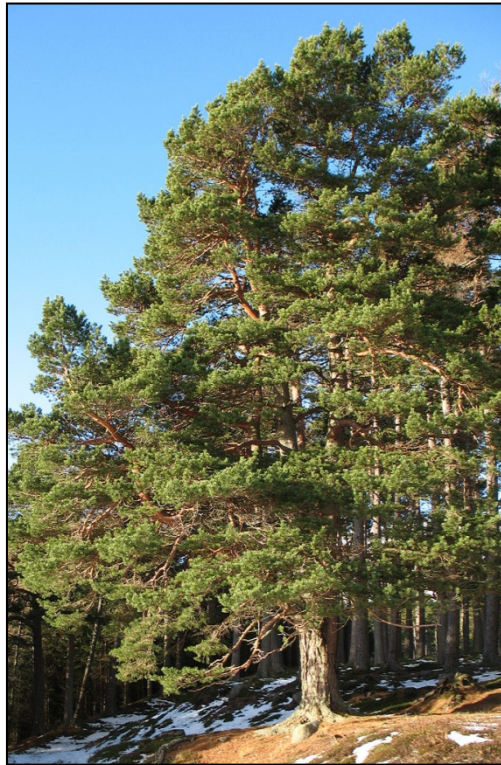
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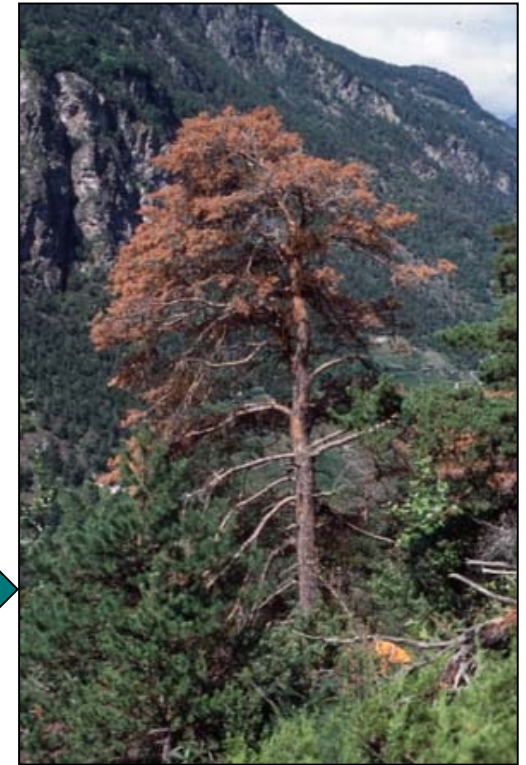
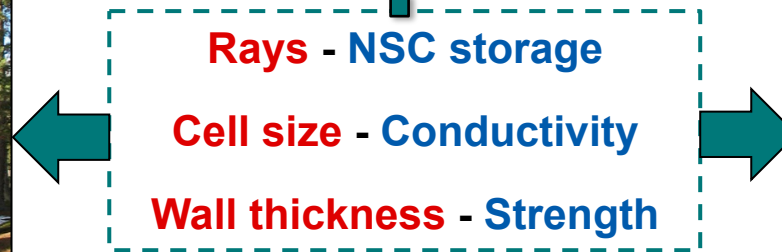
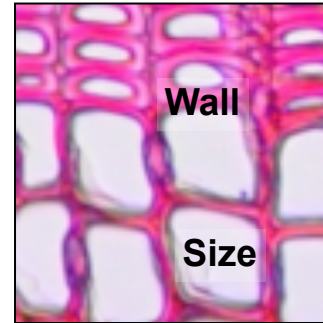
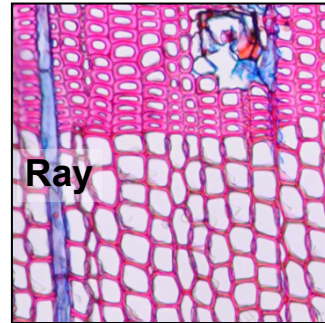
20-year time series of RW and % Ray



Structure-function relationship in the stem xylem related to the water and carbon cycle



Vigorous



Dying